

PacifiCorp
Draft RFP 2009
Responses due December 1, 2005

**RFP 2009
ATTACHMENT 7
LAKE SIDE APSA
RIGHTS AND FACILITIES
September 2005**

**ATTACHMENT 7
LAKE SIDE RIGHTS AND FACILITIES
PPA AND TSA BIDDERS ONLY**

Easements

PacifiCorp will grant a non-exclusive easement on PacifiCorp's property between Bidder's switchyard to the new 345kV substation serving Bidder's Facility. Easement will be determined based on Bidder's routing of Bidder's cable.

PacifiCorp will grant a non-exclusive easement to allow for the connection of Bidder's Facility to a natural gas supply line located on PacifiCorp property, if required. As an alternative, PacifiCorp, in its sole discretion, may convey such property as required for Bidder's natural gas pipeline and metering station to Bidder as part of the Site Purchase Agreement for Lake Side shown as Attachment 19 to this RFP. Specific details of the interconnection are provided in Appendix B to the APSA.

Water Rights

PacifiCorp does not hold any Water Rights that can be acquired by the Bidder. Bidder will be responsible for acquiring such rights.

Emission Reduction Credits (ERCs)

PacifiCorp has ERCs that can be acquired by the Bidder. Pricing is shown in the Site Purchase Agreement for Lake Side. The available Utah County ERCs are (in tons):

PM-10	46.8
SO ₂	4.6
NO _x	22.4

Bidder is responsible for obtaining all ERCs necessary for the operation of the Project.

Facilities Interconnections

Bidder will be entitled to connect, at its own expense with PacifiCorp's raw water connection as specified in Appendix B to the APSA. Supply is limited to water used for construction purposes.

Bidder will acquire, under the Site Purchase Agreement for Lake Side (Attachment 16), rights to one half of the currently available capacity contracted for by PacifiCorp from Questar. Terms of this contract are to be found in the Site Purchase Agreement.

RFP 2009
ATTACHMENT 8
CURRENT CREEK APSA
RIGHTS AND FACILITIES
September 2005

PacifiCorp
Draft RFP 2009
Responses due December 1, 2005

ATTACHMENT 8 CURRANT CREEK RIGHTS AND FACILITIES PPA AND TSA BIDDERS ONLY

Easements

PacifiCorp will grant a non-exclusive easement on PacifiCorp's property between Bidder's switchyard to the 345kV substation serving Bidder's Facility. Easement will be determined based on Bidder's routing of Bidder's cable.

PacifiCorp will grant a non-exclusive easement to allow for the connection of Bidder's Facility to a natural gas supply line located on PacifiCorp property, if required. As an alternative, PacifiCorp, in its sole discretion, may convey such property as required for Bidder's natural gas pipeline and metering station to Bidder as part of the Site Purchase Agreement for Currant Creek shown as Attachment 17 to this RFP. Specific details of the interconnection are provided in Appendix B to the APSA.

Water Rights

PacifiCorp has Water Rights that can be acquired by the Bidder. Quantities and pricing are shown in the Site Purchase Agreement for Currant Creek shown as Attachment 21 to this RFP.

Emission Reduction Credits (ERCs)

PacifiCorp does not believe that ERCs will be required for this project at this time. Bidder to confirm.

Facilities Interconnections

Bidder will be entitled to connect, at its own expense with PacifiCorp's raw water connection as specified in Appendix B to the APSA.

Bidder will acquire, under the Site Purchase Agreement for Currant Creek (Attachment 17), rights to one half of the currently available capacity contracted for by PacifiCorp from Questar. Terms of this contract are to be found in the Site Purchase Agreement.

**RFP 2009
ATTACHMENT 9
OWNER'S COSTS UNDER
APSA AND EPC
September 2005**

ATTACHMENT 9 OWNER'S COST ASSUMPTIONS UNDER AN APSA¹

Costs for both Lakeside and Currant Creek:

ESTIMATED OWNER COSTS	CURRENT CREEK	LAKE SIDE
Project Management	\$ 1,000,000	\$ 1,000,000
Plant Labor	\$ 682,500	\$ 682,500
Misc. Consultants	\$ 100,000	\$ 100,000
Owners Legal Council	\$ 100,000	\$ 100,000
Regulation, PR & Communication	\$ 100,000	\$ 200,000
C&T Charges for PSC Hearings	\$ 20,000	\$ 20,000
Legal Costs for PSC Hearings	\$ 200,000	\$ 200,000
Computer Hardware	\$ 150,000	\$ 150,000
Permitting & License Fees	\$ 200,000	\$ 200,000
Startup / Fuel and Testing	\$ 965,400	\$ 965,400
Site Surveys/Studies	\$ 50,000	\$ 50,000
Site Security	\$ 250,000	\$ 250,000
Operating Spare Parts	\$ 6,600,000	\$ 6,600,000
Permanent Plant Equipment, Tools, & Furnishings	\$ 300,000	\$ 300,000
Builders All Risk Insurance	TBD	TBD
Training	\$ 150,000	\$ 150,000
Escalation Owner's Costs	TBD	TBD
Sales Tax & Duties ²	Bidder to Supply	Bidder to Supply
Owner Contingency ³	TBD	TBD
Capital Surcharge	\$ 500,000	\$ 500,000
Capitalized Property Taxes ⁴	TBD	TBD
Interest During Construction (AFUDC ⁵) (Based on payment schedule)	TBD	TBD
PROJECT TOTALS	\$ 11,367,900	\$ 11,517,900

The above cost figures were developed by PacifiCorp as estimates to be used by PacifiCorp for its own purposes, including but not limited to evaluation of proposals submitted pursuant to the RFP. In no event shall PacifiCorp be responsible for errors or omissions in the above figures or any cost estimates developed by respondents to the RFP.

Notes:

- ¹ Costs over and above those stated in Attachment 7 and 8 "Owner's Development Costs"
- ² Bidder shall divide proposal into taxable and non-taxable items.
- ³ Owner's Contingency will be the same on both sites.
- ⁴ Current Effective Rate for Currant Creek is 0.86%, for Lake Side, 1.10%. Both are subject to change.

PacifiCorp

Draft RFP 2009

Responses due December 1, 2005

⁵ The Current Effect Rate for AFUDC is 7.5%. This is subject to change.

RFP Analysis Guidelines for AFUDC and Capitalized Property Tax

For purposes of analyzing resource RFP responses which require PacifiCorp to assume a progress payment obligation during the construction phase for a resource that will be transferred to and owned by PacifiCorp, the total capitalized cost shall include:

- (1) a capitalized financing cost as applied through the application of Allowance for Funds Used During Construction (AFUDC), pursuant to Regulatory Commissions' guidelines, and
- (2) an amount for capitalized property taxes, pursuant to PacifiCorp's property tax capitalization policy.

AFUDC

Monthly AFUDC shall be calculated by multiplying the average balance of Construction Work in Progress (CWIP) by the applicable projected AFUDC rate in use by PacifiCorp. CWIP shall include all applicable construction overheads, AFUDC from prior months, and capitalized property taxes that are associated with the final capitalized cost of such resource until such resource is projected to be placed in service.

This rate is currently 7.5% annually. The actual rate in effect at the time of the bid evaluation will be the one used.

Property Tax

If the projected CWIP balance is greater than \$50 million as of the first day of each calendar year, the amount of capitalized property taxes that will be added to CWIP will be equal to each year's beginning CWIP balance multiplied by an estimated property tax rate applicable for the resource under consideration.

The standard (non-site specific) rate for PacifiCorp is currently 1.2% of the CWIP balance. The actual rate in effect when the final RFP is issued in September, will be the one used.

PacifiCorp
Draft RFP 2009
Responses due December 1, 2005

RFP 2009
ATTACHMENT 10
OWNER'S DEVELOPMENT COST
ASSUMPTIONS
September 2005

ATTACHMENT 10 OWNER'S DEVELOPMENT COST ASSUMPTIONS

Lake Side Development Costs:

Permitting and License Fees	\$200,000
Regulation, PR and Communications	\$200,000
Owner's Legal Counsel	\$100,000
Surveys/Studies	\$50,000
Water Rights ¹	\$12,048,000
ERCs ¹	\$1,065,169
Miscellaneous Consultants	\$125,000
Total	\$13,288,169

Currant Creek Development Costs

Permitting and License Fees	\$200,000
Regulation, PR and Communications	\$200,000
Owner's Legal Counsel	\$100,000
Surveys/Studies	\$50,000
Water Rights ^{2,3}	Obtained with Block 1
ERCs ²	Obtained with Block 1
Miscellaneous Consultants	\$125,000
Total	\$675,000

The above development cost figures were developed by PacifiCorp as estimates to be used by PacifiCorp for its own purposes, including but not limited to evaluation of proposals submitted pursuant to the RFP. Each entity responding to the RFP shall not rely on these figures, and each respondent shall be solely responsible for developing its own estimates of development costs. In no event shall PacifiCorp be responsible for errors or omissions in the above figures or any development cost estimates developed by respondents to the RFP.

Notes:

¹ See Site Purchase Agreement for Lake Side for specific acreages and quantities

² See Site Purchase Agreement for Currant Creek for specific acreages and quantities

³ Currant Creek's design utilizes an Air-Cooled Condenser (ACC)

PacifiCorp
Draft RFP 2009
Responses due December 1, 2005

RFP 2009
ATTACHMENT 11
FORM OF LETTER OF CREDIT
September 2005

Attachment 11 to RFP 2009
Requirements for a Letter of Credit

A Letter of Credit means an irrevocable standby letter of credit in a form reasonably acceptable to PacifiCorp, naming PacifiCorp as the party entitled to demand payment and present draw requests thereunder, which letter(s) of credit:

- (1) is issued by a U.S. commercial bank or a foreign bank with a U.S. branch, with such bank having a net worth of at least \$1,000,000,000 and a credit rating on its senior unsecured debt of:
 - (a) "A2" or higher from Moody's; or
 - (b) "A" or higher from S&P;
- (2) on the terms provided in the letter(s) of credit, permits PacifiCorp to draw up to the face amount thereof for the purpose of paying any and all amounts owing by Seller hereunder.
- (3) if a letter of credit is issued by a foreign bank with a U.S. branch, permits PacifiCorp to draw upon the U.S. branch;
- (4) permits PacifiCorp to draw the entire amount available thereunder if such letter of credit is not renewed or replaced at least thirty (30) Business Days prior to its stated expiration date;
- (5) permits PacifiCorp to draw the entire amount available thereunder if such letter(s) of credit are not increased, replaced or replenished as and when provided where applicable;
- (6) is transferable by PacifiCorp to any party to which PacifiCorp may assign;
- (7) shall remain in effect for at least ninety (90) days after the end of the Term.

**RFP 2009
ATTACHMENT 12
STANDARD AND POOR'S
INFERRED DEBT
METHODOLOGY ARTICLE
September 2005**

Research

"Buy Versus Build": Debt Aspects of Purchased-Power Agreements

Publication date:

08-May-2003

Credit Analyst:

Jeffrey Wolinsky, CFA, New York (1) 212-438-2117; Dimitri Nikas, New York (1) 212-438-7807; Anthony Flintoff, London (44) 20-7826-3874; Laurie Conheady, Melbourne (61) 3-9631-2036

Standard & Poor's Ratings Services views electric utility purchased-power agreements (PPA) as debt-like in nature, and has historically capitalized these obligations on a sliding scale known as a "risk spectrum." Standard & Poor's applies a 0% to 100% "risk factor" to the net present value (NPV) of the PPA capacity payments, and designates this amount as the debt equivalent.

While determination of the appropriate risk factor takes several variables into consideration, including the economics of the power and regulatory treatment, the overwhelming factor in selecting a risk factor has been a distinction in the likelihood of payment by the buyer. Specifically, Standard & Poor's has divided the PPA universe into two broad categories: take-or-pay contracts (TOP; hell or high water) and take-and-pay contracts (TAP; performance based). To date, TAP contracts have been treated far more leniently (e.g., a lower risk factor is applied) than TOP contracts since failure of the seller to deliver energy, or perform, results in an attendant reduction in payment by the buyer. Thus, TAP contracts were deemed substantially less debt-like. In fact, the risk factor used for many TAP obligations has been as low as 5% or 10% as opposed to TOPs, which have been typically at least 50%.

Standard & Poor's originally published its purchased-power criteria in 1990, and updated it in 1993. Over the past decade, the industry underwent significant changes related to deregulation and acquired a history with regard to the performance and reliability of third-party generators. In general, independent generation has performed well; the likelihood of nondelivery--and thus release from the payment obligation--is low. As a result, Standard & Poor's believes that the distinction between TOPs and TAPs is minimal, the result being that the risk factor for TAPs will become more stringent. This article reiterates Standard & Poor's views on purchased power as a fixed obligation, how to quantify this risk, and the credit ramifications of purchasing power in light of updated observations.

■ Why Capitalize PPAs?

Standard & Poor's evaluates the benefits and risks of purchased power by adjusting a purchasing utility's reported financial statements to allow for more meaningful comparisons with utilities that build generation. Utilities that build typically finance construction with a mix of debt and equity. A utility that leases a power plant has entered into a debt transaction for that facility; a capital lease appears on the utility's balance sheet as debt. A PPA is a similar fixed commitment. When a utility enters into a long-term PPA with a fixed-cost component, it takes on financial risk. Furthermore, utilities are typically not financially compensated for the risks they assume in purchasing power, as purchased power is usually recovered dollar-for-dollar as an operating expense.

As electricity deregulation has progressed in some countries, states, and regions, the line has blurred between traditional utilities, vertically integrated utilities, and merchant energy companies, all of which are in the generation business. A common contract that has emerged is the tolling agreement, which gives an energy merchant company the right to purchase power from a specific power plant. (see "Evaluating Debt Aspects of Power Tolling Agreements," published Aug. 26, 2002). The energy merchant, or toller, is typically responsible for procuring and delivering gas to the plant when it wants the plant to generate power. The power plant operator must maintain plant availability and produce electricity at a contractual heat rate. Thus, tolling contracts exhibit characteristics of both PPAs and leases. However, tollers are typically unregulated entities competing in a competitive marketplace. Standard & Poor's has determined that a 70% risk factor should be applied to the NPV of the fixed tolling payments, reflecting its assessment of the risks borne by the toller, which are:

- Fixed payments that cover debt financing of power plant (typically highly leveraged at about 70%),
- Commodity price of inputs,
- Energy sales (price and volume), and
- Counterparty risk.

■ Determining the Risk Factor for PPAs

Alternatively, most entities entering into long-term PPAs, as an alternative to building and owning power plants, continue to be regulated utilities. Observations over time indicate the high likelihood of performance on TAP commitments and, thus, the high likelihood that utilities must make fixed payments. However, Standard & Poor's believes that vertically integrated, regulated utilities are afforded greater protection in the recovery of PPAs, compared with the recovery of fixed tolling charges by merchant generators. There are two reasons for this. First, tariffs are typically set by regulators to recover costs. Second, most vertically integrated utilities continue to have captive customers and an obligation to serve. At a minimum, purchased power, similar to capital costs and fuel costs, is included in tariffs as a cost of service.

As a generic guideline for utilities with PPAs included as an operating expense in base tariffs, Standard & Poor's believes that a 50% risk factor is appropriate for long-term commitments (e.g. tenors greater than three years). This risk factor assumes adequate regulatory treatment, including recognition of the PPA in tariffs; otherwise a higher risk factor could be adopted to indicate greater risk of recovery. Standard & Poor's will apply a 50% risk factor to the capacity component of both TAP and TOP PPAs. Where the capacity component is not broken out separately, we will assume that 50% of the payment is the capacity payment. Furthermore, Standard & Poor's will take counterparty risk into account when considering the risk factor. If a utility relies on any individual seller for a material portion of its energy needs, the risk of nondelivery will be assessed. To the extent that energy is not delivered, the utility will be exposed to replacing this power, potentially at market rates that could be higher than contracted rates and potentially not recoverable in tariffs.

Standard & Poor's continues to view the recovery of purchased-power costs via a fuel-adjustment clause, as opposed to base tariffs, as a material risk mitigant. A monthly or quarterly adjustment mechanism would ensure dollar-for-dollar recovery of fixed payments without having to receive approval from regulators for changes in fuel costs. This is superior to base tariff treatment, where variations in volume sales could result in under-recovery if demand is sluggish or contracting. For utilities in supportive regulatory jurisdictions with a precedent for timely and full cost recovery of fuel and purchased-power costs, a risk factor of as low as 30% could be used. In certain cases, Standard & Poor's may consider a lower risk factor of 10% to 20% for distribution utilities where recovery of certain costs, including stranded assets, has been legislated. Qualifying facilities that are blessed by overarching federal legislation may also fall into this category. This situation would be more typical of a utility that is transitioning from a vertically integrated to a disaggregated distribution company. Still, it is unlikely that no portion of a PPA would be capitalized (zero risk factor) under any circumstances.

The previous scenarios address how purchased power is quantified for a vertically integrated utility with a bundled tariff. However, as the industry transitions to disaggregation and deregulation, various hybrid models have emerged. For example, a utility can have a deregulated merchant energy subsidiary, which buys power and off-sells it to the regulated utility. The utility in turn passes this power through to customers via a fuel-adjustment mechanism. For the merchant entity, a 70% risk factor would likely be applied to such a TAP or tolling scheme. But for the utility, a 30% risk factor would be used. What would be the appropriate treatment here? In part, the decision would be driven by the ratings methodology for the family of companies. Starting from a consolidated perspective, Standard & Poor's would use a 30% risk factor to calculate one debt equivalent on the consolidated balance sheet given that for the consolidated entity the risk of recovery would ultimately be through the utility's tariff. However, if the merchant energy company were deemed noncore and its rating was more a reflection of its stand-alone creditworthiness, Standard & Poor's would impute a debt equivalent using a 70% risk factor to its balance sheet, as well as a 30% risk-adjusted debt equivalent to the utility. Indeed, this is how the purchases would be reflected for both companies if there were no ownership relationship. This example is perhaps overly simplistic because there will be many variations on this theme. However, Standard & Poor's will apply this logic as a starting point, and modify the analysis case-by-case, commensurate

with the risk to the various participants.

■ Adjusting Financial Ratios

Standard & Poor's begins by taking the NPV of the annual capacity payments over the life of the contract. The rationale for not capitalizing the energy component, even though it is also a nondiscretionary fixed payment, is to equate the comparison between utilities that buy versus build--i.e., Standard & Poor's does not capitalize utility fuel contracts. In cases where the capacity and energy components of the fixed payment are not specified, half of the fixed payment is used as a proxy for the capacity payment. The discount rate is 10%. To determine the debt equivalent, the NPV is multiplied by the risk factor. The resulting amount is added to a utility's reported debt to calculate adjusted debt. Similarly, Standard & Poor's imputes an associated interest expense equivalent of 10%--10% of the debt equivalent is added to reported interest expense to calculate adjusted interest coverage ratios. Key ratios affected include debt as a percentage of total capital, funds from operations (FFO) to debt, pretax interest coverage, and FFO interest coverage. Clearly, the higher the risk factor, the greater the effect on adjusted financial ratios. When analyzing forecasts, the NPV of the PPA will typically decrease as the maturity of the contract approaches.

■ Utility Company Example

To illustrate some of the financial adjustments, consider the simple example of ABC Utility Co. buying power from XYZ Independent Power Co. Under the terms of the contract, annual payments made by ABC Utility start at \$90 million in 2003 and rise 5% per year through the contract's expiration in 2023. The NPV of these obligations over the life of the contract discounted at 10% is \$1.09 billion. In ABC's case, Standard & Poor's chose a 30% risk factor, which when multiplied by the obligation results in \$327 million. Table 1 illustrates the adjustment to ABC's capital structure, where the \$327 million debt equivalent is added as debt, causing ABC's total debt to capitalization to rise to 59% from 54% (11 plus 48). Table 2 shows that ABC's pretax interest coverage was 2.6x, without adjusting for off-balance-sheet obligations. To adjust for the XYZ capacity payments, the \$327 million debt adjustment is multiplied by a 10% interest rate to arrive at about \$33 million. When this amount is added to both the numerator and the denominator, adjusted pretax interest coverage falls to 2.3x.

	Original capital structure		Adjusted capital structure	
	\$	%	\$	%
Debt	1,400	54	1,400	48
Adjustment to debt	-	-	327	11
Preferred stock	200	8	200	7
Common equity	1,000	38	1,000	34
Total capitalization	2,600	100	2,927	100

		Original pretax interest coverage (x)		Adjusted pretax interest coverage (x)	
Net income	120				
Income taxes	65	300		(300+33)	
Interest expense	115	115	= 2.6x	(115+33)	= 2.3x
Pretax available	300				

■ Credit Implications

The credit implications of the updated criteria are that Standard & Poor's now believes that historical risk factors applied to TAP contracts with favorable recovery mechanisms are insufficient to capture the financial risk of these fixed obligations. Indeed, in many cases where 5% and 10% risk factors were applied, the change in adjusted financial ratios (from unadjusted) was negligible and had no effect on ratings. Standard & Poor's views the high probability of energy delivery and attendant payment warrants recognition of a higher debt equivalent when capitalizing PPAs. Standard & Poor's will attempt to identify utilities that are more vulnerable to modifications in purchased-power adjustments. Utilities can

offset these financial adjustments by recognizing purchased power as a debt equivalent, and incorporating more common equity in their capital structures. However, Standard & Poor's is aware that utilities have been reluctant to take this action because many regulators will not recognize the necessity for, and authorize a return on, this additional wedge of common equity. Alternatively, regulators could authorize higher returns on existing common equity or provide an incentive return mechanism for economic purchases. Notwithstanding unsupportive regulators, the burden will still fall on utilities to offset the financial risk associated with purchases by either qualitative or quantitative means.

RFP 2009
ATTACHMENT 13
PACIFICORP COSTS ASSOCIATED
WITH INTEGRATION
September 2005

Preliminary Assessment of Transmission Impacts Associated with RFP Points of Delivery

1. Overview of Points of Delivery

PacifiCorp is interested in resources that are capable of delivery into or in a portion of the Company's network transmission system in PACE. Specifically, the point(s) of delivery of primary interest to PacifiCorp are:

- Salt Lake Valley
- PacifiCorp Sites
 - Currant Creek
 - Lake Side
- Mona 345 kV
- Glen Canyon 230 kV
- Nevada/Utah Border:
 - Gonder-Pavant 230 kV line known as "Gonder 230 kV"
 - Sigurd – Harry Allen 345 line known as "NUB" or Red Butte 345 kV
 - Crystal 500 kV
- West of Naughton

The Company is generally not interested in resources delivered to the following areas:

- Four Corners
- Wyoming, unless the resource(s) electrically reside south of the Naughton-Monument 230 kV line and the cost of the upgrade is included.
- Borah, Brady or Kinport unless such resource is interconnected to the Company's Southeast Idaho electrical system near the Goshen area.

2. Transmission Assumptions Associated with the Points of Delivery

PacifiCorp may need to increase transmission import capability and upgrade its network system capacity in order to integrate a resource delivered to the preferred points of delivery. The table below indicates what possible additions might be necessary and the indicative cost associated with the upgrade². These indicative costs are based on assessments done by the PacifiCorp Transmission group for RFP 2003B, the 2004 Integrated Resource Plan and System Impact Studies. These cost estimates will be used for the purpose of evaluating bids and may be refined if better estimates are received prior to issuance of the RFP.

² Transmission studies have been requested to clarify incremental transmission costs, and will be included in final RFP if available prior to issuance.

Point of Delivery	Description of Possible Transmission Additions / Upgrades	Path(s) to Upgrade and Voltage Support	Estimated Cost of Upgrades
Salt Lake Valley	Upgrades to existing lines	Unknown	\$10 – 20 M
Lake Side	Transmission line, substation, SVC	Lake Side to Salt Lake Valley	\$77 M
Mona 345 kV / Currant Creek	Transmission line, substation, SVC	Mona to PACE ¹	\$69 M
Glen Canyon 230 kV	Transmission line(s), substation, SVC	Glen Canyon to Sigurd and Mona to PACE	\$TBA ² M (Glen Canyon) + \$69 M (Mona)
Gonder 230 kV over 200 MW ³	Transmission line(s), substation, SVC	Gonder/Nevada Border to Sigurd and Mona to PACE	\$TBA M (Gonder) + \$69 M (Mona)
NUB (Harry Allen 345 kV)	Transmission line, substation, SVC	NUB to West Cedar and Mona to PACE	\$TBA (NUB) + \$69 M (Mona)
Crystal	Transmission line(s), substation, SVC, transformer	Crystal to Red Butte and Mona to PACE	\$119 M (Crystal) + \$69 M (Mona)
West of Naughton	New line, substation	Naughton to Evanston ⁴ Evanston to Salt Lake Valley	\$19 M (Naughton) + \$120 M (Evanston)
Path C ⁵ up to 150 MW	Substation, upgrade to existing line		\$45 M
Path C up to 300 MW	Substation, upgrade of existing line, line extension, series capacitors		\$65 M
Path C up to 600 MW	All the upgrades associated with increasing capacity to 300 MW and a new line	Treasureton to Ben Lomond	\$ 85 M + \$65M

¹ Mona – Oquirrh - Incremental costs that will be used for the purpose of delivering resources at or through the Mona area will be priced less the cost for the Hunter 4 proxy resource in the IRP Preferred Portfolio.

² To be assessed (TBA)

³ Resources under 200 MW won't require upgrades from the Nevada border to Sigurd.

⁴ Naughton to Evanston portion may not be needed depending on location.

⁵ Path C - Although Path C was not a preferred path for delivery, it has been included for evaluation purposes.

PacifiCorp
Draft RFP 2009
Responses due December 1, 2005

RFP 2009
ATTACHMENT 14
CONFIDENTIALITY AGREEMENT
September 2005

This CONFIDENTIALITY AGREEMENT (this "Agreement") is entered into as of the ____ day of _____, 2005, by and between PacifiCorp, an Oregon corporation ("PPW"), and _____ (collectively with all its subsidiaries, officers, directors, members, managers, employees, agents, accountants and attorneys, "Recipient"); with reference to the following:

WHEREAS, PPW and Recipient are discussing a potential transaction relating to PPW's Request for Proposals 2009, and in connection therewith Recipient wishes to receive certain Confidential Information (as hereinafter defined), but requires as a condition precedent Recipient's execution of this Agreement;

NOW, THEREFORE, in consideration of the above and the mutual promises herein contained, the parties hereto agree as follows:

1. Confidential Information. "Confidential Information" means any oral or written information which is made available to Recipient by PPW or any of its corporate affiliates or its or their officers, directors, employees, agents, accountants or attorneys (a "Disclosing Party") before or after the date hereof, regardless of the manner furnished, and includes without limitation: (i) compilations and analyses prepared by Recipient; (ii) names of current and potential manufacturers, suppliers, customers and marketing relationships of any Disclosing Party, (iii) the nature, terms, conditions or other facts respecting any discussions between PPW and Recipient (including their existence and status). Confidential Information does not include information which at the time of disclosure is generally available to the public (other than as a result of disclosure by Recipient) or was available to Recipient on a nonconfidential basis from a source other than a Disclosing Party not under a duty of confidentiality to a Disclosing Party.

2. Confidentiality; Disclosure. The Confidential Information will be kept confidential by each Recipient and will not be used for any purpose by its Recipient other than for the purpose set forth above. Recipient will be responsible for any breach of this Agreement by any of its officers, directors, employees, agents, accountants and attorneys. Recipient shall restrict the dissemination of the Confidential Information to its employees who have a need to see it, and shall cause any agent, accountant or other non-employee to whom it wishes to show the Confidential Information sign an agreement in the form hereof in advance thereof. Recipient will keep confidential any Confidential Information contained in any analyses, compilations, studies or other documents prepared by Recipient that contain or reflect any Confidential Information. Upon request from PPW, Recipient promptly will return all copies of the Confidential Information.

3. Protective Order. If Recipient becomes legally compelled to disclose any Confidential Information, it shall provide PPW with prompt prior written notice so that PPW may seek a protective order or other appropriate remedy. If such protective order or other remedy is not obtained, Recipient shall (i) furnish only that portion of the

Responses due December 1, 2005

Confidential Information which, in accordance with the advice of its own counsel, is legally required to be furnished, and (ii) exercise reasonable efforts to obtain assurances that confidential treatment will be accorded the Confidential Information so furnished.

4. No Representation or Warranty. Recipient acknowledges that no Disclosing Party is making any representation or warranty as to the accuracy or completeness of any information furnished (except specifically to the extent and only to such extent as shall be expressly set forth in an executed and delivered definitive agreement). No Disclosing Party or any of its officers, directors, employees, agents or controlling persons (including, without limitation, parent and subsidiary companies) shall have any liability to a Recipient or any other person relating to or arising from the use of the Confidential Information provided by a Disclosing Party.

5. Conduct of Process. Except for any confidentiality agreements, none of PPW or any Disclosing Party is under any obligation to Recipient, and PPW is free to elect not to consummate an agreement or to furnish or receive information. Nothing contained in this Agreement shall prevent PPW from negotiating with or entering into a definitive agreement with any other person or entity without prior notice to Recipient. Until PPW and Recipient enter into a definitive agreement, no contract or agreement or other investment or relationship shall be deemed to exist between any Disclosing Party or any Recipient as a result of this Agreement, the issuance of a term sheet, the issuance, receipt, review or analysis of information, the negotiation of definitive documentation, or otherwise, and none of the foregoing shall be relied upon as the basis for an implied contract or a contract by estoppel.

6. Intellectual Property Rights. Nothing contained herein grants any rights respecting any intellectual property (whether or not trademarked, copyrighted or patented) or uses thereof.

7. Costs and Expenses. Except as otherwise provided in any other written agreement between the parties, the parties shall bear their own costs and expenses, including without limitation fees of counsel, accountants and other consultants and advisors.

8. Remedies. PPW shall be entitled to equitable relief, including injunction and specific performance, in the event of any breach hereof, in addition to all other remedies available to PPW at law or in equity. No failure or delay by PPW in exercising any right, power or privilege hereunder will operate as a waiver, nor will any single or partial exercise or waiver of a right, power or privilege preclude any other or further exercise thereof.

9. Venue and Choice of Law. This Agreement is governed by the laws of the State of Oregon. Any suit, action or proceeding arising out of the subject matter hereof, or the interpretation, performance or breach hereof, shall be instituted in any State or Federal Court in Multnomah County, Oregon (the "Acceptable Forums"). Each party agrees that the Acceptable Forums are convenient to it, and each party irrevocably

PacifiCorp
Draft RFP 2009

Responses due December 1, 2005

submits to the jurisdiction of the Acceptable Forums, and waives any and all objections to jurisdiction or venue that it may have any such suit, action or proceeding.

10. Miscellaneous. This Agreement constitutes the entire agreement of the parties relating to its subject matter, and supersedes all prior communications, representations, or agreements, verbal or written. This Agreement may only be waived or amended in writing. Notices hereunder shall be in writing and be effective when actually delivered. This Agreement may be executed in counterparts, each of which, when taken together, shall constitute one and the same original instrument. Neither party may assign or otherwise transfer its rights or delegate its duties hereunder without prior written consent, and any attempt to do so is void.

IN WITNESS WHEREOF, the undersigned parties have executed this Confidentiality Agreement as of the date first written above.

PACIFICORP
an Oregon corporation

a _____

By: _____
Its: _____

By: _____
Its: _____

PacifiCorp
Draft RFP 2009
Responses due December 1, 2005

RFP 2009
ATTACHMENT 15
NON-RELIANCE LETTER
September 2005

PacifiCorp
Draft RFP 2009
Responses due December 1, 2005

825 N.E. Multnomah
Portland, Oregon 97232
(503) 813-5000



September __, 2005

[Name]
[Address]

Re: RFP 2009

Dear [_____]:

This letter clarifies PacifiCorp's rights relating to its further evaluation and discussion of your possible involvement with _____ ("Counterparty") proposal submitted in response to PacifiCorp's Request for Proposals (RFP) 2009 (collectively with Counterparty's proposal and all matters relating thereto, the "Project") and any subsequent negotiations regarding the terms of any agreement or agreements entered into with you or any other party in connection with the Project. PacifiCorp will agree to enter into further discussions with you only upon your prior acknowledgement of these rights. "You" and similar words (whether or not capitalized) refer to the addressee of this letter, Counterparty, and any Project development entity or other affiliate of the addressee in any way involved in the Project.

PacifiCorp is committed to following a fair process in selecting the winning proposal. However, PacifiCorp reserves the right, in its sole discretion, to terminate the consideration of the Project and any discussions with you or any other parties (such as your lenders) relating to the Project at any time and for any reason without incurring any liability for costs or expenses incurred by you in the course of, or as a result of, your participation in the bidding process or negotiations respecting the Project, including but not limited to any costs or expenses related to or arising from the preparation or submission of your proposal, your legal fees, transmission or environmental studies or reviews, expenses of any third party incurred at your behest, your participation in discussions with PacifiCorp, the Project, or any development costs incurred by you in connection with this process. The submission of a proposal by [Counterparty] and PacifiCorp's decision to engage in further discussions with you does not constitute acceptance of the Project, and shall not obligate PacifiCorp to accept or to proceed further with the Project. The acceptance of any proposal and the commencement of the

PacifiCorp
Draft RFP 2009

Responses due December 1, 2005

Project are contingent on a number of factors, including but not limited to financial and creditworthiness considerations, strategic decisions, resource planning, regulatory approvals, and the approval of PacifiCorp's board of directors and/or shareholders. PacifiCorp makes no representation as to the likelihood of [Counterparty]'s proposal being accepted or of the Project being commenced and, if PacifiCorp decides not to accept [Counterparty]'s proposal or the Project, you hereby fully and forever release and discharge PacifiCorp of all liability whatsoever, whether arising from your alleged reliance on PacifiCorp's acceptance of the Project or any part thereof or whether based upon any other action or claim in tort, contract, promissory estoppel, equity, negligence or intentional conduct, and PacifiCorp shall not be liable for any amount of liability or damages, including but not limited to any amounts for incidental, special, consequential or punitive damages.

PacifiCorp reserves the right to engage in discussions with multiple parties simultaneously with respect to RFP 2009 or any other matter, and to accept or reject any type of proposal of any party in its sole discretion. PacifiCorp also reserves the rights to reject all proposals relating to RFP 2009, and to pursue any other course it deems appropriate, including without limitation the development of a cost-base self build alternative.

PacifiCorp shall have no obligations to you with respect to the Project unless and until the execution by all applicable parties of one or more definitive written agreements (the "Definitive Agreements") in form and substance satisfactory to the parties entering into such Definitive Agreements and then only to the extent stated therein. No contract will nor will be deemed to exist, whether by estoppel or otherwise, in any other way than execution and delivery (if ever) of the Definitive Agreements. The execution (if any) of any Definitive Agreements would be subject, among other things, to the satisfactory completion of due diligence by such parties as well as the satisfaction of applicable financial, environmental and other regulatory requirements as determined by PacifiCorp. If PacifiCorp selects the Project, then except as specifically set forth in the Definitive Agreements, PacifiCorp shall have no obligations to you in the event that the Project or any part thereof is discontinued, cancelled, stopped, or terminated for any reason whatsoever, including without limitation financial or creditworthiness considerations concerning you or any contemplated source of Project-related funds, third-party delay or failure (with PacifiCorp's transmission function constituting a third party for purposes hereof), regulatory restrictions, gas or transmission infrastructure restrictions, environmental or community challenges, or the Project is embargoed, restrained, subject to labor strike or lockout, destroyed, subject to terrorist attack or any other force beyond your control, is incapable of receiving required gas or electricity transmission or network service, or is otherwise rendered impossible to complete by the times set forth in the Definitive Agreements for any other reason, whether your fault or not.

Whether or not the Project is commenced and Definitive Agreements executed, you will be responsible to pay your own fees and expenses, including without limitation legal fees and expenses, incurred in connection with the preparation, discussion and negotiation of the Project as well as the preparation, negotiation, execution and delivery of the

PacifiCorp

Draft RFP 2009

Responses due December 1, 2005

Definitive Agreements and any other agreements or documents contemplated thereby, and PacifiCorp will not be responsible for any of those fees and expenses.

If the foregoing is acceptable, please indicate so by executing and dating both originals of this letter in the space indicated below, returning one original to the undersigned within three days of the date hereof and retaining the other original for your files.

Sincerely,

PacifiCorp

By: _____

Name: _____

Title: _____

Date: _____

ACCEPTED AND AGREED:

[Insert Name of Party]

By: _____

Name: _____

Title: _____

Date: _____

PacifiCorp
Draft RFP 2009
Responses due December 1, 2005

**RFP 2009
ATTACHMENT 16
SITE PURCHASE AGREEMENT
FOR LAKE SIDE
September 2005**

**AGREEMENT FOR SALE AND PURCHASE
OF REAL PROPERTY**

This Agreement for Sale and Purchase of Real Estate (the "Agreement") is entered into as of the ___ day of _____, 20____, by and between _____ ("Buyer") and PacifiCorp, an Oregon corporation ("Seller").

RECITALS

A. Seller is the owner of approximately _____ acres of real property situated within Utah County, _____ and more particularly described on the attached Exhibit "A" (the "Property").

B. Buyer wishes to purchase the Property for;

C. Seller is willing to sell the Property on the terms and conditions stated herein.

NOW, THEREFORE, in consideration of the amounts to be paid and the mutual promises contained herein, Buyer and Seller agree as follows:

**ARTICLE I
AGREEMENT TO PURCHASE AND SELL; PURCHASE PRICE**

1.1 Purchase and Sale. Upon the terms and conditions set forth in this Agreement, Seller agrees to convey to Buyer, and Buyer agrees to purchase and take from Seller, fee title interest in and to that certain parcel of real property, as more particularly described on Exhibit "A", attached hereto and by this reference made part of this Agreement, together with all appurtenances, rights, privileges and easements belonging thereto (collectively referred to herein as the "Property"), unless otherwise expressly stated in this Agreement.

(a) The description of the Property contained in Exhibit "A" is approximate. The exact acreage of the Property will be determined by a survey (the "Survey") to be prepared by Seller, at its sole cost, and provided to Buyer no later than ninety (90) days after the date of this Agreement. The Survey shall be attached to this Agreement as Exhibit "B" upon its completion.

(b) Any water rights associated with the Property are not included as part of this Agreement.

(c) Emissions Reduction Credits associated with the Property are included as part of this Agreement. Details of the Credits are provided in Exhibit "C".

(d) An assignment and transfer from Seller to Buyer, and the acceptance and assumption by Buyer, of fifty percent (50%) of Seller's rights and obligations under that

certain Agreement for Firm Transportation to PacifiCorp – Lakeside Generation Facilities dated February 4, 2005, as amended May 3, 2005 between Seller and Questar Gas Company is being entered into in connection with this Agreement. The terms of such assignment, transfer and assumption are included in a separate Assignment and Assumption Agreement between Seller and Buyer of even date herewith, and the effectiveness of such agreement constitutes an express condition for the effectiveness of this Agreement.

1.2 Purchase Price. The purchase price for the Property (the “Purchase Price”) shall be _____ (\$_____).

1.3 Payment of Purchase Price. Buyer shall pay the Purchase Price to Seller in cash, by cashier’s check, or other immediately available funds on the Closing Date, as adjusted for prorations on the Closing Date as provided herein.

ARTICLE II TITLE INSURANCE

2.1 Commitment of Title Insurance.

(a) Within thirty (30) days after the date of this Agreement, Seller shall deliver to Buyer a commitment for title insurance covering the Property (the “Commitment”), issued by the Title Company and dated on or after the date of this Agreement.

(b) Buyer shall have ten (10) days following receipt of the Commitment to provide any written objections to any matter set forth on Schedule B of the Commitment. If Buyer does not timely deliver written notice of objection to Seller, Buyer shall be deemed to have approved of all matters set forth in the Commitment. Matters which Seller has agreed to discharge pursuant to Section 2.1 (c) and any encumbrances or other title exceptions to which Buyer does not object shall be deemed to be “Permitted Exceptions” and shall not be considered objections to any matter contained in the Commitment.

(c) If Buyer provides a written notice of objections in accordance with Section 2.1 (b), then Seller shall have the option to: (i) cure such objections at Seller’s sole cost; or (ii) terminate this Agreement.

(d) Buyer’s sole remedy for Seller’s inability to convey title subject only to the Permitted Exceptions or to cure Buyer’s objections in accordance with Section 2.1 (c) shall be to terminate this Agreement. In that case, Seller shall have no other obligation to Buyer in connection with this Agreement or the Property.

2.2 Delivery of Title Insurance. Except as otherwise stated in Section 2.1, Seller shall obtain and deliver to Buyer within ten (10) days after the Closing Date an ALTA Standard

Owner's Policy of title insurance in the amount of the Purchase Price, effective as of the Closing Date and containing no exceptions other than the Permitted Exceptions.

ARTICLE III REPRESENTATIONS AND WARRANTIES

3.1 Representations and Warranties of Seller. Seller makes the following representations and warranties to Buyer, as of the date of this Agreement and as of the Closing Date, each of which representations and warranties shall extend beyond the Closing Date and delivery of the Special Warranty Deed.

(a) Seller has and on the Closing Date will have good and marketable fee simple title to the Property to be conveyed, free and clear of all encumbrances, liens, claims, or reservations, except as specifically approved by Buyer under this Agreement.

(b) Seller has the right, power and authority to execute, deliver, and perform this Agreement and the execution, delivery, and performance of this Agreement have been duly authorized by all necessary corporate action on the part of Seller, and upon execution and delivery this Agreement shall constitute valid and binding obligations of Seller enforceable against Seller in accordance with its terms and except as enforceability may be limited by bankruptcy, insolvency, and other similar laws affecting claims and rights generally or be general equitable principles.

(c) Seller has not received written notice of any judgment, suit, claim, action, arbitration. Legal, administrative, or other proceeding or governmental investigation pending or threatened with respect to any of the Property that would materially adversely affect the Property, and no activities or events have occurred on or in connection with the Property that could give rise to any such claims or proceedings.

(d) Seller has not received any written notices, demands or deficiency statements from any mortgagee of the Property or from any state, municipal or county government or agency or any insurer relating to the Property and which have not been cured or remedied except property valuation and tax notices issued by Utah County.

(e) Except as otherwise expressly disclosed in the Commitment, the Property is not subject to any proposed special assessment or to any existing special assessment lien arising as a result of any works or improvements completed, installed or contemplated at or before the Closing Date.

(f) Seller has paid and shall pay all liens, charges, taxes and assessments for the Property arising prior to the Closing Date.

(g) No person, broker or entity, whether or not affiliated with Seller, is entitled to a commission, finder's fee or other compensation arising from this Agreement, as regarding Seller. Seller shall indemnify defend and hold Buyer harmless from and

against any and all claims, loss or damage relating to or arising out of any claim for compensation by any broker, person or entity claiming by or through Seller.

3.2 Representations and Warranties of Buyer. Buyer makes the following representations and warranties to Seller, as of the date of this Agreement and as of the Closing Date, each of which representations and warranties shall survive the Closing and delivery of the Special Warranty Deed.

(a) Buyer has the right, power and authority to execute, deliver and perform this Agreement.

(b) No person, broker or entity, whether or not affiliated with Buyer, is entitled to a commission, finder's fee or other compensation arising from this Agreement as regarding Buyer. Buyer shall indemnify, defend and hold Seller harmless from and against any and all claims, loss or damage relating to or arising out of any claim for compensation by any broker, person or entity claiming by or through Buyer.

3.3 Acknowledgment by Buyer Regarding Seller's Representations and Warranties. Except as expressly set forth in other portions of this agreement, Buyer hereby affirms that neither Seller nor its agents, employees or attorneys have made, nor has Buyer relied upon any representation, warranty, or promise (either express or implied) with respect to the Property or any other subject matter of this Agreement including, without limitation:

(a) the general plan designation, zoning, value, use, tax status or physical condition of any part of the Property or the improvements to the Property;

(b) the flood elevations, drainage patterns and soil and subsoils composition and compaction levels and other conditions at the Property;

(c) the existence or nonexistence of any hazardous or toxic substance, waste or material (as defined or regulated by any federal, state or local law or regulation);

(d) the accuracy of any soils reports or any other plans or reports regarding the Property;

(e) the suitability of the Property for Buyer's intended purpose; or

(f) the status, suitability or sufficiency of any Emissions Reduction Credits associated with the Property.

WITHOUT LIMITING THE GENERALITY OF THE FOREGOING AND EXCEPT AS EXPRESSLY SET FORTH IN THIS AGREEMENT, BUYER ACCEPTS THE PROPERTY FROM THE SELLER "AS IS", SUBJECT TO "ALL FAULTS" INCLUDING, BUT NOT LIMITED TO, BOTH LATENT AND PATENT DEFECTS, AND THE ENVIRONMENTAL CONDITION OR DEFECTS THEREOF. EXCEPT AS EXPRESSLY SET FORTH IN THIS

AGREEMENT, BUYER HEREBY WAIVES ALL WARRANTIES, EXPRESS OR IMPLIED, REGARDING THE CONDITIONS AND THE USE OF THE SUBJECT PROPERTY, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

ARTICLE IV USE OF PROPERTY

4.1 Seller's Use of the Property Prior to Closing Date. From and after Seller's execution of this Agreement and except in the ordinary course of administering its general mortgage, Seller shall not grant or convey any easement, lease, license, permit or any other legal or beneficial interest in or to the Property or engage in any contract with any party other than Buyer regarding the purchase or sale of the Property, without the prior written consent of Buyer. Further, except as otherwise provided for herein, Seller agrees to pay, as and when the same are due, all payments on any encumbrances presently affecting the Property and any and all taxes, assessments and levies in respect of the Property through the Closing Date.

4.2 Buyer's Right to Enter Property Prior to the Closing Date. Buyer or its employees or agents may enter the Property at any time prior to the Closing Date upon twenty-four (24) hours notice to Seller to inspect the Property and perform surveys or tests as Buyer may elect; provided, however, that such entry shall not unreasonably interfere with the activities of Seller on the Property, and Buyer shall indemnify and hold Seller harmless from, all liabilities and all consequences of any interruption of Seller's operation of Seller's generation facilities located adjacent to the Property associated with Buyer's activities on the Property.

ARTICLE V EASEMENTS

5.1 Seller's Use of the Property After the Closing Date. Seller reserves the right to continue to use those portions of the Property identified in Attachment A for the purpose of owning, operating and maintaining electrical distribution and transmission lines and related facilities, including communications and other facilities, whether above or underground, and also for access to Seller's existing substation located adjacent to the Property. On or before the Closing Date, Buyer shall grant to Seller one or more easements, in a form acceptable to Seller, which will allow for such continued use and access or future related uses and access by Seller.

5.2 Existing Easements. Buyer purchases the Property subject to all existing easements identified as Permitted Exceptions under Section 2 above.

5.3 New Easements. On or before the Closing Date, Seller shall grant to Buyer one or more easements for access to Seller's existing, or future, electrical and/or natural gas interconnection points (to be) located near the Property, which will allow for such continued use and access or future related uses and access by Buyer.

ARTICLE VI CLOSING

6.1 Time and Place of Closing. The Purchase and sale transaction contemplated by this Agreement shall be consummated through a closing conference (the "Closing") which shall be held at the Title Company on or before _____, (the "Closing Date"), or at such earlier time and place as the parties may mutually agree in writing.

6.2 Actions at Closing. At the Closing, the following events shall occur and each being declared to have occurred simultaneously with the other:

(a) All documents to be recorded and funds to be delivered hereunder shall be delivered to the Title Company in escrow, to hold, deliver, record and disburse in accordance with supplemental escrow instructions, the form and content of which shall be agreed to by the parties prior to Closing.

(b) At the Closing or sooner as otherwise stated in the escrow instructions, the following shall occur:

(i) Seller shall deliver or cause to be delivered in accordance with the escrow instructions:

(1) Special Warranty Deed conveying the Property to Buyer, duly executed and acknowledged by Seller and in proper form generally for recording in _____; and

(2) All other documents required to be executed by Seller pursuant to the terms of this Agreement.

(ii) Buyer shall deliver or cause to be delivered in accordance with the escrow instructions:

(1) The Purchase Price to be; and

(2) All other documents required to be executed by Buyer pursuant to the terms so this Agreement.

(c) Buyer and Seller shall each deliver to the other, two executed copies of the Buyer's and Seller's Statement of Settlement setting forth all prorations, credits provided in this Agreement, disbursements of the purchase price, and expenses of the Closing.

(d) Seller shall bear any and all Closing or escrow charges of the Title Company.

6.3 Seller's Remedies. In the event this transaction fails to close due to Buyer's fault or inability to close, Seller may elect either to seek specific performance of this Agreement by suit in equity, to seek damages from Buyer.

6.4 Buyer's Remedies. In the event this transaction fails to close due to Seller's fault, this Agreement shall be declared void and of no effect.

ARTICLE VII PRORATIONS

7.1 Prorations Between Seller and Buyer. The following prorations shall be made between Seller and Buyer as of the Closing Date:

(a) Real property taxes and assessments on the Property for the year of Closing shall be prorated between Seller and Buyer based on the number of days each owned the Property. In the event the Property constitutes some portion of a larger tract of land, such proration shall be based upon the average of the Property as a percentage of the acreage of the entire tract. If, as of the Closing Date, the actual tax bills for the year or years in question are not available and the amount of taxes to be prorated cannot be ascertained, then the most recent known rates, millages and assessed valuations (which amounts shall relate to the same tax year) shall be used, and such proration shall be repeated when the final tax bill is available and either Buyer and Seller, as the case may be, shall promptly pay to the other the net amount owing as a result of such redetermination.

(b) Other Closing costs shall be apportioned between the parties in accordance with the normal and customary practice of commercial real estate transactions in Utah County, Utah.

ARTICLE VIII RELEASE, ASSUMPTION AND INDEMNITY

8.1 Seller shall indemnify, hold harmless and defend Buyer against all claims, suits, losses and damages made against or incurred by Buyer relating to the condition of the Property prior to the Closing Date or any activity in connection with the Property which occurred prior to the Closing Date. Buyer shall indemnify, hold harmless and defend Seller against all claims, suits, losses and damages incurred by Seller relating to the condition of the Property after the Closing Date or any activity in connection with the Property which occurs after the Closing Date.

ARTICLE IX MISCELLANEOUS

9.1 Entire Agreement. This Agreement contains the entire agreement between the parties respecting the matters herein set forth and supersedes all prior agreements, which written or oral, between the parties respecting such matters. Any amendments or modifications hereto in

order to be effective shall be in writing and executed by the parties hereto. Notwithstanding the foregoing, Buyer's use and occupancy of this Agreement shall be subject at all times to the terms and conditions of that certain Construction Coordination Agreement dated [DATE] between Seller and Buyer.

9.2 Amendments. This Agreement may be amended or modified only by mutual written agreement.

9.3 Survival. All warranties, representations, covenants and agreements contained in this Agreement shall survive the execution and delivery of this Agreement and all documents delivered in connection with this Agreement and shall survive the Closing of the transactions contemplated by this Agreement and all performances in accordance with this Agreement.

9.4 Successors and Assigns. This Agreement shall be binding upon and inure to the benefit of the parties hereto and their respective successors, heirs, administrators, and assigns; provided, however, that notwithstanding the foregoing, neither party's interest under this Agreement may be assigned, encumbered, or otherwise transferred, whether voluntarily, involuntarily, by operation of law or otherwise.

9.5 Notices. Any notice, demand or document which any party is required or any party desires to give or deliver to or make upon any other party shall be in writing, and may be personally delivered or given or made by recognized overnight courier service or by United States registered or certified mail, return receipt requested, with postage prepaid, addressed as follows:

To Seller:

To Buyer:

Any party may designate a different address for itself by notice similarly given. Unless provided herein, any such notice, demand or document so given shall be effective upon delivery of the same to the proper address of the party or parties to whom the same is to be given.

9.6 Time of Essence. Time is of the essence in the performance of each and every term, condition, and covenant of this Agreement.

9.7 Counterparts. This Agreement may be executed in any number of counterparts which together shall constitute the contract of the parties.

9.8 Paragraph Headings. The paragraph headings herein contained are for purposes of identification only and shall not be considered in construing this Agreement.

9.9 Attorneys' Fees. The prevailing party in any legal proceeding brought to enforce rights hereunder shall recover from the other party its reasonable attorneys' fees and costs. As

used herein in the term "prevailing party" means the party entitled to recover the costs in any suit, whether or not brought to judgment, and whether or not incurred before or after the filing of suit.

9.10 Waiver. Except as herein expressly provided, no waiver by a party of any breach of this Agreement or any warranty or representation under this Agreement by another party shall be deemed to be a waiver of any other breach of any kind or nature (whether preceding or succeeding and whether or not of the same or similar nature) and no acceptance of payment or performance by a party after any such breach by another party shall be deemed to be a waiver of any further breach of this Agreement or of any representation or warranty by such other party whether or not the first party knows of such a breach at the time it accepts such payment or performance. No failure on the part of a party to exercise any right it may have by the terms of this Agreement or by law upon the default of another party, and no delay in the exercise of any such right by the first party at any time when such other party may be in default, shall operate as a waiver of any default, or as a modification in any respect of the provision of this Agreement.

9.11 Exhibits. Any and all exhibits attached or to be attached hereto are hereby incorporated and made a party of this Agreement by reference.

9.12 Governing Law. This Agreement shall be governed and construed in accordance with the laws of the State of Utah.

9.13 No Recording. This Agreement shall not be recorded in the real property records.

9.14 Further Instruments. Each party hereto shall from time to time execute and deliver such further documents or instruments as the other party, its counsel or the Title company may reasonably request to effectuate the intent of this Agreement, including without limitation documents necessary for compliance with the laws, ordinances, rules and regulations of any applicable governmental authorities.

9.15 Confidentiality. The purchase price and terms of this Agreement are intended by both parties to be confidential. Therefore, except as directed by a court, administrative authority or required by subpoena, neither party shall disclose the purchase price or terms of this Agreement or any other non-public information related thereto.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement effective as of the date and year first above written.

PACIFICORP

By: _____

Its: _____

Date Signed:

[BUYER]

By: _____

Its: _____

Date Signed:

EXHIBIT A

**PROPERTY DESCRIPTION TO BE COMPLETED PRIOR
TO CLOSING**

EXHIBIT B

SURVEY TO BE ATTACHED

EXHIBIT C

EMISSIONS REDUCTION CREDITS

Buyer shall receive the following credits (in tons) as part of the transaction:

- PM-10 46.8
- SO₂ 4.6
- NO_x 22.4

PacifiCorp
Draft RFP 2009
Responses due December 1, 2005

RFP 2009
ATTACHMENT 17
SITE PURCHASE AGREEMENT
FOR CURRANT CREEK
September 2005

**AGREEMENT FOR SALE AND PURCHASE
OF REAL PROPERTY**

This Agreement for Sale and Purchase of Real Estate (the "Agreement") is entered into as of the ___ day of _____, 20____, by and between _____ ("Buyer") and PacifiCorp, an Oregon corporation ("Seller").

RECITALS

- A. Seller is the owner of approximately _____ acres of real property situated within Juab County, _____ and more particularly described on the attached Exhibit "A" (the "Property").

- B. Buyer wishes to purchase the Property for;

- C. Seller is willing to sell the Property on the terms and conditions stated herein.

NOW, THEREFORE, in consideration of the amounts to be paid and the mutual promises contained herein, Buyer and Seller agree as follows:

**ARTICLE I
AGREEMENT TO PURCHASE AND SELL; PURCHASE PRICE**

1.1 Purchase and Sale. Upon the terms and conditions set forth in this Agreement, Seller agrees to convey to Buyer, and Buyer agrees to purchase and take from Seller, fee title interest in and to that certain parcel of real property, as more particularly described on Exhibit "A", attached hereto and by this reference made part of this Agreement, together with all appurtenances, rights, privileges and easements belonging thereto (collectively referred to herein as the "Property"), unless otherwise expressly stated in this Agreement.

(a) The description of the Property contained in Exhibit "A" is approximate. The exact acreage of the Property will be determined by a survey (the "Survey") to be prepared by Seller, at its sole cost, and provided to Buyer no later than ninety (90) days after the date of this Agreement. The Survey shall be attached to this Agreement as Exhibit "B" upon its completion.

(b) Water rights associated with the Property are included as part of this Agreement. These rights are defined in Exhibit "C" to this agreement.

(c) An assignment and transfer from Seller to Buyer, and the acceptance and assumption by Buyer, of fifty percent (50%) of Seller's rights and obligations under that certain Firm Transportation Contract—Rate Schedule T-1 dated March 31, 2005, between

Seller and Questar Pipeline Company is being entered into in connection with this Agreement. The terms of such assignment, transfer and assumption are included in a separate Assignment and Assumption Agreement between Seller and Buyer of even date herewith, and the effectiveness of such agreement constitutes an express condition for the effectiveness of this Agreement.

1.2 Purchase Price. The purchase price for the Property (the "Purchase Price") shall be _____ (\$_____).

1.3 Payment of Purchase Price. Buyer shall pay the Purchase Price to Seller in cash, by cashier's check, or other immediately available funds on the Closing Date, as adjusted for prorations on the Closing Date as provided herein.

ARTICLE II TITLE INSURANCE

2.1 Commitment of Title Insurance.

(a) Within thirty (30) days after the date of this Agreement, Seller shall deliver to Buyer a commitment for title insurance covering the Property (the "Commitment"), issued by the Title Company and dated on or after the date of this Agreement.

(b) Buyer shall have ten (10) days following receipt of the Commitment to provide any written objections to any matter set forth on Schedule B of the Commitment. If Buyer does not timely deliver written notice of objection to Seller, Buyer shall be deemed to have approved of all matters set forth in the Commitment. Matters which Seller has agreed to discharge pursuant to Section 2.1 (c) and any encumbrances or other title exceptions to which Buyer does not object shall be deemed to be "Permitted Exceptions" and shall not be considered objections to any matter contained in the Commitment.

(c) If Buyer provides a written notice of objections in accordance with Section 2.1 (b), then Seller shall have the option to: (i) cure such objections at Seller's sole cost; or (ii) terminate this Agreement.

(d) Buyer's sole remedy for Seller's inability to convey title subject only to the Permitted Exceptions or to cure Buyer's objections in accordance with Section 2.1 (c) shall be to terminate this Agreement. In that case, Seller shall have no other obligation to Buyer in connection with this Agreement or the Property.

2.2 Delivery of Title Insurance. Except as otherwise stated in Section 2.1, Seller shall obtain and deliver to Buyer within ten (10) days after the Closing Date an ALTA Standard Owner's Policy of title insurance in the amount of the Purchase Price, effective as of the Closing Date and containing no exceptions other than the Permitted Exceptions.

**ARTICLE III
REPRESENTATIONS AND WARRANTIES**

3.1 Representations and Warranties of Seller. Seller makes the following representations and warranties to Buyer, as of the date of this Agreement and as of the Closing Date, each of which representations and warranties shall extend beyond the Closing Date and delivery of the Special Warranty Deed.

(a) Seller has and on the Closing Date will have good and marketable fee simple title to the Property to be conveyed, free and clear of all encumbrances, liens, claims, or reservations, except as specifically approved by Buyer under this Agreement.

(b) Seller has the right, power and authority to execute, deliver, and perform this Agreement and the execution, delivery, and performance of this Agreement have been duly authorized by all necessary corporate action on the part of Seller, and upon execution and delivery this Agreement shall constitute valid and binding obligations of Seller enforceable against Seller in accordance with its terms and except as enforceability may be limited by bankruptcy, insolvency, and other similar laws affecting claims and rights generally or be general equitable principles.

(c) Seller has not received written notice of any judgment, suit, claim, action, arbitration. Legal, administrative, or other proceeding or governmental investigation pending or threatened with respect to any of the Property that would materially adversely affect the Property, and no activities or events have occurred on or in connection with the Property that could give rise to any such claims or proceedings.

(d) Seller has not received any written notices, demands or deficiency statements from any mortgagee of the Property or from any state, municipal or county government or agency or any insurer relating to the Property and which have not been cured or remedied except property valuation and tax notices issued by Utah County.

(e) Except as otherwise expressly disclosed in the Commitment, the Property is not subject to any proposed special assessment or to any existing special assessment lien arising as a result of any works or improvements completed, installed or contemplated at or before the Closing Date.

(f) Seller has paid and shall pay all liens, charges, taxes and assessments for the Property arising prior to the Closing Date.

(g) No person, broker or entity, whether or not affiliated with Seller, is entitled to a commission, finder's fee or other compensation arising from this Agreement, as regarding Seller. Seller shall indemnify defend and hold Buyer harmless from and against any and all claims, loss or damage relating to or arising out of any claim for compensation by any broker, person or entity claiming by or through Seller.

3.2 Representations and Warranties of Buyer. Buyer makes the following representations and warranties to Seller, as of the date of this Agreement and as of the Closing Date, each of which representations and warranties shall survive the Closing and delivery of the Special Warranty Deed.

(a) Buyer has the right, power and authority to execute, deliver and perform this Agreement.

(b) No person, broker or entity, whether or not affiliated with Buyer, is entitled to a commission, finder's fee or other compensation arising from this Agreement as regarding Buyer. Buyer shall indemnify, defend and hold Seller harmless from and against any and all claims, loss or damage relating to or arising out of any claim for compensation by any broker, person or entity claiming by or through Buyer.

3.3 Acknowledgment by Buyer Regarding Seller's Representations and Warranties. Except as expressly set forth in other portions of this agreement, Buyer hereby affirms that neither Seller nor its agents, employees or attorneys have made, nor has Buyer relied upon any representation, warranty, or promise (either express or implied) with respect to the Property or any other subject matter of this Agreement including, without limitation:

(a) the general plan designation, zoning, value, use, tax status or physical condition of any part of the Property or the improvements to the Property;

(b) the flood elevations, drainage patterns and soil and subsoils composition and compaction levels and other conditions at the Property;

(c) the existence or nonexistence of any hazardous or toxic substance, waste or material (as defined or regulated by any federal, state or local law or regulation);

(d) the accuracy of any soils reports or any other plans or reports regarding the Property;

(e) the suitability of the Property for Buyer's intended purpose; or

(f) the status, suitability or sufficiency of any water rights associated with the Property.

WITHOUT LIMITING THE GENERALITY OF THE FOREGOING AND EXCEPT AS EXPRESSLY SET FORTH IN THIS AGREEMENT, BUYER ACCEPTS THE PROPERTY FROM THE SELLER "AS IS", SUBJECT TO "ALL FAULTS" INCLUDING, BUT NOT LIMITED TO, BOTH LATENT AND PATENT DEFECTS, AND THE ENVIRONMENTAL CONDITION OR DEFECTS THEREOF. EXCEPT AS EXPRESSLY SET FORTH IN THIS AGREEMENT, BUYER HEREBY WAIVES ALL WARRANTIES, EXPRESS OR IMPLIED, REGARDING THE CONDITIONS AND THE USE OF THE SUBJECT PROPERTY,

INCLUDING, BUT NOT LIMITED TO, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

ARTICLE IV USE OF PROPERTY

4.1 Seller's Use of the Property Prior to Closing Date. From and after Seller's execution of this Agreement and except in the ordinary course of administering its general mortgage, Seller shall not grant or convey any easement, lease, license, permit or any other legal or beneficial interest in or to the Property or engage in any contract with any party other than Buyer regarding the purchase or sale of the Property, without the prior written consent of Buyer. Further, except as otherwise provided for herein, Seller agrees to pay, as and when the same are due, all payments on any encumbrances presently affecting the Property and any and all taxes, assessments and levies in respect of the Property through the Closing Date.

4.2 Buyer's Right to Enter Property Prior to the Closing Date. Buyer or its employees or agents may enter the Property at any time prior to the Closing Date upon twenty-four (24) hours notice to Seller to inspect the Property and perform surveys or tests as Buyer may elect; provided, however, that such entry shall not unreasonably interfere with the activities of Seller on the Property, and Buyer shall indemnify and hold Seller harmless from, all liabilities and all consequences of any interruption of Seller's operation of Seller's generation facilities located adjacent to the Property associated with Buyer's activities on the Property.

ARTICLE V EASEMENTS

5.1 Seller's Use of the Property After the Closing Date. Seller reserves the right to continue to use those portions of the Property identified in Attachment A for the purpose of owning, operating and maintaining electrical distribution and transmission lines and related facilities, including communications and other facilities, whether above or underground, and also for access to Seller's existing substation located adjacent to the Property. On or before the Closing Date, Buyer shall grant to Seller one or more easements, in a form acceptable to Seller, which will allow for such continued use and access or future related uses and access by Seller.

5.2 Existing Easements. Buyer purchases the Property subject to all existing easements identified as Permitted Exceptions under Section 2 above.

5.3 New Easements. On or before the Closing Date, Seller shall grant to Buyer one or more easements for access to Seller's existing, or future, electrical and/or natural gas interconnection points (to be) located near the Property, which will allow for such continued use and access or future related uses and access by Buyer.

ARTICLE VI

CLOSING

6.1 Time and Place of Closing. The Purchase and sale transaction contemplated by this Agreement shall be consummated through a closing conference (the "Closing") which shall be held at the Title Company on or before _____, (the "Closing Date"), or at such earlier time and place as the parties may mutually agree in writing.

6.2 Actions at Closing. At the Closing, the following events shall occur and each being declared to have occurred simultaneously with the other:

(a) All documents to be recorded and funds to be delivered hereunder shall be delivered to the Title Company in escrow, to hold, deliver, record and disburse in accordance with supplemental escrow instructions, the form and content of which shall be agreed to by the parties prior to Closing.

(b) At the Closing or sooner as otherwise stated in the escrow instructions, the following shall occur:

(i) Seller shall deliver or cause to be delivered in accordance with the escrow instructions:

(1) Special Warranty Deed conveying the Property to Buyer, duly executed and acknowledged by Seller and in proper form generally for recording in _____; and

(2) All other documents required to be executed by Seller pursuant to the terms of this Agreement.

(ii) Buyer shall deliver or cause to be delivered in accordance with the escrow instructions:

(1) The Purchase Price to be; and

(2) All other documents required to be executed by Buyer pursuant to the terms so this Agreement.

(c) Buyer and Seller shall each deliver to the other, two executed copies of the Buyer's and Seller's Statement of Settlement setting forth all prorations, credits provided in this Agreement, disbursements of the purchase price, and expenses of the Closing.

(d) Seller shall bear any and all Closing or escrow charges of the Title Company.

6.3 Seller's Remedies. In the event this transaction fails to close due to Buyer's fault or inability to close, Seller may elect either to seek specific performance of this Agreement by suit in equity, to seek damages from Buyer.

6.4 Buyer's Remedies. In the event this transaction fails to close due to Seller's fault, this Agreement shall be declared void and of no effect.

ARTICLE VII PRORATIONS

7.1 Prorations Between Seller and Buyer. The following prorations shall be made between Seller and Buyer as of the Closing Date:

(a) Real property taxes and assessments on the Property for the year of Closing shall be prorated between Seller and Buyer based on the number of days each owned the Property. In the event the Property constitutes some portion of a larger tract of land, such proration shall be based upon the average of the Property as a percentage of the acreage of the entire tract. If, as of the Closing Date, the actual tax bills for the year or years in question are not available and the amount of taxes to be prorated cannot be ascertained, then the most recent known rates, millages and assessed valuations (which amounts shall relate to the same tax year) shall be used, and such proration shall be repeated when the final tax bill is available and either Buyer and Seller, as the case may be, shall promptly pay to the other the net amount owing as a result of such redetermination.

(b) Other Closing costs shall be apportioned between the parties in accordance with the normal and customary practice of commercial real estate transactions in Utah County, Utah.

ARTICLE VIII RELEASE, ASSUMPTION AND INDEMNITY

8.1 Seller shall indemnify, hold harmless and defend Buyer against all claims, suits, losses and damages made against or incurred by Buyer relating to the condition of the Property prior to the Closing Date or any activity in connection with the Property which occurred prior to the Closing Date. Buyer shall indemnify, hold harmless and defend Seller against all claims, suits, losses and damages incurred by Seller relating to the condition of the Property after the Closing Date or any activity in connection with the Property which occurs after the Closing Date.

ARTICLE IX MISCELLANEOUS

9.1 Entire Agreement. This Agreement contains the entire agreement between the parties respecting the matters herein set forth and supersedes all prior agreements, which written or oral, between the parties respecting such matters. Any amendments or modifications hereto in order to be effective shall be in writing and executed by the parties hereto. Notwithstanding the foregoing, Buyer's use and occupancy of this Agreement shall be subject at all times to the terms and conditions of that certain Construction Coordination Agreement dated [DATE] between Seller and Buyer.

9.2 Amendments. This Agreement may be amended or modified only by mutual written agreement.

9.3 Survival. All warranties, representations, covenants and agreements contained in this Agreement shall survive the execution and delivery of this Agreement and all documents delivered in connection with this Agreement and shall survive the Closing of the transactions contemplated by this Agreement and all performances in accordance with this Agreement.

9.4 Successors and Assigns. This Agreement shall be binding upon and inure to the benefit of the parties hereto and their respective successors, heirs, administrators, and assigns; provided, however, that notwithstanding the foregoing, neither party's interest under this Agreement may be assigned, encumbered, or otherwise transferred, whether voluntarily, involuntarily, by operation of law or otherwise.

9.5 Notices. Any notice, demand or document which any party is required or any party desires to give or deliver to or make upon any other party shall be in writing, and may be personally delivered or given or made by recognized overnight courier service or by United States registered or certified mail, return receipt requested, with postage prepaid, addressed as follows:

To Seller:

To Buyer:

Any party may designate a different address for itself by notice similarly given. Unless provided herein, any such notice, demand or document so given shall be effective upon delivery of the same to the proper address of the party or parties to whom the same is to be given.

9.6 Time of Essence. Time is of the essence in the performance of each and every term, condition, and covenant of this Agreement.

9.7 Counterparts. This Agreement may be executed in any number of counterparts which together shall constitute the contract of the parties.

9.8 Paragraph Headings. The paragraph headings herein contained are for purposes of identification only and shall not be considered in construing this Agreement.

9.9 Attorneys' Fees. The prevailing party in any legal proceeding brought to enforce rights hereunder shall recover from the other party its reasonable attorneys' fees and costs. As used herein in the term "prevailing party" means the party entitled to recover the costs in any suit, whether or not brought to judgment, and whether or not incurred before or after the filing of suit.

9.10 Waiver. Except as herein expressly provided, no waiver by a party of any breach of this Agreement or any warranty or representation under this Agreement by another party shall

be deemed to be a waiver of any other breach of any kind or nature (whether preceding or succeeding and whether or not of the same or similar nature) and no acceptance of payment or performance by a party after any such breach by another party shall be deemed to be a waiver of any further breach of this Agreement or of any representation or warranty by such other party whether or not the first party knows of such a breach at the time it accepts such payment or performance. No failure on the part of a party to exercise any right it may have by the terms of this Agreement or by law upon the default of another party, and no delay in the exercise of any such right by the first party at any time when such other party may be in default, shall operate as a waiver of any default, or as a modification in any respect of the provision of this Agreement.

9.11 Exhibits. Any and all exhibits attached or to be attached hereto are hereby incorporated and made a party of this Agreement by reference.

9.12 Governing Law. This Agreement shall be governed and construed in accordance with the laws of the State of Utah.

9.13 No Recording. This Agreement shall not be recorded in the real property records.

9.14 Further Instruments. Each party hereto shall from time to time execute and deliver such further documents or instruments as the other party, its counsel or the Title company may reasonably request to effectuate the intent of this Agreement, including without limitation documents necessary for compliance with the laws, ordinances, rules and regulations of any applicable governmental authorities.

9.15 Confidentiality. The purchase price and terms of this Agreement are intended by both parties to be confidential. Therefore, except as directed by a court, administrative authority or required by subpoena, neither party shall disclose the purchase price or terms of this Agreement or any other non-public information related thereto.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement effective as of the date and year first above written.

PACIFICORP

By: _____

Its: _____

Date Signed:

[BUYER]

By: _____

Its: _____

Date Signed:

EXHIBIT A

**PROPERTY DESCRIPTION TO BE COMPLETED PRIOR
TO CLOSING**

EXHIBIT B

SURVEY TO BE ATTACHED

EXHIBIT C

WATER RIGHTS

Buyer shall receive water rights to two hundred (200) acre-feet of ground water as part of this transaction.

PacifiCorp
Draft RFP 2009
Responses due December 1, 2005

RFP 2009
ATTACHMENT 18
CURRENT CREEK ENGINEERING,
CONSTRUCTION AND
PROCUREMENT CONTRACT
(EPC)
September 2005

**ENGINEERING, PROCUREMENT
AND CONSTRUCTION CONTRACT**

dated as of [DATE]

by and between

PacifiCorp,
as Company

and

[Contractor Name]
as Contractor

TABLE OF CONTENTS

	<u>Page</u>
ARTICLE 1 DEFINITIONS AND INTERPRETATION.....	2
Section 1.1 Defined Terms	2
Section 1.2 Interpretation.....	2
ARTICLE 2 PROJECT COMMENCEMENT AND COMPLETION.....	2
Section 2.1 Notice To Proceed	2
Section 2.2 Time for Completion	4
Section 2.3 Company’s Request for Earlier Completion.....	4
Section 2.4 Delay in Completion.....	4
ARTICLE 3 CONSIDERATION AND PAYMENT	4
Section 3.1 Payment Milestones.....	4
Section 3.2 Conditions Precedent	5
Section 3.3 Wire Transfer.....	7
Section 3.4 Invoice Instructions	7
Section 3.5 Contractor Taxes.....	7
Section 3.6 Project Taxes	8
Section 3.7 Offset Provisions	8
Section 3.8 Payment Lien and Claim Releases	8
Section 3.9 Withholding Payment	8
Section 3.10 Basis of Contract Price	9
ARTICLE 4 REPRESENTATIONS AND WARRANTIES OF CONTRACTOR	10
Section 4.1 Organization, Standing and Power	10
Section 4.2 Capital Structure	10
Section 4.3 Authority; Execution and Delivery: Enforceability.....	11
Section 4.4 Validity of Contract; No Conflict	11
Section 4.5 Governmental Approvals and Consents	12
Section 4.6 No Proceedings	12
Section 4.7 Compliance	12
Section 4.8 Environmental Matters	13
Section 4.9 Security Interests and Liens.....	13
Section 4.10 No Defaults	13
Section 4.11 Expertise	13
ARTICLE 5 REPRESENTATIONS AND WARRANTIES OF COMPANY	14
Section 5.1 Corporate Organization; Etc.	14
Section 5.2 Validity of Contract; No Conflict	14
Section 5.3 Consents, Approvals and Authorizations	15

Section 5.4 Resources 15

Section 5.5 No Proceedings 15

ARTICLE 6 CREDIT REQUIREMENTS 15

Section 6.1 Credit Requirements 15

Section 6.2 Security 15

ARTICLE 7 GENERAL OBLIGATIONS OF CONTRACTOR 16

Section 7.1 Contractor’s General Obligations 16

Section 7.2 Physical Obstructions and Conditions 17

Section 7.3 Selection of Vendors and Use of Subcontractors 17

Section 7.4 Compliance With Applicable Law 17

Section 7.5 Governmental Approvals 18

Section 7.6 Opportunities for Other Contractors; Labor Relations 18

Section 7.7 Labor and Employment 19

Section 7.8 Authority For Access for Inspection 20

Section 7.9 Contractor’s Use of Company’s Drawings 20

Section 7.10 Contractor Drawings and Manuals 20

Section 7.11 Training 21

Section 7.12 Safety 22

Section 7.13 Intellectual Property Rights and Computer Program Licenses 22

Section 7.14 Contractor’s Representative 23

Section 7.15 Contractor’s Personnel/Drugs, Alcohol and Firearms 24

Section 7.16 Use of Premises and Trespassing 24

Section 7.17 Electricity, Water and Pipeline Natural Gas 24

Section 7.18 Temporary Facilities 25

Section 7.19 Decisions and Instruction Of Company’s Representative 25

Section 7.20 Cooperation Between the Parties 25

Section 7.21 Spare Parts Inventory 26

Section 7.22 Further Assurances 26

Section 7.23 Indebtedness 27

Section 7.24 Liens 27

Section 7.25 Restriction on Fundamental Changes 27

Section 7.26 Amendment of Project Documents; Additional Project Documents 27

Section 7.27 Environmental Matters 28

Section 7.28 Records and Accounts 28

Section 7.29 Condemnation, Eminent Domain, Casualty Events 28

Section 7.30 Contractor’s Organizational Documents 29

Section 7.31 Construction Coordination Agreement 29

Section 7.32 Import Permits, Licenses and Duties 29

Section 7.33 Compliance with Planning Permissions, Consents 29

Section 7.34 Permits 29

Section 7.35 Lay Out 29

ARTICLE 8 GENERAL OBLIGATIONS OF THE COMPANY	30
Section 8.1 Company's General Obligations.....	30
Section 8.2 Planning Permissions, Consents	30
Section 8.3 Operations and Maintenance Staff.....	31
Section 8.4 Certificate of Convenience and Necessity	31
Section 8.5 Company's Representative	31
Section 8.6 Standard of Conduct	32
ARTICLE 9 WORKING ARRANGEMENTS	32
Section 9.1 Site Regulations	32
Section 9.2 Site Security	32
Section 9.3 Preservation of Public and Private Access	33
Section 9.4 Night, Weekend or Holiday Work.....	33
Section 9.5 Avoidance of Noise and Disturbance	33
Section 9.6 Opening Up of Work	34
Section 9.7 Fencing, Protection, Lighting	34
Section 9.8 Site Services.....	34
Section 9.9 Cleanup	34
Section 9.10 Contamination.....	35
Section 9.11 Material Safety Data	35
Section 9.12 Historical Artifacts.....	35
ARTICLE 10 PROJECT SCHEDULE.....	36
Section 10.1 Project Schedule	36
Section 10.2 Form of Project Schedule	36
Section 10.3 Rejection of the Project Schedule.....	36
Section 10.4 Alterations to Project Schedule	36
Section 10.5 Revision of Project Schedule.....	36
Section 10.6 Contractor's Responsibility to Comply with Milestone Completion Dates	37
Section 10.7 Rate of Progress	37
Section 10.8 Progress Reports	37
Section 10.9 Progress Meetings.....	38
ARTICLE 11 DELIVERY, SHIPPING, AND HANDLING OF PLANT AND EQUIPMENT	38
Section 11.1 Delivery Responsibility	38
Section 11.2 Packing	38
Section 11.3 Transportation.....	39
Section 11.4 Extraordinary Traffic	39
Section 11.5 Allocation	39
ARTICLE 12 CONTRACTOR'S EQUIPMENT.....	39
Section 12.1 Contractor's Equipment.....	39
Section 12.2 Contractor's Equipment on Site.....	39

	<u>Page</u>
Section 12.3 Maintenance of Contractor's Equipment.....	40
ARTICLE 13 CHANGE ORDERS.....	40
Section 13.1 Changes.....	40
Section 13.2 Procedure for Changes.....	41
Section 13.3 Continued Performance Pending Resolution of Disputes	43
Section 13.4 Preservation of Schedule and Contract Price.....	43
ARTICLE 14 WORKMANSHIP AND MATERIALS.....	43
Section 14.1 Manner of Execution	43
Section 14.2 Condition of Materials.....	43
Section 14.3 Inspection.....	43
ARTICLE 15 DRAWINGS.....	44
Section 15.1 Drawings.....	44
Section 15.2 Consequences of Documents not in accordance with Contract.....	45
Section 15.3 Drawings Submitted	45
Section 15.4 Inspection of Drawings.....	45
Section 15.5 Operating and Maintenance Instructions	45
Section 15.6 Company's Use of Drawings.....	46
Section 15.7 Manufacturing Drawings	46
Section 15.8 Errors in Drawings Supplied by Contractor	46
ARTICLE 16 SUSPENSION OF WORKS, DELIVERY OR ERECTION	47
Section 16.1 Order to Suspend	47
Section 16.2 Protection of Work	47
Section 16.3 Resumption of Work.....	48
Section 16.4 Change Order in Event of Suspension.....	48
ARTICLE 17 PERFORMANCE TESTING	49
Section 17.1 Performance Tests	49
Section 17.2 Emissions Guarantee	50
Section 17.3 Cost and Direction	50
Section 17.4 Company's Right to Validate	50
Section 17.5 Additional Tests; Test Energy	51
Section 17.6 Timing.....	51
Section 17.7 Test Reports	51
Section 17.8 Failure on Tests or Inspection.....	52
Section 17.9 Duty to Advise of Defects, Errors and Omissions in Plant and Equipment.....	52

ARTICLE 18 DEFECTS BEFORE TRANSFER OF POSSESSION AND CONTROL OF WORK.....52

Section 18.1 Identification of Defects52

Section 18.2 Replacement of Defects53

ARTICLE 19 NOTICE OF SUBSTANTIAL COMPLETION, NOTICE OF FINAL ACCEPTANCE AND TRANSFER OF CARE, CUSTODY AND CONTROL.....53

Section 19.1 Notice of Substantial Completion of Work53

Section 19.2 Care, Custody and Control; Punch List Items53

Section 19.3 Dispatch Coordination54

Section 19.4 Use Before Acceptance Date54

Section 19.5 Title and Risk of Loss54

Section 19.6 Marking of Equipment and Plant.....55

Section 19.7 Removal of Equipment56

Section 19.8 Notice of Final Acceptance of Work56

ARTICLE 20 CODES AND STANDARDS.....57

Section 20.1 Comparable Quality.....57

ARTICLE 21 ENVIRONMENTAL MATTERS57

Section 21.1 General.....57

Section 21.2 Release On-Site57

Section 21.3 Release Off-Site.....57

Section 21.4 Liability.....58

Section 21.5 Pre-existing Regulated Materials.....58

Section 21.6 Notice.....58

ARTICLE 22 WARRANTIES OF WORK.....58

Section 22.1 Warranties.....58

Section 22.2 Warranty Period.....59

Section 22.3 Repair of Defects59

Section 22.4 Warranty Period Extension.....59

Section 22.5 Contractor and Subcontractor Warranties59

Section 22.6 Delay in Remediating Defects59

Section 22.7 Removal of Defective Work.....60

Section 22.8 Further Tests60

Section 22.9 Contractor to Diagnose.....60

Section 22.10 Latent Defects.....60

Section 22.11 Significant Defects.....61

ARTICLE 23 LIQUIDATED DAMAGES61

Section 23.1 General.....61

Section 23.2	Critical Milestone Guarantee Liquidated Damages.....	61
Section 23.3	Liquidated Damages for Delay in Substantial Completion	62
Section 23.4	Liquidated Damages for Net Capacity and Net Heat Rate	62
Section 23.5	Liquidated Damages for Startup and Commissioning.....	62
Section 23.6	Calculations and Payments of Liquidated Damages	62
ARTICLE 24 LIMITATIONS OF LIABILITY		63
Section 24.1	Duty to Mitigate.....	63
Section 24.2	Limitation of Company’s Liability	63
Section 24.3	Enforceability of Liquidated Damages	63
Section 24.4	Limitations on Liquidated Damages.....	64
ARTICLE 25 INDEMNIFICATION		64
Section 25.1	Indemnification for Third Party Claims	64
Section 25.2	Title Indemnity and Liens.....	66
Section 25.3	Indemnity Period	67
ARTICLE 26 INSURANCE.....		67
Section 26.1	Contractor’s and Subcontractors’ Insurance Coverage	67
Section 26.2	Waiver of Rights.....	70
Section 26.3	Contractor’s Cooperation with Company	70
ARTICLE 27 FORCE MAJEURE		70
Section 27.1	Effect of Force Majeure.....	70
Section 27.2	Notice of Occurrence	70
Section 27.3	Performance to Continue	70
Section 27.4	Termination in Consequence of Force Majeure	70
Section 27.5	Risk of Loss	71
ARTICLE 28 DEFAULT		71
Section 28.1	Contractor’s Default	71
Section 28.2	Company’s Default	72
Section 28.3	Removal of Contractor’s Equipment	73
Section 28.4	Remedies on Default.....	73
ARTICLE 29 TERMINATION.....		74
Section 29.1	Termination by Company	74
Section 29.2	Termination by Contractor	74
Section 29.3	Procedures Following Termination by Contractor or due to Force Majeure.....	75
Section 29.4	Exclusivity	75

ARTICLE 30 TAXES.....	76
Section 30.1 Company’s Obligation.....	76
Section 30.2 Contractor’s Obligation	76
ARTICLE 31 CLAIMS, CLAIM NOTICE AND DISPUTE RESOLUTION.....	76
Section 31.1 Claims	76
Section 31.2 Dispute Resolution.....	77
ARTICLE 32 ASSIGNMENT.....	77
Section 32.1 Assignment of Contractor’s Interests	77
ARTICLE 33 CONFIDENTIALITY	78
Section 33.1 Confidentiality	78
ARTICLE 34 MISCELLANEOUS PROVISIONS.....	79
Section 34.1 Notices, Consents and Approvals.....	79
Section 34.2 Entire Contract.....	80
Section 34.3 Amendment; Waiver.....	80
Section 34.4 Successors and Assigns	80
Section 34.5 Third Party Beneficiaries.....	80
Section 34.6 Severability	80
Section 34.7 Further Assurances	81
Section 34.8 Publicity.....	81
Section 34.9 Independent Contractor	81
Section 34.10 Survival.....	81
Section 34.11 Governing Law; Waiver of Jury Trial	81
Section 34.12 Counterparts.....	82
Section 34.13 Captions	82
Section 34.14 Consent Contracts.....	82

List of Appendices

Appendix A:	Site References; Legal Description
Appendix B:	Scope of Supply and Technical Specifications
Appendix C:	Project Schedule
Appendix D:	[RESERVED]
Appendix E:	Governmental Approvals
Appendix F:	Glossary of Terms
Appendix G:	[RESERVED]
Appendix H:	Substantial Completion, Final Acceptance, Performance Guarantees and Performance Tests
Appendix I:	[RESERVED]
Appendix J:	Change Order Costing
Appendix K:	[RESERVED]
Appendix L:	Contractor Final Waiver and Release of Lien
Appendix M:	Emissions Reductions Credits
Appendix N:	Pre-Existing Regulated Materials
Appendix O:	[RESERVED]
Appendix P:	[RESERVED]
Appendix Q:	Approved/Preferred Supplier List
Appendix R:	Price Options
Appendix S:	Construction Coordination Agreement
Appendix T:	Witness Point Schedule

List of Exhibits

Exhibit A	Form of Notice of Request For Payment
Exhibit B	Form of Notice to Proceed
Exhibit C	Credit Matrix
Exhibit D	Change Order Forms:
D-1	Form of Change Order
D-2	Form of Change Order Request
D-3	Form of Change Order Notice
Exhibit E	Form of Officers' Certificates for Notice to Proceed
Exhibit F	Form of Letter of Credit
Exhibit G	Planning Consents
Exhibit H	Insurance Certificates
Exhibit I	[RESERVED]
Exhibit J	Form of Contractor Lien Release
Exhibit K	Form of Subcontractor Lien Release
Exhibit L	Form of Supplier Lien Release

List of Schedules

<u>Schedule 2.1(b)(viii)</u>	Lien Search
<u>Schedule 4.2(a)</u>	Membership Interests
<u>Schedule 4.2(b)</u>	Reserved Membership Interests

Schedule 4.5(b)
Schedule 4.6
Schedule 7.24(a)

Required Consents and Approvals
Proceedings
Permitted Liens

THIS WORKING DRAFT DOES NOT CONSTITUTE A BINDING OFFER, SHALL NOT FORM THE BASIS FOR AN AGREEMENT BY ESTOPPEL OR OTHERWISE, AND IS CONDITIONED UPON SELECTION OF THE BIDDER, EXECUTION, AND EACH PARTY'S RECEIPT OF ALL REQUIRED MANAGEMENT AND BOARD APPROVALS IN THEIR SOLE DISCRETION (INCLUDING FINAL CREDIT AND LEGAL APPROVALS). ANY ACTIONS TAKEN BY A PARTY IN RELIANCE ON THE TERMS SET FORTH IN THIS WORKING DRAFT OR ON STATEMENTS MADE DURING NEGOTIATIONS RELATING TO THIS WORKING DRAFT SHALL BE AT THAT PARTY'S OWN RISK. UNTIL THE TOLLING AGREEMENT IS NEGOTIATED, APPROVED BY ALL APPROPRIATE PARTIES AND EXECUTED BY EACH PARTY'S AUTHORIZED SIGNATORY, NO PARTY SHALL HAVE ANY LEGAL OBLIGATIONS, EXPRESSED OR IMPLIED, OR ARISING IN ANY OTHER MANNER UNDER THIS WORKING DRAFT OR IN THE COURSE OF NEGOTIATIONS. ANY ASSERTION TO THE CONTRARY IN ANY PROCEEDING OR ACTION REGARDING THIS WORKING DRAFT SHALL RENDER THIS WORKING DRAFT NULL AND VOID IN ITS ENTIRETY. DURING DISCUSSIONS AND NEGOTIATIONS ANY PARTY MAY CHANGE ITS POSITION ON ANY MATTER, WHETHER OR NOT SET FORTH IN OR BASED UPON THIS WORKING DRAFT, ANY OTHER DOCUMENT OR ANY COURSE OF DEALING, AT ANY TIME OR FOR ANY REASON.

ENGINEERING, PROCUREMENT AND CONSTRUCTION CONTRACT

THIS ENGINEERING, PROCUREMENT AND CONSTRUCTION CONTRACT (this "Contract") is made and entered into as of _____ (the "Effective Date"), by and between PacifiCorp, an Oregon corporation ("Company"), and [CONTRACTOR FULL NAME], a Delaware limited liability company ("Contractor"), each referred to individually as "Party" and collectively, as "Parties."

WITNESSETH:

WHEREAS, Contractor responded to a Request for Proposals – PacifiCorp RFP-2009 (the "RFP") which was issued by Company on [RFP DATE]. Company's objective in issuing the RFP was to fulfill a portion of its resource requirements as contemplated in Company's integrated resource plan published in January 2005;

WHEREAS, Contractor responded to the RFP with a detailed written proposal for the construction of a generation facility of approximately 500 MW net generation capacity on real property owned by the Company immediately adjacent to the Company's Currant Creek generation facility near Mona, Utah;

WHEREAS, in accordance with the procedures set forth in the RFP, Contractor and Company have agreed upon a conformed scope of work (as described herein and in the Exhibits hereto, the "Work") setting forth any exceptions or modifications to Specification included in the RFP, upon which the Parties have agreed;

WHEREAS, Contractor will, subject to the terms and conditions in this Contract, carry out and complete the Work; and

WHEREAS, Company will, in consideration of the performance by Contractor of the Work in strict accordance with the terms and conditions of this Contract, pay Contractor the Contract Price at the times and in the manner specified in this Contract.

NOW, THEREFORE, in consideration of the mutual representations and warranties and covenants made herein, Company and Contractor, each intending to be legally bound, hereby agree as follows:

ARTICLE 1

DEFINITIONS AND INTERPRETATION

Section 1.1 Defined Terms

Unless the context requires otherwise, capitalized terms used in this Contract shall have the meanings assigned to them in the Glossary of Defined Terms attached hereto as Appendix F.

Section 1.2 Interpretation

Unless the context requires otherwise, in this Contract: (a) words singular or plural in number shall be deemed to include the other and pronouns having a masculine or feminine gender shall be deemed to include the other; (b) any reference in this Contract to any person shall include its permitted successors and assigns and, in the case of any governmental instrumentality, any person succeeding to its functions and capacities; (c) any reference in this Contract to any Article, sub-Article, Section, sub-Section, Appendix, Exhibit, Schedule or Attachment to any of these shall mean and refer to the Article, sub-Article, Section, sub-Section, Appendix, Exhibit, Schedule or Attachment contained in or the Article, sub-Article, Section, sub-Section, Appendix, Exhibit, Schedule or Attachment attached to this Contract, as the same may be amended or modified from time to time; and (d) the words “include” and “including” shall mean to include, without limitation.

ARTICLE 2

PROJECT COMMENCEMENT AND COMPLETION

Section 2.1 Notice To Proceed

(a) Contractor shall not take any action with respect to the Project until Company has issued the Notice to Proceed substantially in the form attached as Exhibit B, except as provided in this paragraph. Issuance of the Notice to Proceed is expressly made subject to the satisfaction or waiver by Company of each of the conditions in Section 2.1(b), Company. Following issuance of the Notice to Proceed Contractor shall proceed with developing the Project and performing the Work. Company shall provide at least three (3) Business Days' prior notice of its intention to issue the Notice to Proceed. At Company's option, Company may issue one or more limited notices to proceed prior to

issuing the Notice to Proceed, pursuant to which Contractor shall perform or cause to be performed certain development activities specified in any such limited notice to proceed.

(b) The obligation of Company to issue the Notice to Proceed to Contractor is subject to the satisfaction or waiver by Company of all of the following conditions precedent:

(i) CCN and Governmental Approvals. Company's receipt of and satisfaction with the terms of the CCN and all Governmental Approvals;

(ii) Network Resource Integration. PacifiCorp Transmission shall have demonstrated to Company that the Project can be integrated with PacifiCorp Transmission's System as a network resource on or prior to May 1, 2009.

(iii) Accounting Treatment. Company shall be satisfied that the accounting treatment relating to PacifiCorp's obligations under any Project Document or in connection with the Project will not result in the addition of liabilities to the balance sheet of PacifiCorp.

(iv) Appendices, Exhibits and Schedules. Each Appendix, Exhibit and Schedule to this Contract shall be in final form and substance satisfactory to Company and Company's Representative, each in its sole discretion.

(v) Project Documents. Company shall have received the Project Documents, the Security Documents (including any Guaranty), and the Consents, (together with all amendments, supplements, schedules, and exhibits thereto), each of which shall (A) have been duly authorized, executed and delivered by each party thereto, (B) be in the form of the applicable form attached hereto (if such a form is attached) and otherwise in form and substance satisfactory to Company, and (C) be in full force and effect.

(vi) Officers' Certificates. Company shall have received the certificate of an authorized officer of Contractor certifying that (A) each of the conditions precedent to the issuance of the Notice to Proceed has been satisfied (other than to the extent that the satisfaction of a condition is dependent on the judgment of Company) (B) that each of the conditions in Sections 3.2(b), 3.2(c), 3.2(d), 3.2(e), 3.2(f), 3.2(h) and 3.2(i) has been and will be satisfied as of the date of the issuance of the Notice to Proceed; and (C) each of the representations of Contractor set forth in Article 4 is true and correct. The form of such aforementioned certificate is attached hereto as Exhibit E.

(vii) Security Documents; Filings. The Security Documents and all financing statements or other instruments with respect thereto, as may be necessary, shall have been duly filed or recorded in such manner and in such places as are required by Applicable Law to establish and perfect first priority Liens, in favor of Company, as granted pursuant to the Security Documents. Company shall have received either copies of all such documents (including copies of all acknowledgment copies of filed financing statements and all other recordings made pursuant hereto) or other evidence satisfactory to Company of the filing of all such financing statements and other recordings.

(viii) Record Searches. A search, made no more than thirty (30) days prior to the date of issuance of the Notice to Proceed, of the Uniform Commercial Code filing offices or other

registers in each jurisdiction in which Contractor is organized, has an office, or in which assets of Contractor are located, as certified by an authorized officers of Contractor, shall have revealed no filings, recordings or equivalent standard with respect to any of the Collateral (except such filings and recordings with respect to the Permitted Liens) in favor of any Person other than Company. A list of all of such filings and recordings or equivalent standard is set forth on Schedule 2.1(b)(viii). Company shall have received a copy of the search reports received as a result of such search.

(ix) Emission Reduction Credits. Company shall be satisfied with the form, substance and quantity of ERCs, if any, to provide for the lifetime operation of the Project.

(x) Equipment. Company shall be satisfied with the Equipment and all anticipated storage plans with respect thereto.

(xi) Additional Matters. Company shall have received such other certificates, documents and instruments relating to the transactions contemplated hereby as may have been reasonably requested by Company, and all corporate or other organizational actions and other matters and all other documents (including all documents referred to herein and not appearing as exhibits hereto) and all legal matters in connection with such transactions shall be satisfactory in form and substance to Company.

Section 2.2 Time for Completion

Contractor shall complete the Work and the Performance Tests in accordance with the Project Schedule and the terms of this Contract. Without limiting the foregoing, Contractor shall cause the Substantial Completion Date to occur no later than the Guaranteed Substantial Completion Date.

Section 2.3 Company's Request for Earlier Completion

Company may request completion of the Project earlier than the Guaranteed Substantial Completion Date and Contractor shall make all commercially reasonable efforts to comply with such request.

Section 2.4 Delay in Completion

If Contractor fails to meet the Substantial Completion Criteria by the Substantial Completion LD Commencement Date, Company shall be entitled to liquidated damages under article 23 ("Liquidated Damages").

ARTICLE 3

CONSIDERATION AND PAYMENT

Section 3.1 Payment Milestones

(a) As full consideration for the satisfactory performance of Contractor's obligations under this Contract, Company shall pay Contractor the aggregate fixed price amount (the "Contract Price") in accordance with Exhibit D. Company shall pay Contractor all undisputed invoice amounts within

thirty (30) days upon receipt of an invoice in strict accordance with the a Milestones, less a retention of five (5) percent; provided, however, in no event shall any payment be due and owing until such time as the Work has been satisfactorily completed and accepted by Company pursuant to the procedures set forth in Exhibit D and all other conditions have been satisfied. Notwithstanding the foregoing, no payment shall be made 30 days prior to the date set forth in the Payment Milestones. No payment shall be made unless Contractor (i) has achieved the Milestones for which the payment is requested, and (ii) all Milestones with Milestone Dates prior to such Milestone have been achieved prior to Contractor submitting its invoice with respect thereto. Contractor shall submit to Company a request for release of retention upon achieving Final Completion, as defined in article 19 (“Notice of Substantial Completion”). Payment of undisputed retention amounts shall be made to Contractor within thirty (30) days of receipt of invoice.

(b) Payment Milestones have been selected to clearly identify the actual status of Work completed, rather than anticipated Project Schedules. This will establish a tangible basis for mutual agreement that the Milestone objective has been met.

(c) Company will consider all Work complete only when the Work is completed in accordance with this Contract, Exhibits and Appendices, including but not limited to: all training and documentation has been provided, all Equipment and spares have been provided, the Work is finished, the final product has been inspected and tested, all deficiencies are corrected, all Liquidated Damages have been reconciled and the Project is operating in a condition satisfactory to Company in its reasonable discretion, as specified in the Contract documents.

(d) Company’s Representative shall, within fifteen (15) days after receipt of any invoice, determine whether (i) the Work evidenced by Contractor’s invoice has been completed in conformance with the requirements of this Contract; (ii) the invoice, together with any required backup information, has been properly submitted; and (iii) the invoiced amount reflects the payment due under Payment Milestones. Company's Representative shall inform Contractor as to whether it disputes the invoice or any portion of the invoice.

Section 3.2 Conditions Precedent

The obligation of Company to pay payments for any invoice, is subject to the satisfaction on each Payment Date of each the following conditions precedent:

(a) Notice Required. Prior to being entitled to any payment under this Contract, Contractor shall submit a Notice of Request for Payment in the form attached hereto as Exhibit A and in substance satisfactory to Buyer, that meets all of the requirements of this Section 3.2 and of Section 3.4 (“Invoice Instructions”)

(b) Payments on Business Days. The payment due date shall be a Business Day. If any payment becomes payable on a day that is not a Business Day, the payment shall be paid on the next succeeding Business Day. Contractor shall bear the cost of any and all banking charges imposed by Contractor’s bank with respect to any payment.

(c) Milestones. Contractor shall have achieved the Milestones associated with the Work for which the payment is requested prior to Contractor submitting its invoice with respect thereto, and shall have completed all Milestones to have been achieved prior to the date of such payment.

(d) Representations and Warranties. (i) The representations and warranties made by Contractor in each Transaction Document to which it is a party shall be true and correct in all material respects on such payment date both before and after giving effect to the making of such payment, and (ii) the representations and warranties made by each Project Party other than Contractor in the Transaction Documents shall be true and correct in all material respects on such payment date both before and after giving effect to the making of such payment. In each case such representations and warranties shall be deemed renewed and re-stated as of the date of such payment.

(e) No Default. (i) No circumstance, event or condition shall exist which either immediately or with the passage of time or the giving of notice, or both, would permit Contractor to withhold payment under any Primary Construction Contract; (ii) no breach, violation or default shall have occurred and be continuing under (A) this Contract (B) any Guaranty; (C) any Consent or (D) the Security Documents and (iii) to the extent not already set forth in this Section 3.2(e), no circumstance, event or condition shall exist which either immediately or with the passage of time or the giving of notice, or both, would permit Contractor's counterparty to terminate any Transaction Document.

(f) No Proceeding or Litigation. No action, suit, proceeding or investigation by or before any Governmental Authority or any arbitrator shall be pending or to Contractor's knowledge threatened against or affecting a Project Party or the Project which would result in a Material Adverse Change, unless such action, suit, proceeding or investigation has been initiated or threatened by Company.

(g) Material Adverse Change. Since the date hereof, no Material Adverse Change shall have occurred, except and to the extent that such Material Adverse Change is a result of an act or omission of Company.

(h) Governmental Approvals. Except with respect to the Deferred Governmental Approvals, all Necessary Governmental Approvals required to be obtained by such time shall have been obtained and shall be in full force and effect.

(i) Notice to Proceed. Company shall have issued the Notice to Proceed.

(j) Right to Withhold Payment. Company shall have determined that it is not necessary to withhold payment to protect Company from loss relating to any of the following causes:

(i) Work not in accordance with the requirements of the Project Documents;

(ii) Claims filed against Company, the Plant, or the Site from Contractor's actions or inactions in connection with the performance of the Work (and not otherwise covered by insurance), unless Contractor is disputing such Claims in good faith and if reasonably requested by Company, has bonded the Claim with a bonding company or other surety reasonably acceptable to Company, and if any Lien is imposed with respect to such Claims, Contractor has discharged such Lien; or

(iii) failure of Contractor to make payments in respect of material or labor or other obligations incurred as a result of activities covered by this Agreement, unless Contractor has, in good faith, disputed such payments and, if any Lien is filed with respect thereto, Contractor

has posted a bond against such Lien with a bonding company or other surety reasonably acceptable to Company.

Section 3.3 Wire Transfer

All payments to Contractor hereunder shall be paid in dollars via wire transfer to a bank account of Contractor as specified by Contractor.

Section 3.4 Invoice Instructions

(a) Separate Invoices. In order to facilitate sales tax compliance, Contractor shall provide separate invoices for items as follows:

(i) Taxable Items. Tax paid by contractor on Materials and Parts shall be listed as a separate line item and identified as 'Tax on Parts to be reimbursed.'

(ii) Non Taxable Items Listed Separately. The following items shall be listed separately and not taxed on the invoice: (A) Labor to Recondition Materials and Parts (non-taxable) and (B) Freight (non-taxable).

(iii) Non Taxable Items able to be Invoiced Together. The following items may be invoiced together but shall be listed separately on the same invoice and shall not be taxed on the invoice: (A) Scheduled and Unscheduled Work including inspection and on site Turbine Services work (non Taxable) and (B) 'Scheduled and Unscheduled Work' and 'Management Services, Consulting, Administrational, Engineering or Professional Services' (non-taxable);

(b) All invoices shall (i) provide all information as specified in Exhibit E, (ii) reference the applicable Contract number, and (iii) be addressed as follows:

PacifiCorp
Attn: _____
201 South Main Street, Suite 2200
Salt Lake City, UT 84111

With a copy provided to: _____
Attn: _____

(c) ANY INVOICE THAT DOES NOT MEET THE REQUIREMENTS OF THIS SECTION MAY RESULT IN A PAYMENT DELAY.

Section 3.5 Contractor Taxes

Contractor shall be responsible for payment of all taxes, fees and contributions on or measured by Contractor's income, and all taxes, fees and contributions on or measured by employee or other labor costs of Contractor or any Subcontractor, including without limitation all payroll or employment

compensation tax, social security tax or similar taxes for Contractor's or any Subcontractor employees (collectively, the "Contractor Taxes"). Notwithstanding the foregoing, Contractor shall not be liable for any real estate taxes, sales, use gross receipts or ownership taxes for the facility Site. All taxes other than Contractor Taxes shall be the responsibility of Company, and shall be paid by Company or reimbursed to Contractor.

Section 3.6 Project Taxes

(a) The Contract Price does not include any state or local property, license, privilege, sales, use, excise, value added, or other similar tax which may now or hereafter be imposed by the federal or any state government of the United States of America or any of their respective political subdivisions upon the sale, purchase or use by Contractor of materials, supplies, equipment or services or labor (other than employees of Contractor) for the Project (collectively, the "Project Taxes"). Contractor shall pay Project Taxes directly to the applicable governmental authorities imposing such. Company shall reimburse Contractor outside of the Contract Price for any such Project Taxes paid by Contractor directly to the applicable governmental authorities within thirty (30) days after receipt of appropriate supporting documentation and an accompanying invoice. Contractor shall use reasonable efforts to efficiently manage its provision of the Work so as to minimize the incurrence of Project Taxes. Contractor will use prudence and diligence in the administration of Project Taxes to be paid by Contractor hereunder, and Contractor shall confirm with Company in advance any discretionary action, election or omission permitted in connection with Project Taxes

(b) The amount of any and all customs duties, and related customs broker fees and charges or similar charges, for delivery of any components to the United States from countries outside of the United States and transportation to the Site are not included as Project Taxes, and are the responsibility of Contractor. Contractor shall be liable for all payroll and other employee related taxes and costs, and for all taxes based on its income.

Section 3.7 Offset Provisions

Company may offset any payment due Contractor under this Contract to reflect amounts owing from Contractor to Company or its subsidiaries pursuant to this Contract or any other agreement between the parties or otherwise. In addition, Company may withhold all payments otherwise due Contractor until such time as Contractor has provided the Letter of Credit required by this Contract.

Section 3.8 Payment Lien and Claim Releases

Upon request by Company, Contractor shall provide Lien and Claim releases executed by Contractor, each and every Subcontractor, and all suppliers through the date of each invoice submitted in accordance with Exhibit F (Form of Contractor Lien Release), Exhibit G (Form of Subcontractor Lien Release) and Exhibit H (Form of Supplier Lien Release), respectively.

Section 3.9 Withholding Payment

Company may, without limiting any other rights or remedies of Company, withhold from payment sufficient amounts which, in the commercially reasonable opinion of Company, reflect the reasonable cost to repair or replace unsatisfactory Work or the value of any claim against Company which Contractor has failed to settle pursuant to its indemnity contained herein. Company may also

retain from any payment sufficient funds to settle pursuant to this Contract any Liquidated Damages due Company by Contractor and retain from any payment sufficient funds to discharge any delinquent accounts of Contractor for which Liens on Company's property have been or can be filed that have not been cleared or a bond provided by Contractor in accordance with Section 19.6(f) ("Marking of Equipment and Plant"), and Company may at any time and from time to time pay therefrom for Contractor's account such amounts as are, in the commercially reasonable opinion of Company, due thereon, including any sums due under any Applicable Law.

Section 3.10 Basis of Contract Price

(a) Contractor Duty to be Fully Informed. Contractor shall be deemed to have satisfied itself, through its own due diligence efforts and not based on any representation of Company or employees or agents thereof (except as set forth in this article 3 ("Consideration and Payment")), as to the nature and location of the Work, the general, local, physical and other conditions of the Work, and all other matters which could in any way affect the Work or the cost thereof under this Contract. In addition, Contractor shall be deemed to have inspected the Site and to have satisfied itself as to the state and condition (including but not limited to ground, geological, climatic and hydrological condition) of all circumstances affecting the Site (including but not limited to any reasonable safety regulations of Company or otherwise applicable to the Work and the project) and to have examined any documentation and information supplied or made available to Contractor by Company or available for inspection in the public domain, the conditions and/or the Specification (with such drawings, exhibits, plans and information as may be annexed thereto or referred to therein) and to have satisfied itself as to the feasibility of executing the Work at the Site. Contractor shall be responsible for its own interpretation of such documentation and information. The failure of Contractor to adequately investigate and acquaint itself with any applicable conditions and other matters shall not relieve Contractor from the responsibility for properly estimating the difficulties and costs of successfully performing the Work and completing this Contract, and shall not be grounds for adjusting either the Contract Price or the schedule agreed in this Contract.

(b) Underground Obstructions. Without prejudicing or limiting the provisions of the preceding paragraph (b)(i) or of Section 10.1 ("Project Schedule"), Contractor shall be responsible for ascertaining the location of and avoiding damage to all underground installations including without limitation cable, gas, water pipes, telephone lines, and other underground installations, whether the location of the excavation, digging, or trenching required for performance of the Work is fixed by Company or by Contractor. Contractor shall be responsible for all delays, costs, loss and/or expense arising, whether directly or indirectly, from any ground conditions or artificial obstructions or hazards (excluding hazardous materials encountered by Contractor during the execution of the Work) including any Work underground or involving excavation that Contractor should have been made reasonably aware of based on information available and Contractor shall not be entitled to any additional Cost, any extension to the Time for Completion or any increase in the Contract Price as a result thereof.

(c) Surveying. Contractor is responsible for performing, and shall include in its pricing, all construction layout surveying required for execution of the Work. Contractor shall be held responsible for preserving all established project control monuments unless their removal is requested by Contractor and authorized in writing by Company. Any costs incurred by Company to reestablish control monuments destroyed by Contractor shall be borne by Contractor.

(d) Responsibility for Information. Contractor shall be responsible for any misunderstanding or incorrect information in connection with the Site (excluding information provided by Company or its representative prior to the date of commencement of the Work unless such information could reasonably be verified by Contractor).

(e) Existing Foundations, Structures and Work. Contractor shall be solely responsible for the consequences of incorporating into the Work of any existing foundations, structures, Work, equipment or materials including, without limitation, any existing piling, floor slabs and culverts. To the extent that the same are incorporated into the Work, such pre—existing items shall be subject to the conditions as if they were supplied by Contractor hereunder. Without prejudice to the foregoing, Contractor shall notify Company’s Representative of its intention to incorporate any existing foundations, structures, Work, equipment or materials into the Work other than those specifically identified in the Contract as soon as is practicable and seek the prior written consent of Company’s Representative to the use or utilization thereof, which consent may be withheld in the sole discretion of Company’s Representative.

ARTICLE 4

REPRESENTATIONS AND WARRANTIES OF CONTRACTOR

As used in this Article 4, “to Contractor’s knowledge” refers to matters within the actual knowledge of Contractor. Contractor represents and warrants to Company on the Effective Date (except as otherwise stated), and on each date the following representations and warranties are made or are deemed made, as follows:

Section 4.1 Organization, Standing and Power

Contractor is a [ENTITY TYPE AND DESCRIPTION], duly formed, validly existing and in good standing under the laws of the State of _____ and has the full [corporate/limited liability company] power and authority and possess all material governmental franchises, licenses, permits, authorizations and approvals necessary to enable them to own, lease or otherwise hold its properties and assets (including the Project) and to carry on its business in the places and in the manner currently conducted. Contractor is duly qualified to do business in each jurisdiction where the nature of its business or the ownership or leasing of its properties makes such qualification necessary, including without limitation the State of Utah.

Section 4.2 Capital Structure

(a) [ASSUMES LLC STRUCTURE; CORRESPONDING REPRESENTATIONS WILL BE EXPECTED TO REFLECT CORPORATE STRUCTURE IF APPLICABLE] All of the membership interests of Contractor (the “Membership Interests”) are issued and outstanding, and no Membership Interests are held by Contractor in its treasury. The names of each member of Contractor and the amount of Membership Interests Controlled by each such Person are set forth on Schedule 4.2(a).

(b) Except as set forth on Schedule 4.2(b), no Membership Interests or other voting securities of Contractor are issued, reserved for issuance or outstanding. There are not any bonds,

debentures, notes or other securities or Indebtedness of Contractor having the right to vote (or convertible into, or exchangeable for, securities having the right to vote) on any matters on which Membership of Contractor may vote.

Section 4.3 Authority; Execution and Delivery: Enforceability

(a) Contractor has all requisite power and authority to execute each of the Project Documents to which it is a party and to consummate the transactions contemplated hereby and thereby. The execution and delivery by Contractor of each Project Document to which it is a party and the consummation by Contractor of the transactions contemplated hereby and thereby has been duly authorized by all necessary [limited liability company/corporate] action on the part of Contractor. Each of Contractor has duly executed and delivered each Project Document to which it is a party, and each Project Document to which it is a party constitutes its legal, valid and binding obligation, enforceable against it in accordance with its terms except as such enforceability may be limited by applicable bankruptcy, insolvency, reorganization, moratorium or similar laws from time to time in effect that affect creditors' rights generally and by legal and equitable limitations on the availability of specific remedies.

(b) The managing member or other governing body of Contractor, acting by written consent in lieu of meetings and executed as of _____ unanimously adopted resolutions approving this Contract, the other Project Documents and in accordance with Contractor's Organizational Documents and the [APPLICABLE STATE ORGANIZATIONAL LAWS].

(c) No vote of the Membership with respect to any of the Membership Interests is required under applicable Law or otherwise in connection with Contractor's execution and delivery of this Contract, the other Project Documents or the consummation of the transactions contemplated hereby and thereby.

Section 4.4 Validity of Contract; No Conflict

The execution, delivery and performance by Contractor of this Contract and each other Project Document to which Contractor is a party, the consummation of the transactions contemplated hereby and thereby, and the compliance with the provisions hereof or thereof, by Contractor shall not, with or without the passage of time or the giving of notice or both:

(a) conflict with, constitute or result in a breach, default or violation of any provision of, or give rise to any right of termination, cancellation or acceleration under, or loss of any right and/or benefit under, any contract, lease, license, Governmental Approval, instrument or other agreement to which Contractor is a party or by which it, the Project or its assets is bound;

(b) conflict with or violate Contractor's Organizational Documents;

(c) result in the creation or imposition of any Lien of any nature on the Project, other than Permitted Liens; or

(d) violate any Applicable Law applicable to Contractor.

Section 4.5 Governmental Approvals and Consents

(a) Appendix E sets forth all Governmental Approvals. Such Governmental Approvals that are the responsibility of Company to obtain prior to Substantial Completion are separately identified on Appendix E (the “Company Governmental Approvals”). All Necessary Governmental Approvals have been obtained, are in full force and effect, and are final and all appeal periods with respect thereto have expired or terminated. Each Deferred Governmental Approval shall be obtained in a final and non-appealable form in the ordinary course prior to the time it is required to be obtained hereunder or under the other Project Documents. There is no action, suit, investigation or proceeding pending, or, to Contractor’s knowledge, threatened, that could result in the modification, rescission, termination, or suspension of any Necessary Governmental Approval obtained prior to the date this representation is made or deemed made. Subject to Section 8.2 (“Planning Permissions, Consents”), except for the Governmental Approvals listed in Appendix E, Contractor is not required, and under existing Applicable Law will not in the future be required, to obtain any Governmental Approval in connection with the execution and delivery by Contractor of this Contract or the performance of Contractor’s obligations hereunder.

(b) Except as set forth on Schedule 4.5(b), no consent or approval of any Person is required to be obtained or made by or with respect to Contractor transferring the Project to Company or in connection with the execution, delivery and performance of this Contract, the Project Documents or the consummation of the transactions contemplated hereby other than those that may be required solely as result of the specific regulatory status of Company.

Section 4.6 No Proceedings

Except as set forth on Schedule 4.6, (a) there are no actions, suits, investigations or proceedings by or before any Governmental Authority or arbitrator pending against Contractor or against the Project, or, to Contractor’s knowledge, threatened against or affecting Contractor or the Project, which would result in a Material Adverse Change and (b) there are no actions, suits, investigations or proceedings by or before any Governmental Authority or arbitrator pending or, to Contractor’s knowledge, threatened against or affecting Contractor or any Guarantor which would result in a Material Adverse Change.

Section 4.7 Compliance

(a) The Project is being designed and constructed and all components thereof are being procured, in compliance with all Applicable Law in existence as of the Effective Date and in compliance with the requirements of all Governmental Approvals and Prudent Industry Practice. As constructed, based on Applicable Law, the Project shall conform to and comply with all zoning, environmental, land use and other Applicable Law and the requirements of all Governmental Approvals.

(b) Contractor and the operation of its businesses are and at all times have been, in compliance in with all Applicable Laws, including those relating to occupational health and safety.

Section 4.8 Environmental Matters

(a) The Project has been constructed and the Work has been performed, in compliance with all Environmental Laws.

(b) Contractor has not received any written notice of a pending or threatened Claim, or inquiry by any Governmental Authority or other Person relating to any actual or alleged violations of Environmental Laws or any actual or potential obligation on the part of Contractor to investigate or take any other action relative to any Regulated Material (as defined herein) or threatened Release of any Regulated Material and is and has been in compliance with all Environmental Laws.

(c) Contractor has not entered into or agreed to any decree or order with any Governmental Authority and Contractor is not subject to any Judgment relating to compliance with any Environmental Law or to the investigation or cleanup of Regulated Materials.

(d) Neither Contractor nor any other Person has generated, transported, treated, stored, disposed of, arranged to be disposed of, Released or threatened to Release any Regulated Materials at, on, from or under the Site in violation of, or so as would reasonably be expected to result in liability under, any Environmental Laws.

Section 4.9 Security Interests and Liens

The Security Documents create, valid and enforceable perfected first priority Liens on all of the Collateral, in favor of Company, subject to no Liens other than the Permitted Liens. All Necessary Governmental Approvals relating to such Liens in favor of Company have been duly effected or taken.

Section 4.10 No Defaults

Contractor is not in breach of, or in default under, any Project Document, or any other agreement or instrument to which it is a party or by which it or its properties or assets may be bound, and no Project Party is in breach of, or in default under, any other agreement or instrument to which it is a party or by which it or its properties or assets may be bound except where such breach or default would not, singly or in the aggregate, result in a Material Adverse Change.

Section 4.11 Expertise

(a) Contractor has no reason to believe that (i) the Project will not achieve Substantial Completion by May 1, 2009 or (ii) that the cost to complete the Project will exceed the Contract Price.

(b) The construction and operation of the Project in accordance with the Project Documents and in compliance with Governmental Approvals, Applicable Law and pursuant to this Contract is technically feasible.

(c) Contractor has substantial experience and expertise in the development and management of turnkey construction of combined cycle power plants such as the Plant and the capability to carry out the Work and acknowledge that Company is relying on such experience, expertise and capability in executing this Contract.

(d) Contractor has not relied on any information supplied by Company, including information regarding conditions at, on, or under the Site in order to make any representation or warranty in this Contract accurate or not misleading.

ARTICLE 5

REPRESENTATIONS AND WARRANTIES OF COMPANY

As used in this Article 5, “to Company’s knowledge” refers to matters within the actual knowledge of Company. Company represents and warrants to Contractor on the Effective Date (except as otherwise stated) and on each date the following representations and warranties are made or are deemed made as follows:

Section 5.1 Corporate Organization; Etc.

Company is a corporation duly organized and validly existing under the laws of the State of Oregon. Company has full corporate power and authority to carry on its business as it is now being conducted and to own the properties and assets it now owns.

Section 5.2 Validity of Contract; No Conflict

(a) This Contract has been duly authorized, executed and delivered by Company and is a legal, binding and valid obligation of Company enforceable against Company in accordance with its terms, except as such enforceability may be limited by applicable bankruptcy, insolvency, reorganization, moratorium or similar laws from time to time in effect that affect creditors’ rights generally and by legal and equitable limitations on the availability of specific remedies.

(b) The execution, delivery and performance by Company of this Contract, the consummation of the transactions contemplated hereby, and the compliance with the provisions hereof by Company shall not, with or without the passage of time or the giving of notice or both:

(i) as to execution, delivery and performance, require any consent or approval of Company’s board of directors or any of Company’s shareholders which has not been obtained and each such consent and approval that has been obtained is in full force and effect,

(ii) conflict with, constitute a breach or violation of any provision of, or give rise to any right of termination, cancellation or acceleration under, or loss of any right and/or benefit under, any material contract or agreement to which Company is a party or to which it or its assets are subject or to any Governmental Approval held by or on behalf of Company, the loss of which would reasonably be expected to result in a Material Adverse Change on Company’s performance under this Contract;

(iii) conflict with or violate the certificate of incorporation or bylaws of Company;

(iv) violate any Applicable Law applicable to Company.

Section 5.3 Consents, Approvals and Authorizations

Appendix E sets forth all Company Governmental Approvals. Except for Company Governmental Approvals listed in Appendix E, to Company's knowledge, Company is not required, and under existing Applicable Law, will not in the future be required, to obtain any Governmental Approval in connection with the execution and delivery by Company of this Contract or the performance of its obligations hereunder, the failure to obtain which would materially impair Company's performance of its obligations hereunder.

Section 5.4 Resources

Company has the financial resources, assets, operating capital, credit and other resources and means necessary to fulfill its obligations under this Contract on a timely basis.

Section 5.5 No Proceedings

Except as otherwise disclosed by Company to Contractor prior to the Effective Date, there are no actions, suits, investigations or proceedings by or before any Governmental Authority or arbitrator pending or, to its knowledge, threatened against or affecting Company which, to Company's knowledge, would result in a Material Adverse Change.

ARTICLE 6

CREDIT REQUIREMENTS

Section 6.1 Credit Requirements

(a) Contractor is to utilize the Credit Matrix in the attached Exhibit C to determine the amount of any credit assurances to be provided. The amount of credit assurances will be based upon the Credit Rating of Contractor or the entity providing credit assurances on behalf of Contractor, and the size of the project.

(b) The Credit Rating will be the lower of: (x) the most recently published senior, unsecured long term debt rating (or corporate rating if a debt rating is not available) from Standard & Poor's (S&P), or (y) the most recently published senior, unsecured long term debt rating (or corporate rating if a debt rating is not available) from Moody's Investor Services. If Option (x) or (y) is not available, the Credit Rating will be determined by Company's Credit Dept. through an internal process review and utilizing a proprietary credit scoring model developed in conjunction with S&P.

(c) If requested by Company, Contractor shall, within thirty (30) days, provide Company with copies of its most recent annual and quarterly financial statements prepared in accordance with GAAP.

Section 6.2 Security

(a) Security for the credit assurances required in the Credit Matrix shall include, but not be limited to, a guaranty in a form acceptable to Company, a Letter of Credit or Cash Escrow.

(b) If this Contract is terminated as a result of Contractor's default, Contractor shall pay Company the positive difference, if any, obtained by subtracting the Contract Price from the Replacement Price for any Work that Contractor was otherwise obligated to provide during the remaining term of this Contract plus compensation for additional managerial and administrative services and such other costs and damages as Company may suffer as a result of Contractor's breach ("Net Replacement Cost"). Amounts owed by Contractor pursuant to this paragraph shall be due within five (5) Business Days after any invoice from Company for the same.

If required by Company, Contractor shall, within five (5) Business Days after the Effective Date, submit to Company a Letter of Credit in the amount set forth in the Credit Matrix. The terms of the Letter of Credit shall meet the requirements of the attached Exhibit F as well as the requirements of this Contract and be issued by a bank satisfactory to Company. The Letter of Credit shall provide for payment to Company of the Letter of Credit face value if Contractor defaults under the terms of this Contract. Company shall have the right to call the entire amount of the Letter of Credit if Contractor has not renewed the Letter of Credit by thirty (30) days prior to its expiration date. Contractor's expenses of complying with this Letter of Credit requirement shall be paid by Contractor.

ARTICLE 7

GENERAL OBLIGATIONS OF CONTRACTOR

Section 7.1 Contractor's General Obligations

(a) Contractor's general obligation hereunder is to provide Company with a fully operational Project for the Contract Price, completed in accordance with the other terms of this Contract, on or before the Guaranteed Substantial Completion Date.

(b) The finished Work shall be complete in all respects. The intent of this Contract, the Appendices, Exhibits and the Scope of Work is for Contractor to Provide to Company an engineered solution of first class workmanship in each and every respect. All hardware shall be manufactured, fabricated, assembled, finished and documented with workmanship of the highest quality throughout, and all of its components shall be new and suitable for the purposes specified. In addition, the solution shall be engineered, implemented, tested and documented in accordance with Prudent Industry Practice and shall be suitable for the purpose specified.

(c) The Equipment shall be manufactured and the Work executed in the manner set forth in the Specification or, where not so set forth, to the satisfaction of Company and all Work on Site shall be carried out in accordance with Prudent Industry Practice and such directions as Company's Representative may give.

(d) Contractor shall, in accordance with the terms and conditions of this Contract, employ the Subcontractors who in turn shall provide all labor, services, management, supervision, Materials, tools, facilities, utilities, Governmental Approvals, licenses and other aspects of the Work necessary for the design, engineering, construction, startup, testing, commissioning and completion of the Plant including those items specifically required in Appendix B.

(e) Additionally, Contractor shall: (i) carry out and complete, and cause the Subcontractors to carry out and complete, the Work in accordance with the requirements, duties and obligations

imposed on the Subcontractors pursuant to Prudent Industry Practice and all applicable Site conditions; (ii) ensure that the Subcontractors design and perform the Work such as to achieve the objective of a Plant which complies with the Applicable Law and the other requirements of this Contract and their respective contracts; (iii) have the resources, experience, qualifications and capabilities as are required to fully perform its obligations under this Contract; (iv) keep Company informed as to the status of deliveries, and if any such materials or Equipment are not being properly manufactured or fabricated in accordance with the requirements of contracts and the requirements pursuant to which they were purchased, or do not otherwise conform with such requirements, promptly making Company aware thereof and taking necessary corrective action; (v) acquire the Site, the Water Rights, all Governmental Approvals necessary for the development, construction and operation of the Plant, and the Emission Reduction Credits in accordance with the Milestones; (vi) cause each of the conditions precedent to the issuance of the Notice to Proceed set forth in Section 2.1(b) ("Notice to Proceed") respectively, to occur; and (vii) maintain at least one office in the State of Utah.

Section 7.2 Physical Obstructions and Conditions

If, during the performance of the Work on the Site, Contractor encounters unusual or unforeseen (a) endangered plant and animal species which are regulated or require special handling under Environmental Laws, (b) underground conditions or (c) items of archeological or historical significance, Contractor shall notify Company as soon as practicable and shall use best efforts to perform its obligations hereunder, including those obligations affected by such discoveries, and in compliance with Applicable Law.

Section 7.3 Selection of Vendors and Use of Subcontractors

(a) In connection with its performance of this Contract, Contractor shall either (i) cause each Subcontractor to purchase Equipment from the Approved/Preferred Suppliers set forth in Appendix Q; or (ii) elect to use vendors others than those set forth in Appendix Q, in which event, Contractor shall provide a price adjustment to the Contract Price. Such adjustment shall be set forth in Appendix R, and shall be accepted by Company in its sole discretion.

(b) Contractor shall be fully liable to Company hereunder for all acts and omissions of each Subcontractor to the same extent as though any such act or omission had been performed or omitted to be performed by Contractor directly. In no case shall Contractor's engagement of any Subcontractor relieve Contractor of any of its obligations or Liabilities hereunder and, notwithstanding the use of any Subcontractors hereunder, Contractor shall remain fully and primarily liable to Company for the full and complete performance of Contractor's obligations hereunder.

(c) Company shall have no contractual obligation to, and shall not be deemed to be in privity with, any Subcontractor; provided, however, that in the event Contractor's obligations hereunder terminate for any reason, Contractor shall, at Company's request, take such actions and execute such documents as may be necessary or desirable to assign any or all of the Project Documents selected by Company to Company at Contractor's sole cost and expense.

Section 7.4 Compliance With Applicable Law

(a) Contractor shall comply with all Applicable Law, and shall cause each Subcontractor to comply with Applicable Law applicable to its respective scope of work on the Project, the

noncompliance with which could adversely affect the Work, the Plant, the Site or Contractor's obligations under this Contract. Contractor shall be responsible for ascertaining the nature and extent of any Applicable Law, which may affect the Work, the Plant or the Site as a result of the performance by Contractor of its obligations under this Contract or, prior to Substantial Completion, the operation of the Plant. Contractor shall ensure that the Work complies with Applicable Law, Prudent Industry Practice and Governmental Approvals and further except to the extent any non-compliance therewith results from Company's gross negligence or willful misconduct or operation of the Work by or for Company (other than by Contractor) not in compliance with [*insert applicable Equipment manufacturer*] product manual, a copy of which is included in Appendix D.

(b) Subject to the preceding paragraph, Contractor shall be responsible for fines and penalties which may arise (including those that Company pays or becomes liable to pay) as a direct result of Contractor's non-compliance with Applicable Law, or as a result of Company's inability to operate the Project in compliance with Applicable Law due to the inaccuracy of Contractor's representations and warranties or the breach by Contractor of any of its covenants, other than any fines and penalties arising from any act or omission of Company, or the agents, employees, contractors (other than Contractor and Subcontractors), and representatives of Company.

Section 7.5 Governmental Approvals

(a) Contractor shall obtain all Governmental Approvals designated as Contractor's responsibility in Appendix E and all other Governmental Approvals that are not specifically designated as Company Governmental Approvals in Appendix E and shall cause Contractor and the Subcontractors to reasonably support the efforts of Company in obtaining all Company Governmental Approvals, including providing such engineering and environmental data and statistical information as may be reasonably requested by Company. Company shall be properly included as the permittee, co-permittee or authorized party with respect to all Governmental Approvals.

Section 7.6 Opportunities for Other Contractors; Labor Relations

(a) Contractor shall, in accordance with Company's reasonable instructions, afford to other contractors identified by Company from time to time all reasonable opportunities for carrying out their work at the Site, provided that the same shall not materially obstruct or disturb the progress of the Work. Contractor shall also afford access to Company's employees, including employees who will operate and maintain the Plant, to perform their work at the Site.

(b) Contractor shall be responsible for coordinating Company's contractors and employees as it relates to mobilization and laydown space requirements, interconnection with Site construction power and temporary storage facilities, water, emergency evacuation requirements, trash/waste disposal, Site access, temporary office space, safety and security and other Site regulations and requirements. Each of Company's contractors shall be responsible for any costs with respect to that contractor's work, including mobilization and laydown space requirements, interconnection with Site construction power and temporary storage facilities, water, emergency evacuation requirements, trash/waste disposal, Site access, safety and security and other Site regulations and requirements.

(c) Contractor agrees that claims resulting from the concurrent Company contractor activities shall be brought to Company's attention within ten (10) Business Days of their occurrence.

Company and Contractor agree to informally resolve claims as they occur and otherwise in accordance with article 31 "Claims, Claim Notice and Dispute Resolution."

Section 7.7 Labor and Employment

(a) Contractor shall, and shall cause Contractor to, ensure that all construction contracts and subcontracts of any tier for the Project be awarded (i) in compliance with Utah State and Federal and all other Applicable Law and (ii) on a Merit Shop basis. Contractor shall, and shall award construction contracts and subcontracts of any tier for the Work (x) in compliance with the requirements of U.S. Federal and Utah state laws and regulations and (y) on a Merit Shop basis or (z) through a project labor agreement. Contractor and each Subcontractor shall, subject always to the requirements of law or regulation or applicable collective bargaining agreement, and to the fullest extent commercially reasonable, perform the Work using Utah labor. Any contract or subcontract shall be awarded on the basis of the best value to the Project including an evaluation of the Subcontractors' ability to work in harmony with others working on the Project including Contractor, the existing labor force, Governmental Authorities, and without regard to whether or not the successful bidder is signatory or non-signatory to agreements with labor organizations. Contractor shall, and shall cause each Subcontractor to, refrain from any discrimination against any employee on the basis of such employee's membership in any labor organization, or his or her lack of such membership. All employees working on the Project shall be permitted to exercise their right to engage in protected concerted activity, as defined in Section 7 of the National Labor Relations Act, as amended, or to refrain from doing so, without any discrimination or other adverse consequence. Contractor shall, and shall cause each Subcontractor to, comply with Applicable Law regarding labor relations and employment matters. Any administrative or civil proceedings filed against a Project Party or any Subcontractor shall be promptly reported to Company. Nothing in this provision shall affect any obligation of a Project Party or Subcontractor under a lawful collective bargaining agreement applicable to some or all of such Person's operations on the Project.

(b) Contractor shall be aware of, and familiar with, all collective bargaining agreements, which do or may pertain to or affect the work under this Contract or other work at the Site. Contractor shall plan and conduct its operations so that its employees and subcontractors of any tier will work harmoniously with Company employees and other workers employed on the same or related projects to assure that there will be no delays, work stoppages, excessive labor costs, or other labor difficulties. Contractor shall ensure that Contractor and each and every Subcontractor comply with all Applicable Law pertaining to such labor.

(c) Scarcity and Quality of Labor. Contractor shall have no claim for an extension of the Time for Completion or a claim for loss, damage or additional Costs of any kind in respect of any alleged or proved unsuitability, scarcity, inefficiency of the labor it may engage or wish to engage.

(d) Equal Employment Opportunity and Other Non-Discrimination Clauses.

(i) Contractor shall, at all times, comply with all Applicable Law applicable to employees, including without limitation those governing wages, hours, desegregation, employment discrimination, employment of minors, health and safety. Contractor shall comply with equal opportunity laws and regulations to the extent that they are applicable.

(ii) Contractor shall indemnify, defend and hold harmless Company, its Board of Directors, officers, employees and agents from all losses, costs and damages by reason of any violation thereof and from any liability, including without limitation fines, penalties and other costs arising out of Vendor's failure to so comply.

(iii) Contractor shall execute and deliver to Company a completed Certificate of Compliance using Company's form of Certificate before starting to perform Work under this Contract.

(e) Workers Compensation. Contractor shall comply with all Applicable Law regarding workers' compensation and shall, prior to commencing Work, furnish proof thereof satisfactory to Company.

Section 7.8 Authority For Access for Inspection

Inspection of the Work at the Site and attendance at meetings (whether conducted in-person, telephonically or through similar medium) relating to the Project which are attended by Contractor and any Subcontractor and related to status, progress, quality, scope, schedule and safety coordination shall at all times be afforded by Contractor to Company, Company's Representative and such other Persons as shall be designated by Company or Company's Representative. Company, in its inspection, shall give due consideration to the needs of Contractor to carry out Contractor's obligations and strive not to hinder or unduly impede Contractor while carrying out such inspection. Company, in its inspection, may observe the progress and quality of the Work to determine, in general, if the Work is proceeding in accordance with the Project Documents. Inspections under this Section 7.8 are solely for the benefit of Company and any inspection or failure to inspect and any objection or failure to object by Company shall not (i) relieve Contractor, or any Subcontractor of its respective obligations under any Project Document or (ii) be used as evidence that Company agreed that Contractor, or any Subcontractor had fulfilled any obligations under any Project Document or that Company had waived any of its rights under any Project Document.

Section 7.9 Contractor's Use of Company's Drawings

Contractor may use Company's Drawings only for fulfilling its obligations under this Contract. Company's Drawings, specifications and other information submitted by Company to Contractor shall remain the property of Company. Such materials shall not, without the written consent of Company, which consent may be withheld in Company's sole discretion, be used, copied or communicated to a third party, other than Contractor, by Contractor unless necessary to fulfill the purposes of this Contract, and then pursuant to a full reservation of rights in Company. Company makes no representations or warranties as to the accuracy, completeness or suitability of Company's Drawings and Contractor shall not rely on such Company's Drawings.

Section 7.10 Contractor Drawings and Manuals

(a) Contractor shall at all times keep a copy of the most recent version of Contractor Drawings and Manuals at Contractor's office on the Site to be made available for Company's review. In addition, Contractor shall provide and make available to Company electronic versions of Contractor Drawings and Manuals accessible by Company through a file transfer protocol site to be maintained by Contractor.

(b) Contractor shall cause to be set forth in Contractor Drawings and Manuals provided to Company such information as is required to operate and maintain the Work, including to the extent applicable, recommended operating and maintenance procedures, system descriptions, product catalogs, drawings, design sheets, specifications, logic diagrams, maintenance and instruction sections, spare parts lists, any vendor-supplied training documents, and current heat balances. Contractor Drawings and Manuals shall be (i) prepared in accordance with the Specification and when completed, shall be in sufficient detail to accurately represent the Project as constructed. Contractor Drawings and Manual shall be maintained and be available, with up-to-date drawings, specifications and design sheets, for the training as set forth in Section 7.11 (“Training”).

(c) Contractor shall prepare initial system descriptions, design basis documents, and operational guidelines for the Project and deliver such to Company for its review at least one (1) year prior to the Guaranteed Substantial Completion Date.

(d) At least sixty (60) days prior to the Guaranteed Substantial Completion Date, Contractor shall provide Company with initial drafts of the final Contractor Drawings and Manuals for review (the “Draft Manuals”). The Draft Manuals shall contain such information described in Section 7.10(b), other than the drawings which, in accordance with this Section 7.10, are being maintained so as to be up-to-date. Two (2) complete sets of the Draft Manuals shall be provided to Company at least sixty (60) days prior to Substantial Completion and shall be a condition of Substantial Completion.

(e) Contractor shall provide to Company both hard and electronic final copies of Contractor Drawings and Manuals. Contractor shall provide to Company five (5) final hard copies of Contractor Drawings and Manuals within sixty (60) days after achievement of Substantial Completion. Company shall not be required to deliver the Notice of Final Acceptance until all such Contractor Drawings and Manuals have been so delivered.

(f) Any modifications to Contractor Drawings and Manuals made necessary as a consequence of any Final Punch List items or modifications to the Work shall be issued as addenda to Contractor Drawings and Manuals within sixty (60) days following completion thereof.

Section 7.11 Training

(a) Training of Company’s personnel (or other employees or agents of Company) shall be given by Contractor prior to the Substantial Completion Date as required by the Specification, in accordance with the timetable to be agreed upon with Company prior to the Substantial Completion Date and shall include training (including on-site and classroom) in connection with the operation and maintenance of the Work. Such training shall be provided directly to Company’s personnel as specified by Company in Section 10 to Appendix B “Scope of Supply and Technical Specifications” and shall be conducted by a trainer experienced in the operation and maintenance of the Work.

(b) As more fully described in Appendix B “Scope of Supply and Technical Specifications,” starting at least sixty (60) days prior to the first operation of one of the combustion turbines at the Site of the Project and continuing until Final Acceptance, Contractor shall oversee the development of and provide qualified and experienced support for Company’s execution of a practical and participatory training program at the Site for an adequate number of employees designated by

Company, which personnel shall be experienced in electric generating facility operation appropriate to their respective job descriptions.

Section 7.12 Safety

(a) Contractor shall be solely responsible for being aware of and initiating, maintaining and supervising compliance with all safety laws, regulations, precautions, and programs in connection with the performance of this Contract, including without limitation the provisions of Section 9.2 (“Site Security”), Section 9.7 (“Fencing, Protection, Lighting”) and Section 9.11 (“Material Safety Data”) of this Contract. Prior to the start and throughout the performance of the Work, Contractor shall assure that each of its employees, together with all employees of its Contractor and each Subcontractor, are fully informed concerning all safety, health, and security regulations pertaining to the Work. Contractor shall conduct all operations under this Contract in such a manner as to avoid the risk of bodily harm to persons or risk of damage to any property.

(b) In the event Contractor fails to promptly correct any violation of safety or health regulations, Company may suspend all or any part of the Work. Contractor shall not be entitled to any extension of time or reimbursement for costs caused by any such suspension order. Failure of Company to order discontinuance of any or all of Contractor’s operations shall not relieve Contractor of its responsibility for the safety of personnel and property. Contractor shall maintain an accurate record of and shall promptly report to Company all cases of property damage in excess of \$100 and of death, occupational diseases, or injury to employees or any other third parties and incident to performance of Work under this Contract. Contractor shall promptly notify Company and provide a copy of any safety citation issued by any governmental entity. Contractor shall perform all Work under this Contract in strict accordance with its Company-approved Health and Safety Plan.

Section 7.13 Intellectual Property Rights and Computer Program Licenses

(a) Contractor represents and warrants that it has and upon the Substantial Completion Date will have, (i) all rights necessary with respect to the Work (and each part thereof) and the ownership or operation of the Project after it is constructed and to perform Contractor’s obligations under this Contract and (ii) that the Work (and each part thereof) does not violate or infringe any patent or copyright. Contractor shall not take any action that would violate or infringe any patent or copyright.

(b) Contractor shall, at its sole cost and expense, settle or defend and pay any costs (including attorney’s fees) and damages awarded in connection with, and shall defend, indemnify and hold harmless each of Company and Company’s Representative, and any of its respective officers, directors, employees, contractors, agents or representatives, from and against, any and all Claims, suits or proceedings based on a Claim that the Work (or any part thereof) or the ownership or operation of the Project, infringes or violates any patent or copyright. Company shall give Contractor notice of any such Claim promptly after Company has actual knowledge thereof, provided that the omission of Company to give such notice shall not relieve Contractor of their obligations hereunder except to the extent that such omission results in a failure of actual notice to Contractor and Contractor is damaged as a result of such failure. The provisions of article 22 (“Warranties of Work”) and article 31 (“Claims, Claim Notice and Dispute Resolution”) shall also apply to any Claim under this Section 7.13(b).

(c) In case the Work (or any part thereof) or the ownership or operation of the Project is held to infringe or violate any patent or copyright and the use of the Work (or part thereof) or the operation of the Project is restricted or prohibited as a result thereof, Contractor shall, at its sole cost and expense, at Contractor's option, either procure for Company the right to continue using the Work (or part thereof), replace the same with non-infringing comparable substitute Work, or modify the Work (or part thereof) so that it becomes non-infringing (provided that such modification does not adversely affect the Work (or any part thereof)).

(d) Contractor shall obtain and transfer to Company perpetual, fully-paid licenses to use all computer programs necessary or useful for the operation of the Plant, together with all warranties related thereto.

Section 7.14 Contractor's Representative

(a) Contractor shall employ one or more competent representatives, whose name or names and details of qualifications and previous experience shall have been provided to Company and Company's Representative by Contractor, to manage the project and who shall have Contractor's authority in respect of all matters arising out of or in connection with the Contract and the Work.

(b) Assigned Project Roster.

(i) Contractor shall designate a Project Manager, a Project Engineer, a Lead Mechanical and Lead Electrical, a Construction/Site Manager, a Safety Manager and a Startup or Commissioning Manager for the project. All employees assigned by Contractor to perform any of Contractor's obligations shall be fully qualified to perform the tasks assigned them.

(ii) Such representative, or if more than one shall be employed, then one of such representatives, shall be present on the Site during working hours and at all times the Work is in progress, and any orders or instructions which Company or Company's Representative may give to the said representative of Contractor shall be deemed to have been given to Contractor.

(iii) Company or Company's Representative shall each have the right, in its sole discretion, to approve or disapprove Contractor's selections for Project Manager, Project Engineer, Lead Mechanical and Lead Electrical, Construction/Site Manager, Safety Manager, Startup or Commissioning Manager and any Subcontractors or independent contractors or consultants utilized by Contractor.

(iv) In the event Contractor intends to remove or change its Project Manager, Project Engineer, Lead Mechanical and Lead Electrical, Construction/Site Manager, Safety Manager, or Startup or Commissioning Manager assigned to the project or reassign any such personnel to another project, Contractor shall give Company fifteen (15) days advance written notice of Contractor's intentions. Company shall give due diligence and consideration to any request by Contractor to replace such persons and shall respond within fifteen (15) days to any such requests. Contractor shall not replace its Project Manager, Project Engineer, Lead Mechanical and Lead Electrical, Construction/Site Manager, Safety Manager, or Start up or Commissioning Manager assigned to the project without the prior written consent of Company.

(v) Company shall have the right to approve Contractor's senior staff on Site, and may request the removal of any of Contractor's personnel.

(vi) Contractor shall not remove any of the individuals identified in Section 7.14(b)(i) from the Work or the Site without the prior written consent of Company, and then only if a suitable replacement for such representative has been approved by Company prior to the removal of such representative.

(c) Objection to Representatives or Employees. Company shall be entitled by notice to Contractor to object to any representative or person employed directly or indirectly by Contractor in the execution of or otherwise about the Work who, in the opinion of Company, misconducts itself, is incompetent or negligent, and Contractor shall remove and exclude such person from the Work.

Section 7.15 Contractor's Personnel/Drugs, Alcohol and Firearms

With regard to the performance of the Work, Contractor shall, and shall ensure that each and every Subcontractor shall, only employ persons qualified to perform the Work. Contractor shall, at all times, enforce strict discipline and good order among its employees and the employees of Contractor and any Subcontractor. Contractor shall not permit or allow the introduction or use of any firearms, illegal drugs or intoxicants upon the Work under this Contract, or upon any of the grounds occupied, controlled, or used by Contractor in the performance of the Work. Contractor shall immediately remove from the Work, whenever requested by Company, any person considered by Company to be incompetent, insubordinate, careless, disorderly, in violation of the above restriction on firearms, illegal drugs or intoxicating liquor, or under the influence of illegal drugs or intoxicants, and such person shall not again be employed in the performance of the Work herein without the consent of Company.

Section 7.16 Use of Premises and Trespassing

Contractor shall confine the storage of materials and construction equipment to locations acceptable to Company and in accordance with all Applicable Law. Contractor shall, at all times, prohibit its staff, workers and all other persons employed directly or indirectly by Contractor on the Site from poaching or trespassing and any such person found so doing shall be removed forthwith from the Work and shall not be re-employed without the prior written consent of Company.

Section 7.17 Electricity, Water and Pipeline Natural Gas

(a) During the construction of the Plant, Contractor shall provide for its own use, on-Site distribution for all utilities, including, the following: drainage, water, sewage and electrical power. Contractor shall pay for electrical power, fuel and raw water used by Contractor during the construction of the Project. Contractor shall make provisions in its temporary construction power load center for loads and feeds of Company, provided that Contractor have been supplied with adequate information relative to such additional uses prior to initial mobilization at the Site; provided, however, distribution of such additional power feeds, and the cost of usage of such electrical power, shall be borne by Company or contractors engaged by Company.

(b) Contractor shall provide all required supplies of demineralized water, pipeline natural gas and other commodities required for the purposes of commissioning and startup activities and the

Performance Tests in accordance with manufacturer's and/or contractors' published specifications for the Plant and Equipment. Notwithstanding the foregoing, Company shall reimburse Contractor for the cost of providing pipeline natural gas in an amount not to exceed the equivalent to two hundred seventy-five (275) hours of full-load CT operation, without duct burners in operation, based on the design documents for the Facility, for purposes of commissioning and startup activities and the Performance Tests. Contractor shall provide to Company in writing not less than 180 days prior to first firing of the Gas Turbines, the design consumption rate to be used in calculating Company's reimbursement obligations under this paragraph. Contractor shall be responsible for all pipeline imbalance and other charges that may be assessed by any party in connection with the supply of natural gas and/or electric service to the Project in connection with commissioning and startup activities and Performance Testing. Contractor shall be responsible for the initial filling of all chemicals, lubricants, and any other consumables necessary for the startup activities and Performance Tests.

Section 7.18 Temporary Facilities

Contractor shall make provisions, at its cost, for all temporary facilities necessary for the construction of the Project and the installation of the Equipment, including arrangements for the supply of telephone, office equipment, sanitary toilet facilities, compressed air and other services for the Work and shall provide and maintain all pipes, cables and services required for its operation. Contractor shall provide and maintain on the Site office accommodations for itself and an office for Company and Company's Representative. Contractor shall also install and maintain, at its own cost and expense, a system of lighting to provide a reasonable degree of illumination over the area of its Work during performance of the Work. Contractor shall remove any of such temporary installations pursuant to Section 19.7 ("Removal of Equipment").

Section 7.19 Decisions and Instruction Of Company's Representative

(a) Contractor shall proceed with the decisions and instructions given by Company's Representative in accordance with this Contract. Such decisions or instructions may be given orally but shall be effective only when confirmed in writing.

(b) If Contractor disputes or questions any decision or instruction by Company's Representative, Contractor shall give notice to Company within five (5) days after receipt thereof, giving reasons therefor. Company shall within a further period of five (5) days by notice to Contractor with reasons, confirm, reverse or vary such decision or instruction. If Contractor disagrees with Company's response, or if Company fails to reply to Contractor's notice within the stipulated days, the matter shall be resolved in accordance with article 31.

Section 7.20 Cooperation Between the Parties

The Parties are expected to be called upon to make decisions regarding matters not reasonably anticipated in order to meet their respective obligations under this Contract. In making such decisions, the Parties shall cooperate fully in all regards with the intent to improve the performance of the Work and reduce the likely operating and maintenance impacts. The vehicle for reaching agreement and causing a change to occur in the Work and/or the schedule for performance and/or the Guaranteed Substantial Completion Date and/or additional substantiated costs as a result of errors and omissions in

information supplied by Company shall be by Change Order. Additionally, if errors or omissions in information provided by Contractor materially affect Company's or its other contractors' work during construction of the Plant, Company shall be entitled to make a Claim against Contractor for Company's substantiated costs as the result of errors or omissions. Notwithstanding the foregoing, the Parties at all times shall abide by the terms of the Construction Coordination Agreement.

Section 7.21 Spare Parts Inventory

(a) Contractor shall provide and include in the Contract Price all spares and consumables necessary for the complete performance of the Work through Final Acceptance and through the Acceptance Period. Such spares and consumables shall be located at Site and immediately available to ensure all works, testing and reliability testing continues unimpeded by such unavailability of onsite spares and consumables.

(b) Contractor shall prepare a proposed list of spare parts for the Work to be available one hundred eighty (180) days prior to the Guaranteed Substantial Completion Date. Contractor shall submit the proposed inventory of spare parts to Company in a timely fashion so as to permit thirty (30) days for Company to review the list and for Company, in Company's sole discretion, to procure such spare parts or, at Company's option pursuant to a Change Order, to direct Contractor to procure such spare parts and have such spare parts delivered to the Site or cause such spare parts to be procured and delivered to the Site, to the extent practical, prior to the Guaranteed Substantial Completion Date. The proposed inventory of spare parts shall describe each component in detail, identify the manufacturer and supplier thereof and set forth the cost and lead time of such item. Upon the request of Company, Contractor shall meet with Company and its designees to discuss the proposed inventory of spare parts. If available, Company shall allow Contractor to use any spare parts owned by Company, but in no event shall Company be liable or shall Contractor be entitled to a Change Order in the event that the absence of any particular spare part or parts impacts completion of the Work.

(c) In the event Contractor uses Company's spare parts, such spare parts shall be expeditiously replaced by Contractor at its sole cost and expense.

(d) Company does not warrant the condition, quality, suitability, absence of defects, fitness for any purpose or aspect of any Company spare part and if a Contractor uses any Company spare part, it does so at its own risk.

(e) Availability of Spare and Expansion Parts. Contractor shall supply, at prices in accordance with prices already established within this Contract, all required spare and expansion parts, or their functional equivalents, and maintenance services under this agreement that may be required for the system, for a period of not less than one major maintenance cycle from date of Final Acceptance.

Section 7.22 Further Assurances

Contractor shall take all such further actions and execute all such further documents and instruments as Company may at any time reasonably determine to be necessary to further carry out and consummate the transactions contemplated by the Project Documents or to perfect or protect the Lien of Company on the Collateral under the Security Documents.

Section 7.23 Indebtedness

Until the Substantial Completion Date shall have occurred, Contractor shall not create, incur, assume, suffer to exist or otherwise become or remain directly or indirectly liable with respect to any Indebtedness other than Indebtedness incurred in the ordinary course of business that will not result in a Material Adverse Change.

Section 7.24 Liens

(a) Until the Substantial Completion Date shall have occurred, Contractor shall not create, incur, assume or suffer to exist, directly or indirectly, any Lien on any of its property now owned or hereafter acquired in connection with the Project, other than the following:

(i) Liens set forth on Schedule 7.1(a)(i) ("Permitted Liens");

(ii) mechanics Liens relating to the Work supplied and performed by Contractors or by any Subcontractor that have not yet been paid in the ordinary course of business; and

(iii) Liens filed with respect amounts payable to Contractor or any Subcontractor that are being disputed in good faith, provided that Contractor have posted a bond against such Liens with a bonding company or other surety reasonably acceptable to Company.

(b) Contractor shall cause all Subcontractors and Suppliers to deliver Lien releases in the form attached as Exhibits G and H, respectively, for all Liens that arise with respect to the Project.

Section 7.25 Restriction on Fundamental Changes

(a) Until the Substantial Completion Date shall have occurred, Contractor shall not, without Company's prior written consent, enter into any merger or consolidation, or liquidate, wind-up or dissolve (or suffer any liquidation or dissolution), discontinue their business.

(b) Until the Substantial Completion Date shall have occurred, and except in the ordinary course of business (such as the replacement of substitution of items from customary wear and tear), Contractor shall not convey, sell, lease, assign, transfer or otherwise dispose of any of Contractor's assets if such sale, lease, assignment, transfer or other disposition would not, singly or in the aggregate, result in a Material Adverse Change.

Section 7.26 Amendment of Project Documents; Additional Project Documents

Until the Substantial Completion Date shall have occurred, Contractor shall not:

(a) without the prior written consent of Company (i) assign or permit any Person to assign any of its rights or obligations to or under any Project Document, (ii) terminate any Project Document, or (iii) make any amendment or other modification to any Project Document that would (A) result in a breach of this Contract or the inaccuracy of any representation or warranty in this Contract, (B) increase the Contract Price, (C) extend the Guaranteed Substantial Completion Date, or (D) have a Material Adverse Effect;

(b) to the extent not covered by Section 7.26(a), amend, modify, grant any consent or approval with respect to any obligation under, waive timely performance or observance by any Person (other than Company) of any obligation under, exercise any options or remedies or issue any change order, notice or make any elections under any Project Document without providing notice thereof and copies of all material documentation related thereto, to Company;

(c) compromise or settle any claim against any Project Party if to do so would have a Material Adverse Effect; or

(d) enter into any Additional Project Document that would have a Material Adverse Effect. Contractor shall deliver copies of all Additional Project Documents to Company within three (3) Business Days of the execution thereof.

Section 7.27 Environmental Matters

Until the Substantial Completion Date shall have occurred, Contractor shall not permit (a) any underground storage tanks (other than for water or sewage) to be located on the Site, (b) any asbestos to be contained in or form part of any building, building component, or structure on the Site and (c) any polychlorinated biphenyls (PCBs) to be used or stored at the Site.

Section 7.28 Records and Accounts

Contractor shall maintain all records and accounts in accordance with GAAP consistently applied and in Dollars in order to support any and all invoices, claims and disputes under this Contract. Contractor shall permit Company, upon reasonable prior notice and during business hours, to audit Contractor's records and accounts to verify invoice amounts and to confirm any increases or decreases to the Contract Price and any Change Orders.

Section 7.29 Condemnation, Eminent Domain, Casualty Events

(a) In the event that any Governmental Authority or any Person, acting under any Governmental Authority, other than Company, takes any action to condemn, seize or appropriate all or any substantial part of the Project (each a "Condemnation Proceeding"), Contractor shall promptly notify Company of the Condemnation Proceeding and promptly update Company on significant events in connection with the Condemnation Proceeding, including with respect to settlement offers, and provide other information reasonably requested by Company as often as may be reasonably requested by Company. Any monetary offer to settle a Condemnation Proceeding or compensate Contractor with respect thereto shall at all times be subject to Company's sole and absolute discretion to accept or reject such offer, and in the event that Company directs Contractor to accept such offer, and provided that no Contractor Default, shall have occurred and be continuing, the proceeds thereof shall be applied first as a credit against any cancellation payment that may arise under article 29 ("Termination"), and the remainder of such proceeds shall be paid to Company.

(b) In the event that any casualty event (other than a Force Majeure) shall occur which causes a suspension of all or a substantial portion of the Work for a period greater than (i) forty-five (45) days after the receipt of insurance proceeds in an amount required to successfully restore or repair the Project without having to increase the Contract Price or (ii) ninety (90) days after the occurrence of such casualty event, then, provided that no Contractor Default shall have occurred and be continuing,

the proceeds of any insurance policies in respect of such casualty event shall be applied first as a credit against any cancellation payment that may arise under article 29 (“Termination”) and the remainder of such proceeds shall be paid to Company.

Section 7.30 Contractor’s Organizational Documents

Within thirty (30) days following the Effective Date, Contractor shall deliver to Company or its representatives true and complete copies of their [APPLICABLE ORGANIZATIONAL DOCUMENTS] (the “Contractor’s Organizational Documents”), as amended through (and including) such date.

Section 7.31 Construction Coordination Agreement

Contractor shall conduct all development, construction, commissioning and testing activities in accordance with the provisions of the Construction Coordination Agreement, attached as Appendix S, and in a manner that shall not interfere with the operation of Unit 1.

Section 7.32 Import Permits, Licenses and Duties

Contractor shall obtain all import permits or licenses required for any part of the Plant, Equipment or Work within the time stated in the Project Schedule or, if not so stated, in reasonable time having regard to the time for delivery of the Plant, the Equipment and the Time for Completion. Contractor shall pay all customs and import duties arising upon the importation of Plant into the applicable port of entry. All such payments shall be deemed to be included in the Contract Price.

Section 7.33 Compliance with Planning Permissions, Consents

Contractor shall comply fully in respect of design and work at Site and all other obligations under the Contract, with the terms, conditions and requirements of all consents, licenses and planning permissions obtained by Company or Contractor in accordance with Section 8.2 (“Planning Permissions, Consents”).

Section 7.34 Permits

Contractor shall, and cause each and every Subcontractor to, at its sole cost and expense, secure and maintain all applicable construction and construction related permits which are required by Applicable Law (each a “Permit”) in order to undertake the Work.

Section 7.35 Lay Out

(a) Contractor shall be, and ensure that each and every Subcontractor is, responsible for the true and accurate laying out of the Work by reference to original points, lines and levels of reference given by Company’s Representative and provide all necessary instruments, appliances and labor therefore.

(b) If, at any time during the execution of the Work, any error appears in the positions, levels, dimensions or alignment of the Work, Contractor shall rectify the error.

(c) Contractor shall bear the Cost of rectifying any error caused or permitted by Contractor.

(d) Contractor shall identify and protect bench marks, sight rails, pegs and other monuments or reference points used in laying out the Work.

ARTICLE 8

GENERAL OBLIGATIONS OF THE COMPANY

Section 8.1 Company's General Obligations

(a) Company's general obligation hereunder is to purchase the Project, upon performance of Contractor's obligations as provided in this Contract.

(b) Additionally, Company shall:

(i) keep Contractor informed as to the status of any governmental or regulatory or other activities undertaken by Company that would relate to the Plant and take corrective action related thereto, if necessary;

(ii) comply with all Applicable Law, the noncompliance with which are likely to materially adversely affect the Work, the Plant, the Site or Contractor's or Company's obligations under this Contract; and

(iii) maintain all records and accounts in accordance with GAAP consistently applied and in Dollars in order to support any and all invoices, claims and disputes under this Contract.

Section 8.2 Planning Permissions, Consents

(a) Company shall, before the time specified in the schedule for delivery of any Equipment or Plant to the Site, obtain the Planning Consents set forth in the Exhibit G. In the event Contractor considers that a consent not contained in Exhibit G must be obtained for the execution of the Work and/or operation of the Site and which, as a result of the application of Applicable Law, can only be obtained by Company, Contractor shall immediately inform Company. If Company determines, in its sole discretion, that any additional consent is required, Company shall use commercially reasonable efforts to obtain such consent.

(b) Except as expressly provided or set out in this Section 8.2 or otherwise agreed in writing, Company shall have no obligation to obtain any further planning or similar consents which are or may be necessary for the performance of the Work. The obtaining of any and/or all other necessary consents, permits, planning permission from local or other authorities or adjacent lands shall be the responsibility of Contractor who shall ensure that the same are promptly obtained considering the schedule and the time for delivery of the Equipment, the Plant and the Time for Completion.

(c) Each Party agrees to provide reasonable assistance to the other where such assistance is necessary for any consent, license or permission to be obtained. Contractor shall ascertain, comply with, and ensure that the Work complies with, all Applicable Law, and all consents, licenses and permissions relating thereto.

Section 8.3 Operations and Maintenance Staff

Company shall provide to Contractor any reasonably necessary support staff during the commissioning and startup of the Plant as set out in this paragraph. Company shall provide operations and maintenance staff personnel to participate in the commissioning activities and Performance Tests as set out below. This support shall be provided during normal working hours or other times as may reasonably be requested by Contractor with advance notice. Company shall provide operation and maintenance personnel as may be reasonably required by Contractor to carry out the Performance Tests for purposes of commissioning, Performance Tests, training and system turnover, not to exceed ten (10) FTE (full-time equivalent) personnel for a period not to exceed 180 consecutive days. Contractor shall supply a schedule of support not less than one hundred twenty (120) days prior to commencing startup and commissioning activities. Company's operation and maintenance personnel shall work under the direction of Contractor to perform their work in connection with the startup and commissioning activities. Subject to the following sentence, Company's personnel shall have acceptable minimum skill levels to operate the equipment. This participation shall be considered on the job training and treated as on the job training for Contractor.

Section 8.4 Certificate of Convenience and Necessity

Prior to the issuance of the Notice to Proceed, Company shall open a docket before the PSCU with respect to the CCN. Promptly after obtaining the CCN, Company shall provide notice thereof to Contractor. Contractor agrees to take commercially reasonable and prudent steps to represent themselves in the PSCU proceedings in support of the CCN, including causing the Subcontractors to provide cooperation and assistance to Company in connection therewith. Such regulatory participation by Contractor shall be at Contractor's sole cost and expense.

Section 8.5 Company's Representative

(a) Company's Power to Delegate. Company may at any time and from time to time delegate to its representative (the "Company's Representative") any of its duties and obligations (other than its payment obligations) under the Contract. Except as explicitly provided herein, any written decision, instruction or order given by Company's Representative to Contractor in accordance with such delegation shall have the same effect as though it had been given by Company.

(b) Duties of Company's Representative. Company's Representative shall carry out such duties in issuing certificates, decisions, instructions and orders as are specified in the Contract but except as expressly provided in the conditions neither the performance of or the failure to perform such duties whether properly or at all by Company's Representative, nor the fact that a representative has been appointed by Company shall in any way relieve Contractor of any responsibility or liability for any of its obligations under the Contract. No approval of, or consent to or failure to approve or disapprove of any matter by Company or Company's Representative shall relieve Contractor of any liability or any of its obligations under the Contract.

(c) Company Representative's Decisions, Instructions and Orders. Contractor shall proceed with the Work in accordance with the decisions, instructions and orders given by Company's Representative in accordance with the Contract and to the reasonable satisfaction of Company's

Representative. Any decision, instruction or order of Company's Representative may be oral or in writing; if given orally, such instruction or order shall be effective only when confirmed in writing.

Section 8.6 Standard of Conduct

Unless stated otherwise in this Contract, whenever the Parties or their representatives are required to exercise discretion by: (i) giving a decision or consent, or (ii) expressing satisfaction or approval, or (iii) determining value, or (iv) otherwise taking action which may affect their respective rights and obligations hereunder, the exercise of such discretion shall be made in a reasonable manner and in good faith consistent with this Contract so as to reasonably minimize any disruption to the other Party, and having regard to all the circumstances reasonably applicable thereto.

ARTICLE 9

WORKING ARRANGEMENTS

Section 9.1 Site Regulations

Contractor, while performing Work at the Site, shall make itself aware of and adhere to Company's Site regulations, if any, including without limitation environmental protection, loss control, dust control, safety, and security, as well as any plant Site special conditions.

Section 9.2 Site Security

(a) Site security shall be under the direct control of Company and shall be in accordance with Company's established procedures, which include the requirements stated in this Section. Contractor and its personnel and its Subcontractor's personnel of any tier shall strictly adhere to all Site security provisions. Company will furnish within fenced-in areas of the Site a guard force to control access to and from the Site.

(b) All personnel working at the Site and all repeat visitors may be provided and where provided, shall be required to keep in their possession at all times, while on the premises, an Identification Tag ("ID Tag") provided by Company. Visitor's ID Tags will be available, but persons with such ID Tags may be required to be escorted by a designated representative of Company.

(c) Contractor shall be assigned a personnel gate through which its employees must enter and depart. ID Tags issued to Contractor's employees may, at Company's option, be utilized as "brass", and Contractor shall be responsible for the control of ID Tags issued to its employees, subcontractors, suppliers and visitors.

(d) Notwithstanding Company's provision of guard service, Contractor shall be fully responsible for all Equipment, as well as Company-furnished material and Equipment in the care, custody and control of Contractor.

(e) Company shall designate parking areas for all persons outside the fenced-in area of the Site. Certain individuals, authorized specifically by Company, may drive vehicles onto the Site and may enter and leave through the main gate at times designated by Company. Access to the Site between the hours of 3:30 P.M. local time and 7:00 A.M. of the normal work week and all hours on

weekends shall be subject to the consent of Company. Contractor shall follow the procedure designated by Company in obtaining consent for access to the Site at other than normal working hours.

(f) Contractor shall maintain and submit to Company an up-to-date inventory of Equipment and tools brought onto the Site.

(g) A representative of Company shall have the unqualified right to demand identification of and/or search all persons and all vehicles entering or leaving the Site. Materials leaving the Site must have an appropriate material pass issued by Company. Contractor shall make, and cause its Subcontractors to make, advanced arrangements for tool inventory when leaving the Site upon completion of the Project. The inventory shall be coordinated with Company and can be conducted on weekdays between 9:00 A.M. to 2:00 P.M.

(h) Company shall inform Contractor of all restricted areas of the Site. Before entering any such restricted area, Contractor shall obtain prior consent from Company Representative. Any individual found in restricted areas without Company consent shall be subject to removal from the Site.

Section 9.3 Preservation of Public and Private Access

Contractor shall not damage, close, or obstruct any highway, road, or other public or private easement, except to the extent allowed by Permits. If such facilities are closed, obstructed, damaged, or made unsafe by Contractor, Contractor shall, at its sole cost and expense, make such repair as necessary and shall also provide such temporary guards, lights, and other signals as necessary or required for safety or as reasonably requested by Company.

Section 9.4 Night, Weekend or Holiday Work

In the event Contractor determines it necessary to undertake the Work at night, on weekends, or on holidays, and such Work is on the Site, Contractor shall provide Company's Representative forty-eight (48) hours notice, unless the Work is necessary for the protection of life or property or for the safety of the Work, in which case Contractor shall immediately advise Company's Representative. Such Work shall be performed in accordance with all Applicable Law, Permits, consents and licenses, and without inconvenience to third parties. Contractor explicitly agrees and acknowledges that full consideration and payment for the satisfactory completion of the Work includes all necessary labor hours inclusive of Work during night, weekends and holidays and explicitly agrees and acknowledges that Contractor shall not file Change Orders because of the need to attract labor to perform Work at night, weekends or on holidays.

Section 9.5 Avoidance of Noise and Disturbance

All Work at the Site (including night, weekend or Holiday Work subject to the requirements of Section 9.4 ("Night, Weekend or Holiday Work")) shall be carried out in such a way as to minimize noise and disturbance and Contractor shall indemnify and keep indemnified Company against any costs, losses or expenses, including without limitation, liability for damages arising out of or in connection with noise or other disturbance, falling outside of the limits specified in the Applicable Law and created by Contractor in performing the Work.

Section 9.6 Opening Up of Work

(a) No major material part of the Work shall be covered up or put out of view without the prior written consent of Company's Representative. Contractor shall timely inform Company's Representative and shall afford full opportunity for Company's Representative to inspect any part of such Work which is about to be covered up or put out of view and to examine foundations before any part of the Work is placed thereon.

(b) Contractor shall uncover any part of such Work or make openings in or through the same as Company's Representative may from time to time direct and shall reinstate and Repair such part. The cost of such uncovering, repair or reinstatement shall be borne by Contractor unless (i) the requirements of Section 13.2(c) ("Required Change Orders"), if applicable, have been fulfilled with respect to such part, (ii) such part is found to have been executed in accordance with the Contract, and (iii) it was not reasonable to have requested the opening up given the existence of Defects of a similar nature in other parts of the Work, in which event the cost of such uncovering, repair, or reinstatement shall be borne by Company.

(c) Notwithstanding any other provision of this Section, if Defects are uncovered, Company shall be entitled to either accept the defective Work or to accept them only partially remedied and, provided that Contractor has had a reasonable opportunity to remedy the Defects (except where such work has been deliberately concealed by Contractor) the Contract Price shall be reduced by an amount mutually agreed by Company and Contractor, and in the absence of such agreement, an amount as is determined pursuant to the provisions of article 31 ("Claims, Claim Notice and Dispute Resolution").

Section 9.7 Fencing, Protection, Lighting

Contractor shall provide adequate safety barriers, signs, lanterns, and other warning devices and service to properly protect any person having access to or near the Site. Contractor shall be solely responsible for any act of trespass or any damage to adjacent property resulting from or in connection with its operations under this Contract.

Section 9.8 Site Services

Contractor shall be responsible for obtaining any and all electricity, water, fuel, air and other services as Contractor may require for the purposes of the Work, and Contractor shall be responsible for the cost thereof.

Section 9.9 Cleanup

Contractor shall keep the Work area, including storage areas used by it, free from accumulation of waste materials or garbage arising out of the Work, and shall, prior to completion of the Work, remove and properly dispose of any such waste materials or garbage from and about the Work area as well as remove all tools, equipment and materials not property of Company. Upon completion of the Work, Contractor shall leave the Work area in a condition reasonably satisfactory to Company. In the event of Contractor's failure within a reasonable time to comply with any of the foregoing, Company may, after written notice to Contractor of such failure, perform the cleanup and removal at the sole cost and expense of Contractor.

Section 9.10 Contamination

Contractor shall, at all times, be responsible for keeping the Site free from any Contamination brought to or generated at the Site by Contractor, Contractor or any Subcontractor. Prior to the Substantial Completion Date, Contractor shall manage any Contamination, whether brought on to the Site or pre-existing, according to Applicable Law and within the requirements of Company's policies and programs for management and disposal of Contamination. Contractor shall not be responsible for the remediation or disposal of any pre-existing Contamination. Prior to the disposal or disposition of any Contamination, Contractor shall obtain the written approval of Company for such disposal or disposition.

Section 9.11 Material Safety Data

Contractor shall be familiar with and abide by all provisions of the OSHA Hazard Communication Standard. Contractor shall pay special attention to the following provisions from the "Contractor Employees" section of the PacifiCorp Hazard Communication Program:

(a) Contractor shall require that suppliers furnish appropriate Material Safety Data Sheets (collectively, "MSDS") and appropriate labels of all purchased chemicals.

(b) For materials that a Contractor plans to bring onto the Site, MSDS for those materials must first be presented to Company for review by Company's Plant Safety Coordinator. Contractors coming onto the Site will provide to Company an MSDS for the materials to be used. Materials will be contained so as to meet any State or Federal Regulations.

(c) Contractor and its employees shall review the MSDS of the appropriate hazardous chemicals, and follow the requirements of the OSHA Hazard Communication Standard.

(d) Contractor is responsible for all applicable training and adherence to the program by its employees, Subcontractors, and Subcontractor's employees, subcontractors and agents.

(e) Any employee of Contractor working in an area where hazardous chemicals are or may be present shall be notified in writing by Contractor of the chemicals present and provided with appropriate MSDS. It will be the responsibility of Company to inform Contractor of the hazardous chemicals at the Site to which its employees may be exposed.

Section 9.12 Historical Artifacts

In the event that any relics, items or structures with archaeological, geographical or historical value or any Articles (including but not limited to fossils, coins, Articles of value or antiquity and any Native American relics) are discovered by Contractor or any of its subcontractors of any tier or any of their representatives or employees, Contractor shall leave said items undisturbed and shall immediately notify Company and await its direction before proceeding with any work in the vicinity. All such historical artifacts shall be deemed to be the absolute property of Company and under no circumstances shall Contractor take possession of any item discovered..

ARTICLE 10

PROJECT SCHEDULE

Section 10.1 Project Schedule

Attached hereto as Exhibit C is a preliminary general project timetable setting forth the major tasks that must be completed by Contractor (each a “Milestone”) and completion dates for such tasks (“Milestone Completion Dates”) as provided by Contractor in accordance with the Specification. One such Milestone is the final approval by both parties of a more detailed project timetable (the “Project Schedule”) setting forth in more detail Milestones and Milestone Completion Dates, including all design, development and other Milestones to be achieved. In the event that the Notice to Proceed is delayed, within thirty (30) Days from the date of the Notice to Proceed, Contractor shall submit to Company’s Representative an updated version of the Project Schedule for the approval of Company’s Representative.

Section 10.2 Form of Project Schedule

The Project Schedule shall be in form and content acceptable to Company. Such Project Schedule shall specify any tasks, obligations, or responsibilities (each a “Company Obligation”) which Company must perform or fulfill in order for Contractor to achieve the Milestone Completion Dates for each Milestone, and the date by which Company is to fulfill each and every Company Obligation.

Section 10.3 Rejection of the Project Schedule

(a) Company’s Representative shall have the right to reasonably reject, vary, amend, substitute or otherwise change the Project Schedule prior to approval thereof. Any such variation, amendment, substitution, or other change (other than a rejection) shall be considered a Company-Initiated Change under Section 13.1 (“Changes”).

(b) If, under Section 10.3(a), Company’s Representative rejects any Project Schedule submitted by Contractor, Contractor shall, within seven (7) days of such rejection, submit four (4) copies of the final form of a revised Project Schedule for approval by Company’s Representative and of the Project Schedule.

Section 10.4 Alterations to Project Schedule

Contractor shall not, without the prior written consent of Company’s Representative, make any material alteration to the Project Schedule.

Section 10.5 Revision of Project Schedule

If Company or Company’s Representative determines, each in its sole discretion, that progress of the Work does not or is unlikely to match the Project Schedule, or otherwise to enable the Work to be completed by the Time for Completion, Company’s Representative may order Contractor to revise the Project Schedule. Contractor shall thereafter revise the Project Schedule to show the modifications necessary to ensure completion of the Work within the Time for Completion. Contractor shall notify

Company's Representative as soon as possible of any circumstances of which Contractor is or becomes aware which might result in progress not matching the Project Schedule.

Section 10.6 Contractor's Responsibility to Comply with Milestone Completion Dates

Contractor shall undertake sole and complete responsibility to complete and to commit sufficient manpower and resources to insure the completion of each Milestone by the appropriate Milestone Completion Date.

Section 10.7 Rate of Progress

(a) Company's Representative shall notify Contractor if Company's Representative decides that the rate of progress of the Work is, in its opinion, too slow to meet the Time for Completion due to a circumstance for which Contractor is entitled to an extension of the Time for Completion under the provisions of this Contract.

(b) Following receipt of such a notice Contractor shall at its own cost take such steps as may be necessary and as Company's Representative may approve to remedy or mitigate the likely delay, including revision of the Project Schedule. Contractor shall not be entitled to any additional payment or additional Cost or any increase in the Contract Price for taking such steps.

Section 10.8 Progress Reports

(a) Contractor shall submit to Company's Representative on the third (3rd) working day of each month or such other date as is agreed upon between Contractor and Company, a progress report ("Progress Report") in compliance with the requirements set forth in the Specification. Contractor shall submit two (2) copies of each Progress Report to Company's Representative.

(b) The written progress reports submitted by Contractor shall specify in detail:

(i) any problem or circumstance (each a "Project Problem") encountered by Contractor during the preceding month (including without limitation the failure of Company to perform any Company Obligations under the Contract or the inadequacy of any such performance by Company) which might (A) prevent Contractor from completing any Milestone by its Milestone Completion Date or (B) cause Contractor to incur additional expenses in completing any Milestones;

(ii) the estimated length of any delay and the estimated amount of any additional expenses, if any, which may be chargeable to Company hereunder, as a result of any Project Problem identified pursuant to the Contract, and

(iii) to the best of Contractor's knowledge, after due inquiry and analysis, the cause of any Project Problem specified pursuant to the Contract and the specific steps taken or proposed to be taken by Contractor to correct such problem.

(c) In the event that Contractor fails to specify in writing any Project Problem (an "Unidentified Project Problem") with respect to a given monthly period in the appropriate report and in such manner and at such time as specified pursuant to the Contract as a Project Problem, Contractor

shall not be entitled to rely on any such Unidentified Project Problem as a purported justification for either (i) claiming that it is entitled to receive any additional amounts pursuant to the Contract (including without limitation, damages arising out of any alleged failure by Company to perform any of Company Obligations) or (ii) failing to complete any Milestone by the specified Milestone Completion Date.

(d) The submission by Contractor of any Progress Report shall not alter, amend or modify Contractor's or Company's rights or obligations pursuant to this Contract, including the Contract Price. In the event and to the extent any Milestone is not completed by the specified Milestone Completion Date as a direct and unavoidable result of Company's failure (other than as a result of Contractor's failure to perform any of its obligations on a timely basis) to fulfill any Company Obligation by its respective completion date, then the Milestone Completion Date for such Milestone shall be extended by one (1) day for each day in which completion of any such Company Obligation is delayed beyond its respective completion date and all extra costs actually incurred by Contractor by reason of such delay shall be paid by Company, unless the delay in completing any Company obligation results from Contractor's failure to perform any of its obligations on a timely basis.

Section 10.9 Progress Meetings

Progress meetings will be held as deemed necessary by Company, but normally shall not be less than once a week. Such meetings shall be at Company Site unless Company requests to change the location of such meetings. Progress meetings will be utilized to review the Work schedule and discuss any delays, unusual conditions or critical items, which have affected or could affect the progress of the Work.

ARTICLE 11

DELIVERY, SHIPPING, AND HANDLING OF PLANT AND EQUIPMENT

Section 11.1 Delivery Responsibility

Contractor shall be responsible for the safe delivery of all Plant and Contractor's Equipment to the Site. Contractor shall abide by the requirements of Appendix B for delivery of major items of Equipment, Plant or Contractor's Equipment to the Site. Contractor shall be responsible for the reception and unloading on Site of all Equipment, Plant and Contractor's Equipment delivered for the purposes of the Contract.

Section 11.2 Packing

(a) Contractor is responsible for assuring that the Equipment is suitably packaged to ensure against damage under normal handling and transportation methods. All Equipment or components thereof shall be identified with Company's equipment number or tag number, if required by the technical specifications. All shipping shall be in accordance with Appendix B.

(b) The Equipment and all related parts shall be shipped FOB the Site, Freight Prepaid and Allowed, with Contractor retaining risk, liability and responsibility, financial or otherwise, until Substantial Completion, and then only in accordance with this Contract.

(c) Prior to the shipment of any Equipment, Contractor shall become knowledgeable of transportation conditions, such as clearances and restrictions, height and width, bridge load limits and other limitations affecting such shipment. Notwithstanding any other provision of this Contract, any limitations or the lack of transportation facilities shall not become the basis for Claims or damages, or for an extension of time for completion of Work under this Contract.

Section 11.3 Transportation

Contractor shall observe all Applicable Law in relation to and obtain all necessary consents and permissions for the transport of Plant, Equipment and Contractor's Equipment over highways, bridges or culverts and shall indemnify Company against all claims for the repair of any such highways, bridges or culverts arising out of the execution of the Work and in respect of all proceedings, damages, costs, charges and expenses arising out of or in connection with such transportation.

Section 11.4 Extraordinary Traffic

Contractor shall use best efforts to prevent damage to any of the highways, bridges or culverts on the routes to the Site by any traffic of Contractor or any of his subcontractors. Contractor shall be responsible for the cost of protecting or strengthening any highway, bridge or culvert as necessary to facilitate the moving of the Equipment, Plant or Contractor's Equipment and shall be liable for any damage or injury to highways, bridges or culverts arising out of the execution of the Work, and shall indemnify Company in respect of any claim, proceedings, damages, cost, charges and expenses in relation thereto which may be incurred as a result of Contractor's default under this Section.

Section 11.5 Allocation

In the event of a partial failure of Contractor's sources of supply, Contractor will first meet all of Company's requirements hereunder prior to any allocation among other customers

ARTICLE 12

CONTRACTOR'S EQUIPMENT

Section 12.1 Contractor's Equipment

Contractor shall, within thirty (30) days after the Effective Date, provide to Company an indicative list of Contractor's Equipment that Contractor intends to use on the Site, which shall be updated from time to time during the carrying out of the Work and which shall be available for inspection by Company's Representative.

Section 12.2 Contractor's Equipment on Site

All Contractor Equipment shall, when brought on to the Site, be deemed to be exclusively intended for the execution of the Work. Contractor shall not thereafter remove the same or any part thereof from the Site without the consent of Company, which shall not be unreasonably withheld in the case of Contractor's Equipment not currently required for the execution of the Work on Site.

Loss or Damage to Contractor's Equipment

Contractor shall be liable for loss or damage to any of Contractor's Equipment which may occur otherwise than through the default of Company or those for whom Company is responsible.

Section 12.3 Maintenance of Contractor's Equipment

Contractor shall be responsible for maintaining Contractor's Equipment on Site in safe working order.

ARTICLE 13

CHANGE ORDERS

Section 13.1 Changes

(a) From time to time circumstances may arise which justify a Change.

(b) No Change shall be effective unless authorized by Company by issuance of a Change Order pursuant to the provisions of this Article 13.

(c) Company shall, when reviewing each potential Change and determining the nature and extent of any Change Order which is to be granted in accordance with the subsequent paragraphs of this Article, consider in detail the following information:

(i) The nature, scope and extent of the Change, including but not limited to any additions or deletions from the Scope of Work;

(ii) The effect, if any, of the Change on the Project Schedule or on the Guaranteed Substantial Completion Date(s), as applicable;

(iii) The effect, if any, of the Change on the amount the Contract Price; provided, however, that in no event shall the amount of the Contract Price be subject to change for any Change that does not constitute a material change in the Scope of Work requested by Company; and

(iv) Such other information as may reasonably be necessary for the implementation of the Change Order, including but not limited to the effect on any other provisions hereof which may be impacted by the Change.

Company shall, in the case of an Company-Initiated Change or, if it elects to do so, in the case of Contractor Initiated Changes, and in all events in the case of Required Changes, thereafter issue such Change Order having regard to all such circumstances as is just and equitable and in a form substantially similar to the Change Order Form attached hereto as Exhibit D-1 which shall address, to the extent required, all of the issues set out in this Section 13.1(c).

(d) In the case of any request for a Change Order which is permitted to be made in accordance with this Contract, it shall take the form of a Change Order Request (each a "Change Order Request") which shall be delivered to Company in writing as soon as possible and in any event within ten (10) days after Contractor becomes aware of the circumstances which it believes (or through the

exercise of Best Recognized Practice should believe) necessitates a Change. In no case shall Contractor be entitled to recover costs as a Change Order in connection with conditions that give rise to such Change Order arising prior the date on which Contractor requests the Change Order, except to the extent that such costs are incurred reasonably and properly in order to achieve the Guaranteed Completion Dates. Any Change Order Request shall be in a form substantially similar to the Form of Change Order Request attached hereto as Exhibit D-2 and comprising the following information: (a) the factors necessitating or the basis for the Change; (b) the impact, if any, which the proposed Change is likely to have on the Contract Price; (c) the impact, if any, which the proposed Change is likely to have on the Project Schedule (including the Guaranteed Substantial Completion Date); (d) other impacted provisions hereof; and (e) such other information which Company may reasonably request in connection with such proposed Change.

(e) The issuance of a Change Order shall not result in invalidation of this Contract.

(f) Except with respect to a Company Initiated Change, as to which the disregarded amount shall be \$25,000, no circumstances will constitute grounds for a Required Change Order or a Contractor Initiated Change Order unless and to the extent that (i) the costs of such Change Order, in either case, is in excess of \$5,000, or (ii) the effect of such Change Order request impairs the achievement of an Company Critical Schedule Milestone or a Contractor Critical Schedule Milestone, as applicable, by more than 3 days (except in circumstances where Contractor has no means of recovering such schedule impairment in which case Contractor shall be entitled to a Change Order if Contractor would otherwise have been so entitled). Neither party shall game or otherwise manipulate the foregoing process, by aggregating or disaggregating cost and/or circumstances as the case may be (or otherwise), for the purpose of recovering or avoiding additional cost or time in accordance with the foregoing.

(g) Change Orders (in each case in excess of the applicable disregarded amount) shall address the change, if any, in the amount of the Contract Price in one of the following manners:

(i) Company and Contractor shall agree upon the amount by which the Change will impact the Contract Price; or

(ii) Company and Contractor shall agree as to the nature and extent of the Change, but in lieu of changing the Contract Price, Contractor shall perform the activities associated with the Change on a cost-reimbursement basis, in which event no change shall be made in the amount of the Contract Price.

Section 13.2 Procedure for Changes

(a) Changes Initiated by Contractor. Contractor may, at any time and from time to time, make proposals to Company for improvements, efficiencies, cost savings and other similar Changes to the Work (each a "Contractor-Initiated Change"), but no such proposal shall be carried out by Contractor except as instructed in writing by Company in the form of a Change Order, which Company may in its discretion elect to issue as it sees fit. Such proposals of Contractor shall be submitted in the form of a written Change Order Request in the manner substantially as set out in 13.1(d), and shall also contain and be supplemented with such information or additional information as

Company may reasonably require in order to effect a reasoned decision as to the implementation, or rejection, (as the case may be) of the Change Order Request.

(b) Changes Initiated by Company. If Company desires to make a Change (each a “Company-Initiated Change”) not comprising rectification or recovery Work due to Contractor’s negligence or breach of this Contract, Company will submit a written Change Order Notice to Contractor, substantially in the form of Exhibit D-3, comprising the nature and extent of the proposed change to the Scope of Work together with, to the extent available and/or applicable, Company’s opinion as to those matters required to be taken into account in accordance with Section 13.1 (“Changes”). Contractor will promptly review the Change Order Notice and notify Company in writing within a reasonable amount of time of the options for implementing the proposed Change (including, if possible, any option that does not involve an extension of time) and the estimated effect(s), if any, that each such option would have on the Contract Price and Project Schedule, and any other affected provision herein, as applicable. Such response shall also contain all those matters required to be set out in a Change Order Request. Based upon such information, Company may, in its sole discretion, issue a Change Order making a Change.

(c) Required Change Orders. Contractor shall be entitled to the issuance of Change Orders pursuant to Article 13 in connection with any circumstances which constitute a Change and which are attributable to the matters identified in subparagraphs (a) through (g) below (each a “Required Change”):

(i) Due to Change in Law Applicable Law/Permit or Site Condition. If and to the extent that a change in any Requirement of Law or Permit after the Effective Date or results in an increase in the cost of the Work or extends the Project Schedule, and in each case only to the extent that such increase or extension is greater than the threshold amounts identified in Section 13.1(f) above.

(ii) Change Order Due to Suspension of Work by Company. In the event that Company suspends the Work (i) in the circumstances with respect to which Contractor is entitled to a Change Order as set out in Section 13.1, or (ii) in the circumstances set out in article 16.

(iii) Change Order Due to Non-Performance by Company. If Company fails to perform or is late in performing in any material way any material obligation of Company under this Contract and the cost to Contractor is in excess of \$25,000 or a delay of more than 3 days. Neither party shall game or otherwise manipulate the foregoing process, by aggregating or disaggregating cost and/or circumstances as the case may be (or otherwise), for the purpose of recovering or avoiding additional cost or time in accordance with the foregoing.

Contractor shall in all cases use or have used commercially reasonable efforts to mitigate potential delays to the Project Schedule and/or potential increases to the Contract Price (the cost of such mitigation efforts to be addressed in any applicable Change Order).

(d) Except in the circumstances as set out in this Section 13.2 and with respect to which an application is properly made in accordance with this Article 13, Contractor shall not be entitled to seek

either a Change, Change Order or extension of the Guaranteed Substantial Completion Date, nor to receive additional remuneration or reimbursement with respect to the Work.

Section 13.3 Continued Performance Pending Resolution of Disputes

Notwithstanding and pending the resolution of any dispute with respect to a Change or Change Order, Contractor must proceed with the Work and the performance of any Change ordered by Company or any Required Change, unless Company directs Contractor not to so proceed, provided that Contractor is being paid on a current basis for all undisputed Work and for all disputed Work which has been ordered to be paid through a Claim proceeding dispute resolution relating thereto in accordance with this Contract.

Section 13.4 Preservation of Schedule and Contract Price

Where any proposed Change or Change Order Request may give rise to an extension of any of the Project Schedule or an increase in the Contract Price, then Company reserves, in its sole discretion and to the extent possible, the right to require Contractor to vary, amend or effect such other Change to the Work in such a manner as will mitigate or avoid the requirement for such extension of time or increase in price.

ARTICLE 14

WORKMANSHIP AND MATERIALS

Section 14.1 Manner of Execution

The Work to be supplied, including all materials, manufactured components and labor and services to be performed, shall be designed and executed in the manner set out in this Contract. Except where the manner of design, manufacture and execution is otherwise specifically set out in this Contract, the Work shall be designed and executed in a proper and workmanlike manner, all in accordance with accepted industry standards and Prudent Industry Practice.

Section 14.2 Condition of Materials

The materials, Equipment (including any rented Equipment), fixtures, software, any related items of personal property and other tangible personal property of Contractor, any Subcontractor or Contractor constituting the Project shall be OEM Certified, and shall be suitable for their current use in the generation of energy and the transportation of natural gas in accordance with the Specifications. All Equipment shall be procured solely for use in connection with the Project. Contractor shall not allow any Equipment to be placed into storage for more than one year prior to shipping to the Site, nor utilize any Equipment in the Project that has been so stored.

Section 14.3 Inspection

(a) In addition to the inspection rights of Company under Section 7.8 (“Authority for Access for Inspection”), within sixty (60) days after the Effective Date, Contractor shall submit to Company a schedule (the “Witness Point Schedule”), including but not limited to those events identified in Appendix T of tests and inspections (the “Witness Point Events”) reasonably acceptable to

Company which shall include locations where the Equipment shall be manufactured or tested and the location at which such tests and inspections can be viewed by Company. Contractor shall provide no less than three (3) Business Days' advance confirmation of the actual date of each Witness Point Event identified on the Witness Point Schedule. Company shall be entitled to attend and witness all Witness Point Events. To the extent that any Witness Point Events have been completed prior to the date on which the Witness Point Schedule is submitted to Company, at Company's sole discretion, Contractor shall (i) allow Company to observe the materials and workmanship of the Project and to review documentation which may be available in lieu of viewing or witnessing the Witness Point Event, or (ii) re-open the affected portion of the Project for inspection by Company and repair or correct (if necessary) and restore the affected portion of the Project at no additional cost to Company. All inspections shall take place on the Site, on a Contractor's or a Subcontractor's premises or such other reasonable site as the Parties may agree, as appropriate, during normal working hours. No such inspection or examination or witnessing of tests shall release Contractor from any obligation or liability under this Contract. Inspections under this Section 14.3 are solely for the benefit of Company and any inspection or failure to inspect and any objection or failure to object by Company shall not (i) relieve Contractor or any Contractor of any of their obligations under any Project Document or (ii) be used as evidence that Company agreed that either or both of Contractor or any Subcontractor had fulfilled any obligations under any Project Document or that Company had waived any of its rights under any Project Document.

(b) If, as a result of an inspection or examination referred to in paragraph (a) above, Company decides that any portion of the Work is nonconforming or otherwise not in accordance with this Contract, Company shall promptly notify Contractor thereof. Such notice shall state Company's objections and its reasons therefor in reasonable detail. Contractor shall make good the nonconformity or ensure that any such portion of the Work complies with this Contract at no additional cost to Company.

(c) For purposes hereof, "nonconforming" means defective or not in conformity with the Specification.

ARTICLE 15

DRAWINGS

Section 15.1 Drawings

(a) Following receipt and approval of the Project Schedule, Contractor shall prepare a contract documentation and drawing list identifying those key data, calculations (as required for regulatory purposes and consents), drawings, technical specifications and concepts required for review for conformance with the Contract.

(b) Contractor shall, within the time detailed in the Project Schedule or elsewhere in this Contract, submit to Company's Representative in hard copy and electronic form (the specific form of which shall be agreed to by the Parties) such key data, calculations, drawings, technical specifications and concepts.

(c) Contractor shall timely submit to Company's Representative drawings of temporary and permanent buildings and structures and any other information required under the terms and conditions of consents, licenses and planning permissions obtained by Contractor or Company.

(d) Company's Representative may, in its sole discretion, disapprove any drawing; provided, however, it shall notify Contractor of any such disapproval within twenty (20) days of receipt, except for documents and information (including calculations) which are required by Company's Representative for consultation with Company's third party contractors for the purposes of the interconnections at terminal points, where the period shall be thirty (30) days. Contractor shall supply additional copies of documents or information (including calculations) in the form and numbers stated in the Contract. Without waiver of or prejudice to any rights of Company, Contractor shall bear all risk in relation to its performance of work arising from or in relation to all documents or information (including calculations).

Section 15.2 Consequences of Documents not in accordance with Contract

Any documents or information (including calculations) which Company's Representative identifies as not being in accordance with the Contract shall be modified and resubmitted without delay.

Section 15.3 Drawings Submitted

Contractor shall not deviate from drawings accepted by Company or issued by Contractor as approved for construction, except with the prior written consent of Company.

Section 15.4 Inspection of Drawings

Contractor shall maintain and provide to Company's Representative from time to time or upon request a complete list of drawings identifying which is approved for construction. Company shall have the right at all reasonable times to inspect all drawings of any part of the Work.

Section 15.5 Operating and Maintenance Instructions

(a) Not less than six (6) months prior to the scheduled Guaranteed Substantial Completion Date, Contractor shall deliver to Company's Representative one (1) set of preliminary operating and maintenance manuals sufficiently complete that the Plant and Equipment may be safely commissioned and Company's personnel properly trained pursuant to Section 7.11 ("Training"). Contractor shall, at its sole cost and expense, continuously update such manuals so that, as of the Substantial Completion Date, such operating and maintenance manuals are substantively in their final form with any amendments made as necessary.

(b) Within three (3) months of the scheduled Substantial Completion Date, Contractor shall supply to Company three (3) copies of final operation and maintenance manuals and drawings of the Work as-built plus five (5) CD-ROMs incorporating any changes made during testing and/or Commissioning of the Work.

(c) All operating and maintenance manuals and drawings of the Work as-built shall be in such detail as will enable Company to operate, maintain, dismantle, reassemble, adjust and repair all parts of the Work. Where the employment of Contractor is terminated for default or in the case of

Contractor's Material Adverse Change prior to the Transfer of Possession and Control of Project to Company Date, Contractor shall provide to Company such information including copy drawings and Draft Manuals as is reasonable and as is necessary for Company to complete, use and maintain the Work.

(d) Where the employment of Contractor is terminated for convenience, Contractor shall provide to Company such information, including copy drawings and Draft Manuals, in the state of completion at the date of such termination.

(e) The provision by Contractor of the final operation and maintenance manuals and drawings of the Work as-built in accordance with the provisions of this Section shall be identified as a Milestone in Appendix C and the provisions of article 10 shall apply.

Section 15.6 Company's Use of Drawings

(a) Drawings and information created by Contractor for purposes of designing, developing, constructing, commissioning and operating the Project constitute "work made for hire," and Contractor hereby transfers and assigns all rights in and to such drawings and information to Company.

(b) Drawings and information supplied by Contractor that are not created by Contractor specifically for or in connection with the Project, but that are necessary or useful for the operation and maintenance of the Project, the Work or any portion of them, may be used by Company for the purposes of completing, maintaining, operating, improving, adapting, renewing, enlarging, dismantling, re-assembly, adjusting and repairing the Work, and for any other legal purpose, pursuant to the license granted in Section 15.6.

(c) Contractor grants to Company an irrevocable perpetual royalty free license to use all drawings and information for the foregoing purposes and Contractor shall provide Company with copies of such drawings and information.

Section 15.7 Manufacturing Drawings

In the event of a Defect resulting in outage of the Plant in excess of two (2) days during the applicable Warranty Period, Contractor shall immediately give Company full, unimpeded, and unqualified access to all information, documents, processes and operations, processes or operations so as to enable Company to satisfy itself that the Plant and Equipment shall in all respects be properly and timely repaired and/or replaced and so as to be in full compliance with the requirements of the Contract.

Section 15.8 Errors in Drawings Supplied by Contractor

(a) Contractor shall be responsible for the accuracy, completeness and suitability of all drawings, samples, patterns, models, calculations or information submitted by Contractor, Contractor any Subcontractor in connection with the Work. Notwithstanding Company's or Company's Representative's inspection or approval of drawings, samples, patterns, models, calculations or information submitted by Contractor, Contractor shall not be relieved of any responsibility or liability imposed on it by any provisions of the Contract and shall be responsible for any errors, omissions or discrepancies therein.

(b) Contractor shall bear any and all costs Contractor or Company may incur as a result of delay in providing such drawings, samples, patterns, models, calculations or information or as a result of errors, omissions or discrepancies therein or for the correction thereof.

(c) Contractor shall, at its sole cost and expense, carry out or cause to be carried out any alterations or remedial work necessitated by such errors, omissions or discrepancies for which it is responsible and modify the drawings, samples, patterns, models, calculations or information accordingly.

ARTICLE 16

SUSPENSION OF WORKS, DELIVERY OR ERECTION

Section 16.1 Order to Suspend

(a) Company may, at its sole option, upon not less than seven (7) days' prior written notice to Contractor, suspend at any time (a) the performance of all or any portions of the Work, (b) delivery of a component of the Work, or (c) erection of any portion of the Work that has been delivered to the Site. Such notice shall specify the length of time that Company anticipates the Work shall be suspended.

(b) If the cumulative days of Work suspension totals One Hundred and Eighty (180) days, or if the Work is suspended four (4) or more separate times for a period of more than 45 days in any single instance or 180 days in aggregate, Contractor may terminate this Contract by thirty (30) days' written notice to Company unless the suspension is lifted within such 30-day period, and such termination shall be treated as a Company voluntary termination pursuant to Section 29.1(c) ("Voluntary Termination").

(c) Unless otherwise instructed by Company, Contractor shall during any suspension affecting the progress of the Work on Site, maintain its staff, labor and equipment on or near the Site ready to proceed with the Work upon receipt of the further instructions of Company.

(d) If Company desires to extend the period of suspension for a longer time than that specified in the original notice given by Company, Company shall so notify Contractor in writing and the same procedures described in article 10 ("Project Schedule") shall be followed to determine whether to actually extend the suspension and the amount of the costs and charges which shall be incurred as a result of any such extension.

Section 16.2 Protection of Work

(a) Contractor shall, during such suspension, store, preserve, protect and otherwise secure each of the Work, Equipment and the Plant.

(b) If Company is unwilling or unable to receive any of the Equipment as a result of a suspension by Company under Section 16.1 ("Order to Suspend"), Contractor shall, upon notice to Company and giving Company reasonable opportunity to designate a mutually acceptable destination, place such Equipment in storage. If any Equipment is placed into storage pursuant to this provision,

delivery thereof shall not be deemed to occur until such Equipment is delivered to the Site or Company has notified Contractor that it is prepared to accept delivery at some other location.

Section 16.3 Resumption of Work

(a) Following any suspension by Company under article 16, after receipt of notice to resume progress of the Work, Contractor shall examine the Work affected by the suspension. Contractor shall, within twenty-one (21) calendar days after receipt of notice to resume the suspended Work, submit to Company a written report detailing any deterioration, nonconformities and losses to the Project or any portion thereof and a Change Order Proposal related to such damages, losses and deterioration. Contractor shall, pursuant to a Change Order, correct, repair or replace any deterioration to, nonconformity in or loss of the Work that occurred during the suspension; provided, however, that no Change Order shall be required or issued for any deterioration, nonconformity or loss resulting from Contractor's negligence or wrongdoing during the period of suspension; and shall promptly resume performance on the suspended Work to the extent required in the notice.

(b) Any claims on the part of Contractor for extensions of time in connection with a suspension shall be made in accordance with the appropriate provisions of this Contract. Notwithstanding any other provision of this Contract, no compensation or extension of time shall be granted to the extent that suspension results from Contractor's non-compliance with the terms of the Contract.

Section 16.4 Change Order in Event of Suspension

(a) Contractor may, at any time prior to thirty (30) days after receipt of notice to resume progress of the Work under Section 16.3 above, notify Company of its request for a Change Order as a result of suspension by Company under Section 16.1 ("Order to Suspend").

(b) Contractor shall, within seven (7) Business Days following receipt of any notice from Company indicating Company's intention to suspend the performance of all or any portion of the Work pursuant to Section 16.1, deliver to Company an itemized account of the estimated charges and costs which Contractor believes will be incurred by Company pursuant to as a result of such suspension. Contractor shall make a good faith estimate of such charges and cost that will be accurate within a range of plus or minus five percent (5%). Following receipt of such estimate, Company shall have the right by written notice to Contractor at any time prior to the effective date of suspension specified in Company's suspension notice to either (i) revoke its decision to suspend performance, in which event Contractor will not suspend performance of such Work, (ii) instruct Contractor to suspend performance in accordance with the terms of Company's suspension notice and to confirm that the charges and costs quoted by Contractor are acceptable, or (iii) instruct Contractor to suspend performance in accordance with the terms of Company's suspension notice, with Company reserving the right to contest the charges and costs quoted by Contractor.

- (c) In the event of such suspension, Contractor shall, unless the notice requires otherwise:
- (i) Discontinue the Work on the date and to the extent specified in the notice;
 - (ii) Place no further orders or subcontracts for Equipment, Plant or services with respect to the suspended Work, other than to the extent required in the notice;

(iii) Promptly make every reasonable effort to obtain suspension, upon terms reasonably satisfactory to Company, of all orders, subcontracts and rental agreements to the extent they relate to performance of the Work suspended; and

(iv) Unless otherwise specifically stated in the notice, continue to protect and maintain the Work theretofore completed, including the Work suspended hereunder.

(d) As full compensation for any such suspension, Contractor shall be reimbursed for the following costs, reasonably incurred, without duplication of any item, to the extent that such costs directly result from such suspension of Work, up to a maximum of one hundred and five percent (105%) of the estimate submitted by Contractor pursuant to the Contract hereof:

(i) If determined necessary by Company, a standby charge to Contractor during the period of suspension of the Work, which standby charge shall be sufficient to compensate Contractor for the reasonable costs of keeping, to the extent required in the notice, its personnel and equipment committed to the Work in a standby status;

(ii) Expenses reasonably and necessarily incurred by Contractor in connection with storage of Equipment pursuant to Section 16.2 ("Protection of Work"), including preparation for and placement into storage, handling, transportation, storage, inspection, preservation, taxes and insurance and any necessary rehabilitation prior to installation; and

(iii) Reasonable costs associated with demobilization of Contractor's personnel and equipment to the extent such costs are not recovered by Contractor in using such personnel and equipment on other projects during the standby period; and an equitable amount to reimburse Contractor for the actual cost to Contractor, if any, of maintaining and protecting that portion of the Work upon which activities have been suspended;

Company shall have the right, upon reasonable advance written notice to Contractor, to inspect and audit Contractor's books and records in order to verify the accuracy of and/or to determine the amount of any cost-based reimbursement associated with any suspension of the Work.

(e) Contractor shall not be entitled to be paid any additional amounts under this article 16 if and to the extent suspension is necessary by reason of default on the part of Contractor or persons for whom Contractor is responsible or for the proper execution or the safety of the Work, Equipment or Plant.

ARTICLE 17

PERFORMANCE TESTING

Section 17.1 Performance Tests

Contractor shall conduct or cause to be conducted the Performance Tests as soon as practicable in accordance with the Specifications, procedures and protocols of Appendix H and the other tests, procedures and protocols to be developed by the Parties. At least nine (9) months prior to the Guaranteed Substantial Completion Date, Contractor shall deliver to Company a supplement to

Appendix H further outlining the tests and procedures to be followed in conducting the Performance Tests criteria. Such supplement shall include, at a minimum, provisions addressing (a) testing procedures for each item of Equipment, (b) functional performance tests for starting up the Plant under different specified operating conditions and (c) any other activities that, in accordance with Prudent Industry Practices, should be included. Thereafter, the Parties shall promptly agree on modifications to such supplement so that Appendix H, as supplemented, is satisfactory to Company. Contractor shall provide Company with notice when the Plant is ready for Performance Testing.

Section 17.2 Emissions Guarantee

Contractor shall conduct the Performance Tests in accordance with Appendix H and, as a condition of Substantial Completion, shall demonstrate that emissions from the Project meet the Guaranteed Emissions. If the Guaranteed Emissions are not met, either in whole or in part, Contractor shall, at its sole cost and expense, to diligently make such changes, modifications and/or additions to the Plant or any part thereof as may be necessary to achieve the Guaranteed Emissions. Contractor shall notify Company upon completion of the necessary changes, modifications or additions, and Contractor shall repeat the Performance Tests as necessary until the Guaranteed Emissions have been met. Nothing contained in this Section 17.2 shall relieve Contractor of Contractor's obligation to pay liquidated damages under this Contract.

Section 17.3 Cost and Direction

(a) The Performance Tests shall be conducted by and under the direction of Contractor. Company will cooperate with Contractor's reasonable requests in connection with the Performance Tests, but shall not be required to provide any materials, electricity, fuel, water or stores.

(b) Contractor shall provide all materials, electricity, fuel, water and stores, and all personnel necessary to supervise startup and the conducting of the Performance Tests and shall provide all necessary technical assistance and advice in connection with the Performance Tests. Except as approved by Company in writing, Contractor shall not use personnel in excess of the normal contingent of Plant operations staff to operate the Plant during the performance tests. During training and conducting the Performance Tests Company's operating personnel shall be working under the technical direction and instruction of Contractor and Contractor shall be responsible for the accuracy of its instructions/directions provided to Company's operating personnel.

Section 17.4 Company's Right to Validate

Company and Company's Representative, in connection with the performance of this Contract by Contractor, shall have the right and opportunity to be present and observe the Performance Tests and shall have the right and opportunity in advance or during the Performance Tests to inspect and validate all meters, meter readings and other pertinent data necessary to verify the results of the Performance Tests. Company shall provide reasonable notice to Contractor of any such observation and inspection, including the specific information desired and method of obtaining such information. Contractor and Company shall coordinate such observation, inspection and validation so as not to interfere with the Performance Tests yet provide for a verifiable result. Company shall have the same rights with respect to any other Performance Tests conducted by Contractor as set forth above.

Section 17.5 Additional Tests; Test Energy

(a) After the Substantial Completion Date with respect to the Work, Contractor may, unless Company reasonably objects, make any additional tests which Contractor considers desirable at their own risk and cost; provided, however,

(i) if such tests require any change in Company's dispatch schedule for the Project, then Contractor shall reimburse Company for all costs and Claims associated with such change in dispatch;

(ii) if such tests damage the Project in any way, then Contractor shall bear all costs of making good such damage and of all Claims resulting from such damage; and

(iii) if such test may cause the Project to no longer meet the Performance Guarantees, then Contractor shall, at its sole cost, re-conduct the Performance Tests and compensate Company for all costs and Claims associated with reconducting the Performance Tests.

(b) Company shall have the exclusive right to all electric energy generated by the Plant during any Performance Tests.

Section 17.6 Timing

Contractor shall give Company at least ninety (90) days' prior notice of the date on which the first Performance Tests will begin and at least five (5) days' prior notice of a change in the Performance Test schedule. Company may request that Contractor conduct the Performance Tests at another time more convenient to Company, which request shall set forth the reasons therefor.

Section 17.7 Test Reports

(a) Contractor shall deliver to Company a preliminary test report, including the test data sheets and calculated results for each Performance Test or retest (the "Preliminary Performance Test Report"), promptly after completion of each Performance Test, together with a notice to Company certifying completion of the Performance Tests in accordance with this Contract and results of such Performance Tests. Promptly after receipt of such Preliminary Performance Test Report, Company and Contractor shall consult concerning the results of such tests, and within three (3) days thereafter, Company shall (i) state it concurs with the results of the Performance Tests or (ii) state it disputes the results of the Performance Tests and stating in detail the reasons therefor.

Within fifteen (15) Business Days following completion of the Performance Tests, Contractor shall provide to Company a final test report, including test data sheets and calculated results of each Performance Test or retest (the "Final Performance Test Report") and a final notice to Company certifying completion of the Performance Tests. Within fifteen (15) days of receipt of such documentation from Contractor, Company shall either (i) accept the Performance Test results or (ii) state it disputes the results of the Performance Tests and the reasons therefor. If Company disputes the accuracy of the Performance Tests results in the Final Performance Test Report, then Contractor shall re-perform the applicable Performance Tests (or part thereof) in accordance with the procedures set forth in Appendix H. If the results of the re-test confirm the accuracy of the initial test, then

Company shall pay the increased costs directly resulting from the re-test. If the results of the re-test do not confirm the accuracy of the initial test, then Contractor shall pay for the costs of the re-test and any subsequent tests necessary to confirm compliance with all Performance Guarantees.

Section 17.8 Failure on Tests or Inspection

If after inspection, examination or witnessing the testing of any of the Work, Company decides, in its sole discretion, that such Work or any part thereof is defective or not in accordance with the Contract, it may reject the said Work or part thereof by giving to Contractor, within ten (10) Days, notice of such rejection, stating therein the grounds upon which the said decision is based. Following any such rejection, Contractor shall replace or repair the Equipment, the Plant or part thereof rejected and re-submit the same for test or inspection in accordance with this Clause. All expenses reasonably incurred by Company in attending or in consequence of such re-testing or inspection and Company's or Company's Representative's attendance and that of entities providing finance in connection with the Project and their representatives' attendance shall be deducted from the Contract Price.

Section 17.9 Duty to Advise of Defects, Errors and Omissions in Plant and Equipment

Contractor shall advise promptly Company forthwith upon it becoming aware of any design, engineering, manufacturing or other Defect, error or omission that might effect the Work and its operability, operational life and maintenance and warrants and represents that, prior to the acceptance of any certificate by Company or Company's Representative and except in relation to such matters that have been notified to or by Company in Writing, there are no such Defects, errors and/or omissions to the best of its knowledge and belief.

ARTICLE 18

DEFECTS BEFORE TRANSFER OF POSSESSION AND CONTROL OF WORK

Section 18.1 Identification of Defects

(a) If, in respect of any part of the Work not already transferred and under control by Company, and in all cases prior to Substantial Completion Date, Company's Representative, at any time: (i) determines, in its sole discretion, that any Work done or Equipment or Plant supplied or materials used by Contractor, Contractor or any Subcontractor is or are defective or otherwise not in accordance with the Contract (each a "Defect"), or that any part thereof is defective or does not fulfill the requirements of the Contract and (ii) as soon as reasonably practicable notifies Contractor of the said decision, specifying particulars of the Defects alleged and of where the same are alleged to exist or to have occurred, then Contractor shall with all speed, at its sole cost and expense, remedy the Defects so specified.

(b) If Contractor fails to remedy such Defect, Company may take, at the sole cost and expense of Contractor, such steps as may in all the circumstances be reasonably necessary or convenient to remedy such Defects. The cost of remedying such Defect may be deducted from any payment due under the Contract and be recoverable as a debt.

Section 18.2 Replacement of Defects

All Equipment or Plant provided or Work done by Company to replace defective Equipment or Plant shall comply with the Contract and shall be obtained at reasonable prices and where reasonably practicable under competitive conditions. Contractor shall be entitled at its own expense to remove and retain all defective Equipment or Plant that Company may have replaced. Nothing contained in this Section shall affect any Claim by Company under article 31 (Claims, Claim Notice and Dispute Resolution).

ARTICLE 19 NOTICE OF SUBSTANTIAL COMPLETION, NOTICE OF FINAL ACCEPTANCE AND TRANSFER OF CARE, CUSTODY AND CONTROL

Section 19.1 Notice of Substantial Completion of Work

(a) When the Work meets the Substantial Completion Criteria set forth in Appendix H, Contractor shall so notify Company and provide Company a certificate of an Authorized Officer of Contractor certifying that the Substantial Completion Criteria have been met and the date thereof (such notice and affidavit, the “Request for Substantial Completion”).

(b) Within five (5) days after receipt of the Request for Substantial Completion, Company shall by notice (“Notice of Substantial Completion”) either: (i) reject such Request for Substantial Completion and refuse to issue the Notice of Substantial Completion and state what Substantial Completion Criteria Contractor failed to achieve; or (ii) accept the Request for Substantial Completion as given or with punch list items, and issue the Notice of Substantial Completion with Substantial Completion deemed to occur on the date set forth in said Request for Substantial Completion.

(c) If Company rejects the Request for Substantial Completion, Contractor shall promptly provide to Company a plan and schedule for remedying the deficiencies specified in Company’s rejection, shall carry out such plan at its own cost and expense, and, upon completion thereof, shall issue a new Request for Substantial Completion.

(d) The foregoing procedure shall apply again and successively thereafter until Substantial Completion Criteria have been achieved. Disputes as to whether Contractor has achieved Substantial Completion shall be resolved pursuant to article 311 (“Claims, Claim Notice and Dispute Resolution”).

Section 19.2 Care, Custody and Control; Punch List Items

(a) Contractor shall be responsible for care and custody, control and risk of loss of the Work and shall make good at Contractor’s own cost any loss or damage that may occur to the Work or any part thereof from any cause whatsoever until the Substantial Completion Date. Contractor shall also be responsible for loss or damage thereto caused by Contractors or the Subcontractors in the course of any work carried out under or the Project Documents or in connection with the Project until Final Acceptance. Contractor hereby waives any and all claims or causes of action it might have now or in the future against Company, whether by way of affirmative action, offset, cross claim or otherwise, resulting from any negligence of Company for any loss or damage that may occur to the

Work or any part thereof caused by Company in the course of any work carried out by Company in connection with the Project. Contractor shall be liable for any loss or damage to any Materials.

(b) Care, custody and control of the Work shall be transferred to Company as of the Substantial Completion Date. Company shall begin to compile a preliminary punch list as the Work progresses (with Contractor and Company in good faith mutually determining the Dollar value of such list). Company shall submit to Contractor the completed preliminary punch list at least ten (10) Business Days prior to the anticipated Substantial Completion Date. Within five (5) Business Days following the Substantial Completion Date, Company shall issue to Contractor a final punch list (the "Final Punch List"). After receipt thereof, Contractor and Company shall mutually agree on the punch list items, the value related thereto and on a schedule for completion of such items. Company shall withhold from its final payment an amount equal to 1.5 times the agreed upon value of the Final Punch List, but shall make periodic pro-rata payments as Contractor demonstrate completion of the items on the Final Punch List to Company. All of the items on the Final Punch List shall be completed expeditiously after the Substantial Completion Date. Company shall provide to Contractor for such purpose reasonable access to the Work.

Section 19.3 Dispatch Coordination

During the startup, testing and commissioning of the Plant, Contractor shall coordinate with Company's Representative and Company's operating personnel the orderly startup and shut-down of the Plant. Ninety (90) days prior to the initial startup of the Plant, Contractor shall provide to Company a schedule of dispatch for the Plant during the commissioning period, including expected net plant output, duration of the commissioning activity and expected fuel usage. Within thirty (30) days of the initial startup of the Plant, Contractor shall provide to Company an update to this schedule and thereafter on a weekly basis until Substantial Completion is achieved. Contractor shall also provide 72 hours' advance notice to Company of the planned Plant dispatch profile including net plant output, duration of the commissioning period and expected fuel usage.

Section 19.4 Use Before Acceptance Date

Company shall not operate or assume control of all or a portion of the Work prior to the Substantial Completion Date; provided, however, that in no event shall Company be limited in its operation of any joint facilities or facilities adjacent to the Work or the Project except as may expressly be provided in the Construction Coordination Agreement.

Section 19.5 Title and Risk of Loss

(a) Risk of loss with respect to the Project and the Work shall remain with Contractor until the Substantial Completion Date, whereupon the same shall pass to Company.

(b) The Equipment and Plant to be supplied pursuant to the Contract shall become the property of Company at whichever is the earlier of the following times:

- (i) the Substantial Completion Date;
- (ii) when Contractor becomes entitled to have the contract value of the Equipment and Plant in question included in an Interim Certificate of Payment, or

- (iii) when the Equipment and Plant is appropriated for the purpose of the Project.

Contractor shall indemnify and keep indemnified Company against any claims, losses or damage arising from any defect in title or encumbrances or charge upon any of the Equipment and Plant supplied pursuant to the Contract.

Section 19.6 Marking of Equipment and Plant

(a) Where, prior to delivery, the property in Equipment and Plant passes to Company, Contractor shall, so far as is practicable, set the Equipment and Plant aside and mark it as Company's property in a manner reasonably required by Company.

(b) Until the Equipment and Plant has been so set aside and marked, Company shall be entitled to withhold any interim Progress Payment to which Contractor might otherwise be entitled.

(c) Contractor shall permit Company at any time upon reasonable notice to inspect any Equipment or Plant which has become the property of Company and shall grant Company or procure the grant of access to Contractor's premises for such purposes or any other premises where such Equipment and Plant may be located. Such inspection shall not constitute acceptance of the Equipment and Plant.

(d) All such Equipment and Plant shall be in the care and possession of Contractor solely for the purposes of the Contract and shall not be within the ownership or disposition of Contractor.

(e) No Progress Payment or interim Certificate of Payment issued by Company shall prejudice its right to reject Equipment or Plant which is not in accordance with the Contract. Upon any such rejection the property in the rejected Equipment or Plant shall immediately revert to Contractor.

(f) Contractor shall transfer title to the Work to Company at the earliest to occur of (i) when the Equipment and/or Materials are brought on the Site; (ii) the specific Equipment and/or Materials are included in a request for a Progress Payment; and (iii) when the Equipment and/or Materials are appropriated for use in the Project. Contractor shall cause Contractors to transfer the Work supplied and performed by Contractors to Company (x) prior to the Substantial Completion Date, free and clear of all Liens other than (A) mechanics liens relating to the Work supplied and performed by Contractors' Subcontractors that have not yet been paid and (B) amounts payable to Contractors' Subcontractors that are being disputed in good faith provided that Contractors have posted a bond against such Liens with a bonding company or other surety acceptable to Company in its reasonable judgment, and (y) upon the Substantial Completion Date, free and clear of all Liens. Contractor shall indemnify and keep indemnified the Company against any claims, losses or damage arising from any defect in title or encumbrances or charge upon any of the Equipment and Plant supplied pursuant to this Contract.

(g) Where, prior to delivery, the property in Equipment and Plant passes to Company, Contractor shall, so far as is practicable, set the Equipment and Plant aside and mark it as Company's property in a manner reasonably required by Company. Until the Equipment and Plant has been so set aside and marked, Company shall be entitled to withhold any Progress Payment to which Contractor might otherwise be entitled. Contractor shall permit Company at any time upon reasonable notice to inspect any Equipment or Plant which has become the property of Company and shall grant Company

or procure the grant of access to Contractor's premises for such purposes or any other premises where such Equipment and Plant may be located. Such inspection shall not constitute acceptance of the Equipment and Plant.

(h) All such Equipment and Plant shall be in the care and possession of Contractor solely for the purposes of the Contract and shall not be within the ownership or disposition of Contractor.

(i) With respect to any Lien or Claim relating to the Project other than Permitted Liens (i) arising through Contractor or any Subcontractor, Contractor agrees to cause Contractor or Subcontractor to promptly remove or cause, or cause to be removed, any such Lien or Claim and (ii) Contractor agrees promptly remove or cause, or caused to be removed, any such other Liens or Claims not covered by the immediately preceding clause (a).

(j) Ownership of the Non-Company Materials used in connection with the Work shall remain with Contractor or the Subcontractors. Notwithstanding the transfer of title of the Work pursuant to Section 21.5 the responsibility for care, custody and control thereof, together with the risk of loss or damage thereto shall remain with Contractor until the Substantial Completion Date.

Section 19.7 Removal of Equipment

Prior to Final Acceptance, Contractor shall remove from the Site all equipment, materials, temporary structures constructed by or on behalf of Contractor or other items of any nature required for execution or completion of the Work, but excluding equipment, materials, appliances or other items intended to form or forming part of the Work. Prior to disposition of such items, Contractor shall make a written offer to sell items to Company which Contractor or any Contractor desires to sell. Contractor shall leave the Site in good order and in neat and presentable condition. Any surplus items will become property of Company if not removed by Contractor or its Contractors within thirty (30) days after Final Acceptance (or such later date contemplated in any completion and demobilization procedure mutually agreed by Company and the Project Parties). All costs to dispose of any such items not removed by Contractor within the thirty (30) days following Final Acceptance (or such later date contemplated in any completion and demobilization procedure mutually agreed by Company and the Project Parties) and which Company does not wish to keep shall be for the account of Contractor. Prior to removing any equipment from the Site Contractor shall provide to Company a detailed list of Contractor Equipment to be removed. No equipment shall be Contractor Equipment unless it is included in the then-current list approved pursuant to Section 12.1 ("Contractor's Equipment").

Section 19.8 Notice of Final Acceptance of Work

Upon completion of all the criteria for Final Acceptance set forth in Appendix H, Contractor shall give notice to Company by request for Final Acceptance, together with an affidavit that all requirements for Final Acceptance set forth in Appendix H have been met. Thereafter, the same procedures as specified in Section 13.1 ("Change Orders") shall apply until Company issues notice to Contractor accepting Contractor's request for Final Acceptance ("Notice of Final Acceptance"), at which time the Project shall be deemed completed ("Final Completion"). Disputes as to whether Contractor has achieved Final Acceptance shall be resolved pursuant to Article 31 ("Claims, Claim Notice and Dispute Resolution").

ARTICLE 20

CODES AND STANDARDS

Section 20.1 Comparable Quality

Appendix B sets forth all major systems/sub-systems/Equipment/components which will be supplied in performance of the Work. Notwithstanding the foregoing, the Parties recognize that Appendix B is not all inclusive and does not specify all Equipment/components required for Plant completion. Therefore, the Parties agree that for Equipment/components not specifically set forth in Appendix B, the quality standards of such unspecified Work shall be consistent with the requirements of Article 14 (“Workmanship and Materials.”).

ARTICLE 21

ENVIRONMENTAL MATTERS

Section 21.1 General

Contractor shall prepare and submit to Company appropriate materials management and emergency response procedures covering any Regulated Materials Contractor expects to be used in the completion and testing of the Work, which procedures shall be satisfactory to Company. Contractor shall comply, and shall cause all Subcontractors to comply, at all times with such materials management and emergency response procedures, all Environmental Laws and all Governmental Approvals applicable to the Work and the Site. No Regulated Materials and shall be improperly released, disposed of or buried on the Site.

Section 21.2 Release On-Site

Contractor shall immediately notify Company and applicable Governmental Authorities of any Release by Contractor or any Subcontractor of Regulated Materials at the Site which is reportable to Governmental Authorities under applicable Environmental Laws and take such emergency measures as are prudent and necessary to protect the environment consistent with the materials management and emergency response procedures referred to above and Applicable Law. Contractor shall take all appropriate steps consistent with the materials management and emergency response procedures referred to above and Applicable Law for immediate containment of any such Release and Remediation of the affected area.

Section 21.3 Release Off-Site

In the event of a Release by Contractor or any Subcontractor of a Regulated Material off the Site but related to the Work which is reportable to Governmental Authorities under applicable Environmental Laws, Contractor shall be responsible for notifying all applicable federal, state and local regulatory agencies in accordance with Applicable Law or for causing such notification to occur by the party responsible for such action. To the extent required, Contractor shall take all appropriate steps consistent with the materials management and emergency response procedures referred to above

and Applicable Law for immediate containment of any such Release and Remediation of the affected area.

Section 21.4 Liability

To the extent any Release referred to in Sections 21.2 and 21.3 above is caused by an act or omission of Contractor, Contractors or any Subcontractor, Contractor shall be responsible for all Liabilities with respect to such Release and the indemnification provisions set forth in Section 27.1("Indemnification for Third Party Claims") shall apply.

Section 21.5 Pre-existing Regulated Materials

(a) Contractor shall develop a contingency plan to address contaminated soils or groundwater that Contractor may encounter during construction of the Project. The purpose of the contingency plan is to avoid any delays in construction of the Project by planning in advance how to respond to unexpected pre-existing environmental conditions that could impact the Schedule or the Guaranteed Substantial Completion Date. The contingency plan shall, at a minimum, provide for:

(i) a contaminated soils staging area so that construction of the Project can continue without delays. Such contaminated soils (that must be removed for construction purposes) can be placed in the staging area while testing and subsequent disposal decisions are made;

(ii) the handling of any contaminated groundwater that might be extracted, including the prospective procurement of a UPDES permit in the event the contingency plan calls for such extracted water being discharged into an area that is subject to Clean Water Act jurisdiction;

(b) Contractor shall be responsible for implementing any recommendations relating to pre-existing Regulated Materials contained in any environmental surveys or reports.

Section 21.6 Notice

Contractor shall immediately notify Company of the occurrence of any event that would or could reasonably be expected to result in any violation or noncompliance or potential violation or noncompliance of any Environmental Law relating to the Work, the Plant, or the Site, or otherwise constitutes either a Material Adverse Change or Material Adverse Effect under this Contract.

ARTICLE 22

WARRANTIES OF WORK

Section 22.1 Warranties

(a) Contractor warrants that, for the duration of the Warranty Period, the Work shall be (i) free from Defects in design, engineering, workmanship materials and operations, (ii) in accordance with the Contract, and (iii) in compliance with Applicable Law. Contractor further warrants that all Equipment and Plant shall be new and of standard quality, free of Defects and deficiencies in design, material, workmanship and title (the "Warranty").

(b) The Warranty shall not extend to Defects or deficiencies to the extent resulting from (i) operation by Company's personnel in a manner inconsistent with or contrary to instructions contained in the Operation and Maintenance Manuals, (ii) repairs or alterations by Company's personnel in a manner inconsistent with or contrary to instructions provided by Contractor or as contained in the Operation and Maintenance Manuals provided by Contractor, or (iii) normal wear and tear.

Section 22.2 Warranty Period

Subject to the provisions in this Article 22, the Warranty shall remain in full force and effect regarding all phases of the Work for a period beginning on the Substantial Completion Date and ending eighteen (18) months thereafter (such period, the "Warranty Period"). In no event shall any Warranty terminate less than eighteen (18) months following the Substantial Completion Date.

Section 22.3 Repair of Defects

If Company or Contractor discovers that the Work, or any portion thereof, fails to meet the Warranty, the it shall notify the other Party of such failure promptly upon discovery, along with the reasonable basis therefore. Upon receipt of such notice, or upon Contractor's own discovery thereof, Contractor shall promptly (i) cure such failure in accordance with the Warranty and (ii) perform such tests as Company may reasonably require to demonstrate the cure of such failure. Contractor shall coordinate repairing, replacing or re-performing any of the Work with Company so as to minimize any adverse effects on the operation of the Project.

Section 22.4 Warranty Period Extension

(a) Extension for Corrected Work. Any Work re-performed and any part of the Site that is reworked, repaired or replaced in satisfaction of Contractor's obligations in connection with the Warranty will be re-warranted by Contractor pursuant to the same Warranty set forth in this Article 22, and Contractor will have the same obligations in relation thereto as set forth in this Article 22 for a period equal to eighteen (18) months from the date such re-performance, rework, repair or replacement is completed.

(b) Extension for Total Shutdown. If, during the Warranty Period, the Site is shut down (other than for the purpose of scheduled or routine maintenance) and such shutdown is caused by a defect or failure covered by the Warranty, then the Warranty Period will be extended by a period equal to the duration of the shutdown required to repair such defect or failure.

Section 22.5 Contractor and Subcontractor Warranties

Contractor will procure from Contractor and each Subcontractor warranties with respect to services, Plant and Equipment provided by such entity for a period of no less than eighteen (18) months after the Substantial Completion Date and for a further eighteen (18) months after any warranty repair with respect to the subject of the repair. Contractor shall obtain and maintain all such warranties in full force and effect.

Section 22.6 Delay in Remedying Defects

If any such Defect or damage is not remedied by Contractor within a reasonable time or requires prompt remediation as a result of an emergency situation existing at the Site, Company may

proceed to do the Work at Contractor's risk and expense provided that it does so in a reasonable manner and notifies Contractor of Company's intention so to do. All Costs incurred by Company shall be deducted from the Contract Price or be paid by Contractor to Company.

Section 22.7 Removal of Defective Work

Contractor may, with the consent of Company, remove from the Site any part of the Work which is defective or damaged, if the nature of the Defect or damage is such that repairs cannot be expeditiously carried out on the Site.

Section 22.8 Further Tests

If repairs or replacements are of such a character as may affect the operation of the Work or any part thereof, Company may, within one (1) month after such repair or replacement, give to Contractor notice requiring further testing to be conducted, in which case such tests shall be carried out at Contractor's cost and as provided in Article 17 ("Performance Testing").

Section 22.9 Contractor to Diagnose

Contractor shall, if required by Company's Representative in writing and under the direction of Company's Representative, diagnose the cause of any Defect. Unless such Defect or its cause shall be one which Contractor would otherwise be responsible for repairing, the costs incurred by Contractor in diagnosing such defect shall, subject to this Article 22, be borne by Company and added to the Contract Price.

Section 22.10 Latent Defects

(a) Latent Defects Liability Period. Contractor's liability for latent defects shall remain in full force and effect during all phases of the Work for a period beginning on the Substantial Completion Date and ending five (5) years thereafter (the "Latent Defects Liability Period").

(b) If any latent Defect shall appear in any part of the Work, during the Latent Defects Liability Period, such latent Defect shall be Repaired by Contractor at Contractor's option, with all possible speed and at Contractor's sole cost expense, provided that the latent Defect existed and would not have been disclosed by a reasonable examination conducted in accordance with Best Recognized Practice prior to the expiration of the Defects Liability Period.

(c) Contractor agrees that any examination of the Work undertaken by Company at a relevant time shall, in respect of that part of the Work examined, constitute a reasonable examination conducted in accordance with Best Recognized Practice within the meaning of this Article.

(d) During Latent Defects Liability Period, in the event Contractor's OEM issues any notice, including Technical Information Letters, service bulletins or similar notices recommending replacement or repair of one or more parts of the Equipment and such repair or replacement is necessary for continued safe operation of the Equipment or is issued to address a defect in material, or workmanship, Contractor shall repair or replace the affected parts in accordance with and subject to all the terms of the Warranty provided that Company shall make the affected Work reasonably available for performance of the repairs or modifications and Contractor shall cooperate with Company in scheduling such modifications or repairs in order to avoid disruption to Company's operations.

Section 22.11 Significant Defects

(a) Contractor warrants and guarantees to Company that there will be no Significant Defects.

(b) Consequences of Significant Defects. In the event that a Significant Defect occurs, Contractor shall make good the Significant Defect.

ARTICLE 23

LIQUIDATED DAMAGES

Section 23.1 General

The Parties agree that it is difficult or impossible to determine with precision the amount of damages that would be incurred by Company as a result of Contractor's failure to timely complete the Project or to meet the Guaranteed Substantial Completion Date or Performance Guarantees. Accordingly, the Parties expressly agree that if Contractor fails to timely complete the Project or to meet the Guaranteed Substantial Completion Date or the Performance Guarantees, any sums which would be payable under this Article 23 because of such failures are liquidated damages and not a penalty, and are fair and reasonable and any such sums represent a reasonable estimate of fair compensation for the losses that may reasonably be anticipated from such failures.

Section 23.2 Critical Milestone Guarantee Liquidated Damages

(a) The Project Schedule designates certain times as critical milestones (each a "Critical Milestone") by which Contractor represents that each such Critical Milestone will occur by its respective Target Date. While timely completion of each step in the Project Schedule is important to the success of the project, the occurrence of each Critical Milestone by its respective Target Date is of critical importance to completion of the Project in a timely manner consistent with Company's vital business interests.

(b) The Parties agree that it will be very difficult to determine the cost to Company for late delivery of Critical Milestones; therefore, the Parties agree upon the amounts set forth below, as liquidated damages for such late delivery and not a penalty, as consideration for delay in delivery and the resulting loss of beneficial use of the Work associated with each Critical Milestone. Such amounts being Critical Milestones Liquidated Damages ("Critical Milestone LDs").

(c) For each day of delay after the relevant Target Date in achieving any Critical Milestone, the amounts otherwise payable to Contractor pursuant to this Contract shall be reduced by \$[] per day for each day of delay beyond the relevant Target Date in achieving any Critical Milestone ("Reduction Amount").

(d) The Reduction Amount (i) shall arise independently with respect to each such delay and (ii) shall arise independently with respect to Late Substantial Completion LDs as defined in Section 23.3. At Company's option and in its sole discretion, Company may either require Contractor to pay to Company the Reduction Amount or may deduct the Reduction Amount from any monies subsequently payable to Contractor.

Section 23.3 Liquidated Damages for Delay in Substantial Completion

If Contractor fails to achieve Substantial Completion prior to the Substantial Completion LD Commencement Date, then commencing on the Substantial Completion LD Commencement Date, Contractor shall pay Company liquidated damages, for each day until Contractor achieves Substantial Completion, in an amount equal to (a) fifty thousand Dollars (\$50,000.00) per day if the Project is Dispatchable and (b) one hundred thousand Dollars (\$100,000.00) per day if the Project is not Dispatchable (collectively "Late Substantial Completion LDs")

Section 23.4 Liquidated Damages for Net Capacity and Net Heat Rate

Contractor shall pay liquidated damages in accordance with the terms and conditions set forth in Section 14 of Appendix H as a result of the failure of the Work to achieve the Guaranteed Net Capacity, the Guaranteed Incremental Net Capacity or the Guaranteed Net Heat Rate and the Guaranteed Incremental Net Heat Rate in accordance with the Performance Guarantees. Contractor shall be granted the Cure Period to allow remedial actions to be taken to achieve the Guaranteed Net Capacity and the Guaranteed Incremental Net Capacity or the Guaranteed Net Heat Rate and the Guaranteed Incremental Net Capacity, prior to Contractor's being liable for payment of the liquidated damages as provided in Section 14 of Appendix H.

Section 23.5 Liquidated Damages for Startup and Commissioning

If in connection with startup, commissioning and Performance Testing Contractor exceeds ninety (90) Equivalent Starts and/or three hundred (300) Fired Hours per Combustion Turbine, then Contractor shall pay to Company, in addition to any other Liquidated Damages, and amount equal to (a) Twelve Thousand Dollars (\$12,000) per Equivalent Start in excess of ninety (90) Equivalent Starts for either Combustion Turbine; plus (b) Three Hundred Dollars (\$300) per Fired Hour in excess of three hundred (300) Fired Hours for either Combustion Turbine.

Section 23.6 Calculations and Payments of Liquidated Damages

(a) Unless otherwise set forth in this Article 23, all calculations with respect to amounts payable as liquidated damages under this Article 23 shall be made by Contractor and provided to Company within (i) in the case of Section 23.2 and Section 23.3, ten (10) Business Days after the final day of each month during which amounts become payable thereunder; and (ii) in the case of Section 23.4 and Section 23.5, ten (10) Business Days after Company's receipt of the Final Performance Test Report, but no later than ten (10) Business Days after the end of any applicable cure period. Company shall have the right to audit such calculations. Contractor shall itemize such calculations and such calculations shall include supporting documentation as Company shall reasonably request and shall be in sufficient detail to permit Company to verify each calculation. Company shall notify Contractor as soon as reasonably possible of any portion of the calculations with which Company disagrees.

(b) Liquidated damages shall bear interest at the Late Payment Rate, compounded daily from the date such amount was due, but not to exceed the maximum rate of interest permitted by Applicable Law.

ARTICLE 24

LIMITATIONS OF LIABILITY

Section 24.1 Duty to Mitigate

In all cases, but subject to any right or remedy which the Party may have under or by virtue of this Contract, the Party establishing or alleging a breach of Contract or a right to recover pursuant to any Article under this Contract or a right to be indemnified in accordance with this Contract shall be under a duty to take all necessary measures to mitigate the loss which has occurred provided that the Party can do so without unreasonable inconvenience or cost.

Section 24.2 Limitation of Company's Liability

SUBJECT TO THE OBLIGATION OF CONTRACTOR TO PAY OR ALLOW LIQUIDATED DAMAGES TO COMPANY UNDER THIS CONTRACT, NEITHER CONTRACTOR NOR COMPANY SHALL BE LIABLE TO THE OTHER BY WAY OF INDEMNITY OR BY REASON OF ANY BREACH OF THIS CONTRACT OR OF STATUTORY DUTY OR BY REASON OF TORT (INCLUDING NEGLIGENCE BUT EXCLUDING ANY DAMAGES PAYABLE TO A THIRD PARTY CAUSED BY A TRESPASS OR NUISANCE FOR WHICH CONTRACTOR IS RESPONSIBLE PURSUANT TO THIS CONTRACT) FOR ANY LOSS OF PROFIT OR INCOME, LOSS OF USE, LOSS OF PRODUCTION, LOSS OF CONTRACTS OR FOR ANY INDIRECT OR CONSEQUENTIAL, MULTIPLE, PUNITIVE OR EXEMPLARY DAMAGES THAT MAY BE SUFFERED BY THE OTHER.

Section 24.3 Enforceability of Liquidated Damages

(a) Enforceability of Liquidated Damages. If the provisions for the payment of Liquidated Damages in this Contract are held to be unenforceable, Contractor agrees to pay to Company all actual damages suffered by Company due to the circumstances giving rise to the liability to pay Liquidated Damages (had they been enforceable) including loss of profit or income, loss of use, loss of production, loss of contracts and indirect and consequential damages but subject to the maximum amounts which would have been payable if the Liquidated Damages provisions had been enforceable.

(b) If, however, the provisions for the payment of Liquidated Damages in this Contract are held to be unenforceable as a result of a claim, objection, defense, dispute or proceedings raised or brought by Contractor as part of or during the hearing of which Contractor argues that the said provisions are unenforceable on the grounds that such liquidated damages should be construed at law as and/or amount to a penalty as opposed to an argument or suggestion that Contractor is not liable to pay Liquidated Damages pursuant to this Contract, Contractor expressly agrees to pay to Company all costs, losses and damages whatsoever (including loss of profit, loss of use and loss of production, loss of contracts and indirect and consequential damages) incurred or payable by Company arising from or in connection with the circumstances giving rise to the claim for the payment of Liquidated Damages which has been made by Company, WHICH PAYMENTS SHALL NOT BE SUBJECT TO ANY CAPS ON LIABILITY.

Section 24.4 Limitations on Liquidated Damages

(a) The aggregate amount of liquidated damages payable by Contractor as Reduction Amounts under Section 23.2 shall not exceed, in the aggregate, an amount equal to 5% of the Contract Price set forth in Section 3.1(a).

(b) The amount of liquidated damages payable by Contractor for delays in achieving Substantial Completion under Section 23.3 shall not exceed, in the aggregate, an amount equal to 30% of the Contract Price set forth in Section 3.1(a).

(c) The amount of liquidated damages payable by Contractor attributable to failure to meet the Guaranteed Net Capacity pursuant to Section 23.4 shall not exceed, in the aggregate, an amount equal to 15% of the Contract Price.

(d) The amount of liquidated damages payable by Contractor attributable to failure to meet the Guaranteed Net Heat Rate pursuant to Section 23.4 shall not exceed, in the aggregate, an amount equal to 20% of the Contract Price.

(e) The amount of liquidated damages payable by Contractor attributable to failure to meet the startup and commissioning requirements pursuant to Section 23.5 shall not exceed, in the aggregate, an amount equal to 15% of the Contract Price.

(f) The amount of liquidated damages under paragraphs (a) through (e) shall not exceed, in the aggregate, an amount equal to 50% of the Contract Price.

(g) Without prejudice to or limitation of Contractor's liabilities and obligations set forth under paragraphs (a) through (e), all of which shall be in excess of and not subject to the limitation contained in this paragraph (e), the aggregate liability of Contractor to Company shall not exceed one hundred percent (100%) of the amount of Contract Price.

(e) In calculating the unexpended amounts of Contractor's limitations of liability under this Section, no account shall be taken of any insurance proceeds payable to Contractor (whether payable directly to Contractor or payable to Contractor through Company) under insurance coverage obtained by Company operate to reduce such unexpended limits of liability unless and to the extent that such proceeds are not paid due to circumstances beyond the control of Contractor within a reasonable time following final determination in accordance with the relevant policy of insurance that they are payable. The limitations of liability set out in this Article shall not apply in relation to any failure by Contractor to fulfill its obligations due to its gross negligence or willful misconduct under this Contract.

ARTICLE 25

INDEMNIFICATION

Section 25.1 Indemnification for Third Party Claims

(a) Contractor shall defend, indemnify and hold harmless Company, its shareholders and Affiliates, and their respective directors, officers, employees and agents, from and against all third party Claims and Liabilities for injury, including death, and property damage caused by, arising out of, or in connection with the performance by any Project Party of the Project Documents to the extent any

of such Claims or Liabilities were caused by the negligence, gross negligence or willful misconduct of Contractor, Contractor, any Subcontractor, and its respective employees or agents.

(b) Company shall defend, indemnify and hold harmless Contractor and its managers, officers, employees and agents, from and against all third party Claims and Liabilities for injury, including death, and property damage caused by, arising out of, or in connection with the performance of the Project Documents to the extent any of such Claims or Liabilities were caused by the negligence, gross negligence or willful misconduct of Company, its employees or agents.

(c) Either Party seeking indemnification under this Contract (the "Indemnified Party") shall give notice to the Party required to provide indemnification hereunder (the "Indemnifying Party") promptly after the Indemnified Party has actual knowledge of any Claim as to which indemnity may be sought hereunder, and the Indemnified Party shall permit the Indemnifying Party (at the expense of the Indemnifying Party) to assume the defense of any Claim or litigation resulting therefrom; provided that:

(i) counsel for the Indemnifying Party who shall conduct the defense of such Claim or litigation shall be reasonably satisfactory to the Indemnified Party;

(ii) the Indemnified Party may participate in such defense at its own expense, except the Indemnifying Party shall reimburse the Indemnified Party for its participation in such defense to the extent that the Indemnifying Party requests the Indemnified Party to participate in its own defense; and

(iii) the omission by the Indemnified Party to give notice as provided herein shall not relieve the Indemnifying Party of its indemnification obligations hereunder except to the extent that such omission results in a failure of actual notice to the Indemnifying Party and Indemnifying Party is damaged as a result of such failure to give notice.

Notwithstanding the foregoing, the Indemnifying Party may not settle any Claim related to the indemnity being provided hereunder without the consent of the Indemnified Party, such consent not to be unreasonably withheld.

(d) With regard to any Claim or Liability which is the result of the joint or concurrent fault or negligence of Contractor and Company, the Parties agree to jointly defend any Claim with respect thereto that is based on such joint or concurrent fault or negligence of Company and Contractor. Any Claim of contribution or indemnification between Company and Contractor relating to such Claims shall be resolved on the basis of the percentage of fault or negligence and the Parties agree to reserve the determination of such percentage until after resolution of such Claim. Such pro rata share shall be based upon a final judicial determination of the Parties' comparative fault or negligence or, in the absence of such determination, by mutual agreement.

(e) Nothing in this Section 25.1 is intended to allow any Indemnified Party to be indemnified from and against any third party Claims and Liabilities caused by, arising out of, or in connection with the performance of this Contract to the extent any of such Claims or Liabilities were caused by, arose out of, or were in any way incidental to or in connection with its own negligence or intentional misconduct.

Section 25.2 Title Indemnity and Liens

(a) Contractor shall promptly pay when due all obligations for labor and material in connection with the Work. Contractor shall discharge at once, or bond with a bonding company or surety acceptable to Company or otherwise secure against all Liens and attachments which are filed in connection with the Work.

(b) Contractor shall keep the Work free and clear of and shall promptly release or cause the release of all Liens, recorded notices, Claims for nonpayment and lis pendens filed of record by Contractor or any Subcontractor.

(c) Contractor shall (i) indemnify, defend, and hold harmless Company from all laborers', material men's and mechanics' liens, or claims made or filed upon the Work, or the property on which the Work is located on account of any labor performed or labor, services, equipment, and materials furnished by Contractor's Subcontractors of any tier and all laborers, materialmen, mechanics, and other persons in connection with the work, and (ii) keep the work and said property free and clear of all liens or claims arising from the performance of any Work covered by this Contract by Contractor, its Subcontractors of any tier, and all laborers, materialmen, mechanics and other such persons.

(d) If any Lien arising out of this Contract is filed before or after Work is completed, Contractor, within ten (10) calendar days after receiving from Company written notice of such lien, shall obtain release or provide financial assurance satisfactory to Company to protect Company from or otherwise satisfy such lien. If Contractor fails to do so, Company may take such steps and make such expenditures as in its discretion it deems advisable to obtain release of or otherwise satisfy any such lien or liens, and Contractor shall upon demand reimburse Company for all costs incurred and expenditures made by Company in obtaining such release or satisfaction.

(e) Contractor's obligation to indemnify, defend and hold harmless Company from liens shall not in any way be rendered unenforceable, or altered, amended, eliminated or otherwise conditioned by any laws and regulations related to processing such liens. Company shall have no obligation to deliver a copy of any notice of claim or right to a lien to Contractor or any other person or entity.

(f) If Contractor shall default in discharging any Liens, Claims or encumbrances filed or asserted against the Work, Company shall promptly provide notice to Contractor, and Contractor shall then satisfy or defend any such Liens, Claims or encumbrances. If Contractor either does not promptly satisfy such Liens, Claims or encumbrances or does not give Company reasons satisfactory to Company for not paying such Liens, Claims or encumbrances, within fifteen (15) days of Contractor's receipt of such notice, Company shall have the right, at its option, after providing notice to Contractor, to pay or settle such Liens, Claims or encumbrances by agreement, and Contractor shall, within fifteen (15) days of request by Company, reimburse Company for all costs incurred by Company to discharge such Liens, Claims or encumbrances, including administrative costs, attorneys' fees and other expenses or Company shall have the right to deduct the amount of such costs from the amount payable to Contractor. Contractor shall have the right to contest any such Lien, Claim or encumbrance, provided that Contractor first provide to Company financial assurances in amount, form and substance satisfactory to Company and otherwise complies with Applicable Law with respect to removal of Liens.

(g) Contractor shall at its own expense defend any suit or proceeding based on any Claim for which Contractor is responsible under this Section. Company shall give Contractor such assistance

as Contractor may reasonably require in the defense of such suit, and Company shall have the right to be represented herein by counsel of its own choosing at its own expense. If Contractor fails to defend diligently any such suit or proceeding, Company may, in its reasonable discretion, either defend the suit or proceeding or settle the Claim which is the basis thereof without the consent of Contractor and without relieving Contractor of the obligation to indemnify as provided herein. In such a case Contractor's obligation to defend shall include reimbursement of Company's reasonable legal fees and related costs incurred in defending or settling the suit.

Section 25.3 Indemnity Period

Contractor's obligation to indemnify Company consistent with the provisions of this Article 25 shall continue after the Substantial Completion Date in accordance with the following (collectively, the "Indemnity Period"):

(a) With respect to Claims and Liabilities brought by third parties, Contractor's obligation to indemnify Company shall continue for a period of two years following the Substantial Completion Date.

(b) With respect to Claims and Liabilities relating to the title of the Site, Project, or the Work, Contractor's obligation to indemnify Company shall continue indefinitely.

(c) With respect to all other Claims and Liabilities, Contractor's obligation to indemnify Company shall continue for a period of eighteen months following the Substantial Completion Date.

ARTICLE 26

INSURANCE

Section 26.1 Contractor's and Subcontractors' Insurance Coverage

Contractor shall maintain at all times prior to Final Acceptance Builder's All-Risk Insurance in the amount of the Contract Price.

In addition to the foregoing, Contractor shall maintain and shall require and cause Contractors and all Subcontractors, while performing work on the Site, to provide, pay for and continuously maintain in full force and effect with insurers having an A.M. Best Insurance Reports rating of A-:VII or better the following insurance coverages:

(a) Employers' Liability insurance with a minimum limit of \$1,000,000.

(b) Commercial General Liability insurance, to include contractual liability, with a minimum single limit of \$1,000,000 with \$3,000,000 annual aggregate to protect against and from all loss by reason of injury to persons or damage to property based upon and arising out of the work performed under this Contract.

(c) Umbrella or Excess Liability insurance with minimum limits of \$10,000,000 per occurrence and \$10,000,000 annual aggregate to cover claims in excess of the underlying limits for Employer's Liability, General Liability, and Automobile Liability.

(d) Business Automobile Liability insurance with a minimum single limit of \$1,000,000 for bodily injury and property damage with respect to Contractor's vehicles whether owned, hired or non-owned, assigned to or used by Contractor in the performance of the work.

(e) Professional Liability insurance (Errors and Omissions) with a minimum single limit of \$1,000,000 to cover claims arising out of Consultant's professional services hereunder. This policy shall be maintained until one year after Company's acceptance of Consultant's work..

(f) Transit and Installation insurance with a minimum single limit of \$500,000 to cover damage to property and other claims arising out of the loading, unloading, transportation, lifting, lowering, or other handling of such property.

(g) For Commercial General Liability insurance, the policy shall include:

(i) Provisions or endorsements naming Company, its Board of Directors, officers and employees as additional insured;

(ii) Cross liability coverage so that the insurance applies separately to each insured against whom claim is made or suit is brought, even in instances where one insured claims against or sues another insured.

(h) All policies, except professional liability and transit and installation, shall include provisions that such insurance is primary insurance with respect to the interests of Company and that any other insurance maintained by Company is excess and not contributory insurance with the insurance required hereunder, and provisions that such policies shall not be canceled or their limits of liability reduced without:

(i) Ten (10) days' prior written notice to Company if canceled for nonpayment of premium

(ii) Thirty (30) days' prior written notice to Company if canceled for any other reason.

(iii) A certificate in a form satisfactory to Company certifying to the issuance of such insurance shall be furnished to Company and included at Exhibit H.

(i) Commercial general liability coverage written on a "claims-made" basis, if any, shall be specifically identified on the certificate.

(j) If requested by Company, a copy of each insurance policy, certified as a true copy by an authorized representative of the issuing insurance company, shall be furnished to Company.

(k) Insurance coverage provided on a "claims-made" basis shall be maintained by Contractor for a minimum period of five (5) years after the completion of any award and for such other length of time necessary to cover liabilities arising out of the work.

(l) Insurance coverage provided on a “claims-made” basis shall be maintained by Contractor for a minimum period of five (5) years after the completion of this Contract and for such other length of time necessary to cover liabilities arising out of the Work.

(m) Contractor shall ensure that Contractor and each and every Subcontractor maintains in full force and effect the insurance coverage and limits required under this Section 27.1 (“Contractors’ Insurance”) at all times on and after the commencement of the Work and continuing until the Substantial Completion Date, unless otherwise indicated herein. The coverage under Contractors’ Insurance shall be primary to the extent of Contractors’ obligations to indemnify Contractor and Company without regard to other insurance available to Company. Within thirty (30) days prior to the commencement of the Work at the Site, Contractor shall provide Company applicable insurance certificates of such coverage completed by duly authorized representatives of the insurer certifying that (a) the coverages required hereunder are in effect, and (b) the coverages will not be canceled, nonrenewed or materially changed by endorsement or through issuance of other policies of insurance without thirty (30) days’ prior notice to Contractor and Company. The acceptance by Company of Contractor’s delivery of any certificate of insurance evidencing the insurance coverages and limits required hereunder shall not be deemed to constitute approval or agreement that (i) the insured party has satisfied the insurance requirements set forth herein or (ii) the insurance policies described in such certificates of insurance comply with such requirements.

(n) If Contractor fails to require Contractors and the Subcontractors to maintain the insurance required hereunder, Company shall have the right, but not the obligation, to purchase such insurance at Contractor’s expense.

(o) Contractor’s insurance carrier and the Subcontractors or Subcontractors’ insurance carriers shall use commercially reasonable efforts to provide Contractor and Contractor will provide Company written notice of cancellation, termination or material alteration.

(p) Anything in this Contract to the contrary notwithstanding, the occurrence of any of the following shall in no way relieve Contractor from any of its obligations under this Contract; (a) failure by Contractors or any Subcontractor to procure the insurance required by this Contract; (b) failure by Contractor or any Subcontractor to comply fully with any of the insurance provisions of this Contract; (c) failure by Contractor or any Subcontractor to secure such endorsements on the policies as may be necessary to carry out the terms and provisions of this Contract; (d) the insolvency, bankruptcy or failure of any insurance company providing insurance to Contractor or any Subcontractor; or (e) failure of any insurance company to pay any claim accruing under its policy.

(q) In the event that liability for any loss or damage is denied by the underwriter or underwriters in whole or in part due to the breach of said insurance by Contractor or any Subcontractors, or for any other reason attributable to Contractor or any Subcontractor, or if Contractor or any Subcontractor fails to maintain any of the insurance herein required, then Contractor shall defend, indemnify and hold Company harmless against all losses which would otherwise have been covered by said insurance.

Section 26.2 Waiver of Rights

In regards to any property insurance maintained by any Party, each such Party shall waive all rights of recovery and subrogation against the other Party.

Section 26.3 Contractor's Cooperation with Company

(a) Contractor agrees to cooperate with and assist Company, as reasonably requested by Company, in Company's procurement of any insurance required by this Contract or otherwise to be procured in connection with the Project.

(b) Contractor agrees to provide such assistance and documentation as Company may request in connection with Claims Company may make under its insurance policies purchased in connection with the Project for damage or events that occur after the Effective Date and prior to the expiration of the applicable Warranty Period.

ARTICLE 27

FORCE MAJEURE

Section 27.1 Effect of Force Majeure

Neither Party shall be considered to be in default or in breach of its obligations under this Contract to the extent that performance of such obligations is prevented by any event of Force Majeure arising after the date of this Contract.

Section 27.2 Notice of Occurrence

If either Party considers that any event of Force Majeure has occurred which may affect performance of its obligations under this Contract, it shall promptly notify the other Party thereof stating the full particulars and anticipated duration of the event and the performance obligations that will be affected by the event.

Section 27.3 Performance to Continue

Upon the occurrence of any event of Force Majeure, Contractor shall use commercially reasonable efforts to continue to perform its obligations under this Contract. Contractor shall notify Company of the steps Contractor proposes to take, including any reasonable alternative means for performance, which is not prevented by Force Majeure. Contractor shall not take any such alternative steps unless directed so to do by Company pursuant to a Change Order. In any such case, Contractor shall use reasonable efforts to mitigate all such costs and impacts on the schedule for performance and on the Guaranteed Substantial Completion Date.

Section 27.4 Termination in Consequence of Force Majeure

If circumstances of Force Majeure have occurred that have materially affected the Work and have continued for a period of forty-five (45) days in the aggregate, and there is a corresponding delay in the schedule for performance and the Guaranteed Substantial Completion Date of forty-five (45)

days in the aggregate caused by the Force Majeure, then, notwithstanding that Contractor may by reason thereof have been granted an extension of the schedule for performance and the Guaranteed Substantial Completion Date, by Change Order, Company shall be entitled to provide notice of its intent to terminate this Contract upon thirty (30) days notice to Contractor. If at the expiration of such thirty (30)-day period such Force Majeure shall still continue, Company may elect to terminate this Contract.

Section 27.5 Risk of Loss

Prior to termination of this Contract, nothing in this Article 27 shall change the allocation to Contractor of the risk of loss or damage prior to the Substantial Completion Date, and any Change Order or payment to Contractor resulting from a Force Majeure shall take into account such allocation of the risk of loss or damage.

ARTICLE 28

DEFAULT

Section 28.1 Contractor's Default

Contractor shall be in default ("Contractor Default") hereunder if:

(a) A Project Party fails in any material respect to comply with its obligations under the Project Documents; provided, however, that if all material adverse consequences of a breach of an obligation can be cured or remedied by Contractor within a period of thirty (30) days after such breach, such breach shall not become a Contractor Default until thirty (30) days after such breach;

(b) A Project Party assigns the Project Documents to which it is a party other than as permitted both hereunder and thereunder;

(c) A Project Party shall commence a voluntary case under the Bankruptcy Code; file a petition seeking to take advantage of any other laws, domestic or foreign, relating to bankruptcy, insolvency, reorganization, winding up or composition or adjustment of debts; consent to or fail to contest in a timely and appropriate manner any petition filed against it in an insolvency case under such bankruptcy laws or other laws; apply for, or consent to or fail to contest in a timely and appropriate manner, the appointment of, or the taking of possession by, a receiver, custodian, trustee, liquidator or the like of itself or of a substantial part of its assets; admit in writing its inability to pay, or generally not be paying, its debts (other than those that are the subject of bona fide disputes) as they become due; make a general assignment for the benefit of creditors; take any action for the purpose of effecting any of the foregoing; or a case or other proceeding shall be commenced by a third party against a Project Party seeking (i) relief under the Bankruptcy Code or under any other laws, domestic or foreign, relating to bankruptcy, insolvency, reorganization, winding up or composition or adjustment of debts or (ii) the appointment of a trustee, receiver, custodian, liquidator or the like of such Project Party of all or any substantial part of its assets, and such case or proceeding shall continue undismissed or unstayed for a period of sixty (60) days;

(d) any representation or warranty made by Contractor for which an express remedy is not provided shall prove to have been false in any material respect as of the date made;

(e) any Judgment shall be entered against any Project Party (i) decreeing such Person's involuntary dissolution or split up or (ii) any (x) such Judgment shall award non monetary relief which results in a Material Adverse Change or (y) such Judgment shall award monetary damages in an amount of (I) \$ _____ with respect to Contractor or (II) with respect to Project Parties other than Contractor, such Judgment shall award monetary damages in an amount that would cause a Material Adverse Change;

(f) as a result of an act or omission of any Project Party, any of the Security Documents shall for any reason cease to be in full force and effect, or shall cease to give Company the Liens, rights, powers and privileges purported to be created thereby in any material respect. At any time, as a result of an act or omission of any Project Party, Company shall fail to have a first priority perfected security interest in all the Collateral;

(g) a Material Adverse Change shall have occurred and be continuing, unless such Material Adverse Change is a result of an act or omission of Company; or

(h) Contractor fails to pay liquidated damages to Company or to the Substantial Completion LD Delay Account when due, except to the extent such payments are being disputed in good faith.

Section 28.2 Company's Default

Company shall be in default ("Company's Default") hereunder if:

(a) Company fails to pay Contractor any undisputed amount due Contractor under Article 2 ("Project Commencement and Completion") or Article 3 ("Consideration and Payment");

(b) Company has failed in any material respect to comply with its other material obligations under this Contract; provided, however, that if all material adverse consequences of a breach of an obligation can be cured or remedied by Company within a period of thirty (30) Business Days after such breach, such breach shall not become a Company's Default until thirty (30) Business Days after such breach;

(c) Company shall commence a voluntary case under the Bankruptcy Code; file a petition seeking to take advantage of any other laws, domestic or foreign, relating to bankruptcy, insolvency, reorganization, winding up or composition or adjustment of debts; consent to or fail to contest in a timely and appropriate manner any petition filed against it in an insolvency case under such bankruptcy laws or other laws; apply for, or consent to or fail to contest in a timely and appropriate manner, the appointment of, or the taking of possession by, a receiver, custodian, trustee, liquidator or the like of itself or of a substantial part of its assets; admit in writing its inability to pay, or generally not be paying, its debts (other than those that are the subject of bona fide disputes) as they become due; make a general assignment for the benefit of creditors; take any action for the purpose of effecting any of the foregoing; or a case or other proceeding shall be commenced by a third party against Company seeking (i) relief under the Federal bankruptcy laws (as now or hereafter in effect) or under any other laws, domestic or foreign, relating to bankruptcy, insolvency, reorganization, winding up or composition or adjustment of debts or (ii) the appointment of a trustee, receiver, custodian, liquidator or the like of Company of all or any substantial part of its assets, and such case or proceeding shall continue undismissed or unstayed for a period of sixty (60) days;

(d) any representation or warranty made by Company in this Contract for which an express remedy is not provided shall have been false in any material respect as of the date made;

(e) any suspension of the Work requested by Company continues for more than thirty (30) days, and Company and Contractor are unable to agree on a Change Order, unless such dispute is being prosecuted under article 31 (“Claims, Claim Notice and Dispute Resolution”).

Section 28.3 Removal of Contractor’s Equipment

Upon such termination due to Company’s default, Contractor shall be entitled to remove during normal working hours all Contractor Equipment which are on the Site. Prior to removing any Contractor Equipment from the Site Contractor shall provide to Company a detailed list of Contractor Equipment to be removed. No equipment shall be Contractor Equipment unless it is included in the then-current list approved pursuant to Section 12.1 (“Contractor’s Equipment”).

Section 28.4 Remedies on Default

(a) Step-In Rights. During the occurrence and continuance of any Contractor Default or occurrence of any event described in Section 29.1(b) (“Termination by Company”), and in addition to any other rights Company may have hereunder or at law or in equity, Company shall have the right, but not the obligation, take all actions necessary to perform any and all work and labor it deems necessary to complete, operate or maintain the Project in accordance with the terms of this Contract, including causing Contractor to vacate the Project and surrender possession of the Project and all proprietary information, Equipment, spare parts and other supplies located at the Project to Company. If Company at any time exercises its rights under this Section 28.4(a), Company shall be relieved of its obligations of payment during such time as it is exercising its right under this Section, and shall be entitled to recover all costs incurred by Company, plus 20% for general and administrative costs in connection with work performed during that time. Notwithstanding the foregoing, nothing set forth in this Section shall excuse Contractor of its obligations to remedy its default and perform its obligations hereunder.

(b) Cure Rights. During the occurrence and continuance of any Contractor Default or occurrence of any event described in Section 29.1 (“Termination by Company”) and upon receipt of any notice that Contractor is in default of any of its obligations under any of the Project Documents, and in addition to any other rights Company may have hereunder or at law or in equity, Company shall have the right, but not the obligation, to cure any default of Contractor under any Project Document. If Company at any time exercises its right under this Section 28.4(b), Company shall be relieved of its obligations of payment during such time as it is exercising its right under this Section. Notwithstanding the foregoing, nothing set forth in this Section shall excuse Contractor of its obligations to remedy its default and perform its obligations hereunder.

(c) Company Rights Following Termination due to a Contractor Default. Upon termination of this Contract pursuant to Section 29.1(b) (“Termination by Company”) hereof, Company may, but shall not be obligated to:

(i) remove Contractor from the Site with risk of loss of the Work transferring to Company. In addition, Company may, but shall not be obligated to, require Contractor, at no additional cost to Company, to take all steps necessary or requested by Company to assign

Contractor's rights and obligations under the Project Documents and Governmental Approvals identified by Company to Company and to transfer to Company all other property, whether tangible or intangible, in which Contractor has rights which is necessary or desirable for the development, construction ownership or operation of the Project at Contractor's actual cost;

(ii) in addition to the foregoing, upon the occurrence and during the continuance of any Contractor Default, Company may exercise all of its rights as a secured party, under the Security Documents or under applicable Law or otherwise (and all remedial provisions in the Security Documents are hereby incorporated by reference); and

(iii) pursue any and all remedies available at law or in equity.

ARTICLE 29

TERMINATION

Section 29.1 Termination by Company

(a) Company's Termination Right for Failure to Obtain the CCN. (i) Company may elect to terminate this Contract at any time prior to and including _____, without any further liability to Contractor other than with respect to unpaid Progress Payments accruing prior to the date of such termination, in the event that Company does not reasonably expect to obtain or has not obtained the CCN on or prior to such date. In the event that (i) Company has not obtained the CCN prior to and including _____, and (ii) Company has not elected to terminate this Contract, the provisions of Article 16 shall apply.

(b) Default Termination Rights. Upon the occurrence or continuation of a Contractor Default, Company may elect to terminate this Contract as follows:

(i) with respect to a Contractor Default described in subsection 28.1(c), immediately terminate this Contract and remove Contractor from the Site with risk of loss of the Work transferring to Company as provided in Section 28.4(c) hereof; and

(ii) with respect to a Contractor Default described in any subsection other than subsection 28.1(c), after having given notice to Contractor of such Contractor Default and Contractor's having failed to cure such Contractor Default within the cure period specified in such subsection, or, if no cure period is specified, then fourteen (14) days after such notice, terminate this Contract

(c) Voluntary Termination. Following the achievement by Contractor of the Notice to Proceed Milestone, Company may elect to terminate this Contract at any time without cause upon not less than thirty (30) days' notice to Contractor.

Section 29.2 Termination by Contractor

(a) Default Termination Rights. Upon the occurrence or continuance of a Company Default, Contractor may elect to terminate this Contract as provided in Section 30.2.

(i) with respect to a Company's Default described in subsection 28.2(c), immediately terminate this Contract; and

(ii) with respect to a Company's Default described in any subsection other than subsection 28.2(c), after having given notice to Company of such default and Company having failed to cure such Company's Default within the cure period specified in such subsection, or, if no cure period is specified, then fourteen (14) Business Days after such notice, terminate this Contract.

(b) Suspension Termination Rights. Contractor may elect to terminate this Contract due to Suspension of the Work as provided in Section 16.1(b).

Section 29.3 Procedures Following Termination by Contractor or due to Force Majeure

(a) Upon any termination of this Contract pursuant to Section 27.4 ("Termination in Consequence of Force Majeure"), Section 29.1(a) ("Company's Termination Right for Failure to Obtain the CCN"), Section 29.1(c) ("Voluntary Termination") or Section 29.2(a) ("Default Termination Rights"), the following provisions shall apply: (i) Company shall pay to Contractor the amount, if any, by which the applicable termination amount set forth in Appendix I corresponding to the effective date of the termination (partial month to be appropriately pro-rated) exceeds the cumulative payments made by Company prior to such date; (ii) at Company's option, title (to the extent not already transferred) and risk of loss to some or all of the Site and the Materials shall transfer to Company; and (iii) Company shall be responsible for, as applicable, any transportation, storage and insurance of and for the Materials for which Company has elected to take title.

(b) In addition to the foregoing, upon such termination of this Contract pursuant to Section 27.4 ("Termination in Consequence of Force Majeure"), Section 29.1(a) ("Company's Termination Right for Failure to Obtain the CCN"), Section 29.1(c) ("Voluntary Termination") or Section 29.2(a) ("Default Termination Rights"), the following provisions shall apply: Company may, but shall not be obligated to, at no additional cost to Company (i) require that Contractor take all steps necessary or requested by Company to assign its rights and obligations under the Project Documents and Governmental Approvals identified by Company to Company and to transfer to Company all other property, whether tangible or intangible, in which Contractor has rights which is necessary or desirable for the development, construction ownership or operation of the Project and (ii) exercise all of Contractor's rights including the right to request performance under and to enforce any and all rights to, the Collateral, as provided in the Security Documents (and all remedial provisions in the Security Documents are hereby incorporated by reference); and (iv) enter onto the Site and to remove all Materials for which it has elected to take title.

Section 29.4 Exclusivity

THE RIGHTS AND REMEDIES OF CONTRACTOR SET FORTH HEREIN FOR DEFAULT AND TERMINATION ARE EXCLUSIVE AND NO OTHER REMEDIES OF ANY KIND WHATSOEVER SHALL APPLY IN THE EVENT OF SUCH DEFAULT AND TERMINATION.

ARTICLE 30

TAXES

Section 30.1 Company's Obligation

In addition to the Contract Price, Company shall be obligated to pay the amount of any property, privilege, license, sales, use, excise, gross receipts, value added, privilege or similar taxes or assessments applicable to the sale of the Work or to the use of the Work. Contractor shall use all reasonable efforts to minimize the amount of such taxes and assessments payable by Company. All real or personal property taxes related to the Project shall be paid by Company and shall not be apportioned at the Substantial Completion Date.

Section 30.2 Contractor's Obligation

Contractor have included in the Contract Price the amount of any customs duties, and related customs broker fees and charges or similar charges, for delivery of any components to the United States from countries outside of the United States and transportation to the Site. Contractor shall be liable for all payroll and other employee related taxes and costs, for all property taxes related to the Site prior to Substantial Completion Date and for all taxes based on its income. Contractor shall cooperate with Company's reasonable requests with respect to any challenge that Company elects to make with respect to any taxes imposed in connection with the Project.

ARTICLE 31

CLAIMS, CLAIM NOTICE AND DISPUTE RESOLUTION

Section 31.1 Claims

(a) Submission of Claims

(i) In the event Contractor has a claim or request for a time extension, additional compensation, any other adjustment of the Contract terms and conditions, or any dispute arising out of the Work (each a "Claim"), Contractor shall notify Company in writing within five (5) Business Days following the occurrence of the event giving rise to the Claim. Contractor's failure to give notice as required will constitute a waiver of all of Contractor's rights with respect to the Claim.

(ii) As soon as practicable after Claim notification, Contractor shall submit the Claim to Company with all supporting information and documentation. Contractor shall also respond promptly to all Company inquiries about the Claim and its basis.

(iii) Any Claim which is not disposed of by mutual agreement between the Parties shall be decided by Company, which shall provide a written decision to Contractor. Such decision shall be final unless Contractor, within thirty (30) days after such receipt of Company's decision, provides to Company a written protest, stating clearly and in detail the basis thereof, and such protest shall be resolved in accordance with Section 31.2 . It is agreed

that Contractor's failure to protest Company's decision shall constitute a waiver by Contractor of its Claim.

(iv) Contractor shall continue its performance of this Contract notwithstanding the submission of any Claim.

(b) Notification Prior to Incurring Costs. In any circumstances which might give rise to a claim pursuant to this Article, Contractor shall, before incurring any cost or expense, first give Company every opportunity to determine whether the cost or expense should be incurred or whether any act or forbearance shall or might mitigate the cost of any such claim.

(c) Company's Liability to Pay Claims. Company shall not be liable to make payment in respect of any claim for an additional payment unless Contractor has complied with each and all of the requirements of this Article 31, whether as to the time within which claims must be made and/or information provided or otherwise, it being acknowledged and agreed that the absence of complete compliance herewith will involve significant prejudice to Company.

Section 31.2 Dispute Resolution

All disputes in connection with this Contract between Company and Contractor or between Company and any Project Party shall be settled, if possible, by negotiation of Company Representative and Contractor Representative. If the matter is not resolved by such negotiations, either party may, by giving written notice to the other party, cause the matter to be referred to a meeting of a Company Senior Procurement Representative and Contractor's Management Representative. Such meeting shall be held within fifteen (15) days following the giving of the written notice. If the matter is not resolved by such negotiations, either party may, by giving written notice to the other party, cause the matter to be referred to a meeting of appropriate higher management representatives of the parties. Such meeting shall be held within thirty (30) days following the giving of the written notice. If the matter is not resolved within thirty (30) days after the date of the notice referring the matter to the appropriate high management or such later date as may be mutually agreed upon, the parties may then, subject to the terms of this Contract, commence legal action in court of competent jurisdiction in order to resolve the dispute.

ARTICLE 32

ASSIGNMENT

Section 32.1 Assignment of Contractor's Interests

Contractor shall not assign any of its rights and obligations hereunder, except with Company's prior written consent.

ARTICLE 33

CONFIDENTIALITY

Section 33.1 Confidentiality

(a) It is understood that certain information may be exchanged among Company and Contractor that the disclosing Party considers proprietary and confidential. Each Party agrees that it shall (and shall cause its Affiliates and its and their officers, directors, consultants, employees, legal counsel, agents and representatives (together with the Affiliates, the “Confidentiality Affiliates”) to): (i) hold confidential and not disclose other than to its Confidentiality Affiliates having a reasonable need to know in connection with the permitted purposes hereunder, without the prior consent of the other Party, all confidential or proprietary written information which is marked confidential or proprietary or oral information or data which is reduced to writing within five (5) days of such disclosure and marked as confidential or proprietary (including sources of equity and/or other financing, development strategy, competitor information, cost and pricing data, warranties, technical information, research, developmental, engineering, manufacturing, marketing, sales, financial, operating, performance, business and process information or data, know how and computer programming and other software techniques) provided or developed by the other Party or its Confidentiality Affiliates in connection herewith or the Work (“Confidential Information”); and (ii) use such Confidential Information only for the purposes of performing its obligations hereunder or where reasonably necessary to enjoy the benefits of this Contract. In no event shall any Confidential Information be disclosed to any competitor of Contractor or Company.

(b) The obligations contained in the preceding paragraph shall not apply, or shall cease to apply, to Confidential Information if or when, and to the extent that, such Confidential Information (i) was known to the receiving Party or its Confidentiality Affiliates prior to receipt from the disclosing Party or its Confidentiality Affiliates; (ii) was, or becomes through no breach of the receiving Party’s obligations hereunder, known to the public; (iii) becomes known to the receiving Party or its Confidentiality Affiliates from other sources under circumstances not involving any breach of any confidentiality obligation between such source and the disclosing Party’s or discloser’s Confidentiality Affiliates or a third party; (iv) is independently developed by the receiving Party or its Confidentiality Affiliates; or (v) is required to be disclosed by law, governmental regulation or applicable legal process. Contractor acknowledges that Company is subject to regulation as a public utility, and as such may be required to disclose all or substantially all information provided by Contractor pursuant to this Contract by order of state and federal regulators, and that such disclosure shall in no event be deemed a violation of this Section 33.1. As to Confidential Information that is not a trade secret under Applicable Law, the foregoing obligations shall expire three (3) years after the Substantial Completion Date.

(c) When required by the appropriate Governmental Authority, a Party may disclose the Confidential Information of the other Party to such Governmental Authority provided, however, that prior to making any such disclosure, such Party shall: (i) provide the owning Party with timely advance notice of the Confidential Information requested by such Governmental Authority and the intent of such Party to so disclose; (ii) minimize the amount of Confidential Information to be provided consonant with the interest of the owning Party, Contractor, Contractor, and each and every Subcontractor and the requirements of the Governmental Authority involved; and (iii) make every

reasonable effort (which shall include participation by the owning Party, Contractor, Contractor or any Subcontractor, as applicable in discussions with the Governmental Authority involved) to secure confidential treatment and minimization of the Confidential Information to be provided. In the event that efforts to secure confidential treatment are unsuccessful, the owning Party shall have the prior right to revise such information to minimize the disclosure of such Confidential Information in a manner consonant with its interest and the requirements of the Governmental Authority involved.

(d) Company's disclosure of Contractor Drawings and Manuals to third parties in accordance with its obligations hereunder shall not be a breach of this Article 33.

ARTICLE 34

MISCELLANEOUS PROVISIONS

Section 34.1 Notices, Consents and Approvals

Contact information for notices, requests, demands and other communications required or permitted hereunder is as follows:

(a) if to Contractor, to:

with copies to:

or to such other person or address as Contractor shall furnish to Company;

(b) if to Company, to:

PacifiCorp
825 NE Multnomah, Suite 600
Portland, Oregon 97232-2315
Attn: _____

Tel: _____

Fax: _____

with copies, in connection with default notices, to:

or to such other person(s) or address(es) as Company furnishes to Contractor from time to time.

(c) All notices, including, acceptances, consents, approvals, agreements, deliveries of information, designations, requests, demands and other communications required or permitted hereunder shall be in writing, properly addressed as provided in paragraph (a) above, and given by (i) hand delivery, (ii) a national overnight courier service, (iii) confirmed facsimile transmission, followed by a hard copy, or (iv) certified or registered mail, return receipt requested, and postage prepaid. Any such notice or other communication shall be deemed to have been duly given as of the date delivered if by hand delivery, national overnight courier service or confirmed facsimile transmission (provided a hard copy promptly follows by other means provided herein), or five (5) calendar days after mailing if by certified or registered mail.

Section 34.2 Entire Contract

This Contract, together with the appendices and exhibits delivered in connection with it, contains the entire agreement and understanding of the Parties with respect to the subject matter hereof and supersedes all prior agreements and understandings, whether written or oral, of the Parties relating to the subject matter hereof. Any oral or written representation, warranty, course of dealing or trade usage not contained or referenced herein shall not be binding on either Party.

Section 34.3 Amendment; Waiver

No amendment or other modification of any provision of this Contract shall be valid or binding unless it is signed by each of the Parties. No waiver of any provision of this Contract shall be valid or binding unless it signed by the Party waiving compliance with such provision. No delay on the part of either Party in exercising any right, power or privilege hereunder shall operate as a waiver thereof, nor shall any waiver or any partial exercise of any such right, power or privilege preclude any further exercise thereof or the exercise of any other such right, power or privilege. No waiver of any breach, term or condition of this Contract by any Party shall constitute a subsequent waiver of the same or any other breach, term or condition.

Section 34.4 Successors and Assigns

Each and all of the covenants, terms, provisions and agreements herein contained shall be binding upon and inure to the benefit of the Parties hereto and, to the extent permitted by this Contract, their respective successors and assigns.

Section 34.5 Third Party Beneficiaries

The provisions of this Contract shall only be for the benefit of, and enforceable by, the Parties hereto and shall not inure to the benefit of or be enforceable by any third party.

Section 34.6 Severability

In the event any one or more of the provisions contained in this Contract should be held invalid, illegal or unenforceable in any respect, the validity, legality and enforceability of the remaining provisions contained herein shall not in any way be affected or impaired thereby.

Section 34.7 Further Assurances

Each Party shall, at the request of the other, execute and deliver or cause to be executed and delivered such documents and instruments not otherwise specified herein, and take or cause to be taken all such other reasonable actions, as may be necessary or desirable to more fully and effectively carry out the intent and purposes of this Contract.

Section 34.8 Publicity

Except as required by law, Contractor agrees that Contractor will not issue or release for external publication any press release, Article, advertising or other publicity matter in any form (including print, electronic, or interview) relating to the Project, or to this Contract without first consulting with and obtaining the prior consent of Company, which consent shall not be unreasonably withheld or delayed.

Section 34.9 Independent Contractor

Contractor is an independent contractor with respect to the Work, and each part thereof, and in respect of all work to be performed hereunder. Neither Contractor, nor any Subcontractor, nor the employees of any of such entities, employed in connection with the Work shall be deemed to be agents, representatives, joint ventures, employees or servants of Company by reason of their performance hereunder or in any manner dealt with herein. Neither Party shall perform any act or make any representation to any Person to the effect that Contractor, or any of its agents, representatives or Subcontractors, is the agent of Company.

Section 34.10 Survival

The provisions of Articles 4 (“Representations and Warranties of Contractor”), 12 (“Contractor’s Equipment”), 22 (“Warranties”), 23 (“Liquidated Damages”), 24 (“Limitations of Liability”), 25 (“Indemnification”), 26 (“Insurance”), 30 (“Claims, Claim Notice and Dispute Resolution”), and 33 (“Confidentiality”), and Sections 3.7 (“Payment Lien and Claim Release”), 6.2 (“Security”), 7.10 (“Contractor Drawings and Manuals”), 7.18 (“Intellectual Property Rights and Computer Program Licenses”), Section 7.24 (“Liens”), 7.27 (“Environmental Matters”), 7.28 (“Records and Accounts”), 7.31 (“Construction Coordination Agreement”), 9.1 (“Site Regulations”), 9.2 (“Site Security”), 9.9 (“Cleanup”), 15.6 (“Company’s Use of Drawings”), 15.7 (“Manufacturing Drawings”), 21.4 (“Liability”), 28.3 (“Removal of Contractor’s Equipment”), and 34.11 (“Governing Law; Waiver of Jury Trial”) of this Contract shall survive the expiration or earlier termination of this Contract indefinitely, provided that the foregoing enumeration shall not be interpreted to bar survival of any other provision hereof which would otherwise be deemed to survive by operation of law.

Section 34.11 Governing Law; Waiver of Jury Trial

(a) THIS AGREEMENT SHALL BE GOVERNED BY, CONSTRUED IN ACCORDANCE WITH THE LAWS OF THE STATE OF UTAH (WITHOUT GIVING EFFECT TO THE PRINCIPLES THEREOF RELATING TO CONFLICTS OF LAW).

(b) EACH PARTY HEREBY IRREVOCABLY WAIVES ALL RIGHT OF TRIAL BY JURY IN ANY ACTION, PROCEEDING OR COUNTERCLAIM ARISING OUT OF OR IN

CONNECTION WITH THIS AGREEMENT OR ANY OTHER TRANSACTION DOCUMENT OR ANY MATTER ARISING HEREUNDER OR THEREUNDER. EACH PARTY HEREBY WAIVES ANY RIGHT TO CONSOLIDATE ANY ACTION, PROCEEDING OR COUNTERCLAIM ARISING OUT OF OR IN CONNECTION WITH THIS AGREEMENT OR ANY OTHER TRANSACTION DOCUMENT OR ANY MATTER ARISING HEREUNDER OR THEREUNDER IN WHICH A JURY TRIAL HAS NOT OR CANNOT BE WAIVED.

Section 34.12 Counterparts

This Contract may be executed by the Parties in two or more separate counterparts (including by facsimile transmission), each of which shall be deemed an original, and all of said counterparts taken together shall be deemed to constitute one and the same instrument.

Section 34.13 Captions

The captions for Articles and Sections contained in this Contract are for convenience and reference only and in no way define, describe, extend or limit the scope or intent of this Contract or the intent of any provision contained herein.

Section 34.14 Consent Contracts

Contractor agrees to cooperate with Company's efforts to obtain on a timely basis such direct agreements, consents, opinions and related documents from Project Parties or any of Contractor's counterparties to any Additional Project Document as may be reasonably requested by Company, its financing parties, or any entity that is Controlled by or is under common Control with Company.

[THE NEXT PAGE IS THE SIGNATURE PAGE]

IN WITNESS WHEREOF, the authorized representatives of the Parties have executed this Contract as of the first date set forth above:

PACIFICORP,
as Company

By: _____

Print Name: _____

Title: _____

Attest:

By: _____

Print Name: _____

Title: _____

_____,
as Contractor

By: _____

Print Name: _____

Title:

Attest:

By: _____

Print Name: _____

Title:



Appendix A

Site References
Legal Description

To be completed upon site selection

Appendix B
Scope of Supply
And
Technical Specifications

**STATEMENT OF WORK AND
SPECIFICATIONS**

Issued for RFP

Revision 0

**CURRENT CREEK POWER PROJECT
BLOCK 2**

PACIFICORP

CURRANT CREEK POWER PROJECT – BLOCK 2

TABLE OF CONTENTS

SECTION 1.0 - INTRODUCTION	1-1
1.1 GENERAL PLANT DESCRIPTION.....	1-1
1.1.1 Specifications	1-2
1.1.1.1 General	1-2
1.2 OVERALL SCOPE DESCRIPTION	1-3
1.2.1 General Scope	1-3
1.2.2 Work by Others	1-4
1.2.3 Terminal Points	1-5
1.2.3.1 345 kV Switchyard	1-5
1.2.3.2 Natural Gas	1-6
1.2.3.3 Water Supply.....	1-6
1.2.3.4 Process Waste Water Discharge	1-6
1.2.3.5 Telephone and Data Communications	1-6
1.2.4 Owner Furnished Equipment and Systems	1-7
1.2.5 Noise Levels	1-7
1.2.5.1 Equipment Noise Requirements.....	1-7
1.2.5.2 Indoor Noise Limits	1-8
1.2.5.3 Far Field Noise Guarantees	1-9
1.2.6 Mechanical Scope	1-9
1.2.7 Electrical Scope.....	1-10
1.2.8 Instrumentation and Control Scope.....	1-11
1.2.9 Civil Scope	1-11
1.2.10 Structural and Architectural Scope.....	1-12
1.2.11 Construction Facilities and Services	1-12
1.2.11.1 General	1-12
1.2.11.2 Coordination.....	1-14
1.2.11.3 Safety.....	1-15
1.2.11.4 Security	1-16
1.2.11.5 Fire Protection.....	1-16
1.2.11.6 Cleanliness.....	1-17
1.2.11.7 Signs and Barricades	1-17
1.2.11.8 Dust Control	1-17

1.2.11.9	Open Burning	1-18
1.2.11.10	Cooperation with Other Contractors	1-18
1.2.11.11	Energized Facilities.....	1-18
1.2.11.12	Reference Points	1-18
1.2.11.13	Dangerous Materials.....	1-19
1.2.11.14	Waste Disposal.....	1-19
1.2.11.15	Hazardous Material Management.....	1-20
1.2.11.16	Adjoining Utilities	1-20
1.2.12	Production Inputs	1-20
1.2.13	Operating Consumables	1-21
1.3	PLANT OPERATING PROFILE	1-21
1.3.1	Plant Load Definition	1-21
1.3.2	Plant Operating Profile	1-22
1.3.3	Plant Operating Philosophy.....	1-23
1.3.4	Plant Reliability.....	1-23
1.3.5	Plant Performance.....	1-23
SECTION 2.0 - DESIGN CONDITIONS		2-1
2.1	GEOTECHNICAL CONDITIONS.....	2-2
2.2	SITE SECURITY.....	2-2
2.3	SITE ACCESS	2-2
2.4	SITE ENVIRONMENT	2-3
SECTION 3.0 - CODES, STANDARDS, AND REGULATIONS		3-1
SECTION 4.0 - ENGINEERING SCOPE.....		1
4.1	GENERAL REQUIREMENTS.....	1
4.1.1	Architectural Design	4-3
4.1.2	Civil / Structural Design	4-3
4.1.3	Mechanical Design	4-4
4.1.4	Electrical Design.....	4-5
4.1.5	Instrumentation and Controls Design.....	4-6
4.2	DESIGN REVIEWS	4-7
4.3	DRAWING AND SPECIFICATION REQUIREMENTS	4-7
4.3.1	Drawing and Specification Schedule	4-8
4.3.2	Drawing and Specification Submittals.....	4-8
Exhibit A		

4.3.3	Plant Manual and Instruction Books.....	4-16
4.3.3.1	Plant Manual.....	4-16
4.3.3.2	Manufacturer's Instruction Books.....	4-16
4.3.4	System Startup & Commissioning Test Procedures and Reports	4-18
4.3.5	Project Administration Manual	4-18
4.3.6	Critical Path Schedule	4-18
4.3.7	Project Status Reports	4-18
4.3.8	Coordination Meetings	4-18
4.3.9	Contractor Acquired Permits	4-19
4.4	QUALITY ASSURANCE	4-19
SECTION 5.0 - MECHANICAL SCOPE.....		5-1
5.1	GENERAL REQUIREMENTS.....	5-1
5.1.1	General Sizing Criteria	5-1
5.1.2	Piping	5-2
5.1.3	General Arrangements.....	5-4
5.1.4	Platforms	5-4
5.1.5	Accessways and Clearances	5-6
5.1.5.1	Horizontal Clearances (Minimum):.....	5-6
5.1.5.2	Vertical Clearances (Minimum):.....	5-7
5.2	MECHANICAL SYSTEMS AND EQUIPMENT	5-7
5.2.1	General.....	5-7
5.2.2	Pumps - General	5-8
5.2.3	Tanks and Vessels - General.....	5-9
5.2.4	Heat Exchangers - General.....	5-11
5.2.5	Gas Turbine Generator (GTG) System.....	5-11
5.2.5.1	Gas Turbine and Accessories	5-15
5.2.5.2	Prime Mover.....	5-16
5.2.5.3	Governing System.....	5-17
5.2.5.4	Fuel System	5-17
5.2.5.5	Water/Steam Injection System	5-18
5.2.5.6	Lubricating Oil System	5-19
5.2.5.7	Starting System.....	5-19
5.2.5.8	Special Tools.....	5-20
5.2.5.9	Inlet Air Filter.....	5-20

5.2.5.10 Exhaust Connection	5-21
5.2.5.11 Bypass Stack	5-21
5.2.5.12 Water Wash System	5-21
5.2.5.13 Insulation.....	5-22
5.2.5.14 Sound Control Equipment	5-22
5.2.5.15 Maintenance Access	5-22
5.2.5.16 Fire Protection System	5-22
5.2.5.17 Vibration Monitoring Equipment	5-23
5.2.5.18 Painting.....	5-23
5.2.5.19 Gas Turbine – Electrical and Controls.....	5-24
5.2.6 Steam Turbine (STG).....	5-30
5.2.6.1 General	5-34
5.2.6.2 Turbine.....	5-36
5.2.6.3 Electrohydraulic Control System	5-42
5.2.6.4 Turbine Control System	5-43
5.2.6.5 Turbine Rotor Stress Monitoring	5-45
5.2.6.6 Turbine Supervisory System	5-45
5.2.6.7 Lubrication System.....	5-46
5.2.6.8 Gland Steam System	5-48
5.2.7 Combustion and Steam Turbine Electrical Generator	5-49
5.2.7.1 General:	5-49
5.2.7.2 Applicable Codes and Standards	5-49
5.2.7.3 Quality Assurance	5-51
5.2.7.4 Factory Tests	5-51
5.2.7.5 Submittals	5-52
5.2.7.6 Products.....	5-53
5.2.8 Heat Recovery Steam Generator (HRSG) System.....	5-67
5.2.8.1 General	5-69
5.2.8.2 Pressure Parts	5-70
5.2.8.3 Boiler.....	5-71
5.2.8.4 Drums	5-75
5.2.8.5 Piping	5-76
5.2.8.6 Ductwork, Casings and Insulation.....	5-81
5.2.8.7 Insulation.....	5-81
5.2.8.8 Access	5-82

5.2.8.9	Duct Burners	5-83
5.2.8.10	Selective Catalytic Reduction System.....	5-85
5.2.8.11	Ammonia Injection Skid.....	5-87
5.2.8.12	CO Catalyst.....	5-87
5.2.8.13	HRSB Erection.....	5-88
5.2.8.14	Ammonia Equipment.....	5-101
5.2.9	Steam Systems	5-101
5.2.9.1	HP (Main) Steam System.....	5-103
5.2.9.2	Reheat Steam System	5-103
5.2.9.3	LP Steam System	5-104
5.2.9.4	Auxiliary Steam System	5-104
5.2.10	Condensate System.....	5-105
5.2.11	Boiler Feedwater System.....	5-106
5.2.12	Raw Water Supply System	5-107
5.2.13	Service Water System.....	5-108
5.2.14	Raw Water Treatment System.....	5-108
5.2.15	Demineralized Water System.....	5-109
5.2.16	Air Cooled Condensing System.....	5-111
5.2.16.1	Design Parameters	5-114
5.2.16.2	Air Cooled Condenser (ACC).....	5-115
5.2.16.3	Steam Duct:	5-120
5.2.16.4	Condensate Receiver Tank.....	5-121
5.2.16.5	Piping and Valves:	5-121
5.2.16.6	Cold Weather Operation	5-122
5.2.16.7	Steam By-pass System:.....	5-122
5.2.16.8	Air Removal Equipment:	5-122
5.2.17	Chemical Injection Systems	5-124
5.2.17.1	Boiler Water Chemical Systems.....	5-124
5.2.18	Closed Cooling Water System.....	5-125
5.2.19	Fuel Gas System.....	5-127
5.2.20	Compressed Air System	5-129
5.2.21	Sampling and Analysis System.....	5-131
5.2.22	Fire Protection System.....	5-134
5.2.23	Potable Water System	5-138
5.2.24	Process Bulk Gas Storage and Distribution System.....	5-138

5.2.25	Wastewater Collection and Transfer System	5-140
5.2.25.1	Sanitary Wastewater	5-140
5.2.25.2	Oily Wastewater	5-140
5.2.25.3	GTG Water Wash	5-141
5.2.25.4	Process Wastewater	5-141
5.2.26	Heating, Ventilating, and Air Conditioning System	5-141
5.3	PLANT PIPING REQUIREMENTS	5-146
5.3.1	General Requirements	5-146
5.3.2	Piping Classes	5-148
5.3.3	Line List	5-152
5.3.4	Clearances	5-152
5.3.5	Piping Stress Analysis	5-153
5.3.6	Pipe Bending	5-154
5.3.7	Pipe Sleeves	5-154
5.3.8	Dissimilar Metal Joints	5-154
5.3.9	Equipment for Plant Start-up	5-155
5.3.10	Sewer and Underground Piping	5-155
5.3.11	Vents and Drains and Manholes	5-155
5.3.12	Root Valves	5-156
5.3.13	Root Connections	5-156
5.3.14	Fabrication Requirements	5-157
5.3.15	Shop Cleaning	5-157
5.3.16	Inspection	5-157
5.3.17	Protection for Shipment and Construction	5-158
5.3.18	Welding	5-158
5.3.19	Field Installation	5-159
5.3.20	Pipe Supports, Guides, Restraints, and Anchors	5-159
5.3.20.1	General Requirements	5-159
5.3.20.2	Attachments to Piping	5-160
5.3.20.3	Attachments to Structure	5-161
5.3.20.4	Spacing	5-162
5.3.20.5	Pipe Support Identification	5-162
5.3.20.6	Anchors, Restraints, and Sliding Supports	5-163
5.3.20.7	Hanger Rods	5-163
5.3.20.8	Variable Spring Hangers	5-164

5.3.20.9	Adjustment and Locking Devices	5-164
5.3.20.10	Inspection	5-165
5.3.21	Painting	5-165
5.3.22	Testing.....	5-166
5.4	VALVES.....	5-166
5.4.1	General Requirements	5-166
5.4.2	Valve Materials.....	5-167
5.4.3	Valve Shop Painting.....	5-167
5.4.4	Lubricant Materials	5-167
5.4.5	Design Requirements.....	5-167
5.4.6	Valve Operators	5-169
5.5	INSULATION AND JACKETING.....	5-170
5.5.1	General Requirements	5-170
5.5.1.1	Insulation.....	5-170
5.5.1.2	Jacketing.....	5-173
SECTION 6.0 - CIVIL SCOPE		6-1
6.1	GENERAL REQUIREMENTS.....	6-1
6.2	SITE PREPARATION AND MAINTENANCE	6-2
6.2.1	Site Preparation.....	6-2
6.2.2	Site Clearing and Grubbing.....	6-2
6.2.3	Drainage.....	6-2
6.2.4	Erosion	6-2
6.2.5	Debris	6-3
6.2.6	Road Maintenance	6-3
6.2.7	Excavation, Filling, and Backfilling.....	6-3
6.2.8	Site Grading	6-3
6.3	SITE IMPROVEMENTS.....	6-3
6.3.1	Storm Water Drainage System	6-4
6.3.2	Sanitary System	6-4
6.3.3	Fencing and Gates.....	6-4
6.3.4	Crushed Stone Surfacing	6-4
6.3.5	Buildings and Equipment Foundation	6-4
6.3.6	Tank Foundation	6-5
6.3.7	Manholes.....	6-5

6.3.8	Duct Banks	6-5
6.3.9	Landscaping	6-5
6.3.10	Roads and Parking	6-5
6.3.10.1	Roads	6-6
6.3.10.2	Parking Areas	6-7
6.3.10.3	Plant Area Surfacing	6-7
6.3.10.4	Bollards	6-7
6.3.11	Oil/Water Separation	6-7
6.3.12	Unloading Areas	6-8
6.4.12	EVAPORATION PONDS	6-8
SECTION 7.0 - STRUCTURAL SCOPE		7-1
7.1	MATERIALS	7-1
7.1.1	Steel	7-1
7.1.2	Concrete	7-2
7.2	STRUCTURAL LOADING	7-3
7.2.1	Dead Loads	7-3
7.2.2	Live Loads	7-3
7.2.3	Wind Loads	7-4
7.2.4	Seismic Loads	7-4
7.2.5	Thermal Loads	7-4
7.2.6	Crane Loads	7-4
7.2.7	Vehicle Loads	7-4
7.2.8	Pipe and Equipment Anchor Loads	7-4
7.3	STRUCTURAL FOUNDATIONS	7-5
7.4	ARCHITECTURAL	7-6
7.4.1	Siding/Panels	7-6
7.4.2	Roofing	7-6
7.4.3	Interior Construction Materials	7-6
7.4.4	Platforms	7-8
7.4.5	Stairs	7-8
7.4.6	Handrail	7-8
7.4.7	Windows, Window Walls, Entrance Doors, and Louvers	7-8
7.4.8	Painting	7-9
7.4.8.1	Surface Preparation	7-11

7.4.8.2	Prime Protective Coating for Steel	7-12
7.4.8.3	Finish Coating	7-12
7.5	BUILDINGS/STRUCTURES	7-12
7.5.1	Minimum Requirements	7-12
7.5.2	Steam Turbine Generator Building.....	7-13
7.5.3	Other Structures	7-14
7.5.4	HRSG Equipment Enclosure.....	7-14
7.5.5	Turbine Room Crane.....	7-14
SECTION 8.0 - ELECTRICAL SCOPE		8-1
8.1	GENERAL REQUIREMENTS	8-1
8.1.1	Plant System Studies	8-2
8.1.2	Interface Requirements.....	8-4
8.1.2.1	Utility System Interface	8-4
8.1.2.2	Plant Synchronizing and Switching Scheme Interface	8-6
8.1.3	Auxiliary Power Supply Equipment	8-7
8.1.4	Classification of Hazardous Areas	8-8
8.1.5	Lighting.....	8-8
8.1.6	Telephone and Data Systems.....	8-10
8.1.7	Construction Power	8-10
8.1.8	Freeze Protection.....	8-11
8.1.9	Cathodic Protection System.....	8-11
8.1.10	Lightning Protection	8-12
8.2	ELECTRICAL PROTECTIVE SYSTEMS	8-12
8.2.1	Generator Protective Relays	8-13
8.2.2	Generator Step-up Transformer Relays.....	8-13
8.2.3	Unit Auxiliary Transformer Relays.....	8-13
8.2.4	Medium Voltage Switchgear and Motor Controllers.....	8-13
8.3	SWITCHYARD	8-14
8.3.1	Deadend Structures	8-14
8.4	GENERATOR STEPUP TRANSFORMERS	8-14
8.5	PLANT AUXILIARY TRANSFORMERS	8-18
8.6	4160 VOLT METAL-CLAD SWITCHGEAR	8-21
8.6.1	General.....	8-21
8.7	4160 VOLT MOTOR CONTROL CENTERS	8-22

8.7.1	General.....	8-22
8.7.1.1	Codes and Standards	8-22
8.8	480 VOLT SECONDARY UNIT SUBSTATIONS	8-22
8.8.1	General.....	8-22
8.8.1.1	Codes and Standards	8-24
8.9	480V MOTOR CONTROL CENTERS	8-24
8.9.1	General.....	8-24
8.9.2	Circuit Breakers.....	8-25
8.9.3	Combination Starter Units	8-26
8.10	GENERATOR TERMINAL EQUIPMENT/ISOLATED PHASE BUS DUCT	8-26
8.10.1	GT Generator Bus Duct/Auxiliary Power Connections	8-26
8.10.2	Low Side Generator Breakers.....	8-27
8.10.3	ST Generator Bus Duct.....	8-27
8.11	NON-SEGREGATED PHASE BUS DUCT	8-28
8.11.1	General.....	8-28
8.11.2	Bus Enclosures	8-28
8.11.3	Bus Conductors.....	8-28
8.12	BATTERY/UPS SYSTEM.....	8-29
8.12.1	Codes and Standards	8-29
8.12.2	Design and Construction.....	8-29
8.12.3	Rating	8-30
8.12.4	Duty Cycle	8-30
8.12.5	Battery Charger Requirements	8-30
8.12.6	UPS Equipment Requirements	8-31
8.12.6.1	Static Inverter	8-32
8.12.6.2	Inverter Capacity	8-32
8.12.6.3	Static Transfer Switch	8-33
8.12.6.4	Manual Bypass Switch	8-34
8.12.7	Distribution Panelboards	8-34
8.12.8	Construction Details	8-35
8.13	EMERGENCY DIESEL GENERATOR.....	8-36
8.13.1	General.....	8-36
8.14	ELECTRIC MOTORS	8-36
8.14.1	4000 and 460 Volt Integral Horsepower Motors	8-37
8.14.2	Fractional Horsepower Motors	8-41

8.15	RACEWAY.....	8-41
8.15.1	Routing of Above Grade Raceway and Conduit	8-43
8.15.2	Electrical Cable Tray System.....	8-44
8.15.3	Covers	8-45
8.15.4	Tray Supports.....	8-45
8.15.5	Material.....	8-46
8.16	CONDUCTORS	8-46
8.16.1	Cable Specifications.....	8-48
8.17	GROUNDING	8-50
8.17.1	Ground Grid Design	8-51
8.18	PLANT SECURITY SYSTEM	8-52
8.19	ELECTRICAL TESTING	8-52
SECTION 9.0 - INSTRUMENTATION AND CONTROLS SCOPE.....		9-1
9.1	GENERAL REQUIREMENTS.....	9-1
9.2	DISTRIBUTED CONTROL SYSTEM (DCS).....	9-3
9.3	DCS CONTROLLERS AND I/O	9-6
9.4	INTERFACES AND NETWORKS.....	9-8
9.5	REMOTE TERMINAL UNIT (RTU) DISPATCH	9-8
9.6	DCS FACTORY ACCEPTANCE TEST (FAT)	9-9
9.7	HARD PANEL CONTROL BOARD.....	9-9
9.8	INSTRUMENTATION AND CONTROL DEVICES	9-10
9.8.1	General.....	9-10
9.8.2	Thermocouples and Resistance Temperature Detectors	9-10
9.8.3	Thermowells	9-11
9.8.4	Flow Elements.....	9-11
9.8.5	Transmitters	9-11
9.8.5.1	Static Pressure and Differential Pressure Transmitters.....	9-11
9.8.5.2	Level Transmitters.....	9-11
9.8.5.3	Flow Transmitters.....	9-12
9.8.6	Gas Meters	9-12
9.8.7	Temperature, Pressure, Level, and Flow Switches	9-12
9.8.8	Local Indicators	9-13
9.8.8.1	Thermometers.....	9-13
9.8.8.2	Pressure Gauges	9-13

9.8.8.3	Local Level Indicators (Gauge Glasses)	9-13
9.8.9	Control Valves	9-13
9.8.10	Instrument Racks	9-14
9.8.11	Tubing Systems.....	9-15
9.9	CONTROL SYSTEM LOOP COMPONENT DESIGN.....	9-15
9.9.1	Gas Turbine Generator (GTG).....	9-16
9.9.2	Steam Turbine Generator	9-17
9.9.3	Heat Recovery Steam Generator (HRSG).....	9-18
9.9.3.1	HRSG Drum Level Control System.....	9-18
9.9.3.2	Duct Burner Safety System.....	9-19
9.9.3.3	Ammonia Injection Control System	9-19
9.9.3.4	Steam Temperature Control System.....	9-19
9.9.3.5	LP Drum Level Control System.....	9-19
9.9.4	Feedwater System	9-19
9.9.4.1	Condensate Receiver Tank Level Control.....	9-19
9.9.4.2	Boiler Feed Pump Minimum Flow Control.....	9-20
9.9.4.3	Boiler Feed Pump Existing Vibration Monitoring	9-20
9.9.5	Air Cooled Condenser (ACC) System.....	9-20
9.9.6	Water Treatment Systems	9-20
9.9.7	Fuel Gas Metering and Conditioning System	9-20
9.9.8	Plant Systems – Raw Water	9-21
9.9.9	Plant Monitoring System	9-21
9.10	HISTORICAL DATA STORAGE AND RETRIEVAL.....	9-21
9.11	CONTINUOUS EMISSIONS MONITORING SYSTEMS	9-21
9.12	ONLINE PERFORMANCE MONITORING SYSTEM	9-24
SECTION 10.0 - TRAINING		1
SECTION 11.0 - START-UP, INITIAL OPERATION AND PERFORMANCE TESTING		1
11.1	GENERAL.....	1
11.1.1	SUMMARY:.....	1
11.1.2	QUALITY ASSURANCE:	2
11.1.3	SUBMITTALS:.....	2
11.1.4	ACCEPTANCE AND PERFORMANCE TESTS:	3
11.1.5	EXECUTION	3

APPENDICES

A	ABBREVIATIONS	A-1
B	APPROVED VENDORS LIST	B-1
C	CONCEPTUAL SITE ARRANGEMENTS.....	C-1
	DM-011A-C: General Arrangement Site Plan	
	DM- 12A-0: Conceptual Combined Cycle Unit Plot Plan	
	DA-101-1: Admin/Control/Warehouse Building Floor Plan	
D	CONCEPTUAL PROCESS FLOW DIAGRAMS AND WATER BALANCE.....	D-1
	FD-1: Conceptual Process Flow Diagram	
	WB-1: Conceptual Water Balance	
E	CONCEPTUAL ELECTRICAL ONE - LINES.....	E-1
	SKE-1: Conceptual One Line Diagram	
F	PACIFICORP "Material Specification ZS 001-2004, Substation Equipment – Power Transformer All Ratings"	F-1
G	GEOTECHNICAL REPORT	G-1
	Currant Creek Preliminary Geotechnical Investigation Results	
H	LARGE GENERATION INTERCONNECTION AGREEMENT.....	H-1
I	MAKEUP WATER ANALYSIS.....	I-1
J	FUEL ANALYSIS	J-1
K	DATA TO BE COMPLETED WITH BID.....	K-1

SECTION 1.0

INTRODUCTION

1.1 General Plant Description

The Currant Creek Power Project is a natural gas-fired, electric generating plant being developed by PacifiCorp (Owner). The site is located in Juab County, approximately 80 miles south of Salt Lake City and 1 mile west of Mona, Utah, at an elevation of 5051ft. The existing Block 1 plant is a nominal 500MW power block consisting of the combined cycle operation of two (2) GE 7FA combustion turbines, two (2) Heat Recovery Steam Generators, and one steam turbine generator with an air-cooled condenser. This specification shall address the addition of a second 2 X 1 combined cycle power plant (Block 2) at the existing site.

The Block 2 power plant shall consist of two (2) GE Model 7FA or Siemens-Westinghouse W501F gas turbine generators (GTGs). Exhaust gas from each GTG shall be directed into a dedicated heat recovery steam generator (HRSG) for the generation of high-pressure, intermediate-pressure, and low-pressure steam. Contractor shall optimize the design of the plant based on rated output, heat rate, and parasitic energy costs. This optimization shall include evaluation of economically attractive equipment such as natural gas preheater, HRSG duct firing and GTG output. Supplementary firing capability and power augmentation through steam injection shall be provided at Bidder's discretion in each HRSG to generate additional steam for peak power production. The steam generated in the HRSGs shall be supplied to a single tandem-compound, reheat bottom exhaust, steam turbine generator. Exhaust steam from the steam turbine shall be condensed in an air-cooled steam condenser (ACC).

Auxiliary cooling shall be accomplished through an air cooled, elevated heat exchanger with fan cooled sections that can be individually isolated, and two, 100 percent capacity Closed Cooling Water pumps.

The GTGs will be equipped with dry low-NO_x combustors. Each of the HRSGs shall have a selective catalytic reduction (SCR) system to further control NO_x emissions and an oxidation catalyst for carbon monoxide (CO) and volatile organic compounds (VOC) emissions control. The GTGs and HRSG duct burners, if provided, will burn only natural

gas.

The gas turbines, HRSGs, and all other major equipment, except for the steam turbine generator, shall be installed outdoors. The gas turbines will be installed in dedicated enclosures furnished with the equipment. A building shall be provided to enclose the steam turbine and shall include an overhead crane for maintenance. The existing administration building / warehouse provided under Block 1 shall be shared by both plants.

Power produced by the generators will pass through step-up transformers for delivery to the electrical transmission grid through a 345 kV switchyard.

Natural gas will be supplied to a single site interface point.

Raw Water will be supplied from the Owner's raw water supply well(s) to a new Raw Water Storage Tank.

Wastewater shall be collected in small sumps and ultimately discharged to an on-site evaporation pond.

1.1.1 Specifications

1.1.1.1 General

The purpose of the Technical Specifications is to define the minimum scope, plant features, and quality standards for the design, procurement, construction, startup, and testing of the combined cycle power plant.

The Owner has provided a conceptual plant design for the purpose of permit applications and specifying the minimum scope and features of the facility. The conceptual design includes plant heat balances, process flow diagrams, one-line diagrams, arrangement drawings, and plant water balances. The conceptual design is included in Appendix C through Appendix E as a part of the Technical Specifications. Contractor shall verify all aspects of the conceptual design and shall provide final design and detailed specifications and drawings for the plant in conformance with these Specifications. Contractor shall be responsible for all design of the power plant based upon this conceptual design. All conceptual drawings shall become the Contractor's responsibility, and Contractor shall modify or recreate all conceptual drawings to reflect actual design throughout the design and construction phases of the project. See Process

Flow Diagram FD-1 included in Appendix D for a basic overview of the steam cycle.

Contractor shall utilize Vendors from Appendix B – Approved Vendors List whenever applicable. For the equipment listed, alternate vendors may be used with Owner approval only.

1.2 OVERALL SCOPE DESCRIPTION

1.2.1 General Scope

Contractor shall design, procure, fabricate, install, test, and commission a complete, functional, operating, power plant facility as specified herein with a high degree of reliability, integrity, maintainability, efficiency, and environmental compatibility which conforms to normally accepted standards for utility owned power generating facilities.

Except as specified otherwise, provide all equipment, materials, transportation services, labor, labor supervision, technical field assistance, scheduling, consumables, construction equipment, construction tools, special tools, construction utilities, permanent utilities, testing services, spare parts, and other services and items required for, or incidental to the engineering, design, procurement, installation, construction, startup, testing, commissioning, and training for the facility.

Design, fabricate, install, inspect, examine, and test each system in accordance with the specified industry standards and applicable Laws. Comply with all requirements of the Applicable Laws and Applicable Permits as specified in the Contract.

Perform specified, code required, and Contractor's standard quality assurance testing, inspection, examination, and documentation.

Submit design, fabrication, and quality assurance documentation, and operating and maintenance manuals in accordance with the submittal requirements of Section 4.0 of these Specifications.

Except as specified otherwise, provide all transportation services required to transport equipment and materials from point of manufacture or point of origin to the Project Site and provide transportation on the Project Site to the area of installation as required to erect the equipment complete. Transportation services shall include supply and installation of any temporary or permanent transportation facilities required on or off Site as required to facilitate the delivery (i.e., road improvements and the like).

Except as specified otherwise, provide all technical assistance, equipment, and supplies required, specialized and non-specialized, for erection, testing, start-up, and commissioning of all components of the facility including those supplied by the Owner.

Coordinate start-up and commissioning operations with Owner's operating maintenance personnel and involve Owner's personnel in start-up and commissioning activities to the extent desired by the Owner.

Train Owner's operators and maintenance personnel on all operating and maintenance aspects of the facility prior to system start-up in accordance with Section 10.0 of this Exhibit A of the contract

Provide all planning, coordination, arrangements for leasing temporary equipment, installation of temporary equipment and commissioning of the project.

Fire protection during plant construction shall meet the requirements of NFPA 241. All fire protection systems shall be subject to the review and approval of the state and local fire department authorities.

Provide all special tools and lifting devices for equipment supplied by the Contractor as required for maintenance and operations for the intended life.

Contractor shall complete all information requested in Appendix K – Data to be submitted with Bid and turn in as a part of Contractors proposal

1.2.2 Work by Others

Others will be performing work at the Site as part of this Project. Such contracts include the following:

1. 345 kV switchyard supply and installation, 345 kV overhead line, and high voltage connection to step-up transformers; Power and control termination cabinets located in the switchyard control building; Contractor to supply dead-end structures.

Contractor shall coordinate with other contractors as to avoid interference in operations, conduct operations to minimize inconvenience to these contractors, and confine operations to areas within the Contract limits. Construction laydown and parking areas shall be provided for these other contracts and shall be shared with these contractors.

1.2.3 Terminal Points

Boundaries associated with the scope of work for the Project are defined in the following paragraphs. The Contractor shall coordinate with all other contractors to fully define interface requirements and shall provide all facilities as defined and as required to provide a fully functional plant including interface with off-site systems provided by others.

1.2.3.1 345 kV Switchyard

Owner will furnish and install the 345 kV switchyard collector bus and transmission line. (Interface details will be furnished to Contractor at a later date). Unless otherwise specified, Contractor's interface point with switchyard shall be at the high side bushings on Generator Step-up Transformer. Contractor shall include step-up transformer dead end structure. Owner will bring overhead line from switchyard and make drops to transformer arresters and bushings.

Switchyard Relaying and Metering Interface: Switchyard contractor will provide a junction box inside the Switchyard Control Building for relaying and metering interface between the 345 kV Switchyard and the power plant. Provide all facilities required for relaying and metering interface inside the power plant and between power plant and Switchyard junction box. Facilities shall include but not be limited to, ductbank, wiring, programming, controls, and relaying and metering equipment. Contractor shall make terminations on plant side of terminal blocks. Provide a minimum of 2 spare 4-inch conduits in the duct bank between power plant and Switchyard Extension.

RTU Communications: Contractor will provide a fiber optic connection from the switchyard RTU located in the switchyard control building to the plant DCS. Provide all facilities required for RTU communications between the power plant and Switchyard control building. Any I/O points required at RTU but not available in the DCS shall be hardwired to the RTU. Facilities shall include but not be limited to, ductbank, fiber, wiring, programming, and interface equipment.

Grounding: Extend plant grounding system at two locations per generator step-up transformer and connect to the switchyard extension grounding system. Connect any ductbank ground conductor to switchyard grid. Connect power plant fence grounding to the switchyard extension ground grid or electrically isolate the plant fence at all

interfaces with the switchyard extension fence.

Fencing: Switchyard contractor shall provide a separate fence surrounding the switchyard.

1.2.3.2 Natural Gas

Pipeline: Contractor shall connect to the existing Block 1 gas metering station for the supply of natural gas to Block 2 as indicated on the site plan. Provide all facilities downstream of this connection required by these Specifications, including but not limited to, pressure regulation, moisture scrubbers, gas heating, filters/separators, cathodic protection, and piping.

1.2.3.3 Water Supply

Pipeline: An 8-inch raw water supply pipeline already exists to the Block 1 Raw Water/Fire Water Storage Tank. The terminal point for Block 2 service water is on the existing service water pumps supply line (1SWS-10"-151X9-F-91503) from the Raw Water/Fire Water Storage Tank. In addition, a connection has been provided for recirculation from the Block 2 service water pumps to the Raw Water/Fire Water Storage Tank. Contractor shall provide all facilities downstream of the supply line connection and upstream of the recirculation line connection as required by these Specifications including but not limited to, water flow meters, water storage tanks, water treatment systems, and water distribution systems.

1.2.3.4 Process Waste Water Discharge

CTG wash water shall be collected in separate covered drain sumps which shall be provided with hose connections for truck disposal. Equipment/floor drains shall be routed to an Oil/Water Separator. Process water from the Oil/Water Separator, boiler blowdown, water treatment backflush and excess condensate shall be routed to a collection sump where it shall be gravity fed to an evaporation pond. Contractor shall provide sumps and an evaporation pond as required by these specifications for Block 2. Provide all facilities upstream of the evaporation ponds to collect and deliver the process wastewater to the evaporation ponds.

1.2.3.5 Telephone and Data Communications

Communications: Telephone and data communication systems for the facility will be

furnished and installed by the Contractor. The telephone and data communications system will be inter-connected with the systems already existing for the Block 1 plant. The new systems shall be compatible with those already installed. Provide panel boards in the administration building for connection by the telephone and data communications service provider. Provide all facilities, including but not limited to, wiring, jacks, switches, controls, and phones, on the plant side of the communications panels as required to provide a complete and functional plant communications system for both telephone service and data communications service.

Provide a conduit system from site interface point (to be identified later on General Arrangements) to the location of the panel boards for installation of the communications wiring by others.

1.2.4 Owner Furnished Equipment and Systems

The following equipment will be directly purchased by Owner:

1. 345 kV Switchyard - Owner will directly contract the plant switchyard supply and installation and electrical interconnection to the utility grid with Others.
2. Permanent Plant Spares – Owner will provide permanent plant spare parts as required to maintain an operating plant after plant start-up. Contractor shall supply all spare parts required to start-up the facility through Substantial Completion. Contractor shall provide a list of recommended permanent spare parts including unit price, pricing validity timeframe, quantity, description, OEM and OEM part number. The spare parts list shall include a list of all spare parts anticipated for three years of operation.

1.2.5 Noise Levels

1.2.5.1 Equipment Noise Requirements

1. Each Combustion Turbine Generator shall be purchased to meet near field noise requirements of 85 dBA when measured 3 feet in the horizontal plane from the equipment (or enclosure) in any direction and 5 feet from the ground or any personnel platform (without additional attenuation outside OEM scope).

2. The Steam Turbine Generator shall be purchased to meet near field noise requirements of 90 dBA when measured 3 feet in the horizontal plane from the equipment (or enclosure) in any direction and 5 feet from the ground (without additional attenuation outside OEM scope).
3. As a minimum, each HRSG shall be guaranteed to meet 67 dBA when measured 100 feet in the horizontal plane from the HRSG (or enclosure) in any direction and 5 feet from the ground.
4. As a minimum, each Transition Duct shall be guaranteed to meet 67 dBA when measured 100 feet in the horizontal plane from the transition duct in any direction. Attenuation, if required, from the CTG exhaust expansion joint through the HRSG transition duct shall be in Contractor's scope.
5. As a minimum, each HRSG exhaust stack shall be guaranteed to meet 56 dBA when measured 100 feet in the horizontal plane from the HRSG exhaust stack in any direction and 5 feet from the ground.
6. As a minimum, Contractor shall procure all engineered equipment with vendor guaranteed near field noise levels of 85 dBA when measured 3 feet in the horizontal plane from the equipment (or enclosure) in any direction and 5 feet from the ground or any personnel platform. Contractor shall make all reasonable efforts to enforce this criteria.
7. Contractor shall enforce all guarantees to correct equipment which is out of compliance.

Based upon a post construction noise survey completed by Contractor, Contractor shall post noise warning signs in all areas determined to exceed 85 dBA. Sound level measurements shall be made with a sound level meter that meets the requirements of the latest revision of ANSI S1-4 Type 1 or better. Sound level meter must be calibrated to within +/- 1 dB at the beginning and end of each measurement period. Measurements are to be performed in accordance with ANSI S12-23-1989 and S12-36-1990 for the near field. Exceedance areas must have Owner approval.

1.2.5.2 Indoor Noise Limits

Noise levels in normally occupied work areas, such as office and control room areas, shall be limited to 45 dBA.

1.2.5.3 Far Field Noise Guarantees

The far field noise levels shall not exceed guarantee limits at site boundaries as required by Federal, State, and local regulations. Far field noise guarantees must be met during all startup, operating, (including full bypass operation), shutdown, and trip conditions. Sound level measurements shall be made with a sound level meter that meets the requirements of the latest revision of ANSI S1-4 Type 1 or better. Sound level meter must be calibrated to within +/- 1 dB at the beginning and end of each measurement period. Far field noise measurements are to be performed in accordance with ANSI S12 9-1993 and ANSI S12 18-1994.

1.2.6 **Mechanical Scope**

The Mechanical Scope is summarized below and requirements are more fully described in Section 5 of these specifications.

Contractor shall supply, install, and commission all equipment and systems necessary for a complete and fully functional facility. The equipment and systems shall include, but shall not be limited to, the following:

1. Gas Turbine-Generators and systems
2. Steam Turbine-Generator and systems
3. Heat Recovery Steam Generators (HRSGs)
4. HRSG Vents and Drains
5. Steam Systems (including bypass system)
6. Air Cooled Condenser (ACC)
7. Condensate System
8. Feedwater System
9. Service Water System including Raw Water Storage Tank
10. Water Treatment System
11. Cycle Makeup and Storage System
12. Closed Cooling Water System
13. Potable Water for eyewash stations and as required
14. Aqueous Ammonia Storage and Transfer System

15. Fire Protection System extension for Block 2
16. Chemical Treatment and Injection System
17. Sampling System
18. Bulk Gas Storage Systems (CO₂ , H₂ and N₂)
19. Fuel Gas System
20. Instrument/Service Air System
21. Heating, Ventilating, and Air Conditioning (HVAC) System
22. Plant Blowdown System
23. Plant Drains System
24. Wastewater Treatment System
25. Wastewater Collection and Disposal (including oily wastewater)
26. Sanitary Drainage System
27. All Miscellaneous Mechanical Systems and Equipment
28. All temporary facilities and systems needed to implement this work

1.2.7 Electrical Scope

The Electrical Scope is summarized below, and requirements are more fully described in Section 8 of these Specifications.

1. Generator Step-up and Auxiliary Transformers
2. Low Side GTG Generator Breakers
3. Isophase Bus Duct System
4. Medium-Voltage System including switchgear and MCCs
5. Low-Voltage System including switchgear and MCCs
6. Direct Current (DC) Power System
7. Uninterruptible Power Supply (UPS)
8. Communication System expansion
9. Security System expansion
10. Emergency generator

11. Lighting
12. Grounding
13. Cathodic Protection
14. Heat Tracing
15. Data/telephone expansion
16. Lightning Protection
17. All Miscellaneous Electrical Systems and Equipment

1.2.8 Instrumentation and Control Scope

The Instrumentation and Controls Scope is summarized below, and requirements are more fully described in Section 9 of these Specifications.

1. Fully Integrate Block 2 Control Room equipment into existing Block 1 Central Control Room utilizing equipment and programs similar to those used on Block 1
2. Distributed Control Systems and PLC's
3. Recording devices and Historians
4. Sequence of Events Recording
5. Hard-Wired Emergency Trips and Critical Interlocks
6. Continuous Emission Monitoring Systems
7. Performance Monitoring System
8. Instrumentation and Control Devices

1.2.9 Civil Scope

The Civil Scope is summarized below, and requirements are more fully described in Section 6 of these Specifications.

1. Geotechnical Investigations
2. Topographic Construction Surveys
3. Site Preparation
4. Permanent Site Drainage
5. Drainage During Construction

6. Wastewater Evaporation Pond
7. Construction Wastewater Treatment and Disposal
8. All Sub-grade Work and Foundations
9. All Final Grading
10. Roads and Paving including Parking Areas
11. Fencing

1.2.10 Structural and Architectural Scope

The Structural and Architectural Scope is summarized below, and requirements are more fully described in Section 7 of these Specifications.

1. Structural Materials
2. Concrete
3. Steam Turbine-Generator Building
4. Overhead crane
5. Steel including Pipe Racks and Supports
6. Siding and Roofing
7. Miscellaneous Buildings
8. Water Sample Laboratory
9. Painting

1.2.11 Construction Facilities and Services

1.2.11.1 General

Contractor shall furnish and maintain temporary construction facilities and provide construction services including, but not limited to the following:

1. Temporary Storage Facilities at the Site for the proper unloading and storage of all plant material delivered to the Site. If adequate facilities are not available, such material shall be stored at suitable offsite facilities (e.g., warehouses, storage yards, etc.). Laydown and storage areas shall be indicated on the General Arrangement Site Plan in Appendix C.
2. Contractor to provide all permits required for construction.
3. Construction Power and Distribution. Contractor shall be responsible for all electric power tie-ins at the Site.
4. Temporary communication system
5. Temporary lighting system
6. Site drainage, erosion and sedimentation control, and dewatering systems
7. Temporary roads
8. Fire protection service (until Substantial Completion)
9. Construction sanitary facilities including construction offices
10. Temporary water supply and distribution (potable and non-potable). Potable water shall be high quality bottled water.
11. Parking Facilities. Contractor shall furnish adequate parking facilities to accommodate all construction work forces as indicated on the General Arrangement Drawing in Appendix C.
12. Site Security. Contractor shall be responsible for providing the fencing, guarding, and watching the Site as necessary for protection during construction (until Final Completion).
13. Construction testing services (e.g. weld NDE, hydrotesting, megger testing, concrete strength and placement, compaction testing, steel testing etc.).
14. Construction Materials - Contractor shall supply all the equipment, tools, consumables, instruments, etc., necessary for the construction and erection of the plant. The supply of the construction equipment shall include fuel,

lubricants, spare parts, and any other elements or service required for operation and maintenance.

15. Site environmental compliance and protection.
16. First Aid Services. Contractor shall provide onsite first aid services in conjunction with arrangement for offsite first aid transportation and treatment as necessary during the construction of the plant.
17. Temporary Construction Facilities at the site to support Contractor's construction staff and labor force, and the delivery, unloading and storage of equipment and materials.

1.2.11.2 Coordination

Contractor and any other parties involved in the construction of the project shall attend such pre-construction and construction meetings as may be requested by Owner. At the initial meeting, Contractor shall present a construction plan including, but not limited to, the following: safety, procurement plan, major equipment receipt plan, construction sequence, methods and equipment to be used in all phases, tentative access and right-of-way roads, locations of staging areas, regrading of roads, moving of equipment/property that will interfere or impact construction and a construction schedule showing all activities for the entire construction phase of the project. All construction related activities shall be in compliance with PacifiCorp's "Construction Coordination Agreement".

Contractor shall be responsible for contacting all involved utility companies prior to starting any work to determine schedule of work and location of all temporary and permanent facilities in the project area.

Contractor shall prepare an outage plan for all scheduled interruptions of electrical power or other utilities-interference that would affect third parties. This plan shall be submitted by Contractor to Owner and the affected parties at least thirty (30) days prior to outage.

Representatives of Contractor shall attend weekly coordination meetings to discuss matters relative to the progress and execution of the construction and startup of the project. Current week progress and three-week look ahead schedules shall be

presented by the Contractor and reviewed at these meetings in addition to other site coordination items.

1.2.11.3 Safety

Contractor shall implement and maintain, throughout the construction period, a written safety and accident prevention program which meets the requirements of federal, state, and local codes and regulations, and all other authorities having jurisdiction over this work. Subcontractors and vendor-supplied service organizations will each be required to implement a safety program commensurate with the work to be performed and in compliance with Contractor's Site Safety Plan.

Contractor's Safety, Health, and Accident Prevention Program shall be submitted to Owner for approval and shall include disciplinary procedures and safety orientation training procedures applicable to the Contractor and his subcontractor personnel. Special emphasis shall be applied to ensure the use of personal safety equipment and strict adherence to fall protection standards.

Contractor shall include a qualified on-site health, safety and security coordinator who, unless otherwise approved by the Owner in writing, shall have no other duties. The health and safety coordinator shall be on-site during all hours of construction and shall have authority to:

1. Identify unsafe conditions or practices to Construction management for correction.
2. Instruct Construction management when a work stoppage is necessary to correct an unsafe act or condition. Work with Construction management to develop a safe work approach to correction unsafe site conditions.
3. Investigate and respond to Owner identified safety concerns.

The Contractor shall hold regular scheduled safety meetings to instruct his personnel and subcontractor personnel in safety and health practices. The Contractor shall maintain accurate accident and injury reports and shall furnish Owner a monthly summary of injuries and man-hours lost due to injuries and copies of all accident and injury reports.

1.2.11.4 Security

Contractor shall prepare and implement a Site Security Plan. Contractor shall cooperate with the Owner on all security matters. A copy of the Site Security Plan shall be provided for information to the Owner.

1.2.11.5 Fire Protection

Only work procedures which minimize fire hazards to the extent practicable shall be used. Combustion debris and waste materials shall be collected and removed from the site each day. Fuels, solvents, and other volatile or flammable materials shall be stored away from the construction and storage areas in well marked, safe containers. Good housekeeping is essential to fire prevention and shall be practiced by the Contractor throughout the construction period. The Contractor shall follow the recommendations of the AGC "Manual of Accident Prevention in Construction" regarding fire hazards and prevention.

Formwork, scaffolding, planking, and similar materials which are combustible but which are essential to execution of the work shall be protected against combustion resulting from welding sparks, cutting flames, and similar fire sources.

Contractor shall provide qualified personnel for fire control as appropriate. Contractor shall provide adequate fire protection equipment in each warehouse, office and other temporary structures, and in each work area that he is occupying. Access to sources of firewater shall be kept open at all times. Suitable fire extinguishers shall be provided in enclosed areas, in areas that are not accessible to fire water, or in areas that may be exposed to fire that cannot be safely extinguished with water. Each fire extinguisher shall be of a type suitable for extinguishing fires that might occur in the area in which it is located. In areas where more than one type of fire might occur, the type of fire extinguisher required in each case shall be provided. Each extinguisher shall be placed in a convenient, clearly identified location that will most likely be accessible in the event of fire.

Contractor alone shall be responsible for providing adequate fire protection of the construction areas. Failure of Contractor to comply with, or Owner or Owner's Engineer to enforce, the above requirements shall not relieve Contractor from any responsibility or obligation under this Contract.

1.2.11.6 Cleanliness

Special attention shall be given to keeping the structures and surrounding grounds clean and free from trash and debris. The Contractor shall require all disciplines to thoroughly clean their work areas each working day. The Contractor's Construction Manager shall be responsible for Site maintenance and cleanliness. This shall include sweeping the floor, collecting and disposing of trash, and all other functions required to keep the site clean. All hoses, cables, extension cords, and similar materials shall be located, arranged, and grouped so they will not block any accessway and will permit easy cleaning and maintenance.

A roll-up of all hoses, welding leads and electrical cords will be executed once a month as a minimum or as determined by site management. Material and equipment not required for immediate use or installation will be stored in designated laydown and warehouse areas.

All trash, debris, and waste materials shall be collected, sorted, and deposited in waste collection receptacles near the work. These receptacles shall be emptied regularly and the waste properly disposed of off-site.

Promptly upon the completion of a construction task, the Contractor shall thoroughly clean the equipment or structure affected by the task activity by removing all accumulations of dirt, scraps, waste, oil, grease, weld splatter, insulation, paint, and other foreign substances. The Contractor, without additional cost or burden to the Owner, shall properly and adequately restore surfaces damaged by deposits of insulation, concrete, paint, weld metal, or other adhering materials.

1.2.11.7 Signs and Barricades

All signs and barricades shall be provided and maintained by Contractor and shall be in accordance with jurisdictional regulations for accident prevention.

1.2.11.8 Dust Control

Contractor shall be responsible for dust control at the Site. Contractor shall prevent the spread of dust during its operations. Contractor shall moisten all surfaces with water to reduce the risk of dust becoming a nuisance to the public and neighbors. Contractor shall furnish all labor and equipment necessary for dust control including tank trucks and

hoses to apply Owner furnished water. Contractor shall conform to all requirements of the Applicable Permits.

1.2.11.9 Open Burning

On Site open burning will not be permitted.

1.2.11.10 Cooperation with Other Contractors

During the process of the work, it may be necessary for other contractors to be present on or about the site. Contractor shall afford all reasonable cooperation to such other contractors.

Contractor, if required, shall exchange with other contractors furnishing associated equipment, all necessary drawings and other information required to be furnished under the specifications of the respective contracts. Three (3) copies of all drawings and correspondence relating to information exchanged between Contractor and other contractors shall be sent to Owner.

1.2.11.11 Energized Facilities

Contractor may encounter at the site existing energized facilities, operating machinery, and systems, which must remain energized and functional during the execution of the work.

Contractor shall be completely responsible for the safety and protection of his personnel, Owner's personnel, and the public on the site of the Work and shall employ all methods necessary to achieve such safety and also assure continuity of all service systems encountered. These methods shall include, but not be limited to, providing barriers, guard structures, insulating guards and sleeves, warning signs, and prevention of unauthorized access to service system areas.

1.2.11.12 Reference Points

Contractor shall establish baselines, monuments, and reference points for construction as necessary to proceed with layout of the work. Contractor shall be responsible for laying out the work to such lines and grades indicated on the drawings, and shall protect and preserve the established reference points, subject to changes as the Owner may direct.

1.2.11.13 Dangerous Materials

Contractor shall not use explosives, radioactive, or other dangerous material without prior notification to the Owner. Contractor shall be responsible for the proper handling, transporting, storage, and use of such materials. When the use of such materials or methods is necessary, Contractor shall exercise the utmost care and carry on such activities under supervision of its properly qualified personnel. Contractor, at its expense, shall repair any damage caused by its handling, transporting, storage, and use, and shall be responsible for obtaining permits as applicable.

1.2.11.14 Waste Disposal

Contractor shall keep Project Site free at all times from accumulations of waste materials and rubbish. Special attention shall be given to keeping the structures and surrounding grounds clean and free from trash and debris. Contractor shall require all disciplines to thoroughly clean their work areas each working day. Contractor's Construction Manager shall be responsible for Site maintenance and cleanliness. This shall include sweeping the floor, collecting and disposing of trash, and all other functions required to keep the site clean. All hoses, cables, extension cords, and similar materials shall be located, arranged, and grouped so they will not block any accessway and will permit easy cleaning and maintenance.

A roll-up of all hoses, welding leads and electrical cords will be executed once a month as a minimum or as determined by site management. Material and equipment not required for immediate use or installation will be stored in designated laydown and warehouse areas.

All trash, debris, and waste materials shall be collected, sorted, and deposited in waste collection receptacles near the work. These receptacles shall be emptied regularly and the waste properly disposed of off-site.

Promptly upon the completion of a construction task, Contractor shall thoroughly clean the equipment or structure affected by the task activity by removing all accumulations of dirt, scraps, waste, oil, grease, weld splatter, insulation, paint, and other foreign substances. Contractor, without additional cost or burden to Owner, shall properly and adequately restore surfaces damaged by deposits of insulation, concrete, paint, weld metal, or other adhering materials.

1.2.11.15 Hazardous Material Management

Contractor shall be responsible for managing hazardous materials and hazardous wastes. Contractor shall be responsible for designating and managing storage areas, preparing plans, obtaining necessary permits, record keeping and reporting requirements in compliance with applicable, local, state and federal regulations. Owner will obtain an EPA I.D. Number to be used for manifesting hazardous waste.

1.2.11.16 Adjoining Utilities

Contractor shall make necessary efforts to protect any and all parallel, converging, and intersecting electric lines and poles, telephone lines and poles, highways, waterways, railroads, and any and all property from damage as a result of its performance of the work. Contractor shall bear all liability for and shall at its expense repair, rebuild or replace any property damaged or destroyed in the course of its performance of the work.

1.2.12 Production Inputs

Owner will provide the following Production Inputs:

1. Fuel gas for startup and commissioning of the plant, with quality as indicated in Appendix J
2. Water for construction and commissioning of the plant with quality and quantity as indicated in Appendix I. Water required for construction and commissioning in excess of those quantities shall be provided by Contractor.
3. Electricity input into the plant for startup and commissioning of the plant from the auxiliary transformers or backup power source. Construction power shall be provided by Contractor.

Contractor shall provide the following Production Inputs:

1. All Chemicals including, but not limited to, water treatment chemicals, boiler treatment chemicals, ammonia, and ethylene glycol for operation of systems during startup and commissioning of the plant. Owner will select supplier and coordinate purchase of these items. However, costs will be charged to the Contractor's account.

2. All Gases including, but not limited to Nitrogen, Carbon Dioxide, Hydrogen, and CEM gases for operation of systems during startup and commissioning of the plant.
3. Lube oils necessary for flushing and operation of systems during startup and commissioning of the plant. Owner will coordinate purchase of these items. However, costs will be charged to Contractor's account.

1.2.13 Operating Consumables

Until Substantial Completion is reached, Contractor shall provide (at Contractor's cost) all Operating Consumables, including initial fill and other consumables required for preparation, startup, and commissioning of the power plant including but not limited to the following:

1. Demineralized water
2. Water Conditioning Chemicals
3. Grease
4. Lubricants
5. Chemicals required during construction of the plant (such as boiler chemical cleaning chemicals)
6. Purging gases
7. Filters
8. Strainers
9. Spare parts such as gaskets, filter cartridges, light bulbs, lamps, fuses, and related items

1.3 PLANT OPERATING PROFILE

1.3.1 Plant Load Definition

For the purpose of these Specifications, the following plant load definitions shall be

used.

Load Point	Gas Turbine Output	HRSG Output	Steam Turbine Output
Peak	2 @ Base Load	Maximum Duct Burning & power augmentation (if provided)	Turbine Follow/Sliding Pressure
Base	2 @ Base Load	No Duct Burning	Turbine Follow/Sliding Pressure
Minimum	1 @ 50% Base Load or OEM operating minimum	No Duct Burning	Turbine Follow/Pressure Control
Bypass	2 @ Base Load	No Duct Burning	Steam Turbine Bypassed

1.3.2 Plant Operating Profile

Operating conditions are expected to vary seasonally with periods of cyclic operation to minimum load or shutdown at night and periods of base load operation with daily duct firing for peak operation above 80°F ambient temperatures

Contractor shall provide a plant designed to operate continuously at all load conditions between Minimum and Peak operation as indicated above and meeting all the requirements of the Contract, and operating within the limits of all Applicable Permits at any operating point within this range.

Annual plant starts to be utilized for design are as follows:

Cold (> 72 hour shutdown)	12
Warm (24-72 hour shutdown)	55
Hot (< 24 hour shutdown)	263

Contractor shall provide a system designed to start-up, shutdown, and operate as required and within the time frames specified in the Contract.

Contractor shall provide a plant designed to allow continuous bypass operation as defined above, with all steam being bypassed around the steam turbine to the ACC system and without any steam being vented to the atmosphere. Plant shall be capable of full bypass operation while allowing Owner to work on non-operating unit (except STG).

1.3.3 Plant Operating Philosophy

Design plant with suitable equipment, automation, and controls to allow plant to start-up, operate normally at any load between Minimum load and Peak load, and shutdown with one operator in the control room and one operator in the plant. Provide plant with suitable automation consistent with the requirements.

1.3.4 Plant Reliability

In general, provide a plant with full redundancy of all equipment and systems prone to failure that are required to support operation of the plant in Base Load operation and all equipment or systems for which a failure during any operation (Minimum, Base, Peak, or anywhere in between) could result in damage to the equipment or to the system.

Provide redundancy of equipment and systems required to support operation of the plant in Peak Load operation only where specified in this Exhibit A. Where redundant (standby) equipment is supplied, the idle component shall be capable of automatic and immediate initiation into operation upon failure of one or more of the operating components. Necessary instrumentation shall be supplied to sense a failure of one or more of the operating components.

1.3.5 Plant Performance

Design plant to optimize performance (output and heat rate) at the Plant Design Base Load conditions with capability of operating at all other design loads between the Minimum and Peak Loads.

Design plant to provide maximum Peak output at the Plant Design Peak Load conditions indicated in Table 2-1.

SECTION 2.0

SITE DESIGN CONDITIONS

The Currant Creek Power Project Site is located approximately 80 miles south of Salt Lake City, Utah. A Site location map is included in Appendix C, CONCEPTUAL SITE ARRANGEMENTS.

Specific Site design conditions are summarized in Table 2-1.

Table 2-1
Site Design Conditions

Plant Design Base Load Ambient Conditions: (Average Ambient Dry Bulb Temperature/ Coincident Wet Bulb Temperature)	95°F DBT 66°F WBT
Plant Design Peak Load Ambient Conditions: (Average Peak Dry Bulb Temperature/Coincident Wet Bulb Temperature)	95°F DBT 66°F WBT
Maximum Ambient Design Conditions: (Maximum Dry Bulb Temperature/Coincident Wet Bulb Temperature)	110°F DBT 64°F WBT
Minimum Ambient Design Conditions: (Minimum Dry Bulb Temperature/Coincident Relative Humidity)	-21°F DBT -21°F
Elevation	5051 ft above mean sea level
Location	Mona, Utah
Seismic Criteria	See Section 7.2.4 of Exhibit A
Wind Design	See Section 7.2.3 of Exhibit A
Precipitation	
Average Annual Precipitation	14.5 in. *
Maximum 24 hr Precipitation	1.85 in. *
Average Annual Snowfall	44.5 in.*
Maximum 24 hr Snowfall	19 in.*

Design Maximum Rainfall Rate	25 year/24 hour storm
Design Frostline:	As identified by local building code
Fuel	
Primary	Natural Gas
Backup	None
Preheating for starting	As specified by the gas turbine manufacturer. Minimum superheat 50°F.
Preheating for performance	As required by GTG Manufacturer
Supply Pressure at Owner interface point (regulation by contractor)	525 psig
* Data from the Western Regional Climate Center for Nephi, Utah.	

2.1 GEOTECHNICAL CONDITIONS

Results from the Preliminary geotechnical Investigation completed at the Currant Creek site are contained in APPENDIX G, GEOTECHNICAL REPORT. Contractor shall be responsible for dealing with the Geotechnical conditions at the site and may at its option, rely on the GEOTECHNICAL REPORT furnished by Owner. If Contractor believes that additional geotechnical investigations are necessary, it is Contractor's responsibility to perform any additional studies required at no additional cost to Owner. Relying on Owner's GEOTECHNICAL REPORT will not release Contractor from responsibility for the geotechnical integrity of the constructed facilities. Any subsurface anomalies discovered by the Contractor shall be reported immediately to the Owner.

2.2 SITE SECURITY

From the time of initial mobilization to Substantial Completion, Contractor is responsible for security and entrance to the power plant construction area, office trailer area, construction parking area, and laydown areas (Others will control access to switchyard areas). Security will include fencing areas as they come under construction and are completed, secured warehousing of plant equipment and materials and security guards, Contractor is responsible for controlling visitor access and site visits.

2.3 SITE ACCESS

Contractor shall establish a temporary access point into the site and to any temporary staging / laydown areas, as required. Contractor shall construct and maintain access to laydown area(s). Laydown areas will be rough graded by Contractor. Any additional

preparation required for the laydown areas shall be Contractor's responsibility. Contractor shall restore the laydown area to Owner's satisfaction upon completion of use.

Construction of the proposed facility will follow all permit requirements and engineering design specifications. Owner and/or his representatives will be onsite continuously to monitor that construction is in compliance with all permit and design specification requirements. The plant shall be constructed without obstructing public thoroughfares. All warning and traffic signs shall be provided and maintained. A safe workplace environment shall be maintained. The proposed facility site and roadway layout is shown on the site plan and general arrangement drawings. Contractor is required to meet the safety requirements outlined in paragraph 4.9 of the Contract.

2.4 SITE ENVIRONMENT

Contractor shall be responsible for protecting and maintaining the site, which shall include but not be limited to the following:

Proper storage and disposal of all materials, waste and contaminants such as debris, paints, solvents, lubricants, oils, etc. will be required at all times. No materials, wastes or contaminants shall be disposed of on-site. Records of all disposals shall be retained and provided to Owner at the end of the project. Contractor must maintain MSDS information for all materials brought to the site. All waste must be handled in accordance with the applicable local, state, and federal regulations.

Contractor shall maintain the project site in a neat and clean condition at all times. Materials shall be protected from damage due to dirt, debris or the elements. Upon completion, all temporary buildings, rubbish, unused materials and other equipment and materials belonging to and used in the performance of the work shall be disposed of. During construction, storm water and fugitive dust emissions shall be controlled by use of proper construction practices or other suitable means.



SECTION 3.0

CODES, STANDARDS, AND REGULATIONS

The editions and addenda of the following Codes and Publications effective as of the effective date of the Contract shall apply to all work performed under this Contract.

AASHTO	American Association of State Highway and Transportation Officials
ABMA	American Boiler Manufacturer's Association
ACI	American Concrete Institute
AFBMA	Anti-Friction Bearing Manufacturers Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AISC	American Institute for Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
API	American Petroleum Institute
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASNT	American Society for Nondestructive Testing
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
AWS	American Welding Society
BOCA	Building Officials and Code Administrators International
CAGI	Compressed Air and Gas Institute
CMMA	Crane Manufacturers Association of America
CFR	Code of Federal Regulations
CTI	Cooling Tower Institute
DEP	Division of Environmental Protection
EEl	Edison Electrical Institute

EJMA	Expansion Joint Manufacturing Association
EPA	United States Environmental Protection Agency
FAA	Federal Aviation Agency, Department of Transportation
FED	Federal Standards
FM	Factory Mutual
HEI	Heat Exchange Institute
HI	Hydraulic Institute Standards
IBC	International Building Code
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineers Society
IMC	International Mechanical Code
IPC	International Plumbing Code
IPCS	Insulated Power Cable Society
ISA	Instrument Society of America
LPC	Lightning Protection Code
MBMA	Metal Building Manufacturers Association
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry
NAAMA	National Association of Architectural Metal Manufacturers Metal Bar Grating Manual
NACE	National Association of Corrosion Engineers
NAFM	National Association of Fan Manufacturers
NBBPVI	National Board of Boiler and Pressure Vessel Inspectors
NIBS	National Bureau of Standards
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NESC	National Electric Safety Code
NETA	National Electrical Testing Association
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Administration
PPI	Plastic Pipe Institute
PFI	Pipe Fabrication Institute
RMA	Rubber Manufacturers Association
SAE	Society of Automotive Engineers

- SDIS Steel Deck Institute Standards
- SJIS Steel Joist Institute Standard
- SMACNA Sheet Metal and Air Conditioning Contractors National Association
- SSPC Steel Structures Painting Council
- TEMA Tubular Exchanger Manufacturers Association
- TIMA Thermal Insulation Manufacturers Association
- UBC Uniform Building Code
- UL Underwriter Laboratories Incorporated
- UMC Uniform Mechanical Code
- UPC Uniform Plumbing Code
- UUBSAR Utah Uniform Building Standard Act Rules, R156-56
- State of Utah Environmental Protection Agency
- PacifiCorp Document – “Construction Coordination Agreement”
- Juab County Ordinances and local municipal codes as applicable

Contractor shall obtain Owner approval for any deviations to these standards or alternative standards. Request for deviation or alternate shall include an explanation why such change is necessary and how compliance is to be achieved. Owner reserves the right to reject any such request for any reason. If Contractor discovers any conflict between any code, standard, or regulation, Contractor shall notify Owner of such conflict. Owner, in its sole discretion, shall then choose which provision shall take precedence over such conflicting provision.



SECTION 4.0 ENGINEERING SCOPE

4.1 GENERAL REQUIREMENTS

This Section covers the scope of the engineering services to be provided by the Contractor. Contractor (or Contractor's Engineer) shall perform all design engineering work including but not limited to the following items:

1. Prepare design documents, size equipment, generate drawings and specifications, and other supporting activities to the degree of detail required to fully and clearly define manufacturing and construction work requirements and minimize design engineering work in the field.
2. Prepare calculations as required for design decisions, equipment and material selection, and preparation of construction drawings.
3. Prepare system descriptions indicating equipment data, operating characteristics, functions, flow rates, and other process information for all plant systems.
4. Prepare mechanical, electrical, and instrument equipment lists with summary descriptions, vendors, and pertinent data.
5. Develop the detailed Site arrangement including provisions for locations of structures, equipment, and permanent access routes.
6. Coordinate receipt of information and materials so that all phases of the Project are well coordinated.
7. Prepare arrangement drawings for Owner's Review and finalize arrangement drawings for construction.
8. Prepare Piping and Instrumentation Diagrams (P&ID's) for all Mechanical Plant Systems.
9. Provide all civil, electrical, instrument and control, mechanical, and structural construction drawings for the plant and supporting systems, including, but not limited to, the following:
 - A. Site Arrangement
 - B. Plant Arrangement
 - C. Control Room and Electrical Room Arrangements
 - D. Access Roads, Curbs, Walkways, and Parking

- E. Evaporation Ponds
 - F. All Grading
 - G. - All Site Fencing
 - H. Wastewater Evaporative Ponds
 - I. All Drainage
 - J. Foundations and Equipment Pads (excluding the switchyard extension)
 - K. Ductbanks and Manholes
 - L. Structural Steel, Platforms, and Stairs
 - M. Architectural Plans, Elevations, and Details
 - N. Water and Wastewater Supply and Treatment Systems
 - O. Equipment Location Plans and Elevations
 - P. Above Grade Piping 2-½ Inches and Larger
 - Q. All Below Grade Piping
 - R. Steam Blow and Cycle Flush Piping
 - S. Pipe Supports Including Hanger Designs
 - T. Conduit, Cable, and Raceway
 - U. Fire Protection Systems
 - V. One-Line Electrical Diagram
 - W. Three-line Electrical Diagram (generator and auxiliary voltages only)
 - X. Underground Utilities and Yard Piping
 - Y. Grounding Protection
 - Z. Lightning Protection
 - AA. OEM Packages
 - BB. Lighting (excluding switchyard extension) and Communication
 - CC. Power and Control Wiring
 - DD. CEM Systems
 - EE. Instrument Location Plan and Installation Details
 - FF. Electrical Schematics and Interconnect Diagrams
 - GG. Instrumentation Lists, DCS System Architecture Drawings to include all interfaces by hardwire and software to peripheral systems, DCS Control Loops, Logic Diagrams, Conceptual Graphic Displays, and related items.
10. Prepare technical specifications and other documentation to support all equipment procurement, materials, and construction requirements.

11. Obtain necessary plan approvals and building permits from appropriate state, county and local building authorities. Fees to building authorities shall be paid by Contractor.

All Architectural, Civil, Structural, Mechanical, Electrical, and Instrument and Control design documents that are issued for construction or procurement shall be prepared by or under the direct supervision of a registered professional engineer or architect according to the requirements in the State of Utah. Each engineer responsible for the design shall stamp or certify that the design documents have been prepared by or under his direction. Such design documents shall include, but are not limited to, all purchase and construction specifications, arrangement drawings, elevations, structural drawings, civil drawings, foundation designs, P&ID's, equipment arrangements, piping layouts, pipe stress analysis, electrical three-line diagrams, and electrical one-line diagrams.

Owner reserves the right to review all engineering documents and records produced by Contractor at any time.

Upon completion of the Project, provide an as-built technical engineering library including all engineering calculations, design documents, and other technical records produced by Contractor. The as-built technical library shall be in hard copy and electronic form.

4.1.1 Architectural Design

Provide architectural design for all buildings, areas, and spaces described in these Specifications in accordance with the applicable specifications and code requirements.

Review local codes and prepare preliminary conceptual drawings for review by regulatory bodies to obtain building permits, and other permits for construction related activities.

4.1.2 Civil / Structural Design

Provide all design engineering and technical support for final arrangements, site grading, roads, site drainage, storm water diversion channels, parking, Site security, final paving, site improvements, site utilities, and construction surveys within the Site boundary.

Design yard piping and prepare yard piping drawings for all underground piping.

Provide all design engineering for construction facilities including access roads, laydown areas, parking lots, drainage, evaporation ponds, and construction utilities.

Provide analysis and detailed design for major plant equipment foundations.

Provide detailed design for structures including foundations, concrete and reinforcing steel, structural steel, platforms, stairs, and enclosures.

Provide architectural plans and sections for all building indicating general layout, permanent fixtures, finishes, and other architectural features.

4.1.3 Mechanical Design

Prepare plant heat balances to reflect in-progress and final design for both 2x1 and 1x1 operation. Heat balances shall be provided for Minimum Load, Base Load, and Peak Load, with and without duct firing, operating at the following Ambient Conditions:

0°F, 20°F, 40°F, 52°F, 60°F, 80°F, 95°F, and 100°F

Heat balances shall include evaporative cooling / chillers at temperatures above 55°F. Contractor has the option to provide duct burning and power augmentation. If provided, heat balances should be provided reflecting these options.

Prepare plant flow diagrams to reflect proposed, in-progress, and final design.

Clearances shall be provided around equipment for ease of operation and maintenance in accordance with OSHA requirements and good engineering practices.

Prepare P&ID's showing equipment, equipment tag numbers, piping, pipe line numbers, valves, valve tag numbers, piping specials, system codes, connection numbers, heat tracing, equipment sizing/key performance, line sizes, valve sizes, material references, insulation references, instruments and controls, and conceptual control logic.

Prepare plant equipment arrangements and elevations dimensionally locating centerlines of all equipment included in the plant in all planes.

Prepare equipment installation detail drawings for all plant equipment.

Prepare piping plans, piping sections, and detailed isometric drawings showing above grade piping 2-1/2 inches in diameter and larger. Plans and sections shall include piping line tags, line sizes, and general dimensions as required to define the general location of the piping. Isometrics shall include dimensional information necessary to fabricate the piping and shall indicate pipe sizes, instrument connections, and attachments such as hangers. Isometrics shall include a detailed Bill of Material with material quantities and specifications for all materials required to fabricate the piping. Standard details shall be provided to show insulation supports and weld end preparation details. Piping 2 inches in diameter and smaller shall be shown schematically on appropriate drawings.

Design and provide schematics and plan drawings for all plant plumbing systems.

Design pipe hanger systems for piping 2-1/2 inches in diameter and larger and for pipe 2 inches and smaller that operates at greater than 250°F. The location for each hanger shall be shown on the piping drawings for space control and for coordination with other equipment and components. Provide detailed hanger design drawings indicating the hanger installation requirements and including a detailed Bill of Materials with all component specifications indicated.

Provide design engineering and prepare drawings for plant facility HVAC systems.

Provide design engineering and prepare drawings for fire protection and control systems for plant facilities.

Design all piping and equipment insulation and lagging systems.

4.1.4 Electrical Design

Prepare a complete set of plant one-line diagrams of electrical systems rated at 480 volts and higher and a complete set of three-line diagrams for the generator voltage electrical system.

Prepare reports documenting electrical system studies performed for equipment selection, grounding design, cable sizing, and protective relay settings.

Prepare conduit, cable and raceway arrangement drawings for conduit, electrical cable

trays, wire ways, and underground duct banks.

Prepare grounding drawings showing grounding method and connections to all equipment and building structures.

Prepare raceway and circuit lists for electrical and instrumentation installation and termination as required for construction only.

Prepare schematic / wiring / interconnection diagrams showing schematics and terminations for cables including all external connection terminal block numbers. Wiring drawings shall include connection drawings both internal and external, NEMA Standard across-the-line industrial control schematic drawings for all control systems provided or designed by Contractor, physical location drawings for all terminal blocks, power requirements, and other related items. Final electrical drawings shall include circuit numbers, wire designations, and similar features, marked on approval drawings by Engineer. Electrical drawings made for this Project shall have NEMA Standard symbols.

Provide power and instrument transformer connection and polarity diagrams.

Provide bushing and lightning arrestor outline drawings for switchgear and surge protection equipment.

Prepare lighting and communication system drawings.

Prepare power distribution drawings.

Prepare lightning protection and cathodic protection drawings.

4.1.5 Instrumentation and Controls Design

Contractor shall:

1. Provide design engineering for fully integrated microprocessor based Distributed Control Systems (DCS) to provide control, alarm, historical data archiving and performance monitoring functions for the major plant systems. Contractor shall design and specify all plant instrumentation, control, and monitoring devices.

2. Prepare contract instrumentation Lists.
3. Prepare SAMA and ISA style logic diagrams for all control algorithms executed within the DCS.
4. Prepare Instrument Installation Details.
5. Prepare location plans for all field devices including, but not limited to, control valves, transmitters, thermocouples, pressure and temperature gauges and flow elements.
6. Develop instrument data sheets for review and future use by Owner.
7. Design duct burner management systems including purge, burner control, and fuel safety systems.
8. Design CEMS systems as required by the project air quality permits and 40 CFR 60 and 40 CFR 75.
9. Design communications links for all FDIs (Foreign Device Interfaces) including, but not limited to, Fuel Gas Regulating Station Flow Computer, miscellaneous PLCs, and Remote Dispatching RTU.

4.2 DESIGN REVIEWS

Design Reviews shall be performed jointly by Contractor and Owner as part of the engineering execution of the work. PDS Model review will be the primary mechanism used for review of physical plant features. Design reviews will take place when engineering is about 20%, 50%, and 70% complete and appropriate HAZOP reviews will be completed as required.

4.3 DRAWING AND SPECIFICATION REQUIREMENTS

The type, preparation, approval, indexing, and distribution of drawings, specifications, and data shall be governed by this section. Drawings and specifications shall be sufficiently complete to ensure that the Project will conform fully to the requirements of these Specifications and the Contract. All final drawings and specifications shall be provided on an indexed compact disk (CD). Drawings shall be prepared in Contractor's format. Final as-built drawings, including OEM drawings, shall be submitted to Owner on CDs in PDF format, AutoCAD 2000 format, or other Owner approved software. Contractor's specifications shall be prepared using Microsoft Word software. Drawings shall reference and be compatible with all interfacing drawings. Drawings (both electronic and hard copy) shall be modified to show the complete as-built facilities, including any modifications made to the facility during the warranty period resulting from

defects corrected under the warranty. Quantities of copies to be provided are listed in Table 4.2-1.

4.3.1 Drawing and Specification Schedule

Contractor shall submit a Drawing and Specification Schedule to the Owner for review. The Drawing and Specification Schedule shall list all drawings and specifications to be produced by Contractor and shall include, but is not limited to, the following information:

1. Schedule date for the first issue for Owner's Review.
2. Schedule date for return of Owner's Review comments.
3. Schedule date for issue for design, procurement, or construction.
4. Actual date of issue.
5. Actual revision dates.

Contractor shall revise and submit to Owner the Drawing and Specification Schedule monthly, including notation of approval dates, revisions, additions, and deletions.

4.3.2 Drawing and Specification Submittals

Contractor shall submit timely and descriptive information, which relates to the technical aspects of the Scope of Work set forth in the Contract. Such submittals shall be adequate to convey to Owner system arrangement, operating modes, output performance, emission control, selection of construction materials, and all other information as required by Owner to determine Contractor adherence to these Specifications.

Submittals shall be of suitable quality for legibility and reproduction purposes. Every line, character, and letter shall be clearly legible. All words and dimensional units shall be in the English language or in English units. Where standard documents are furnished which cover a number of variations of the general class of equipment, the document shall be annotated to clearly indicate exactly which parts of the drawing apply to the item for which the Submittal is intended. If conforming Submittals cannot be obtained, such documents shall be retraced, redrawn, or photographically restored as necessary to meet these requirements. Contractor's failure to satisfy the legibility requirements will not relieve Contractor from meeting the required schedule for submittal nor will it be

cause for delay in the Project schedule.

Electronic Submittals shall be in the form of AutoCAD and either Microsoft Word or Excel, or Adobe Acrobat files. All AutoCAD files shall also be submitted as PDF files for ease of printing. Identify each Submittal by Project name and number, and indicate equipment or component tag number on each submittal drawing or document.

Owner will, by a notice to Contractor, classify the reviewed submittal to indicate the acceptance or rejection of the documents. Following are definitions of the action categories which will be used by the Owner and the associated meaning and requirements of the Contractor:

1. REVIEWED – NO COMMENT – Signifies that Equipment or Material represented by the Submittal conform to the design concept, comply with the intent of the Contract and Specifications, and are acceptable for incorporation in the Work. Contractor is to proceed with Work based upon the content of the Submittal. Final copies of the Submittal shall be transmitted to Owner as indicated below.
2. REVIEWED – NOTE COMMENTS – Signifies that Equipment or Material represented by the Submittal conform to the design concept, comply with the intent of the Contract and Specifications, and are acceptable for incorporation in the Work with Owner's comments indicated. Contractor is to proceed with Work based upon the content of the Submittal with all comments incorporated. Contractor shall submit a revised Submittal responsive to Owner's comments.
3. REJECTED – INADEQUATE INFORMATION – Signifies that Equipment or Material represented by the Submittal appear to conform to the design concept and appear to comply with the intent of the Contract and Specifications. However, the Submittal is lacking in adequate detail and information or contains discrepancies, which prevent Owner from completing his review. Contractor shall not proceed with Work until Owner approval is obtained. Contractor shall revise the Submittal responsive to Owner's comments and resubmit for approval.
4. REJECTED – NOTE COMMENTS – Signifies that Equipment or Material represented by the Submittal do not conform to the design concept, do not comply with the intent of the Contract and Specifications, and are disapproved for

incorporation in the Work. Contractor shall not proceed with Work until Owner approval is obtained. Contractor shall revise the Submittal responsive to Owner's comments and resubmit for approval.

5. FOR REFERENCE, NO APPROVAL REQUIRED – Signifies the Submittals are for supplementary information only. Owner reviews such Submittals for general content, but not for substance.

6. FINAL – Signifies that Submittal has been previously approved and is being accepted as a final Submittal. Submittal is approved for incorporation by Contractor into the final project documents (O&M manuals, Technical Libraries, etc).

In resubmitting a Submittal which has been reviewed by Owner subject to compliance with comments, or which has been disapproved by Owner, Contractor shall state the action taken on each comment by indicating in his forwarding letter that the comment has been complied with, or by explaining why the requested alternative was not made, and Contractor is proceeding at his own risk.

Resubmit Submittals the number of times required to obtain the REVIEWED – NO COMMENT action on the Submittal. Allow the Owner the time indicated above in the Drawing and Specification Schedule section for each submittal and resubmittal. The requirement for any number of resubmittals will not be grounds for an extension in Key Dates provided the Owner completes his reviews in the time frame specified.

Any resubmittal incorporating changes from the previous submittal shall have changes clearly marked or highlighted in both the hard copies and the electronic format. Any changes made to equipment or systems after receiving approval shall be indicated on the documents and the documents resubmitted for approval.

Contractor shall provide the quantities of Submittals indicated in the following and in the format indicated or in a format approved by Owner in the Project Administration Manual per 4.3.5 of this section:

DOCUMENT FORMAT & QUANTITY				
Table 4.3-1				
TYPE	ABBREVIATION	PRINTS	FTP Server	TO
Issue for Owner's Review	IOR	1	1	Owner
Issue for Information	IFI	1	1	Owner
Issue for Design	IFD	1	1	Owner
Revisions	REV	1	1	Owner
Issue for Bids	IFB	1	1	Owner
Issue for Purchase	IFP	1	1	Owner
Issue for Construction	IFC	1	1	Owner
As-Built	AB	1	3 on CD	Owner

The documents to be submitted by Contractor shall include but are not limited to the following:

Mechanical Submittals	
Table 4.3-2	
Submittal Description	Schedule
Heat and mass balances for all guarantee points and minimum and maximum site conditions at Peak Load,	IOR, IFC, REV, IFD, AB

Base Load and Minimum Load.	
Plant fuel consumption at guarantee points and for Peak Load, Base Load, and Minimum Load.	IOR, IFC, REV, IFD, AB
Water balances for guarantee points and minimum and maximum site conditions	IOR, IFC, REV, IFD, AB
P & Ids	IOR, IFC, REV, IFD, AB
System Descriptions	IOR, IFC, REV, AB
Equipment arrangements and locations	IOR, IFC, REV, IFD, AB
Piping Plans & Sections	IOR, IFI, IFC, REV, AB
Piping Isometrics	IFI, IFC, REV, AB
Hanger Location Drawings	IFI, IFC, REV, AB
Hanger Detail Drawings	IFI, IFC, REV, AB
Steam blow and cycle flush piping	IOR, IFC, REV
Fire system drawings	IOR, IFC, REV, AB
Piping Line List	IOR, IFC, REV, AB
Equipment list	IOR, IFC, REV, AB
HVAC layout	IOR, IFC, REV, IFD, AB
Procurement specifications	IOR, IFB, IFP, REV
Construction specifications	IOR, IFC, REV
Startup, commissioning, and test procedures	IOR, IFC, REV
All vendor drawings and submittals (P&ID's, electrical one-lines and equipment outlines for review, all other drawings for information)	IOR, IFC, REV, IFI, AB
Operation and Maintenance Manuals	IOR, IFC, REV, AB
Pipe Stress Analysis	IFI, IFC, REV
All pump characteristic curves	IFI, IFC, REV, AB
List of all Special Tools for construction and maintenance	IFI, IFC, REV
Requirements for storage and protection of equipment	IFI, IFC, REV
Valve list	IFI, IFC, REV, AB
Lubrication list	IFI, IFC, REV, AB
Chemicals and Consumables list	IFI, IFC, REV, AB

Civil Submittals

Table 4.3-3

Submittal Description	Schedule
Site arrangement	IOR, IFC, REV, IFD, AB
Plant arrangement	IOR, IFC, REV, IFD, AB
Access roads, curbs, parking, walkways, and fencing	IOR, IFC, REV, IFD, AB
Grading Plans and Topography	IOR, IFC, REV, IFD, AB
Evaporation Pond Design and Plans	IOR, IFC, REV, IFD, AB
Construction Drainage Plan	IOR, IFC, REV
Final Drainage Plan	IOR, IFC, REV, AB
Yard piping	IOR, IFC, REV, AB
Underground electrical duct bank	IOR, IFC, REV, AB
Site construction utilities	IFI, IFC, REV
All Site surveys	IFI, IFC, REV
Laydown and temporary facility Plans	IOR, IFC, REV
All construction specifications	IOR, IFC, REV
Geotechnical Reports	IFI, IFC, REV

Electrical Submittals

Table 4.3-4

Submittal Description	Schedule
Electrical Plans and Elevations	IOR, IFC, REV, AB
Conduit, cable, and raceways	IOR, IFC, REV, AB
One-Line Diagrams	IOR, IFC, REV, IFD, AB
Three-Line Diagrams (generator and auxiliary voltages only)	IOR, IFC, REV, AB
All electrical Calculations including short circuit, load flow, relay coordination studies, etc.	IOR, REV
All Lighting and Communication Drawings	IOR, IFC, REV, AB
Plant Grounding System and Lightning Protection	IFI, IFC, REV, AB

Power and Control Wiring Diagrams	IOR, IFC, REV, AB
Electrical Schematics and Connections	IFI, IFC, REV, AB
Motor List	IFI, IFC, REV
All Motor Manufacturer's Data	IFI, IFC, REV
Switchboard Panel Layout	IOR, IFC, REV
Procurement Specifications	IFB, IFP, REV
Vendor Drawings (one-line and outline drawings as well as vendor manuals for review all other for information)	IOR,IFI, REV, IFC, AB

Instrument and Controls Submittals

Table 4.3-5

Submittal Description	Schedule
Instrument list	IFI, IFC, REV, AB
Control Valve and Relief Valve Lists	IFI, IFC, REV, AB
All Procurement Specifications including data sheets for all instruments, control valves, and relief valves	IFB, IFP, REV
Control System Architecture Diagram	IFB, IOR, IFC, REV, AB
DCS Control Loops	IOR, IFC, REV, AB
Control Logic Diagrams	IOR, IFC, REV, AB
Conceptual and Final Graphic Displays	IOR, IFC, REV, AB
Instrument Loop Diagrams	IFI, IFC, REV, AB
All Vendor Drawings and Data	IOR, IFC, REV
Instrument location plans	IOR, IFC, REV, AB
Instrument installation details	IOR, IFC, REV

Structural Submittals

Table 4.3-6

Submittal Description	Schedule
All Structural Steel Design Drawings	IOR, IFC, REV, AB
Foundation Location Plans and Foundation Drawings	IOR, IFC, REV, AB
All Structural Steel Fabrication Drawings	IFI, IFC, REV
All Rebar Drawings	IFI, IFC, REV
All Structural Calculations	IFI, IFC, REV
All Procurement Specifications	IFB, IFP, REV
All Construction Specifications	IOR, IFC, REV
Foundation Design Calculations	IFI, IFC, REV
All Structural Material Specifications	IFI, IFC, REV

Architectural Submittals	
Table 4.3-7	
Submittal Description	Schedule
Building Layout Drawings	IOR, IFC, REV, AB
Building Architectural Drawings	IOR, IFC, REV, AB
Building Interior and Exterior Finish Samples and Color Samples	IOR, IFC, REV
Building Technical Specifications	IOR, IFC, REV

Miscellaneous Submittals	
Table 4.3-8	
Submittal Description	Schedule
Plant Manuals	IOR, IFI, REV, AB
Manufacturers Instruction Books	IOR, IFI, REV
Start Up, Commissioning, and Test Procedures	IOR, IFI, REV
Critical Path Schedule	IOR, IFI, REV (monthly)
Project Status Reports	IOR, IFI (monthly)

Distribution of drawings shall be to multiple parties as defined in the Project Administration Manual.

4.3.3 Plant Manual and Instruction Books

4.3.3.1 Plant Manual

Manufacturers instruction books shall be integrated into a single plant manual with multiple volumes and provided final on three (3) CD copies in MS Word and/or PDF format and ten (10) printed paper copies sized to fit a standard three-ring binder. All paper copies of the manual shall be thoroughly indexed and placed in high quality binders with volumes and content clearly marked on the cover and spine.

The plant manual shall contain site specific information on the plant operation. Normal operating sequences (including startup and shutdown) shall be described together with normal running inspections for all supplied equipment and systems. Troubleshooting and diagnostic recommendations shall also be included. Special notes and cautionary statements shall be included and highlighted throughout the manual to enable easy recognition of special procedures and techniques which must be followed to ensure correctness and safety for equipment and personnel.

Plant manual shall contain the latest as-built information for the facility. Contractor shall obtain all as-built information for all vendor's equipment including Owner purchased equipment. Manuals (both hard copy and electronic) shall be updated with any modifications to equipment or systems made to the facility during the warranty period resulting from defects corrected under the warranty.

4.3.3.2 Manufacturer's Instruction Books

Manufacturer's instruction books shall be provided for all electrical, mechanical, hydraulic, pneumatic, and electronic equipment and instrumentation that requires explicit information and instruction for proper operation and maintenance. Instruction books shall be integrated into a plant manual as described above.

Commercial documents are acceptable to Owner, provided that the specific equipment

used in the construction is clearly identified and that the following are included for all components and sub-components of a complex assembly:

1. Installation, start-up and initial test instructions.
2. Manufacturer Test Reports.
3. Start-up Test Reports.
4. Operating instructions, including safety precautions.
5. Maintenance procedures and routine adjustments.
6. Parts illustrations, including parts lists adequate for the purpose of identifying and ordering replacement parts and lists of recommended spare parts for three (3) years of operation of any given component.
7. Wiring schematics for electrical equipment.
8. Hydraulic diagrams for hydraulic equipment.
9. Detailed descriptions of the functions of each principal component of a system.
10. Performance and nameplate data.
11. Alignment instructions if required.
12. Safety precautions.
13. Maintenance and major overhaul instructions, which shall include detailed assembly drawings with parts numbers, parts lists, instructions for ordering spare parts, and complete preventative maintenance instructions required to ensure satisfactory performance and longevity of the equipment involved.
14. Lubrication instructions, which shall list points to be greased or oiled, shall recommend type, grade, and temperature range of lubricants, and shall recommend frequency of lubrication.

4.3.4 System Startup & Commissioning Test Procedures and Reports

Startup and commissioning test procedures and reports shall be prepared by Contractor for all systems in accordance with the Contract. These procedures shall identify step-by-step actions to be taken to verify that systems operate in accordance with design intent and that all protection, control, indication and alarm functions are operational. Design criteria and acceptable levels (flow, pressure, temperature, time as appropriate) shall be identified in the procedure and provisions for recording of actual criteria observed during the startup will be included. Each step upon its completion shall require a signoff of both Contractor's Test Engineer and Owner's Representative. Five (5) hard copies and three (3) CD of the test procedures and of the test results shall be provided to Owner.

4.3.5 Project Administration Manual

Within 60 Days of notice to proceed, Contractor shall prepare and submit for approval a Project Administration Manual indicating a responsibility matrix; key Project contacts; document distributions; Project scope; Project organization; execution plan; administrative procedures; quality control procedures; Project schedule; equipment, piping, and instrument tagging procedures; design criteria; and other key Project administration functions.

4.3.6 Critical Path Schedule

Contractor shall provide to Owner and update monthly a Critical Path Schedule per the Contract. Critical Path Schedule shall satisfy the requirements set forth in the Contract.

4.3.7 Project Status Reports

Contractor shall prepare and submit to Owner monthly Project Status Reports.

4.3.8 Coordination Meetings

Representatives of Contractor shall attend coordination meetings relative to the progress and execution of this Contract. At the initial meeting, Contractor shall present a plan including, but not limited to, the following: safety, project design parameters, constraints, assumptions, sequence and methods to be used in all phases of design; and detailed Project schedule showing major activities for each system for the entire Project.

Contractor and any other parties involved in the construction of the Project shall attend such pre-construction meetings as may be requested by Owner. At the initial meeting,

Contractor shall present a construction plan including, but not limited to, the following: safety, procurement plan, major equipment receipt plan, construction sequence, methods and equipment to be used in all phases, tentative access and right-of-way roads, locations of staging areas, regrading of roads, moving of equipment/property that will interfere or impact construction and a construction schedule showing all activities for the entire construction phase of the Project.

Contractor shall be responsible for contacting all involved utility companies prior to starting any work to determine schedule of work and location of all temporary and permanent facilities in the Project area.

Contractor shall prepare an outage plan for all scheduled interruptions of electrical power or other utilities interference that would affect the Currant Creek operating plant. This plan shall be submitted by Contractor to Owner for approval at least 30 days prior to outage. The plan shall include all reasonable efforts shall be taken to minimize impact on existing operations including sequencing of work to minimize outage time and work during off peak hours such as night and weekends.

Representatives of Contractor shall attend weekly coordination meetings to discuss matters relative to the progress and execution of the construction and startup of the Project. Current week progress and three-week look ahead schedules shall be presented by the Contractor and reviewed at these meetings in addition to other Site coordination items.

4.3.9 Contractor Acquired Permits

Contractor shall provide Owner three (3) copies of all Contractor Acquired Permit applications as they are being submitted to the responsible agency. Contractor shall provide Owner two (2) copies of all issued Contractor Acquired Permits upon approval from the responsible agency.

4.4 QUALITY ASSURANCE

Provide all equipment and products conforming to applicable Specifications, codes, standards, and requirements of regulatory agencies.

Design, fabricate, and assemble in accordance with the best engineering and shop practices.

Owner and Owner's representative shall have the right to inspect equipment and work at any time or place.

Contractor shall furnish all factory and field test procedures and reports to Owner for information.

At Owner's request, Contractor shall make available all manufacturers quality control documentation.

Contractor shall notify Owner of all Witness Tests at least two weeks in advance of such tests. Owner or Owner's representative may choose to witness test at no additional cost or schedule impact. Contractor shall provide list and schedule of Witness Tests to Owner for review

SECTION 5.0 MECHANICAL SCOPE

5.1 GENERAL REQUIREMENTS

This section provides requirements for major mechanical equipment, mechanical systems, and mechanical interfaces with other plant systems and off-Site facilities.

5.1.1 General Sizing Criteria

All mechanical equipment and systems shall be designed to continuously operate in a stable manner at all operating conditions from Peak Load to Minimum Load including full STG bypass mode. Mechanical equipment, systems, and piping shall be sized based on the operating performance parameters (pressure, temperature, flow rate, and the like) contained in Contractor's heat balances. Contractor shall evaluate the Project for the full range of operating loads including Peak Load, Base Load, and Minimum Load at the full range of design ambient conditions to determine the equipment and system sizing criteria. Contractor shall evaluate and define transient operating conditions (ie. startup, shut down and plant trip scenarios) in design of mechanical systems.

All equipment shall have sufficient design margins based upon good engineering practice. Following is a listing of the minimum design margins for select equipment and systems that shall be applied to the sizing criteria conditions (flow, head, duty, and the like):

Equipment / System	Minimum Design Margin
General Service Pump	10% flow, 5% head
Condensate Pumps	5% flow, 10% head
Boiler Feed Pumps	5% flow, 5% head
Closed Cooling Water Pumps	10% flow, 5% head
Fuel Gas Supply	5% flow at lowest anticipated heating value and pressure.

Line sizes and equipment capacities shall be determined based on flow rates and the specific performance criteria for each system. All sizing values (flow, horsepower, temperature, pressure, diameter, etc.) contained in these Technical Specifications and Conceptual Design Documents contained in Appendices B through E are preliminary. Contractor shall be responsible for final sizing and providing all mechanical equipment, systems, and piping to meet all requirements specified herein.

5.1.2 Piping

Contractor shall size lines to provide fluid velocities that are in accordance with good engineering practice. Table 5-1 shows maximum pipeline velocity guidelines that shall not be exceeded without Owner's approval. The final selection and specification of piping materials shall be suitable for long term durability and shall satisfy all system design and code requirements.

Table 5-1

MAXIMUM PIPELINE VELOCITIES – FEET PER SECOND

Diameter Inches	Super-heated Steam	Saturated Steam > 25 psig	Saturated Steam <25 psig	Compress Air/Gases	Boiler Feed Suction	Boiler Feed Discharge	Condensate Pump Discharge	General Water Pump Discharge	General Water Pump Suction
1	110	100	65	30	3	8	-	4	3
1-1/2	130	110	70	35	3	8	-	4	3
2	150	120	75	40	4	8	8	5	4
4	200	140	85	50	4	12	8	6	5
6	230	150	95	60	4	14	8	8	5
8	250	160	100	60	4	17	10	9	5
10	250	160	100	60	4	18	10	9	5
12	250	160	100	60	4	20	10	10	5
16	250	160	100	60	4	25	10	10	5
20	250	160	100	60	4	25	10	10	5
24	250	160	100	60	4	25	10	10	5
30	250	160	100	60	4	25	10	10	5
36 & Larger	250	160	100	60	4	25	10	10	5

*Actual pipeline velocities shall be less than those specified and shall be selected by the Contractor based on the specific system design conditions and sound engineering practice.

5.1.3 General Arrangements

The location of equipment and valves, and routing of pipe shall be based on safety, economics, ease of maintenance, and operation. Sufficient space shall be provided for maintenance of all equipment including equipment removal without excessive rigging or removal of surrounding equipment, piping, and valves. Where possible, locate valves to be safely accessible from walkways, accessways, or platforms.

5.1.4 Platforms

Provide platforms to access equipment, instruments, engineered valves, start-up vent and drain valves, and other components requiring access for periodic maintenance, start-up, or operation. Provide stair access to maintenance areas that require bulky or heavy tools.

Review Gas Turbine-Generators, Steam Turbine Generator, HRSGs, and Air Cooled Condenser layouts to provide additional access as required to comply with the Manufacturers requirements.

The following paragraphs define the general requirements of where platforms shall be provided. Design and construction requirements for platforms are defined in the Structural and Architectural Scope section.

Provide platforms as required in the following to access elevated components not accessible from grade, unless specified otherwise:

1. Class 1 Areas – Regularly attended areas for daily or weekly lubrication, start-up, operation, inspection, observation, or maintenance.
 - A. Provide platforms a minimum of 3 feet wide, clear of all obstructions with length as required (minimum 4 feet)
 - B. Provide stairs to access the platforms
 - C. Provide emergency escape ladders for platforms as required by OSHA for platforms having dead ends.

2. Class 2 Areas – Maintenance areas requiring access monthly or annually for lubrication, repair, inspection, calibration, or maintenance.

- A. Platforms shall be adequately sized to allow two men to work simultaneously with tools and equipment internals (minimum of 20 square feet – 4 feet x 5 feet)
- B. Platforms shall be accessible by stair or ladder. Areas requiring maintenance with heavy or bulky tools (heavier than 25 lbs) shall be provided with stair access.

As a minimum, areas requiring access as defined above shall include, but not be limited to, the following:

3. Class 1 Areas:

- A. HRSG steam drums and associated level gauges and instrumentation
- B. HRSG, STG, GTG, and other equipment observation ports
- C. Gas turbine borescope inspection ports
- D. Internal and external platforms to provide access to all doors and maintenance access panels provide by GTG manufacturer
- E. Steam turbine operating deck
- F. GTG CEMS ports on HRSG casing (also ductburners, NH₃ injection, etc)

4. Class 2 Areas:

- A. Calibrated instruments including block valves necessary to isolate the instruments for safe routine maintenance and calibration.
- B. Steam turbine bypass and desuperheating valves
- C. Stack CEM port and sample ports
- D. GTG inlet filter plenums
- E. HRSG sample ports
- F. Pressure indicators and gauges
- G. Pressure safety valves
- H. Sample ports
- I. Control valves

- J. Elevated equipment manholes
- K. Motor operated Isolation Valves
- L. Air actuated isolation valves
- M. Top manholes and gauging wells on large tanks
- N. Relief valves and instrument on top of the ammonia storage tanks
- O. Top of field erected tanks (provide a ladder).

Provide a 3-foot minimum wide, continuous catwalk platform on the steam pipe rack. Platform shall extend between the HRSGs to provide access between the HRSG platforms and between the inner most HRSG and the steam turbine deck to provide access from the HRSG platforms to the steam turbine deck. Pipe Rack catwalk shall be accessible from each HRSG and the STG without descending to grade.

5.1.5 Accessways and Clearances

Contractor shall finalize the maintenance laydown areas, show them on general arrangement drawings, and obtain the Owner's approval of the general arrangements prior to detailed design.

Contractor shall provide an area to pull the generator rotor on the steam turbine operating level. The pull area shall have a strong back.

5.1.5.1 Horizontal Clearances (Minimum):

Horizontal clearances (clear of all piping and accessories) shall be maintained as follows (unless approved otherwise by Owner):

- | | |
|--|---------|
| 1. Crane Accessways | 25'- 0" |
| 2. Fork Truck / Pick-up Truck Accessways | 15'- 0" |
| 3. Operating Aisles | 4'- 0" |
| 4. Elevated Maintenance Platforms | 3'- 0" |
| 5. All Around Pumps & Blowers | 3'- 0" |
| 6. All Around Boiler Feed Pumps | 5'- 0" |
| 7. All Around Heat Exchangers | 3'- 0" |
| 8. All Around Tanks | 5'- 0" |

- | | |
|---|--------|
| 9. Around other Major Equipment | 5'- 0" |
| 10. One Side of Control Valve Stations | 3'- 0" |
| 11. Back Side of Control Valve Stations | 1'- 6" |

Provide fork truck / pick-up truck aisles on access side of all equipment with motors, large manholes, or endplates and next to all equipment requiring chemical addition or replacement of totes.

5.1.5.2 Vertical Clearances (Minimum):

Overhead clearances (clear of all piping and accessories) shall be maintained as follows (unless approved otherwise by Owner):

- | | |
|---|---|
| 1. In buildings | 7'- 0" |
| 2. Normal operating or maintenance access areas | 8'- 0" |
| 3. Elevated Platforms | 7'- 0" |
| 4. Control Valves | As required to remove actuator and pilot
(12-inch minimum) |
| 5. Plant access & maintenance roads & crane | 16'- 0" Accessways |
| 6. Railroad crossings | 25'- 0" above the top of the rails |

5.2 MECHANICAL SYSTEMS AND EQUIPMENT

5.2.1 General

Provisions shall be included in the design of all mechanical systems to allow the performance of all routine maintenance without requiring a plant shut down. Provisions shall include but not be limited to redundant equipment, isolation valves, and access spaces.

Contractor shall:

1. Receive, inspect, store, unload, erect, clean, lubricate, align, and prepare all equipment in accordance with equipment manufacturer's instructions before initial operation.
2. Provide lifting lugs on all equipment components or system components requiring removal for maintenance and weighing over 25 lbs.

3. Provide OSHA approved guards on all rotating components.
4. Select materials of construction and design equipment and systems to provide a minimum of a 30-year operating life at all operating conditions specified.
5. Provide major system components designed for a 30-year life without the need for major repairs or replacement. Only routine maintenance items (i.e. belts, couplings, bearings, seals, pump impellers, and the like) shall require replacement at increased frequencies.
6. Provide grounding lugs and ground all equipment and structural components.
7. Care shall be taken to assured that piping connections are made to equipment and machinery so that no reactions or moments in excess of those allowed by the manufacturer are imposed during installation, test, or operation.
8. Provide access doors on equipment and systems as required to adequately clean, inspect, and maintain all system components. In general, access doors shall be bolted and sealed. Access doors over 25 lbs. shall be hinged or supplied with a davit.
9. Extend all grease or lubrication lines for equipment or instruments to be accessible from grade or operating platforms.
10. Provide actuators on all start-up drain and vent valves on the steam turbine, HRSG, steam piping, and boiler feed pump, and elsewhere to enable remote start-up and shutdown of the units.

5.2.2 Pumps - General

General service pumps shall be designed and fabricated in accordance with the recommendations of the Hydraulic Institute and be suitable for the service. All end suction pumps shall be in accordance with ANSI standards.

Horizontal pumps shall have motor and pump mounted on a common baseplate and connected with a flexible spacer coupling and non-sparking coupling guard. Baseplate shall include a containment rim to contain 115% of the maximum amount of lubricant contained in the pump. Provide a drain valve and plug on the baseplate.

All pumps shall be supplied with mechanical seals designed for the service. Similar

parts of duplicate pumps shall be completely interchangeable. Equipment and piping arrangement, and nozzle orientation, shall be selected for ease of maintenance and to minimize the dismantling or removal of piping and electrical connections for maintenance.

Supplied impeller on all pumps except the boiler feedwater pumps shall be a minimum of ½-inch smaller than the maximum impeller for the pump casing.

Pump head curves shall rise continuously from design head to shut-off head. Shut-off head for Boiler Feed Pumps shall be a minimum of 115% of the rated head at design condition and a maximum of 130% of rated head at design condition. Shut-off head of all other pumps shall be a minimum of 115% of the rated head at design condition and a maximum of 150% of rated head at design condition. For condensate and boiler feed pumps, maximum shut-off head shall be 140% of rated head at design condition.

Pumps shall operate at the left of the best efficiency point at design conditions.

Motors shall be sized for end of curve conditions for supplied impeller. Motor service factor may be used in determining motor size for end of curve conditions. Motor service factor shall not be used in selecting motor for operating or rated conditions.

Select pumps for operating speeds of 1800 rpm. Where 1800 rpm pumps will not meet the required head, 3600-rpm pumps shall be used. Pumps shall be subject to shop inspection and manufacturer's standard shop tests.

5.2.3 Tanks and Vessels - General

A new Raw Water Storage Tank shall be added for Block 2. This tank shall be sized as required by Contractor's design. The existing Demineralized Water Storage Tank shall be common to both Block 1 and Block 2. Should Contractor's design determine that the existing tank capacity is inadequate for the addition of Block 2, additional tank storage shall be added by Contractor. Owner shall be advised of this addition and all associated costs shall be included in Contractor's proposal.

Field erected tanks shall be designed, fabricated, inspected, examined, and tested in

accordance with API 650 or AWWA Standard D-100.

All roof seam seams shall be fully seal welded. Roof seams on demineralized water tanks shall be butt joints. Interior welds on demineralized water tanks shall be ground smooth. The tank exterior and interior shall be protected with a suitable lining or coating material.

Tanks and vessels with a design pressure over 15 psig shall be designed, fabricated, inspected, examined, tested and stamped in accordance with ASME Section VIII, Division I, Boiler and Pressure Vessel Code.

Water storage tanks shall be lined or coated on the inside and outside for corrosion protection. Lining and coatings selected shall be suitable for the intended service. Linings and coatings shall be applied in accordance with coating manufacturer's recommendations. Raw Water Storage Tank and Condensate Receiver Tank shall be insulated.

Tank and vessel construction materials shall be selected for the intended service to minimize corrosion and provide an extended life as defined for the plant. Provide a minimum corrosion allowance of 1/16-inch on all carbon steel tanks and vessels.

Contractor shall:

1. Provide cathodic protection for all tanks and vessels as recommended by a corrosion engineer after reviewing soils conditions for the Site. Obtain Owner's approval of cathodic protection design prior to executing work. Block 2 Cathodic Protection System shall be compatible with the existing plant cathodic protection system.
2. Provide a minimum of two manways on each field-erected tank. Manways shall have a minimum opening size of 30 inches diameter. One manway shall be located on the side of the tank or vessel and shall be accessible from grade. The other shall be accessible from the top of the tank or vessel. Provide supports, gaskets, belts, vents, standpipes, interior and exterior

pipng, overflows, wear plates, nozzles, piping connections, level gauges, platforms, stairs, walkways, and an exterior stairway and landing platform with handrails for access to the top of each tank.

3. Provide one manway with a 24-inch minimum opening for shop-fabricated tanks or vessels that are over 36 inches in diameter. Smaller vessels shall be provided with two 6-inch diameter hand holes. Provide a ladder to access the top of all tanks over 10 feet high.

Tank level gages shall be clearly visible from the tank loading area.

5.2.4 Heat Exchangers - General

Shell and tube heat exchangers shall be designed, fabricated, inspected, examined, tested and stamped in accordance with ASME Section VIII, Division I and TEMA, Class C. Shell and tube heat exchangers shall be supplied with flanged channels and flanged channel covers to facilitate access to both the shell and the tube sides for maintenance and cleaning. Provide valved shell and tube-side vents and drains on each exchanger. Provide double-groove, rolled tubes on all heat exchangers.

Plate and frame heat exchangers shall be designed, fabricated, inspected, examined, tested and stamped in accordance with ASME Section VIII. Plate exchangers shall be of the removable plate design and shall be provided with a frame and rollers to support the backplate during plate removal. Frames shall be sized to allow the addition of a minimum of 50% more plates.

Carbon steel components on heat exchangers shall be supplied with a 1/16-inch minimum corrosion allowance. Heat exchangers shall not contain copper.

5.2.5 Gas Turbine Generator (GTG) System

General: Contractor shall provide two (2) GE 7FA/2.6DLN or two (2) Siemens-Westinghouse W501FD2/3 combustion turbines for combined cycle operation including all materials, services, and required labor necessary for a complete functional installation

including all requirements for startup and testing. Gas turbines must meet all latest TIL/Service Bulletins relating to product reliability, design or manufacturing defects as implement on currently manufactured or shipped by the OEM. Equivalent starts penalty factor for trips from load (75% or greater) shall be eight (8) or less.

The equipment shall be designed and manufactured for the application at the specified conditions without overstressing any components. The unit shall be designed to automatically maintain itself in a standby condition ready for immediate operation at all times. Contractor shall provide all necessary connections for measuring pressure drop across filters, compressor pressure ratio, turbine exhaust pressure and temperature, inlet air temperature, inlet pressure drop and turbine firing temperature. All control signals shall have a range of 4-20 mA unless specified otherwise.

Performance Guarantees: All ratings and guarantees shall be made without tolerances. New condition shall be considered to be the condition of the machine immediately after installation and less than 200 actual fired hours.

Capacity of Unit: The gas turbine-generator unit base net output capacity at the ambient conditions specified after unit auxiliary power is deducted from gross output. The capacity, defined as "base rating" shall be that load obtained at the specified ambient conditions and operated at a Turbine Inlet Temperature level consistent with maximum achievement of anticipated parts life. Provide performance correction curves with the Proposal which plot the effect back pressure, barometric pressure steam or water injection, gas turbine inlet air temperature, inlet air pressure drop, and relative humidity on turbine-generator output, air flow, heat rate, and exhaust temperature. These correction curves will be used for performance testing correction to guarantee conditions.

Fuel: Gas turbine-generator units shall be designed to operate satisfactorily at all loads when firing natural gas. See Appendix J for Fuel Gas analysis information.

Combustion System: CTGs shall be provided with dry low NO_x burners. System shall include thermal barrier coated liners, transition pieces, flame detectors, and a dynamic combustion monitoring system.

Sound Criteria: Contractor shall guarantee noise limits per Section 1.

Exhaust Emissions: Contractor shall submit with the Proposal a statement of guarantee that the gas turbine unit and auxiliaries are designed and constructed to operate in compliance with the aforementioned standards.

Evaporative Air Cooler: Shall be 85% effective and designed to work in conjunction with an inlet air filtration system. A Conductivity Control System shall be provided.

Control of Unit: Each GTG shall be supplied with a dedicated turbine control system. The turbine control system contains the unit metering, protection, and control logic required for safe and reliable turbine operation. Standard control of each gas turbine generator, as provided by the manufacturer, shall be from each respective supplied local station and from a common remote station. Remote operator station shall have identical hardware and software as the local operator station and shall also be equipped with multiunit capability to allow for the control and operation of each turbine. In addition, to being designed for starting from the local station located in a control enclosure adjacent to each unit, and remotely from a common remote control station, the unit shall be designed for starting remotely through the DCS. A command to "start" the unit from either the local or remote control station or the DCS shall initiate the automatic start-up sequence to start unit, bring the unit up to speed, synchronize, and pick up a preset minimum load. Controls shall be designed to integrate the starting and stopping of any fuel gas compressor into the automatic start-up and shutdown sequence, if a compressor is required. Controls shall be designed so unit can be loaded from the local or remote station, or DCS. When unit is on-the-line, the following functions may be performed from the local or remote station, or DCS:

- Manual load (governor) control
- Manual voltage (excitation) control
- Manual stopping of unit

Operation of the manual "stop" switch on the local or remote station or remote DCS shall initiate the automatic shutdown sequence to safely shutdown the unit. The unit shall be

automatically shut down in a safe manner in the event of abnormal, injurious, or faulted condition in any part of the gas turbine-generator unit, or its associated mechanical and electrical auxiliary equipment, either during start-up or during "on-line" operation. Unit shall be designed for complete remote and automatic operation. Each condition preventing operation or causing shutdown of unit shall be specifically identified by an alarm on the local, remote control station and DCS. Shutdown sequence shall be complete, including reset ready for automatic restarting. The turbine control system shall include provisions for HRSG interlocks. Provide variable inlet guide vanes on compressor inlet. Guide vanes shall be automatically controlled. Provide vane position indication at both local and remote control stations. Additional turbine control description is provided in SECTION 5.2.5.19. Additional interface description to the DCS is provided in SECTION 9.

Start-Up of Unit: Starting sequence for the unit shall be interlocked to prevent operation when conditions are not normal in all parts of the unit for satisfactory and safe operation. Upon actuation of the unit, start control from the control board or remotely:

1. Gas turbine auxiliaries are automatically energized in correct sequence.
2. If there are no malfunctions of the auxiliaries, the turbine is brought up to speed; otherwise the equipment is automatically shutdown, and an alarm is transmitted to the local control, remote control and the DCS.
3. Automatic governor and excitation control establishes the generated voltage at correct potential and frequency for synchronizing.
4. The equipment furnished shall assure that the generator voltage matches the bus voltage within limits safe to the equipment, with the bus voltage level within $\pm 5\%$ of set point.
5. Generator breaker shall close automatically under control of automatic synchronizing equipment.
6. Provide selection locally at unit for synchronizing automatically or manually by synchroscope and remotely from the remote station.
7. Upon automatic closure of the generator breaker, the unit shall load to a preset value.

5.2.5.1 Gas Turbine and Accessories

Summary: Gas Turbine-Generator unit shall be a gas turbine mechanically coupled to the electrical generator. Gas turbine-generator unit shall be a factory-assembled "package type" designed for automatic operation and shall be manufacturer's standard design as far as is consistent with the intent of these specifications.

Applicable Codes and Standards: Design, fabricate, assemble, install, and test equipment so that when operated in accordance with manufacturer's recommended procedures, it will conform to the applicable provisions of, but not limited to, the following standards:

1. National Electrical Manufacturers Association (NEMA):
SM33 - Gas Turbine Sound
2. American Society for Mechanical Engineers (ASME):
Boiler and Pressure Vessel Code for Unfired Pressure Vessels
B31.1 - Code for Pressure Piping
3. American Society for Testing and Materials (ASTM):
A53 - Welded and Seamless Steel Pipe
A312 - Seamless and Welded Austenitic Stainless Steel Pipe
4. Society for Protective Coatings (SSPC) Surface Preparation Specifications:
SP-10 - Near-White Blast Cleaning: At least 95% of every 9 square inches shall be free of visible residues
SP-11 - Power Tool Cleaning to Bare Metal

Factory Tests:

All standard factory tests on equipment and all tests required by the applicable codes shall be made including:

1. Rotor overspeed test at not less than 110% speed.
2. Vibration and mechanical balance of assembled rotating parts.
3. Lubricating system tests including hot oil flushing and bearing inspection.
4. Comprehensive tests of all systems and controls to assure proper assembly and connection, including simulation tests of all safety devices.

5. Hot oil flushing of all hydraulic and liquid fuel piping.

Notify Owner when factory tests are to be made so that they may have a representative witness the tests, if desired.

Submit certificate of completion of all other tests in triplicate.

5.2.5.2 Prime Mover

The prime mover shall consist of a gas turbine provided with all standard and special accessories as specified and as required for this application.

Gas turbines shall be designed to allow continuous operation.

Compressor inlet equipment shall include air ducting with inlet filters, expansion joints, and transition sections as required, complete with airtight hinged access doors. Modulating Inlet Guide Vanes (IGV) shall be included to control air-flows during start-up for protection against compressor surge and for improved part load performance during combined cycle operation.

The gas turbine ignition system shall be automatic. The ignition system shall provide for 100% backup, and the unit shall be capable of successful starts with 1/2 of the ignition system out of operation.

Gas turbine compressed air system shall be provided as required for blade cooling, seals, complete with instrumentation and alarms.

Main reduction gear shall be designed to conform to AGMA standards for service and application.

Frame-type industrial gas turbines shall be provided with a turning gear to prevent adverse deflections of the shaft during the cooling-off period following shutdown.

Provide cooling air if required to maintain proper turbine temperatures.

5.2.5.3 Governing System

Provide speed governing system including:

1. Speed governor on output shaft or shafts.
2. Fuel control mechanism.
3. Speed changer with provisions for remote adjustment.
4. Minimum fuel limiter.

Provide adjustable load limiter.

Provide fuel control systems, including control valves.

Provide temperature control system, including the following:

1. Temperature detectors.
2. Load limiting controls based on exhaust temperature.
3. Load limiting selector switch for selection of base or peak mode of operation.

Provide overspeed and over-temperature system, including the following:

1. Overspeed governor on turbine shaft.
2. Over-temperature detection.
3. Necessary protection equipment.
4. Fuel stop valves.

5.2.5.4 Fuel System

Provide fuel system complete and ready for operation, including the following:

1. All necessary control, trip, and stop valves.
2. Stainless steel gas piping.
3. Fuel strainers and dual filters with provisions to change filters under load.
Provide differential pressure gauges for all strainers and filters.
4. Gas flowmeters with $\pm 1\%$ system accuracy for the design fuel to measure net

fuel consumed. Supply meters complete with totalizer and other accessories as required to be incorporated into the manufacturer's normal unit control systems. Meter shall supply compensated electrical output proportional to flow.

5. Flowmeters shall meet accuracy requirements of CEMS / permit as a minimum.
6. Pressure switches, pressure gauges, and thermometers.
7. Electric heaters, insulation, and lagging as required.

5.2.5.5 Water/Steam Injection System

Provide water or steam injection system complete and ready for operation for power augmentation, including the following:

1. All necessary control, trip, stop, and check valves
2. Water inlet strainer with five-micron filter elements. Two 100% capacity strainers with on-line manual switching shall be provided. Differential gauges and transmitters shall be included.
3. Water injection pumps, motor driven. Provide two 100% pumps where 100% is defined as the flow for NO_x control or power augmentation flow whichever is greater. This will allow for one spare pump to be available when the gas turbine is operating in power augmentation mode.
4. Water injection manifolds and nozzles as required
5. Flowmeters to measure net water consumption for both emission control and power augmentation
6. Pressure gauges, pressure switches, thermometers
7. Water flow control and water injection system monitoring devices provided with data acquisition and storage
8. Relief valves
9. Recirculation valves and/or orifices, if required
10. Unit heaters and ventilation equipment, as required
11. Electrical heaters, heat tracing, insulation, and lagging as required
12. Turbine control system shall command injection water supply pumps which feed water to the turbine injection skid to start at the proper time in the engine starting sequence

Provide water or steam injection system with all required equipment, controls, wiring, piping, and valves to automatically supply injection water to the gas turbine at the proper pressure and in the required quantities.

5.2.5.6 Lubricating Oil System

Provide oil reservoirs and dual, full flow filters with replaceable-type cartridges.

Provide dual plate and frame type lube oil coolers with stainless steel plates.

Lube oil coolers and filters shall have ASME code stamp.

Provide all valves and controls necessary to regulate cooling water flow to maintain proper lube oil temperatures. Cooling water from the plant system will be used.

Provide complete lubricating oil system including the following:

1. AC Motor driven lube oil pumps
2. AC motor driven auxiliary standby lube oil pump
3. DC emergency bearing oil pump for safe shutdown of unit in the event of an AC power failure
4. Oil reservoir heaters with thermostatic controllers designed for -20°F
5. Oil piping, valves, instruments, and controls including connections to reservoir and cooling system. Lube oil supply piping shall be 304L stainless steel. Lube oil drain piping shall be carbon steel. Lube oil system valves shall have stainless steel trim.
6. Lube vent demister for mist elimination
7. Dial-type thermometers to indicate oil supply and return temperatures
8. Valves, controls, and indicating instruments as required

5.2.5.7 Starting System

Provide complete starting system capable of starting the unit over the range of ambient conditions specified.

Starting system shall be of the electric motor or use of generator as a motor to start unit is also acceptable.

Electric motor starting system shall include the following:

1. Electric starting motor sized to start the unit without exceeding nameplate horsepower rating.
2. Torque converter, couplings, and clutch.
3. All required controls.
4. Cooling system.

If generator is used as motor to start unit, provide all transformers, controls and interlocks necessary to provide for safe start-up of turbine.

5.2.5.8 Special Tools

Provide one set of any special lifting slings or fixtures required for routine inspections, hot gas path inspections, and major overhauls.

Provide one set of all special wrenches and tools required for maintenance.

5.2.5.9 Inlet Air Filter

Provide self cleaning inlet air filtration system, complete with filter housing and all required ductwork to install inlet air filter.

Arrangement shall be up and forward inlet system arrangement.

Face velocity at inlets shall not exceed 600 fpm.

Provide severe duty filter media (high humidity / corrosive environments).

Housing and ductwork shall be steel with hinged access doors. Provide caged ladder access to inlet filter compartment, electric hoist with 500 lb lift capacity, and inlet filter compartment interior lighting.

Provide dust collection kit under each module.

Provide Air Processing Unit (APU) for filter cleaning. Include APU heat tracing kit.

Provide inlet system differential pressure indicator and transducer to measure pressure drop across filtration system and provide an alarm to indicate dirty filters and initiate the self cleaning cycle.

Provide frost point detector with icing alarm.

Provide steel inlet louver complete with stainless steel bird screen over inlet and stainless steel inlet silencing perforated sheet.

Inlet ducting shall include inlet silencing, expansion joint, 90 degree elbow, transition piece, compressor inlet humidity sensor, and compressor inlet temperature thermocouple.

5.2.5.10 Exhaust Connection

Gas turbine shall be provided with an axial exhaust connection.

Provide expansion joint to minimize loads on turbine from ductwork expansion. Expansion joint shall be designed for axial, lateral, or angular displacements. Expansion joint material shall be suitable for use with gas turbine exhaust temperature.

Exhaust system shall be carbon steel shell and stiffeners with stainless steel internal lagging.

5.2.5.11 Bypass Stack

No bypass stack shall be provided.

5.2.5.12 Water Wash System

Provide water and/or solvent wash system complete with all piping, valves, pumps, motors, tanks, including freeze protection, and controls.

System shall be skid mounted and enclosed. System shall allow washing of compressor while turbine is either on- or off-line. Each wash skid shall service two gas turbines.

5.2.5.13 Insulation

Furnish and install all required thermal insulation including insulation for compressor, combustion chambers, turbine casing, exhaust ducts and hoods, piping, oil tanks, and as required for personnel safety. Include lagging if insulation is exposed.

Thermal insulation shall be designed so that outside surface temperature of lagging will not exceed ambient air temperature by more than 10°C when gas turbine is operating.

All insulation materials shall be asbestos-free.

5.2.5.14 Sound Control Equipment

Silencers and sound control equipment shall be designed and applied as required to attenuate all noise generating sources in the gas turbine generator unit, compressor inlet equipment, gas turbine exhaust equipment, and all auxiliaries as required to meet the guaranteed silencing criteria.

Silencers shall be durable construction with sound-absorbing media encased behind perforated panels of type of metal required for a service life equal to the normal design life of the facility.

5.2.5.15 Maintenance Access

Submittals shall include adequate data to determine size of crane required and access space required for crane.

Enclosure shall include provisions for the removal of components of the engine for maintenance with welding. Provisions at roof joints shall be made to prevent the entry of wind driven rain.

5.2.5.16 Fire Protection System

Provide fire detection system and fire protection system for turbine and accessory compartments and enclosures, including low pressure carbon dioxide supply system.

Provide compartment warning signs and compartment exterior alarms.

Provide fire detectors to trip the unit, actuate the fire protection system, stop ventilating fans, close ventilating louvers, and alert the operator.

System shall be of the prolonged-discharge type designed to provide proper concentrations in each protected area. Storage system shall be sized for two discharges.

Perform an acceptance test of system to verify proper operation and concentration during commissioning. Recharge all cylinders or tanks after test.

Provide hazardous atmosphere detectors and readouts for ammonia and hydrogen.

5.2.5.17 Vibration Monitoring Equipment

BFP shall be equipped with Bentley Nevada Vibration Monitoring Control monitoring systems. This system shall be tie to Block 1 main Bentley Nevada Vibration Monitoring System. Display data on both local and remote control station and the DCS.

5.2.5.18 Painting

Turbine-generator and appurtenances shall be surface cleaned to SSPC-SP10 with profile depth of 1.5 mils, and factory prime painted with one coat of inorganic zinc primer to a dry film thickness of 2.5 mils.

Turbine-generator and appurtenances shall be field painted with one coat of polyamide epoxy as follows:

1. Thoroughly clean all surfaces to be painted. Prepare uncoated and damaged coating areas to SSPC-11 quality.
2. Apply one coat of the same primer applied in the factory on all areas where shop coat has been damaged or areas which are uncoated.
3. Apply one finish coat with a minimum dry film thickness of 5.0 mils.

Colors will be selected from manufacturer's standard colors by Owner.

5.2.5.19 Gas Turbine – Electrical and Controls

General: Electrical equipment and controls shall be manufacturer's standard pre-engineered package and shall include all special and optional accessories required for the application.

Logic apparatus for automatic control of starting, operation, and shutdown of the gas turbine unit and gas compressors shall be microprocessor based system with communication links for interconnection with other gas turbine control systems and plant DCS. Communication links shall be redundant.

Electrical equipment and controls shall include all equipment required for operation of appurtenances furnished, other specified devices, and all safety equipment required for automatic shutdown of the plant in event of malfunction.

Factory fabricate and completely assemble and wire circuit breakers and switchgear at Contractor's manufacturing location. No welding shall be required to complete field assembly of these items. Pre-engineered enclosure shall include redundant air-conditioning.

Electrical equipment shall include the following:

1. Auxiliary switchgear, motor control centers and power panels as required.
2. 125Vdc power panel for dc controls, emergency motor power, and dc motor controls.
3. 125Vdc battery of capacity required for unit.
4. Local turbine and generator control boards.
5. Excitation equipment and controls.
6. Motors as required to run necessary auxiliary equipment.
7. Provision for remote control capability.
8. Complete logic control system for starting, synchronizing, shutdown, and protection of the unit (including gas compressors).
9. Protective relays for generator.

10. Generator surge protection equipment.
11. Redundant battery chargers.
12. Static or rotary inverter equipment, if required, for ac control power for emergency shutdown conditions.
13. Other equipment as required for application.
14. A manual transfer arrangement for the 480V power supply interlocked to prevent paralleling the unit supply and the standby supply.

References:

Institute of Electrical and Electronics Engineers (IEEE):

1. No. 21 - Outdoor Apparatus Bushings, General Requirements and Test Procedures.
2. No. 32 - Neutral Grounding Devices.
3. No. 24 - Electrical, Dimensional and Related Requirements for Outdoor Apparatus Bushings.

American National Standards Institute (ANSI):

1. C37.04 - Rating Structure for ac High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis.
2. C37.06a - Schedules of Preferred Ratings and Related Required Capabilities for ac High Voltage Circuit Breakers Rated on a Symmetrical Current Basis.
3. C37.09 - Test Code for Power Circuit Breakers Rated on a Symmetrical Current Basis.
4. C37.11 - Power Circuit Breaker Control.
5. C37.13 - Low-Voltage ac Power Circuit Breakers Used in Enclosures.
6. C37.16 - Preferred Ratings Related Requirements and Application Recommendations for Low-Voltage Power Circuit Breakers and ac Power Circuit Protectors.
7. C37.17 - Trip Devices for ac and General-Purpose dc Low-Voltage Power Circuit Breakers.
8. C37.20 - Switchgear Assemblies Including Metal-Enclosed Bus.
9. C37.90 - Relays and Relay Systems Associated with Electric Power Apparatus.
10. C37.100 - Definitions for Power Switchgear.

11. C57.12.00 - General Requirements for Liquid Immersed Distribution, Power, and Regulating Transformers.
12. C57.12.10 - Requirements for Transformers 230,000V and below 833/958 through 8,333 / 10,417 kVA, single phase, and 750 / 862 through 60,000 / 80,000 / 100,000 kVA three phase.
13. C57.12.70 - Terminal Markings and Connections for Distribution and Power Transformers.
14. C57.12.80 - Terminology for Power and Distribution Transformers.
15. C57.12.90a - Test Code for Liquid-Immersed Distribution, Power and Regulating Transformers.
16. C57.13 - Requirements for Instrument Transformers.
17. C76.1 - General Requirements and Test Procedure for Outdoor Apparatus Bushings.
18. C76.2 - Electrical, Dimensional and Related Requirements for Outdoor Apparatus Bushings.

National Electrical Manufacturers Association (NEMA):

1. SG1 - Electric Power Connectors.
2. SG4 - Standards for Power Circuit Breakers.
3. SG5 - Electric Switchboards.
4. LA1 - Lightning Arrestors.
5. TR1 - Standards for Transformers, Regulators, and Reactors.
6. E1-2 - Instrument Transformers.

Applicable rules of the National Electrical Code and National Electric Safety Code.

Factory Tests:

All standard factory tests on equipment and all tests required by the applicable codes shall be made including:

1. Standard ANSI dielectric tests.
2. Standard circuit breaker tests.
3. Comprehensive tests of all systems and controls to assure proper assembly and connection, including simulation tests of all safety devices.

Notify Owner and Engineer when factory tests are to be made so that they may have a representative witness the tests, if desired. Submit certificate of completion of all tests in triplicate.

PRODUCTS:

GENERAL: Design, fabricate, assemble, install, and test equipment in accordance with applicable standards specified above.

GENERATOR CONNECTION EQUIPMENT:

Provide generator surge protection equipment housed in a metal-enclosed dead-front enclosure, containing station-type lightning arresters and surge capacitors of proper rating to adequately protect the electrical apparatus. Surge protective equipment shall be physically arranged so as to be connected as close as possible to the generator terminals.

Provide generator neutral grounding distribution transformer and secondary resistor housed in a ventilated metal enclosure. Transformer and resistor shall be adequately sized for the generator based upon a one-minute rating.

RELAYING:

Provide all protective relays for the generator and auxiliaries as required for safe start-up, operation, and shutdown of the unit. See Section 8 for generator relaying requirements.

ELECTRIC MOTORS:

See SECTION 8.

SWITCHGEAR AND MOTOR CONTROL CENTERS:

480V switchgear, where provided, shall be metalclad dead front, indoor, 600V class equipment with drawout air circuit breakers and shall contain the following:

1. Air circuit breakers to have adequate interrupting capacity when fed directly from station auxiliary transformer.
2. Potential and current transformers for metering and relaying.

480V motor control centers shall be metal enclosed, dead front, NEMA Class II, Type B or C, equal to General Electric 8000 line and shall contain the following:

1. Air circuit breakers with adequate interrupting capacity when fed directly from station auxiliary transformer.
2. Motor starter and feeder circuit breakers of adequate quantity and size to supply all gas turbine auxiliary equipment.
3. Potential and current transformers for metering and relaying.

Three-phase ac circuit breaker panelboards shall have an adequate number and size of breakers to supply all equipment furnished.

125Vdc circuit breaker panelboard shall have an adequate number and size of breakers to supply all equipment furnished, plus a minimum of two 30-ampere or larger, two-pole breaker spare for Owner's future use.

BATTERY AND CHARGER:

Battery ratings shall be as follows:

1. 125Vdc.
2. Nominal 2.232V per cell.
3. Calcium-alloyed, lead-acid type.
4. Sized for 3 hours operation prior to recharging.

Charger ratings shall be as follows:

1. Input Voltage: 480V, 1 phase, 60 hertz.
2. Output Voltage: 125Vdc.
3. Output Current: Output as required carry continuous load plus recharge batteries in 6 hours.

TURBINE CONTROLS:

Provide a redundant microprocessor based control system to perform all control,

monitoring, alarming, data logging, and communications associated with the turbine. Include local operator station, and remote operator station. Control system shall include redundant communications to the plant DCS system.

The control system shall include the following functions:

1. Automatic startup and shutdown.
2. Speed/load control.
3. Temperature control.
4. Automatic synchronizing.
5. Monitoring and display of temperatures, flows, and pressures.
6. Speed, temperature, vibration, and flame protection.
7. Self diagnostics.
8. Data graphing and trending.
9. Data historian.
10. Alarm logging.
11. Redundant sensors for critical points.
12. Graphical and tabular displays.
13. Remote communication.
14. System administrative functions and security.

Relaying and Metering:

1. See SECTION 8.2 for protective relaying requirements.
2. Provide hand reset lockout relays.
3. Meters and display for generator frequency, field current, field voltage, three phase current, three phase voltage, kW, kWh, kvar, kvarh, power factor, and switchyard voltage.
4. Complete automatic synchronizing equipment for generator breaker including synchronizing relay, synchronizing check cut-off relay, speed matching, and voltage matching relays.
5. Synchroscope, lamps, and switch.
6. Generator breaker control switch and lights.

WIRING:

The gas turbine, generator, and all auxiliary equipment shall be prewired to the

maximum extent possible. The interconnecting wiring between all equipment furnished, except as otherwise specified, shall be furnished and installed by this Contract.

All low-voltage wiring of 600 volts or less shall consist of insulated conductors installed in zinc-coated rigid-steel conduit.

1. Conduit shall be sized and installed in accordance with the requirements of the National Electrical Code.
2. Low voltage wiring shall conform to the requirements of SECTION 8.

All high-voltage wiring above 600 volts shall conform to the requirements of SECTION 8.

Appropriate power and control cable terminals shall be provided within the unit enclosure for external cable terminations. Arrange for grouped entrance of external control and low-voltage connections, and provide cable tray or wireway systems in unit for connection of all 600-volt wiring from point of entrance to internal equipment.

All devices for nominal 125Vdc operation shall provide satisfactory operation for a range of voltage of 100 to 140 volts with a 120°F ambient temperature.

All electrical devices and wiring located under the casing of the machine or at other high-temperature locations shall be specifically designed and constructed of suitable materials to give satisfactory operation in the high ambient temperatures involved.

Low-level instrumentation circuits shall be run in separate conduits. Instrumentation terminal points shall be isolated from other voltage levels.

5.2.6 Steam Turbine (STG)

Contractor shall provide a steam turbine generator unit complete with auxiliaries, appurtenances, and accessories, as required by the manufacturer and as specified herein, including all materials, services, and all required labor necessary for a complete

functional installation, including all requirements for startup and testing.

Furnish the turbine generator unit complete with all piping between contiguous component parts, and with all wiring specified. All equipment and materials supplied shall be from manufacturers on the Approved Vendors List – Appendix B, unless approved by Owner. Contractor shall provide technical assistance and guidance for installation and placing the turbine generator unit into successful operation as specified.

Contractor shall provide technical review and coordination, shop inspection, expedition, shipping coordination, shipping inspections, receiving inspections, off-loading site storage and maintenance. Contractor shall submit an inspection program for Owner approval.

Design pressure, temperature and materials for all piping shall be based on the steam turbine manufacturer's standard, but not less than applicable ASME Boiler and Pressure Vessel Code and ANSI B31.1 requirements.

Contractor shall provide acoustical enclosures or lagging for noise control of the STG control valves to meet noise guarantees.

Applicable Codes and Standards: Design, fabricate, assemble, and test equipment so that upon installation and operation in accordance with manufacturer's recommended procedures for this application, the equipment will conform to the requirements of the applicable provisions of the standards including, but not limited to, the following or Engineer approved equivalent BS, ISO, or DIN standards:

1. American National Standards Institute (ANSI):
 - A. C1 - National Electrical Code (NEC)
 - B. C42.1 - Definition of Electrical Terms, Group 10 Rotating Machinery
 - C. C50.10 - Rotating Electrical Machinery - Synchronous Machines
 - D. C50.13 - Rotating Electrical Machinery - Cylindrical Rotor Synchronous Generators
2. American Society of Mechanical Engineers (ASME):

- A. Boiler and Pressure Vessel Code
 - B. B31.1 - Power Piping
 - C. TDP-1 - Recommended Practice for the Prevention of Water Damage to Steam Turbines Used for Electric Power Generation
3. American Society for Testing and Materials (ASTM):
- A. A194 - Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service
 - B. A437 -Alloy-Steel Turbine-type Bolting Material Specially Heat Treated for High-Temperature Service
4. Institute of Electrical and Electronics Engineers (IEEE):
- A. 4 - Techniques for High Voltage Testing
 - B. 421 - Criteria and Definitions for Excitation Systems for Synchronous Machinery
 - C. 421a Guide for Identification, Testing, and Evaluation of the Dynamic Performance of Excitation Control Systems
 - D. 421b - Synchronous Machines, High-Potential Test Requirements for Excitation Systems
5. National Electrical Manufacturers Association (NEMA)
6. Tubular Exchanger Manufacturer Association (TEMA)
7. Hydraulic Institute (HI)

Experience: All equipment and material furnished shall have an acceptable history of satisfactory reliable service in central station use for a period of at least three years at comparable temperature, pressure, voltage, and design stress levels.

Newly-developed equipment with less than three years' actual service will be considered from established manufacturers, only if it has been adequately tested, meets the

requirements of this Contract, and is approved by Owner.

Factory Tests and Reports:

Before shipment, conduct the following tests:

1. Turbine Tests:
 - A. Mechanical balance
 - B. Overspeed test of rotors with blades at not less than 120% rated speed
 - C. Governor and control function operation
 - D. All standard factory tests
2. Generator Tests:
 - A. Mechanical inspection
 - B. Rotor balance, with rotor at normal maximum operating temperature
 - C. Rotor overspeed at 120% rated speed
 - D. Measurement of cold resistance of stator and rotor windings
 - E. Winding insulation resistance measurement
 - F. Standard IEEE 4 dielectric tests on stator and rotor
 - G. Pressure test on hydrogen-cooled stator frame for gas tightness (if provided)
 - H. Resistance temperature detector test
 - I. For liquid conductor cooled stators, test for flow continuity through windings
 - J. All standard factory tests
3. Provide Owner a list of all factory tests and a test schedule so that a representative may witness the tests.

Results of tests shall be submitted to Owner for review. All factory test results shall be available for examination by Owner upon request.

5.2.6.1 General

Provide each turbine generator unit with all accessories and features normally included with a unit for erection. Arrange equipment and appurtenances for safe and ready access for operation and maintenance. Provide access into enclosures and appearance lagging as required for operation and maintenance.

Provide adequate ventilation in enclosures and appearance lagging for proper cooling of equipment. Provide cooling systems, where required, for equipment that will not operate satisfactorily due to ambient temperature. Control, excitation, and supervisory equipment room will be air conditioned to an ambient temperature of 80°F; however, in case of failure of air conditioning, equipment shall operate satisfactorily at 100°F for continuous periods up to 48 hours, with peaks of 50°C for 3-hour periods during the 48 hours.

Provide couplings for fans, pumps, and other motor-driven equipment as follows:

1. All couplings shall be rated at not less than 140% of the motor horsepower.

Flexible drive couplings shall be as follows:

- A. Designed to prevent any external thrust from being transmitted to the driver shaft under normal operating conditions
- B. Fast gear type, flexible disc type, or approved equal
- C. Equipped with rainhood or cover for outdoor installations

2. Drive couplings shall have guards as follows:

- A. Complying with all applicable state and federal safety requirements
- B. Arranged for ease of disassembly or removal for access to coupling
- C. Rigidly fastened to baseplate
- D. Conform to other specific requirements of these Specifications, as

applicable

3. Bolts, nuts, screws, and other standardized fasteners shall conform to the applicable ASTM A194 or A437 standards, except where higher standards for high temperature and pressure are deemed necessary by the manufacturer. Provide tools and wrenches for each nonstandard item.
4. Provide preservation and protection, suitable for overseas shipment and storage as specified in DIVISION 1. Submit description and details of preservation and protection systems and recommended storage procedures.
5. Unit shall be designed, constructed, and balanced statically and dynamically so that vibration displacement at the bearings at synchronous speed through full-load operation will not exceed Contractor's recommended operating limits.
6. Provide one set of electric bolt heaters, all special erection tools, lifting devices, special instruments, and other special equipment required for erection and installation of the unit. Provide metal storage cabinet for all special tools, wrenches, and instruments.
7. Provide temporary valve cover plates complete with pipe spools with weld end preps, and internal protective shields as required for main stop and reheat stop valves, for steam blowdown. Provide at least one complete set, suitable for use on up to eight turbines.
8. Provide lifting lugs to facilitate disassembly and maintenance. All piping that must be removed for overhaul of turbine shall be equipped with lifting lugs that protrude through the heat insulation. Provide a lifting beam so that the crossover piping (if applicable) can easily be removed as a single unit during disassembly.
9. Hanger assemblies, anchors, and sway braces shall be designed in accordance with the latest editions of the MSS Standard Practice SP-58 and SP-69. Design for seismic zone and building code specified in DIVISION 1.

5.2.6.2 Turbine

The turbine shall be of the multivalve, multistage type. Single governor valves are not permitted. All parts which are subject to temperature changes shall be designed and supported so as to permit free expansion and contraction in order to minimize distortion or misalignment.

Turbine Casings:

1. The casing shall be supported at the centerline, with flexible supports at the high-pressure end.
2. Provisions shall be made in the design of the turbine to control thermal stresses in the turbine casing.
3. Special provisions shall be made in all bolting 50 mm in diameter and larger for tightening.
4. The bearings shall be arranged to permit inspection without removal of the turbine casing.

Turbine Rotor:

1. The rotor shall be of forged construction, with wheels forged integrally with the shaft, as required by design operating conditions. Dovetailed grooves shall be turned in the wheels to securely hold the individual blades.
2. The completed turbine rotor shall be balanced in the manufacturer's plant in order to run smoothly and without excessive vibration.
3. Provisions shall be made in the design and manufacture of the rotor to minimize stress concentrations.

Turbine blading shall be stainless steel and shall be securely and adequately anchored and shall be readily renewable. Welding of blading to wheel disc will not be acceptable in any stage.

Diaphragms:

1. All diaphragm blading shall be of stainless steel.
2. Each diaphragm shall be split along the horizontal centerline and a doweled tongue and groove joint shall be provided to assure correct alignment and prevent interstage leakage.
3. The diaphragm halves shall be securely positioned in the casing of inner element.

Bearings:

1. All bearings shall be designed for pressure lubrication and shall operate without injurious temperature rise or undue wear.
2. All bearings shall be split to permit removal for inspection and shall be removable without removing the rotor.
3. All main bearings shall be provided with a positive visual check for oil flow through the bearings via sight flow indicators. Leakage of oil or oil vapors from the bearing housings shall be minimized.
4. A double-acting tilting pad, multisegment thrust bearing shall be provided to align and maintain the correct axial relationship between the rotating and the stationary parts.

All turbine drains and low point pipe drains will be piped to the condenser. The drain valve controls will be per the manufacturer's recommended design and in general accordance with ASME TDP-1.

Complete control and protective valve system including the following:

1. Main stop valves designed to withstand boiler hydrotest pressure of 1.5 times HRSG drum pressure.
2. Control valves automatically controlled by governor system.
3. Turbine anti-motoring sensor.
4. Devices as required for use with control and monitoring systems specified

below to allow sequential remote testing of main stop valves, and control valves, while turbine is in operation.

5. Provide first-stage pressure sensor, for steam flow measurement.
6. Coarse mesh screens with removable fine mesh start-up screens, removable without disturbing inlet piping, or permanent fine mesh strainers, for main stop valves.
7. Proximity switches for main stop valves, and control valves, with two N.O. and two N.C. electrically separate pairs of contacts for Owner's use at each end of each valve mechanism with space for additional special switches specified below.
8. Hydraulic system trip interlock pressure switch with two electrically separate contacts for Owner's use, for tripping of generator and electrical auxiliary system upon tripping of turbine, if such tripping interlock scheme is recommended by the manufacturer. Provide indication of what caused the turbine to trip.
9. Power-operated drain valves, equipped with solenoid valves and limit switches on each valve if pneumatically operated, and piping between turbine and drain valves. Valves will be operated from the turbine control system. If motor-operated valves are furnished, provide position transmitters in addition to limit switches on each valve. Provide double valves at all steam drains above 400 psig. Where power-operated valves are provided, the first valve shall be manually-operated and provided with a locking device. High-pressure steam drain valves shall have the following:
 - A. Pressure seal bonnet for valves 4 inches and larger, no bonnet or welded bonnet for valves 3 inches and smaller
 - B. Butt-welding ends for valves 2½ inches and larger, socket weld ends for valves 2 inches and smaller
 - C. to 14% chromium steel trim
 - D. Stellite or 11.5 to 14% chromium disc and seat facings.

- E. Integral stellite or 11.5 to 14% chromium back-seating surface
 - F. 600-, 900-, 1500-, or 2500- class cast steel or forged steel bodies, complying with applicable ANSI standards
 - G. Valves shall be manufactured by vendor listed in Appendix B – Approved Vendor List
10. Piping between main stop valves and turbine as required to locate valves either out from under the turbine and its foundation, or above its foundation, including all necessary hangers and supports for the valves and piping.

Exhaust casing spray nozzles with automatic control and internal turbine piping. Include diaphragm (or solenoid) control valve and sensing element for control.

Motor-operated or hydraulically operated turning gear including the following:

1. Turbine control system shall be capable of automatically starting and engaging turning gear.
2. Provide for local manual turning gear (or hydraulic oil pump) motor starting and turning gear engagement should the automatic feature fail.
3. Interlock with lubrication system to prevent operation without bearing lubrication.
4. Zero speed device to prevent automatic starting or engagement while rotor is turning.
5. Electrically separate alarm contacts to indicate zero speed and turning gear disengagement.

All required protective devices including the following:

1. Exhaust hood atmospheric relief diaphragms.
2. Exhaust hood high-temperature alarm.
3. Thrust bearing failure detector with trip function.

4. HP/IP Shell casing packing dump valve if required.

Provide all instruments required to monitor operation of the turbine unit. Instruments shall include at least the following:

1. Thermocouples for at least the following:
 - A. Turbine shells, exhaust hoods, valve casings, and as otherwise required for controlled starting and warm-up
 - B. Thrust bearing shoes
 - C. Main bearing metal temperatures including generator bearings
 - D. Main bearing oil drains including generator bearings
 - E. Thrust bearing oil drains
 - F. Oil inlet and oil outlet of oil coolers
 - G. Hydraulic fluid in and out of coolers
 - H. Lube oil reservoir
2. Thermometers for at least the following:
 - A. Main bearing drains including generator bearings
 - B. Thrust bearing drains
 - C. Exhaust hood
3. Pressure gauges for at least the following:
 - A. Exhaust hood water spray
 - B. Gland condenser vacuum
 - C. Steam chest
 - D. First-stage steam

- E. HP turbine exhaust steam
 - F. LP turbine exhaust steam
 - G. Gland steam header
4. Electronic pressure transmitters for the following:
- A. Lube oil header
 - B. Throttle (before stop valve)
 - C. Control valve chest (between stop and control valve)
 - D. Turbine First Stage
 - E. LP inlet stage
 - F. Turbine Exhaust
 - G. Electrohydraulic control fluid pressure
 - H. Gland steam pressure

5. Provide smart transmitters per the requirements in SECTION 9.

Rotor ground device and grounding pad on exhaust hood and/or bearing standard.

Heat retention insulation for the following:

- 1. Upper and lower turbine shells.
- 2. Steam valve bodies.
- 3. Exhaust casings where required.
- 4. All steam piping furnished with unit.
- 5. Horizontal and vertical joints. Provide reusable blankets.

Insulation jacketing as follows:

- 1. Aluminum jacket for all insulated piping.

2. Removable insulation-filled stainless steel covers for the following:
 - A. Main stop valves.
 - B. Valve flanges at turbine shells.
 - C. Flanges in crossover pipes.

Metal appearance lagging over HP turbine shells and associated stop and control valves and piping to shells.

Moisture protection system for low-pressure stages.

Exhaust connection suitable for welding to condenser neck.

Shims, subsole plates, leveling plates, seating plates, and sole plates.

5.2.6.3 Electrohydraulic Control System

System shall automatically position the various valves listed above as required to control the turbine-generator speed and load under varying conditions plus trip the unit when overspeed or other abnormal conditions occur. Provide means to initiate and monitor sequential remote testing of the valves and other protective and trip devices during operation of the unit.

Hydraulic portion of the system shall be independent of lubricating oil system complete with reservoir, multiple ac motor-driven pumps, hydraulic fluid coolers, accumulators, filters, strainers, instruments, controls, valves, and all required supply and return hydraulic fluid piping to the main turbine.

1. Instruments and controls in the hydraulic portion of the system shall include at least the following:
 - A. Suction and discharge pressure gauges on all pumps and on the discharge header.
 - B. Pressure switches for control of all electrohydraulic fluid pumps.
 - C. Thermometers on electrohydraulic fluid lines at the inlet and discharge of coolers.

- D. Temperature controllers and cooling water control valves to regulate electrohydraulic fluid temperature at the discharge of each cooler.
- E. Instrument and sensors to provide electrically separate alarm contacts for Owner's use for the following:
 - 1) Electrohydraulic fluid reservoir high level.
 - 2) Electrohydraulic fluid reservoir low level.
 - 3) Electrohydraulic fluid reservoir low-low level.
 - 4) Electrohydraulic fluid system low pressure.
 - 5) Electrohydraulic fluid temperature high.
 - 6) Electrohydraulic fluid system filters dirty.
 - 7) Others as required by the turbine supervisory and control systems.

Instruments and sensors as required by the turbine supervisory and control systems for operation of turbine.

- 2. All piping shall be stainless steel with welded joints and a minimum of flanged connections. Piping shall be cleaned internally and then sealed using weld caps or blind flanges before shipment.
- 3. System shall use fire resistant fluid such as FYRQUEL or Owner approved equal.

5.2.6.4 Turbine Control System

The control system shall provide supervisory control of turbines, turbine auxiliaries, generators, and generator auxiliaries. The system shall provide startup, operation, load change, and shutdown, as well as monitoring, alarming, and safety trips for the steam turbine generator unit.

The turbine control system shall be interfaced to the plant DCS control system through a redundant communications link. All operator functions shall be capable from the plant DCS control system. Contractor shall provide a turbine control system that meets the following requirements and the DCS control system requirements in SECTION 9.

The turbine control system hardware will be installed in close proximity to the steam turbine. Provide a remote operator station for the main control room and a local operator

station for the electrical equipment room. Remote operator station shall have identical hardware and software as the local operator station.

Provide means to initiate and monitor sequential remote testing of the valves and other protective and trip devices during operation of the unit.

Provide all sensors, transducers, and transmitters required by the system.

Provide all control, logic and input-output modules, associated power supplies, and related items, installed in a system cabinet assembly, to perform the control functions specified herein.

Provide electrically separate alarm contacts for the DCS use for at least the following:

1. Turbine trip
2. Pre-trip and trip alarm contacts for every turbine trip condition
3. System power supply failure
4. Others as required or recommended by manufacturer

Provide capability of operating in any of the following modes as selected by the operator:

1. Coordinated Boiler-Turbine Mode using a load demand signal generated by Owner's automatic load dispatching system.
2. Coordinated Boiler-Turbine Mode using a load demand signal manually generated from DCS.
3. Boiler Following Mode with turbine valves maintaining speed or load.
4. Turbine Following Mode with turbine valves controlling throttle steam pressure.

Provide a hard wired interface from the turbine control system to DCS for all critical controls, indicators, and interlocks.

Provide controls to allow DCS to immediately reduce the load on the steam turbine

generator. The immediate response of the system shall be impeded upon only by the constraints of the hydraulic system.

5.2.6.5 Turbine Rotor Stress Monitoring

System shall automatically and continuously calculate rotor stresses that occur when temperatures change with machine loading.

System shall operate on the turbine control system hardware.

System shall be capable of operating in at least two separate modes. These modes are:

1. Monitor: In this mode, the system makes available to the operator data required for safe and proper operation of the turbine-generator unit. In this mode, system performs no control functions and all decisions regarding changes in speed or load, rates of change, and other variables are left to the operator.
2. Control: In this mode, the system shall automatically prevent the operator from changing unit load or turbine speed if limits established by the automatic control program or by the operator are exceeded. The system shall also be capable of automatically ramping the turbine from turning gear speed to a target speed, initiating a signal to automatically synchronize the turbine-generator unit, and loading the unit to a target load at a rate selected by operator or as limited by the automatic control program.

Provide all sensors and transducers required by the system.

5.2.6.6 Turbine Supervisory System

System shall automatically monitor at least shaft vibration, vibration phase angle, eccentricity, differential casing and rotor expansion, metal temperatures, speed, and control valve position. Display essential values continuously and alarm any abnormal condition during start-up and operation.

Provide all sensors and transducers required by the system.

Display all information on the turbine control system interface and plant DCS display.

Provide alarms for at least the following:

1. High vibration for all bearings.
2. Rotor eccentricity off normal.
3. Differential expansion off normal.
4. Rotor position alarm.

5.2.6.7 Lubrication System

The turbine lube oil system shall be installed, cleaned, and flushed according to the manufacturer's specifications. Lube oil type and purity shall be in accordance with the steam turbine generator manufacturer's specifications.

Provide a complete lubrication system including but not limited to the following:

1. Oil reservoir with oil level indicator and oil level alarms. Reservoir shall have adequate capacity above maximum lube oil high level alarm to receive the flowback from the lube oil system under tripout conditions
2. Full-capacity positive-displacement or centrifugal-type main oil pump, either shaft-driven or with ac motor drive
3. Full-capacity positive-displacement or centrifugal-type auxiliary oil pump with ac motor drive
4. Positive-displacement or centrifugal-type emergency oil pump with dc motor drive and starter
5. Oil coolers, either two full-capacity or one three-section type with two sections capable of carrying full capacity
6. Transfer valve so that one tube bundle or section can be removed while remaining cooler or sections are in operation
7. Vapor extractor with ac motor drive

8. Lube oil demister
9. Removable strainers for use during start-up at each bearing inlet and at oil return to reservoir, and at other locations as required by manufacturer
10. Lube oil heater interlocked with a low oil reservoir liquid level switch for alarm and to trip the heater to prevent a fire

Provide instruments required for operation. Instrument signals shall be integrated into the turbine control system. Instruments shall include at least the following:

1. Pressure gauges on all pump suction and discharge lines and on the lube oil header
2. Pressure switches for control of all lube oil pumps
3. Thermometers on oil lines at the inlet and discharge of lube oil coolers
4. Thermocouple complete with well for control of cooling water flow
5. Lube oil reservoir level high
6. Lube oil reservoir low level switch
7. Lube oil reservoir level transmitter
8. Differential pressure switch across filters
9. Emergency lube oil pump running
10. Redundant pressure switch to start dc emergency oil pump. Switch shall be located at a different location from the other pressure switch.
11. Others as required by the turbine control system
12. Loss of ac power relay to start dc emergency pump

Provide all required lube oil supply and return piping. Oil pressure piping shall be seamless steel with welded joints, and a minimum of flanged connections. Oil piping shall be thoroughly cleaned by pickling and then sealed using weld caps or blind flanges before shipment. For protection against fire, oil piping shall be suitably shielded with no

flanged joints located above or adjacent to hot surfaces. All lubricating oil piping under pressure in high temperature areas shall be contained within a drain or return line, or within a tight housing which is suitably drained back to a reservoir. Drains shall have adequate capability of returning the oil supplied to any area in the event of a complete rupture of the oil supply pipe in that area. All drain pipes shall be sloped to provide complete drainage of the system back to the lubricating oil reservoir.

5.2.6.8 Gland Steam System

Provide a complete gland sealing system including but not limited to the following:

1. Steam seal pressure control valves, one for each steam source and one for dump to condenser
2. Full-flow gland steam condenser with two ac motor-driven exhausters, both permanently mounted to the condenser
3. Power-operated diaphragm shutoff and bypass valves with remote position indicators as required to manually control gland steam from the turbine control system should regulators fail
4. Valves and all required piping from pressure control valves to turbine and from turbine to gland condenser
5. The gland sealing system shall have the following features:
 - A. The gland sealing system shall not require an external source of steam other than main steam at throttle conditions, or drum steam after pressure reduction. An auxiliary supply of saturated steam shall be provided by Contractor to seal the turbine prior to start-up.
 - B. Gland leakage shall be returned to the cycle by the gland sealing system provided, except such portions as may be contaminated by air or oil vapor.
 - C. Gland steam valves shall be of an Owner-approved type with stellite or 11.5 to 14% chromium seats.

- D. Provide removable flanged spool piece at each connection to the turbine gland seal piping to facilitate steam cleaning of the gland steam system in accordance with the manufacturer's recommendations.
6. Provide all instruments required for operation. Instrument signals shall be integrated into the turbine control system. Instruments shall include at least the following::
- A. Low steam seal pressure switch
 - B. High water level switch in gland steam condenser
 - C. Gland steam temperature sensor

5.2.7 Combustion and Steam Turbine Electrical Generator

5.2.7.1 General:

Generator shall be cylindrical rotor type designed, constructed, and rated in accordance with applicable standards for specified service conditions.

The steam turbine generators will be connected to the delta wound primary of the Generator Step-up (GSU) Transformer. The secondary of the GSU will be solidly connected grounded type wye configuration. The unit will be synchronized across the high side switchyard breaker. See SECTION 8 for additional requirements.

The gas turbine generators will be connected in a high resistance grounded wye configuration through a neutral grounding transformer with neutral grounding resistor connected to transformer secondary. The generator will be connected to a low side generator breaker that is connected to the low side of the GSU. The unit will be synchronized across the low side breaker. See Section 8 for additional requirements.

5.2.7.2 Applicable Codes and Standards

Design, fabricate, assemble, and test equipment so that upon installation and operation in accordance with manufacturer's recommended procedures for this application, the equipment will conform to the requirements of the applicable provisions of the standards (or equivalent IEC standards) including, but not limited to, the following:

1. American National Standards Institute (ANSI):
 - A. B31.1 - Code for Pressure Piping - Power Piping
 - B. C1 - National Electrical Code
 - C. C42.1 - Definition of Electrical Terms, Group 10 Rotating Machinery
 - D. C50.10 - General Requirement for Synchronous Machines
 - E. C50.13 - Cylindrical Rotor Synchronous Generators
 - F. C57.13 - Requirements for Instrument Transformers
2. American Society of Mechanical Engineers:
 - A. Boiler and Pressure Vessel Code
 - B. B31.1 - Power Piping
3. American Society for Testing and Materials (ASTM):
 - A. A194 - Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service
 - B. A437 - Alloy-Steel Turbine-Type Bolting Material Specially Heat Treated for High-Temperature Service
4. Institute of Electrical and Electronics Engineers (IEEE):
 - A. 4 - Techniques for Dielectric Tests
 - B. 21 - Outdoor Apparatus Bushings, General Requirements and Test Procedure
 - C. 32 - Neutral Grounding Devices
 - D. 421 - Criteria and Definitions for Excitation Systems for Synchronous Machinery
 - E. 421a - Guide for Identification, Testing, and Evaluation of the Dynamic Performance of Excitation Control Systems

F. 421b - Standard for High-Potential Test Requirements for Excitation Systems for Synchronous Machines

5. National Electrical Manufacturers Association (NEMA).
6. Tubular Exchanger Manufacturer Association (TEMA).

5.2.7.3 Quality Assurance

All equipment and material furnished shall have an acceptable history of satisfactory reliable service in central station use for a period of at least three years at comparable temperature, pressure, voltage, and design stress levels.

Newly-developed equipment with less than three years' actual service will be considered from established manufacturers, only if it has been adequately tested, meets the requirements of this Contract, and is approved by Owner.

5.2.7.4 Factory Tests

All standard factory tests on equipment and all tests required by the applicable codes shall be performed including:

Mechanical inspection.

1. Rotor balance, with rotor at normal maximum operating temperature.
2. Rotor over-speed at 120% rated speed.
3. Measurement of cold resistance of stator and rotor windings.
4. Winding insulation resistance measurement.
5. Standard IEEE 4-1978 dielectric tests on stator and rotor.
6. Pressure test on hydrogen-cooled stator frame for gas tightness (if provided).
7. Resistance temperature detector test.
8. Lubricating systems including hot oil flushing and bearing inspection.
9. Comprehensive tests of all systems and controls to assure proper assembly

and connection, including simulation tests of all safety devices.

Provide Owner and Engineer a list of all factory tests and a test schedule so that they may have a representative witness the tests, if desired.

Submit certificate of completion of all tests and test reports for all tests. All factory test results shall be available for examination by Owner upon request.

5.2.7.5 Submittals

Submittals required shall include all manufacturer's drawings necessary for design, installation, and operation of equipment furnished, including the following:

1. General outline, base plans, and general arrangement drawings
2. Detailed installation drawings showing foundation details, location connections, weights, and all clearances required for erecting, operating, and dismantling
3. Complete loading diagrams covering static and dynamic loadings for all conditions of operation
4. Schematic wiring diagrams showing all external connection terminal block numbers
5. Complete connection diagrams showing all internal wiring
6. Power and instrument transformer connection and polarity diagrams
7. Instrument transformer performance curves and data
8. Bills of material
9. Drawings showing additional detail if requested by Engineer, or if otherwise required for installation and maintenance

Wiring drawings shall include connection drawings both internal and external, NEMA Standard across-the-line industrial control schematic drawings for all control systems provided or designed by Contractor, physical location drawings for all terminal blocks, and power requirements.

5.2.7.6 Products

GENERAL: Generator stator core shall be so designed and constructed (or flexibly mounted) as to minimize the effects of 120-cycle vibrations on stator frame, foundation, and other structures.

Generator cooling system shall be totally enclosed hydrogen cooled or Totally Enclosed Water Air Cooled (TEWC) with Class F insulation on stator and rotor and limited to Class B temperature rise.

GENERATOR:

1. Minimum net continuous rating of 105% of the turbine peak output at 85% lagging to 95% leading power factor
2. General output voltage $\pm 5\%$ of nominal
3. TIF maximum (1960 weighting), balanced: 40
4. TIF maximum (1960 weighting), residual: 30
5. Minimum short circuit ratio at rated hydrogen pressure: 0.5.

COOLING SYSTEM:

1. The internal generator cooling air shall be adequately filtered and controlled to permit operation without adverse effects on the service life of the insulation or condensation and corrosion of generator iron.

EXCITATION SYSTEM:

1. Provide self-excited main exciter of brushless or static type, having stabilized voltage.
2. Provide control system with fast-acting response, and suitable voltage regulator arranged for local and remote control.
3. Provide excitation control breaker and field discharge or field suppression contactor and resistor.

4. Provide all necessary current transformers, potential transformers, relays, protective devices, and supervisory safety monitoring devices.
5. Generator excitation equipment shall be housed in a metal-enclosed NEMA dead-front enclosure and contain the following:
 - A. Excitation control circuit breaker or field suppression control
 - B. Linear field discharge resistor if required
 - C. Voltage regulator
 - D. Ammeter shunt
 - E. Regulator shall be equipped with tie-line power factor compensation, cross-current compensation, and maximum and minimum excitation limits
 - F. Provisions to interface with distributed control system (DCS) for remote reactive power and voltage control

6. General:

All excitation system voltage response ratios stated herein are to be as defined and recommended in IEEE 421, and shall be determined with the excitation system connected to the generator field, or an equivalent resistive load as described by IEEE 421a. A factory test or an analytical method may be used in determining acceptance of the voltage performance.

7. Provide a complete excitation system of one of the following types:

A. Static type including the following:

- 1) Provide separate dry-type power potential transformer in a free-standing metal enclosure provided with high voltage bushings and flanges for connection to isolated phase bus duct. Overcurrent relay and associated CTs for transformer protection shall be provided.

- 2) Collector enclosure with internal illumination, hinged access doors, observation windows, and ventilation system.
- 3) Metal-enclosed excitation cubicles with voltage regulator, generator supply breaker, field ground detector, silicon rectifiers, and all required control circuits and accessories.

B. Brushless rotating rectifier type including the following:

- 1) Permanent magnet pilot exciter, ac exciter, and a diode and fuse wheel directly connected to the generator shaft. Each diode must have series fuse.
- 2) Exciter enclosure with internal illumination, hinged access doors, observation windows, and cooling system.
- 3) Metal-enclosed excitation cubicles with voltage regulator, exciter supply breaker, automatic field ground detector, and all required control circuits and accessories.
- 4) Furnish an excitation system communication interface to the plant distributed control system to allow operator to monitor and control the excitation system.

8. Provide the following special excitation system features:

- A. Ten additional auxiliary contacts on exciter field breaker. This may be by the addition of a multi-contact auxiliary relay
- B. Provide field ground detection relays for main generator and exciter field
- C. Fuses and terminal blocks for all components of excitation system requiring 220 volts ac or 125 volts dc station service power
- D. Line drop compensation for voltage regulator
- E. Maximum and minimum excitation limit equipment
- F. Two-step maximum volts per hertz excitation protection and limiter

- G. Provisions for the addition of supplemental excitation controls to control excitation in response to generator rotor angle
- H. Dual input power system stabilizer utilizing integral of accelerating power with system studies, settings, and field tuning
- I. Provide main generator field ground detection relay with proper sensitivity and adequate security to use to trip the unit. Provide unit with time delay to prevent trip for momentary field ground
- J. Automatic regulator tracking control for manual regulator.
- K. Regulator and power system stabilizer output status contacts to Owner's SCADA system.
- L. Provide transducers with 4 to 20 mA output to Owner's DCS for exciter field voltage and current.
- M. Hydrogen/temperature Limiter Compensation.
- N. Overvoltage trip.
- O. Provide field overcurrent protection system that has characteristics similar to the thermal capability of the rotor so as to permit full utilization of the rotor thermal capability, but that will positively prevent overcurrent which could damage the rotor. An offline field current limiter shall be provided
- P. Field flashing system for operation using station 125V battery, or separate 460-volt, 3-phase system.
- Q. The exciter shall be capable of maintaining 2.0 pu., or greater, excitation voltage while generator terminal voltage is 0.5 pu
- R. Power factor and VAR automatic control.
- S. Communication ports to Owner's DCS.
- T. Off line excitation protection.
- U. Display panel with self diagnostics

HYDROGEN SYSTEM: (As applicable if Provided by OEM for cooling)

1. Provide hydrogen coolers arranged and sized with adequate capacity to provide 80% generator capability with one isolatable cooler, or section (as applicable), out of service. All fasteners (nuts, bolts, and similar items) exposed to the cooling water shall be stainless steel. Arrange cooler vents for convenient access below the operating floor
2. Provide hydrogen bottle manifold including pressure gauges, shutoff valves, mounting brackets, bottle connectors, piping and a single shutoff valve. Provide a flanged removable section of pipe between the hydrogen shutoff valve and generator for removal while performing generator maintenance.
3. Provide carbon dioxide and nitrogen bottle manifolds including pressure gauge, shutoff valves, mounting brackets, bottle connectors, and single shutoff valve.
4. Provide piping, valves, regulators and analyzer as follows:
 - A. Generator hydrogen pressure regulator with shutoff valves and bypass line
 - B. Purging control valve assembly
 - C. Purging gas analyzer
 - D. Welded steel gas control system piping
5. Provide instrument and controls as follows:
 - A. Electronic transmitters as follows:
 - 1) Generator hydrogen purity
 - 2) Generator hydrogen pressure
 - 3) Generator fan differential pressure
 - 4) Hydrogen density

- 5) Hydrogen dewpoint
- B. Sensors as required to provide at least the following alarms at the hydrogen controls cabinet.
- 1) Generator hydrogen purity high and low
 - 2) Generator hydrogen pressure high and low
 - 3) Hydrogen supply pressure low
 - 4) Generator hydrogen temperature high
 - 5) High Hydrogen dewpoint
 - 6) Others as required by manufacturer
- C. Temperature detectors to include the following: (Detectors listed below are for Owner's use. Any that are required by the turbine control or supervisory system dual detectors shall be furnished.)
- 1) One RTD for each hydrogen cooler gas inlet and outlet.
 - 2) One thermocouple and well in combined gas stream on the outlet of coolers for control of Owner's cooling water valve.
 - 3) Two RTDs in combined gas stream on the outlet of hydrogen coolers.
6. Provide hydrogen control cabinet including the following:
- A. Generator hydrogen pressure indicator.
 - B. Generator hydrogen purity indicator.
 - C. Fan differential pressure indicator.
 - D. Generator gas density indicator.
 - E. Generator cold gas temperature indicator.
 - F. Seal oil differential pressure indicator.

- G. Stator coils water flow indicator, if applicable.
 - H. Stator coils water tank pressure indicator, if applicable.
 - I. Stator coils water pressure differential indicator, if applicable.
 - J. Conductivity recorder for conductor liquid cooling system (if applicable).
 - K. Hydrogen system SCAM-Panalarm Series 80 solid-state annunciator or
 - L. Engineer's approved equal with isolated alarm contact output for each window for Owner's use.
 - M. Complete internal panel piping and wiring.
 - N. Provide space heater and thermostatic alarm control for auxiliary panels.
7. Redundant trains shall have isolation valves to allow maintenance with one train out of service.

MISCELLANEOUS:

- 1. Provide the following materials equipment and instruments:
 - A. Six high-voltage bushings
 - B. Temperature detectors to include six RTD's per phase embedded in stator windings
 - C. Generator field flux probe permanently mounted
 - D. Field retaining ring Material shall be 18 Mn 18 Cr
 - E. Partial Discharge Detectors mounted in stator slots
 - F. Fiber optic end winding mounted accelerometers
 - G. Grounding pads
 - H. Terminals for testing bearing and seal housing insulation on at least one
 - I. generator bearing and both bearings of a rotating exciter

- J. Foundation plates, shims, and sub-sole plates
- K. Metal appearance lagging from floor to centerline of generator
- L. Set of lifting slings, special tools and wrenches, air gap shim, and field shoe for assembly of rotor, and one set of lifting or jacking trunions
- M. Generator casing liquid detector
- N. Bushing current transformers shall be as follows:
 - 1) Provide bushing current transformers as required for relaying and metering
 - 2) Bushing current transformers shall meet ANSI accuracy class of C-800 for relaying, or 0.3B1.8 for metering
- O. Bushings designed and arranged for termination of isolated phase bus duct
- P. Neutral terminals shall be interconnected and completely enclosed in a properly ventilated enclosure with provision for connection to neutral grounding equipment
- Q. Field temperature indicator transmitter including field current shunt in dc bus, if applicable
- R. Vibration monitoring probes
- S. Generator balanced voltage wave shape shall limit the open circuit telephone influence factor to the current standards, based on 1960 weighting factors, or provide at no additional cost all necessary accessories with isolated phase construction required to meet the standards
- T. Generator stator and windings, including series loops and end turns (end turns not fully insulated on gas-cooled stators), shall be fully insulated so as to be satisfactorily tested in accordance with the high potential tests required by IEEE Standard 4, and in a manner satisfactory to Engineer.

Contractor shall submit details of insulation for review and approval prior to award of Contract

HEAT EXCHANGERS:

1. Exchangers with water source from treated raw water:
 - A. Tubes shall be 20 BWG minimum, stainless steel
 - B. Tube sheets shall be Contractor's standard
 - C. Channels and cover plates shall be aluminum bronze
 - D. Water sides of coolers to be designed for the pressure and cooling water temperature as required by Contractor's design
 - E. Minimum tube size shall be 5/8 inch nominal diameter
2. Exchangers in condensate cycle (Refer to SECTION 5):
 - A. Tubes shall be adequate for design pressure as required by Contractor's design
 - B. Tubes for gland steam condenser shall be stainless steel
 - C. Tube sheets shall be Contractor's standard material
 - D. Channels shall be fabricated steel
 - E. Designed for the water temperature ranges as required by Contractor's design
 - F. Minimum tube size shall be 5/8 inch nominal diameter
3. Exchangers in bearing cooling water system (Refer to SECTION 5):
 - A. Designed for design pressure and temperature as required by Contractor's design
 - B. Tubes shall be stainless steel minimum 22 BWG
 - C. Tube sheets shall be Contractor's standard material

D. Channels shall be fabricated steel

E. Minimum tube size shall be 5/8 inch nominal diameter

ELECTRICAL DEVICES:

1. Electric indicating instruments shall be semi-flush mounting, long-scale type, 5 inches square with black metal case, General Electric type AB-40 or DB-40.
2. Position and limit switches shall be suitable and adequate with mountings and actuators as required to provide reliable operation.
3. Alarm switches shall have contact ratings of at least 0.25 amperes at 125 volts dc and shall close for alarm.
4. All control devices such as relays and solenoids for nominal 125-volt dc operation shall provide satisfactory operation for a range of voltage from 90 to 140 volts with a 50°C ambient temperature where obtainable.
5. All electrical devices and wiring located under the casing of the machine shall be specifically designed and constructed of suitable materials to give satisfactory operation in the high ambient temperatures involved.
6. All electrical equipment and devices furnished on the turbine generator unit and its auxiliaries shall be wired out to conveniently located, oversized, terminal boxes for Owner's external wiring connections. Terminal boxes shall be NEMA 12. Terminals shall be marked as designated by Owner.
7. Motors shall conform to SECTION 8 and the following:
 - A. Size motor to operate at less than nameplate horsepower over the capability range of the driven equipment
 - B. Motor insulation shall be NEMA Class F, with Class B temperature rise in accordance with NEMA MG1
 - C. Suitable for across-the-line starting
 - D. Provide TENV or TEFC enclosures for all motors

8. Provide disconnect-type combination motor starters, completely wired, for all dc motor-driven auxiliaries provided by this Contract.

CONTROL PANEL EQUIPMENT:

1. Construction:

- A. Provide panels and cabinets, totally enclosed, self-supporting
- B. Provide hinged access doors and/or removable panels as required
- C. Factory mount all instruments, control switches, and other devices at locations approved by Owner
- D. Smooth, fill, prime and paint panels with two coats of finish paint of manufacturer's standard color subject to the approval of Engineer
- E. Wire and tube completely in factory
- F. Provide panels or insert panels to match Owner's panels provided under other contracts

2. Panel Wiring Terminal Blocks:

- A. Terminate all connections requiring external wiring at terminal blocks, suitable for ring-tongue type connectors
- B. Identify each terminal on each block by stamping or painting the circuit identification number
- C. Provide manufacturer's standard terminal blocks subject to approval of Owner

3. Panel Wiring:

- A. Wire with no splices and with all connections made on equipment studs or terminal blocks. Make all connections with insulated, ring-tongue terminals
- B. Provide General Electric type SIS Specification SI-57275, or standard

conductor switchboard wire insulated for 600 volts

- C. Provide extra flexible hinge wire in areas subject to flexing such as hinged panels and doors
- D. Install in wiring troughs or channels with removable covers for easy accessibility to interior panel wiring

GENERATOR SURGE PROTECTION AND POTENTIAL TRANSFORMER EQUIPMENT:

1. Ratings:

A. Potential Transformers:

- 1) Voltage and BIL as required, 60 Hz.
- 2) Thermal capacity of at least 1000-volt amperes and metering accuracy of 0.3 for burdens W, X, Y, Z, and ZZ, when applied at rated voltage.
- 3) Thermal capacity of at least 580-volt amperes and metering accuracy of 0.3 for burdens W, X, Y, and J.6 for burden Z, when connected line-to-neutral.

B. Surge Arresters:

- 1) Proper rating design for rotating machine protection of the generator. Furnish an operation counter with each arrester.

C. Surge Capacitors:

- 1) Rated for the application and sized at 0.25 micro farads or as recommended by manufacturer.

D. Provide with dual secondary windings: One winding connected in a wye configuration and the other connected in an open delta configuration.

E. Provide loading resistors across secondaries.

2. Type and Design:

- A. Equipment will be located in line terminal cabinet and will be drawout type connected wye-wye, with current limiting primary fuses, secondary fuses, and necessary primary and secondary disconnecting devices and connections. Transformers shall be designed and constructed in accordance with ANSI C57.13.
- B. Surge arresters to be metal-oxide station type, General Electric Tranquell or Ohio Brass Dynavar.
- C. Furnish complete NEMA 2 steel enclosure cubicle with floor plate for above equipment with necessary primary and secondary connections, wiring, terminal blocks, and insulator supports and mounted on I-beam base so as to be self-supporting when resting on concrete floor or foundation.
- D. Furnish flanged connection with seal-off bushings at equipment enclosure and non-segregated bus extension to generator terminal enclosure.
- E. Furnish a ground bus at least 1 inch by ¼ inch cross section to the full width of each enclosure. Furnish connector for 250-MCM copper cable at each end of each ground bus.
- F. Arrange for entrance of external secondary circuit wiring from below.
- G. Surge capacitors and transformers shall not contain any PCB insulating fluid.

GENERATOR NEUTRAL GROUNDING EQUIPMENT:

- 1. Ratings:
 - A. As recommended by Contractor
 - B. Voltage as required, 60 Hz, 110-kV BIL
- 2. Grounding Resistor:

- A. Sized for high resistance ground system
 - B. Voltage rating suitable for connection to 220-volt transformer secondary
3. Type and Design:
- A. Transformer to be sealed dry type 300°F rise
 - B. Resistor to be cast-grid or stainless steel type
 - C. Furnish steel enclosure for housing transformer and resistor, with full height, hinged access doors, floor plate, and I-beam base so as to be self-supporting when resting on concrete floor or foundation. Provide adequate ventilation louvers in enclosure
 - D. Include wiring to terminal block in terminal compartment or cabinet for remote relaying connections, arranged for wiring entrance from above
 - E. Furnish connectors on transformer terminals and other provisions for connection of cable from generator neutral terminals, and for two connections to station ground grid by 250-MCM copper cable

GENERATOR TERMINAL ENCLOSURE:

- 1. Furnish one terminal enclosure.
- 2. Construct enclosure of heavy-gage sheet aluminum with internal stiffeners as required for rigidity.
- 3. The enclosures and/or the terminal attachment flanges at the top, should be able to accommodate an approximate construction variation in the calculated bus centerline-to-terminal vertical and horizontal distances of plus or minus 3/4 inch.
- 4. Construct with large removable access covers to permit removal and replacement of the disconnect links at the main terminals.

ACCESSORIES:

- 1. Provide generator with at least six stator temperature detectors of resistance

type, 100 ohms at 77°F, and at least two temperature detectors to measure cooling air inlet and discharge temperatures wired to terminal box.

5.2.8 Heat Recovery Steam Generator (HRSG) System

Contractor shall provide two (2) complete and functional HRSGs including all materials and labor required to design, fabricate, install, startup, and test the HRSGs. The HRSGs shall be a three pressure, natural circulation, water tube type designed for gas turbine exhaust. Each HRSG shall be complete with inlet ductwork from combustion turbine exhaust connection, including expansion joint, HRSG exhaust duct, and exhaust stack.

The HRSG process design concept is illustrated in Heat Balances and Conceptual Process Flow Diagrams, Appendix D. The HRSG shall be designed and constructed in compliance with the ASME Boiler and Pressure Vessel Code, Section I and NFPA 85.

The Scope of Supply shall include but not limited to the following:

1. Two complete modularized Heat Recovery Steam Generators
2. Inlet ductwork from combustion turbine exhaust, with expansion joint including gasket, bolts and nuts.
3. HRSG exhaust duct with expansion joint, including gaskets, bolts and nuts.
4. Individual Exhaust Stacks with test ports and CEM monitor ports
5. Motor actuated stack dampers
6. Internally insulated HRSG casing with complete liner.
7. Triple pressure HRSG with HP, IP, & LP drums, superheaters, evaporator and economizer sections, superheater attemperators, reheater attemperators.
8. Complete Duct burners system including all required piping, valves, instruments and complete PLC based burner management system. (Contractor option)
9. Selective catalytic reduction (SCR) system, including vaporization skid, piping, valves instrumentation, ammonia injection grid and catalyst, also CO catalyst

10. HP, IP, and LP Drum end enclosures
11. LP economizer recirculation pumps, valves, piping and temperature control system.
12. Galvanized access platforms, ladders and stairways. Ladders shall be located on one side of the HRSG with platforms and stairways located on the opposite side.
13. All structural steel supports to grade for ductwork and stack, as required.
14. All vents, drains, Blowdown, chemical feed connections.
15. All Steam safety valves with silencers vent piping to meet noise requirements specified in Section 1. Vents to be a minimum of 15 ft above the highest platform.
16. All safety valve above seat drains and drip pan drains shall be routed to a safe area.
17. Each heat transfer section shall be completely drainable and ventable. All valves that must be opened or closed as a part of startup, shutdown or transient conditions shall be power operated. All other vents & drains shall have manual valves. Drain valves shall be located at grade.
18. Continuous and Intermittent blowdown piping and power operated valves. Blowdown system shall not be a cascading system. Blowdown shall be routed to dedicated blowdown tanks for each HRSG.
19. Sample connections shall be provided for the water and steam from the HP, IP, and LP steam drums, reheater outlet, LP economizer inlet, and LP economizer outlet.
20. All piping between equipment and components furnished with the HRSG.
21. Temperature test connections (including thermowells) shall be provide for monitoring temperature of water inlet and outlet of each heat transfer sections.
22. Two (2) valved test connections on HRSG gas-side between each heat transfer section.
23. Stainless steel chemical feed connections with check and isolation valves for

the HP and IP steam drums.

24. Complete set of all controls and instrumentation including, but not limited to, steam flow elements, temperature well, thermocouples, and transmitters.
25. Each HRSG shall be provided with a monorail and powered hoist and trolley with a stainless steel cable, rated for routine maintenance, and installation and removal of SCR catalyst.
26. Technical advisors for field installation and erection, finish painting, boilout, hydrostatic testing, startup and testing of the HRSG, SCR system and all auxiliaries, including all electrical raceways, cables, and any other equipment or special accessories and services required for a complete installation.

Each HRSG shall be capable of a full range of plant continuous operation between each of the following cases, at the design ambient temperature ranges:

1. 50% CTG load, single unit operation
2. Base CTG load with maximum duct firing, single unit operation
3. 50% CTG load, two unit operation
4. Base CTG load with maximum duct firing (if provided), two unit operation

5.2.8.1 General

All portions of the heat recovery steam generator shall be drainable. Provide drain system sized such that the drum, economizer, superheater, tubes, headers and piping can be drained in a maximum of 2 hours. Vents shall be provided on all sections of the HRSG. All high pressure vents that must operate during normal start-up and/or shutdown shall include silencers. Design for adequate circulation through all tubes and heating surfaces to prevent overheating of any area under any load and all operating conditions. HRSG shall be designed to allow operation with a floor pressure of 750 psia at all operating conditions (including 1x1 operation) with the CTG at 50% load, HRSG unfired, and with the CTG at base load, maximum HRSG firing and power augmentation.

5.2.8.2 Pressure Parts

Design all pressure parts for safe operation at the outlet pressure specified at all loads. Provide for expansion and contraction so that tube alignment and spacing is not affected. Furnish airtight seals as required to prevent leakage.

Provide all necessary connections for chemical cleaning operations and access to headers for tube flushing, including access through casing and insulation.

All evaporator or economizer tubes shall be electric resistance welded and shall conform to the requirements of the ASME Boiler and Pressure Vessel Code. All reheater and superheater tubes shall be seamless drawn and shall conform to the requirements of the ASME Boiler and Pressure Vessel Code. Tubes shall be extended-surface type with continually welded fins. HRSG tubes shall be a minimum wall thickness of 0.105 inches with a $0.001 \text{ Hr-ft}^2 \text{ }^\circ\text{F/Btu}$ fouling factor on both the gas side and the steam side. Tube arrangement shall facilitate cleaning and inspection without cutting of pipe. For inspection purposes, one turn in each coil shall be provided with a flanged inspection port. There shall be no more than 7 fins per in. Fins shall have a thickness of at least 0.060 inches, and shall be no more than 3/4 in. high. Fin connection to tubes shall utilize continuous high frequency welds. Provide baffles and tube supports as required to prevent acoustic vibration of tubes. No vaporization of feedwater shall take place within the economizer tubes throughout the entire operating range. Tubes shall be arranged for ease of removal and replacement of an individual tube with a minimum of disturbance to all other tubes.

Fin materials shall be as follows:

1. Carbon steel for fin tip temperatures up to 800° F.
2. Material similar to ASME 409 SS for fin tip temperatures up to 1000°F.
3. Material similar to ASME SA 213 Grade TP304 or TP316 for fin tip temperatures up to 1500°F.

Tube materials shall be carbon steel for tube temperatures up to 800°F and ASME SA213 Grade T22 for tube temperatures up to 1000°F and ASME SA213 Grade T91 for tube metal temperatures greater than 1000°F.

Superheater shall be designed to provide for uniform distribution of steam at all loads. Pressure drop shall not exceed 5% of maximum steam pressure at maximum steam flow, without Owner approval.

5.2.8.3 Boiler

Design for adequate circulation through all tubes and heating surfaces to prevent overheating of any area under any load and all operating conditions.

Tubes shall enter a drum or header normal to its surface. Hillside connections on headers are an acceptable alternative. The tubes shall be designed and arranged to provide for natural circulation in the proper direction at all loads.

Headers shall be seamless drawn steel pipe or fabricated from formed steel plate with welded construction. Headers shall have seal welded plug-type handholes, welded capped inspection nozzles, or other type as approved by Engineer, as required for inspection. Inspection handholes or nozzles shall be in accessible locations.

Boiler lower drains shall be provided with chemical-cleaning connections.

Connections for use by Owner shall be welding connections conforming to ANSI/ASME B16.25.

If headers are within the gas stream, they shall be designed as heat absorbing surfaces and shall not be insulated. Headers shall be adequate for the gas temperature encountered without allowance for internal steam cooling. Lower headers shall allow for steam pecking to maintain higher temperature when the unit is off line.

Provide drums and headers with nozzles as required for vents, drains and instruments. Nozzles shall extend beyond the header insulation; size and weld-end preparation of nozzles for Owner's connection shall be subject to the approval of Engineer.

External casing shall be gas-tight, continuously seal welded construction and provided with packing at all piping penetrations and expansion joints. Construct casing of a minimum of ¼ inch thick A-36 carbon steel. Continuously weld all external stiffeners to the casing. Casing stiffeners shall be evenly spaced, horizontal or vertical, resulting in a uniform pattern and subject to approval by Owner. Provide 18 inch x 24-inch minimum

bolted and gasketed access doors upstream and downstream of each tube bundle on both sides of the HRSG, in each transition, and as required to provide complete access to all components for maintenance and inspection.

Maximum bundle depth for all bundles shall be 12 tubes. Minimum access space between bundles shall be 24 inches. Individual tube bundles shall have provisions to facilitate repairs to the tube and header areas without cutting into adjacent tube bundles.

Bends, tees, elbows and downstream straight pipe sections in HRSG areas at high risk for flow accelerated corrosion (erosion-corrosion) shall be fabricated from material containing at least 2.25% chromium. HRSG design shall include proven features to prevent LP erosion/corrosion (due to flow acceleration) and shall be subject to Owner approval.

Ceramic insulation shall be used for all insulated portions of the HRSG (no mineral wool). The entire interior surface of the HRSG shall be lined, from the combustion turbine exhaust flange to the base of the exhaust stack, with steel liners, as follows:

Location	Temperature	Material	Thickness (BWG)
Walls	Up to 700°F	Carbon Steel	12 Ga.
Roof	Up to 700°F	Carbon Steel	12 Ga.
Floor	Up to 700°F	Carbon Steel	12 Ga.
Walls	701°F to 1200°F	TP 409 SS	16 Ga.
Roof	701°F to 1200°F	TP 409 SS	16 Ga.
Floor	701°F to 1200°F	TP 409 SS	12 Ga.
Walls	1201°F to 1400°F	TP 304 SS	16 Ga.
Roof	1201°F to 1400°F	TP 304 SS	16 Ga.

Floor	1201°F to 1400°F	TP 304 SS	12 Ga.
-------	------------------	-----------	--------

Non-steaming economizers shall be provided. Suitable recirculation piping loops shall be provided to maintain sufficient flow through the economizers to prevent steaming during startup of the HRSG. Feedwater and regulating valves shall be configured to provide reliable performance while operating at reduced flow.

The HRSG exhaust stack shall be of self-supporting, carbon steel construction designed and constructed in accordance with ASME/ANSI STS-1. Corten is not acceptable. The required exhaust stack top elevation shall be based on the output of the air permitting process. Exhaust gas sampling and other stack design provisions shall meet all EPA requirements and air permit requirements. The minimum stack gas temperatures and velocity shall meet all permit requirements over the full range of operation. Provide a davit for hoisting tools and test equipment. Provide 120V and 220V single-phase convenience outlets for power tools and test equipment at all stack platforms. Provide lightning protection to minimize potential for personnel injury, structural damage or equipment damage. Provide a minimum of one access door on lower stack breaching to facilitate access for maintenance and inspection. Each exhaust stack shall be provided with a motor operated damper. Provide stack P-trap drain to remove rainwater when stack is not in operation. Each stack shall be designed with a 1/8-inch corrosion allowance for the bottom ten feet of the stack and 1/16-inch thereafter, or be provided with a stainless steel liner.

Piping materials for the HRSG shall be manufacturer's standard, based on appropriate design codes and standards.

Drains shall be provided at various parts of the HRSG for complete water removal to facilitate maintenance. The drain system shall be designed to drain all water from the boiler to protect against freezing during periods of sustained outages and low ambient temperatures. All HRSG drain connections shall have two globe valves in series and the second root valve shall be located at grade level or at a location having permanent access. All drains shall be piped to either a condensate flash tank or a turbine drains tank. Casing drains shall be provided to continuously drain any condensation from

exhaust gas. Vents shall be provided at accessible locations on the HRSG to allow air to enter to facilitate drainage prior to maintenance. Provisions shall be made for venting air during filling and startup. Provisions shall also be provided on the steam drums for nitrogen blanketing during extended shutdowns to minimize corrosion. The nitrogen connections shall be provided at grade. Vents used for plant startup shall be silenced to conform to plant noise permits specified in Section 1.

Design HRSG steam side components to be fully drainable and include valved drains on each component accessible from outside the unit. Provide drain system sized such that any single pressure level, to include the drum, economizer, superheater, tubes, headers and piping, can be drained in a maximum of 8 hours.

Provide isokinetic steam sampling nozzles per ASTM standard D1066 for measuring steam purity.

HRSG shall be designed with pinch points no less than 13°F.

Design economizers such that steaming does not occur during normal operation. Steam venting will be allowed at part load conditions, provided provisions are included in the system for venting this steam to the corresponding steam drum. Venting shall be controlled with a motor operated vent valve

Pressure Drops:

1. Pressure drop for the HP drum to the HP superheater non-return valve shall not exceed 6% at maximum steam flow.
2. Pressure drop from the HRSG cold reheat inlet connection to the HRSG hot reheat outlet connection shall not exceed 4% at maximum steam flow.
3. Pressure drop from the IP drum to the IP superheater outlet connection shall not exceed 6% at maximum steam flow.
4. Pressure drop from the LP drum to the LP superheater outlet connection shall not exceed 6% at maximum steam flow.
5. Pressure drop from the HP economizer inlet to the HP drum shall not exceed 2% at maximum steam flow.

6. Pressure drop from the IP economizer to the IP drum shall not exceed 2% at maximum steam flow.
7. Pressure drop from the Feedwater Preheater to the LP drum shall not exceed 2% at maximum steam flow.

The attemperator shall be located and designed so that under the most adverse operating conditions the temperature of the steam leaving attemperator-mixing zone will exceed the saturation temperature by at least 25°F.

Provide structural and miscellaneous steel required to frame and support the steam generator and all component parts and equipment. Provide structural steel supports for flues, ductwork, transitions, casing and stack as required. The structural steel frame shall be designed to take all piping loads of those pipes connecting to the boiler, within the boiler frame area.

The transition duct angle shall not exceed a 45° angle between floor and roof of transition. Alternate proven configurations shall be subject to approval by Owner.

5.2.8.4 Drums

Size steam drums to provide stable operation under all load conditions including start-up, shutdown, and load variations. Size high pressure and intermediate pressure steam drums to provide a minimum of three (3) minutes of storage with no incoming water at the fired steaming rates between the normal water level and Low Low Trip points. Contractor shall size low-pressure steam drum to provide a minimum of five (5) minutes of storage, with no incoming water, at the fired steaming rates, between the normal water level and Low Low Trip points. HRSG gas side expansion joints shall be of a flanged, insulated design.

Drums shall be fusion-welded throughout with all welds made, tested, radiographed and stress-relieved in strict accordance with the ASME Boiler and Pressure Vessel Code, and approved by a recognized boiler inspection and insurance company.

The steam-separating drum shall be equipped with the following internals:

1. A means to assure even distribution of feedwater throughout the drum length

and equal distribution of flow to the downcomers.

2. Alloy steel chemical feed piping.
3. Steam and water sample piping.
4. Steam deflecting baffles.

Vane- or centrifugal-type steam-cleaning devices designed to ensure a minimum of pressure drop, to provide maximum free space in the drum, and to limit carryover of impurities into the superheater to the level required by the steam manufacturer and in accordance with ABMA guidelines.

All drum internals shall be fabricated in convenient lengths for removal from the drum through the manholes.

Each end of the steam-separating drum shall have a manhole not smaller than 12 in. by 16 in. with a machined seat and forged steel cover hinged to swing inward. Manholes shall be complete with gaskets, arbors, and bolts. Furnish one extra set of gaskets to be turned over to the Owner.

Nozzles shall be fusion-welded to the drum, and the welds shall be stress-relieved.

5.2.8.5 Piping

All pressure parts of the boiler, superheater and economizer shall be connected together as necessary to meet the following requirements:

Provide piping and connect to the steam generator pressure parts:

1. Nitrogen blanketing connection (single connection unless multiple connections are required to blanket entire steam generator).

All necessary piping, valves, fittings, constant force piping supports, and insulation which, when combined with the above items, will constitute a complete steam generating unit. This shall include, but is not limited to, the following:

1. Piping from economizer outlet to steam drum.

2. Double shutoff valves at all external connections to the steam generator pressure parts, whether connected to by Owner or Contractor. The only exceptions to this requirement are the following connections:
 - a. Economizer Water inlet
3. Safety valve connections - Contractor shall furnish safety valves as required by ASME Boiler and Pressure Vessel Code. All safety valves shall be installed in piping furnished by this Contract.
4. Safety valve exhaust piping to a point 10 feet above the elevation of any platform within 25 feet.
5. All vent stacks to a point 10 feet above elevation of any platform within 25 feet.
6. All drain piping and the drum blowdown piping to a point two feet above grade elevation. Location of terminations shall be subject to Owner's approval.

Provide pipe supports for all piping furnished. Supports shall be designed to support the weight of all piping furnished by this Contract.

HRSGs shall be provided with provisions for sampling steam and boiler water, and provisions for blowdown and chemical injection to control dissolved solids in the HRSG operation. The HRSGs shall also be provided with the capability for chemical cleaning after construction.

Drains and vents shall be sized, with remotely operable valves, to allow for frequent starts and short start times and to prevent thermal quenching.

Each HRSG shall be controlled by the plant DCS and shall operate without local attendance. Visual monitoring of the drum levels shall be provided in the control room. The HRSG controls shall comply with all code requirements and shall operate to prevent injury to personnel and damage to the HRSG and other equipment, under all operating and abnormal conditions.

The maximum exhaust gas pressure drop at ISO conditions between the gas turbine

discharge and the stack exit, including SCR and CO catalyst, shall be less than 17 inches of H₂O.

Contractor shall provide minimum of 3 feet clear wide access platforms on the HRSG to facilitate access all around the steam drums and to all instrumentation and elevated manual valves on the HRSG system. Drum level support steel shall not include vertical bracing. Drum end enclosures shall be provided. Only the exhaust stack shall rise higher than 12 inches above the enclosure. Provide a minimum of one set of stairs to access all levels of the platforms and provide alternate egress as required by OSHA.

HRSGs and piping systems shall be designed to proportionally control the cold reheat steam flow to the high pressure steam flow to balance the cold reheat flows between multiple units at all operating conditions.

Contractor shall provide a recirculation system to maintain a minimum stack gas temperature above acid dewpoint under all operating conditions. The condensate temperature setpoint shall be selectable in the DCS.

Contractor shall provide flanged EPA test ports on the stack sized and located in accordance with the air permit requirements. Provide 5 feet minimum wide, full 360° access platforms with ladders to facilitate access to the sample ports. Provide FAA Aviation Lights as required for the stack.

Contractor shall insulate the steam drums and the entire casing of the HRSG through the low pressure economizer section to maintain an external surface temperature at or below 140°F at all operating conditions. The insulation thickness design will be based on an air velocity of 5 mph and an ambient air temperature of 100°F or OSHA requirements, whichever is lower. Provide ventilated and heated drum end enclosures or other suitable protective devices to prevent freezing of the drum trim piping when the HRSG is not in operation and the ambient temperature is at the absolute minimum for the site. The insulation shall be certified asbestos free by the manufacturer.

Contractor shall provide all specialty valves and instrumentation required by the applicable ASME code and including, but not limited to, the following for each HRSG:

1. Drum pressure safety valves with silencers on each steam drum

2. Superheater pressure safety valves with silencers on each superheater
3. Start-up vent valves with silencer and pneumatic operators on each pressure system
4. Automatic continuous blowdown regulating valves with operators on each evaporator system.
5. Intermittent blowdown stop valves with power operator on each evaporator system.
6. Continuous drum blowdown stop valve with power operator for each drum
7. Feedwater stop valves with power operators on each evaporator system
8. Drum level control valves with operators on each evaporator system
9. Superheater drain valves with power operators on each superheater section
10. Steam stop valves with power operators on each outgoing steam line
11. Steam stop-check valves on each outgoing steam line
12. Water column, with probe type alarms: HH, H, L, LL on each drum
13. Water gauge glass on end of each drum
14. Two remote drum level indicators for each drum (one located in control room and one located at the drum level control valve bypass station)
15. Three remote drum level transmitters on each drum
16. Drum pressure transmitters on each drum
17. Drum pressure Indicators on each drum
18. Drum pressure switch on each drum
19. Four drum surface thermocouples for each drum
20. Feedwater thermocouple with well on each drum feedwater line

21. Feedwater temperature indicator with well on each drum feedwater line
22. Feedwater pressure indicator on each drum feedwater line
23. Economizer inlet and outlet thermocouple with well for each economizer
24. Economizer inlet and outlet temperature indicator with well on each economizer.
25. Superheater steam outlet temperature indicator with well for each superheated steam discharge line
26. Superheater steam outlet thermocouple with well for each superheater steam discharge line (two on high pressure steam)
27. Superheater steam outlet pressure indicator for each superheated steam discharge line
28. Cold reheat thermocouple with well
29. Cold reheat pressure indicator
30. High pressure steam and reheat steam attemperators with control valves and actuators
31. Attemperator inlet and outlet thermocouple with well for each attemperator
32. Attemperator inlet and outlet temperature indicator with well for each attemperator
33. Recirculation pump inlet and outlet pressure indicator
34. Recirculation pump outlet thermocouple with well
35. Low pressure economizer inlet thermocouple with well
36. CTG exhaust gas temperature indicators with well (two at inlet transition and one after each component section)
37. CTG exhaust gas absolute pressure indicators (one at inlet transition and one after each component section)

38. Power operated vent and drain valves.

39. Instrument isolation valves, including root valves for all pressure gauges and transmitters.

5.2.8.6 Ductwork, Casings and Insulation

Provide all equipment, materials and labor necessary to encase and insulate the steam generator unit.

Casings, transitions, and ductwork shall be internally insulated.

Outer casing shall be at least 3/16-inch and shall provide a gastight seal. All field joints in the outer casing shall be designed to be seal welded.

All casings, transitions, and ductwork shall be provided with external stiffeners and shall provide a gastight seal at 1.5 times the maximum operating pressure. Penetrations shall be sealed to prevent leakage.

Provide drain connection in bottom of casing to allow for water washing. Drain shall be 2-inch-minimum size, provided with a cap.

Inner casing liner shall be stainless steel. Design inner casing with adequate allowances for expansion, and to protect insulation from gas flow.

Provide gas distribution devices necessary to assure even distribution of gas across heat transfer surfaces.

Casing, insulating, and lining materials shall have been proven acceptable in units of comparable capacity, temperature, and pressure.

5.2.8.7 Insulation

Insulation and other materials shall be in strict compliance with the applicable ASTM standard specifications. They shall be certified asbestos-free by the manufacturer.

Insulation shall be designed so that the outside surface temperature measured at any point (including hot spots) will not exceed 140°F when the ambient air temperature is 100°F 5 feet away from skin or insulation (while the steam generator is operating), with

an outside surface air velocity of 5 mph. Insulation thicknesses shall be reviewed and approved by Owner.

1. Insulation shall be ceramic fiber suitable for design conditions conforming to ASTM C533 or Engineer-approved equal.
2. The binder used in the insulation shall show no deterioration at 100°F above the actual operating temperature where the material is applied. Binders shall be water repellent.
3. Minimum density of any blanket or block insulation shall be 7 pounds per cubic foot.

5.2.8.8 Access

Provide Class 1 access to all areas requiring access during operation, or for normal day-to-day inspection and maintenance, including the following:

1. Observation ports.
2. Lubricated equipment.
3. Instruments.
4. Valve operators.
5. Each end of boiler drums.

Access doors shall be standard cast-hinged doors closed with a strong back arrangement. Provide ladder rung as a handhold above access doors, both on interior and exterior. Access doors shall be a minimum size of 14"x18".

Provide access lanes between each section of the steam generator.

Contractor shall provide expanded metal personnel protection shields or other suitable personnel protection devices at each stack access platform and anywhere else on the HRSG systems where temperatures exceed OSHA limits. Personnel protective devices shall be provided in accordance with applicable OSHA standards.

5.2.8.9 Duct Burners

Supplemental duct firing may be included in Contractor's design to maximize steam generation. At maximum duct burning each HRSGs shall be capable of supplying high-pressure superheated steam to the steam turbine at throttle pressures and temperatures as dictated by Contractor's design.

If included, duct burner design shall meet the following criteria:

1. The duct burners shall be a low-NO_x design that meets the requirements of the project air permits over the full range of plant operating loads and ambient conditions.
2. Superheated steam temperature spread across the HRSG shall not exceed 70°F at any point. Distance from duct burner to first row of tube bundles shall not be less than 15 feet.
3. Tube metal temperature shall not exceed the limits specified by the HRSG manufacturer at any operating condition (fired or unfired). Instrumentation shall be provided for monitoring tube skin temperature and flue gas temperature downstream of the duct burner. Skin temperatures shall be measured throughout the HRSG cross-section, including tube sections located outside of the HRSG casing. Flue gas measurement taps shall be provided at every 10 feet (vertically) from the bottom of the HRSG casing, approximately 3 feet in from the sides of the casing on both sides of the HRSG.
4. Provide a minimum of two view ports per burner (one on each side) in HRSG casings to allow viewing the duct burner flames.
5. Duct burner runner controls, scanners, and view ports shall be accessible from the platforms without requiring ladders or scaffolding.
6. Duct burners shall not utilize air augmentation.
7. The minimum oxygen level in the duct burner exhaust gases shall not be less than those specified by the burner manufacturer.

8. The duct burner control system shall be fully integrated with the plant DCS.
9. The duct burner shall provide a stable flame over a 10 to 1 automatic turndown range.
10. Provide automatic isolation valve for each burner runner (elevation).
11. Duct burner flame scanners, pilot burners, and pilot igniters shall be provided. Include two 100% scanner cooling / purge air blowers each with an inlet air filter and silencer. Two flame Scanners shall be supplied per each burner.
12. Include a Burner Management System (BMS) with a programmable logic controller, factory assembled, wired, and tested, including all safety interlocks and indicators as required by the applicable codes. Provide BMS system designed for remote firing rate signals to be supplied from the main plant DCS controller. The PLC shall be in an air-conditioned enclosure.
13. The fuel gas manifold in the turbine exhaust gas flow shall be type 304 stainless steel.
14. Provide a strainer and a PRV for conditioning of fuel gas supply to the burners. PRV shall be located at grade or platform accessible.
15. Duct burner shall be located in a cross-section of the ductwork and the duct burner shall distribute fuel gas evenly across the duct.
16. Duct burner shall be located to prevent impingement of flames on the tube surfaces.
17. Burner elements shall be designed to allow for thermal expansion and to prevent acoustic vibration.
18. If multiple burner elements are required, provide distribution headers for fuel gas, igniter gas, and scanner cooling air.
19. Duct burner frame shall be insulated for protection from flue gas temperatures.
20. Burner ignition shall be completely automatic.

21. Ignition system shall include gas pilot burner, electric ignition electrode, electric ignition transformer, two power-operated shutoff valves, one manual shutoff valve, pilot gas regulator and strainer.

The duct burner installation shall meet all requirements of NEC, NFPA, Factory Mutual, and local codes.

5.2.8.10 Selective Catalytic Reduction System

A selective catalytic reduction (SCR) system shall be incorporated into each HRSG to meet the NO_x and ammonia slip emission limits specified in the air permit over the full range of operation from Peak Load to Minimum Load and the full range of ambient temperatures. The SCR system design and location shall include consideration of operating temperature requirements for proper catalyst performance, flow straightening devices, ammonia injection grids, and mixing zones. SCR shall be capable of responding in real time to allow for load level changes, up to maximum ramp rate, up or down, so as to maintain permit limits for hourly averages.

SCR system casing shall be of the same construction and cross section as the HRSG casing. Provide access manways and catalyst loading openings in the casing sufficient to facilitate removal and installation of the catalyst modules without the need for cutting or welding of any casing components. Include and integrate a monorail and hoist system to facilitate installation and removal of the catalyst sections. Hoist system shall extend out over open grade for lifting and setting materials from maintenance carts of pallets.

Include space, frame, and design consideration for 50% additional catalyst in the SCR system.

Provide instrumentation necessary to monitor catalyst performance. Provide NO_x sample ports upstream of the SCR Catalyst.

Contractor shall obtain from SCR catalyst Vendor a warranty that the installed catalysts will provide NO_x emissions reduction from the guaranteed combustion turbine emissions, including contribution from the duct burners (if provided), down to the permitted HRSG stack emissions for a minimum period of thirty-six (36) months after the plant Substantial Completion Date, or 22,500 fired hours of operation, whichever comes

last.

Testing penetrations consisting of 2 ½ inch pipe connections shall be provided to permit performance testing of the system. The test ports shall have blind flanges. The design and configuration of the test ports shall allow traverse testing before and after each layer of catalyst in a grid arrangement. Contractor shall provide access to the test locations consisting of walkways, platforms and ladders.

The SCR catalyst shall be of the low dust type. The catalyst shall be designed to minimize pressure loss. The direction of gas flow through the catalyst shall be horizontal.

The catalyst shall be either a homogenous extruded material or the catalyst surface shall be supported on a metallic or ceramic monolithic base material. The catalyst modules shall not be subject to delamination or permanent deformation of the catalyst or support material due to stresses induced by the seismic conditions, vibration, pressure and thermal conditions or combinations thereof.

The catalyst shall be resistant to poisoning by trace elements. The catalyst shall be resistant to water and abrasion.

The volume of catalyst supplied shall be designed to control ammonia slip to the values guaranteed without requiring cleaning, regeneration, or replacement during the performance guarantee period.

The catalyst shall be of modular design to facilitate installation and removal of the catalyst. The catalyst modules shall be the maximum practical size to facilitate and minimize field maintenance. Any special tools required to facilitate the removal or installation of catalyst modules shall be provided. Any special tools or handling fixtures for the proper handling or unloading of the catalyst modules from a truck or rail car shall be provided.

Contractor shall provide catalyst coupons/holders. In order to monitor catalyst life and performance, a minimum of 10 test coupons shall be provided and installed in the catalyst beds as, and where, recommended by the catalyst manufacturer. Additional catalyst coupons shall also be furnished for future reference performance and composition analysis. Each catalyst coupon shall be labeled with a serial number. All

catalyst coupons shall be from the same lot as the installed catalyst. These samples will be tested to evaluate catalyst activity and physical properties as the catalyst ages.

The catalyst modules shall include sealing frame and frame steel to improve the ease of catalyst replacement and installation. The frame materials shall be compatible with the catalyst material. The sealing system shall be designed to limit exhaust gas leakage past each layer of catalyst. The sealing mechanism and materials shall provide a service life equal to or greater than the catalyst.

5.2.8.11 Ammonia Injection Skid

Contractor shall provide a skid mounted aqueous ammonia (19%) injection system complete with all necessary equipment, including but not limited to mixers, blowers, motors, electric or side stream heaters, piping, all valves, vent and drain piping and instrumentation. Two (2) 100% capacity flue gas recirculation air blowers shall be provided as well as associated valves, control valves, and NH₃/air mixer for each skid. The critical components including, but not limited to, the dilution air fans and the electric heaters shall have an installed 100% spare on the skid. The heaters and blowers shall be designed for 100% of maximum flow of reagent to the ammonia injection grid.

5.2.8.12 CO Catalyst

Provide a CO catalyst system with each HRSG to meet the air emission requirements for CO and VOCs. The CO catalyst shall be designed and located in the HRSG to meet the requirements of the air permit over the full range of operation from Peak Load to Minimum Load and the full range of design ambient temperature.

Include space and consideration for 50% additional CO catalyst.

CO catalyst system casing shall be of the same construction and cross section as the HRSG casing. Provide access manways and catalyst loading openings in the casing sufficient to facilitate removal and installation of the catalyst modules without the need for cutting or welding of any casing components. Include and integrate a monorail and hoist system to facilitate installation and removal of the CO catalyst sections. Hoist system shall extend out over open grade for lifting and setting materials from maintenance carts or pallets.

Provide instrumentation necessary to monitor catalyst performance. Contractor shall obtain from the CO catalyst Vendor a warranty that the installed catalysts will provide CO and VOCs emissions reduction from the guaranteed combustion turbine emissions, including contribution from the duct burners, down to the permitted HRSG stack emissions for a minimum of thirty-six (36) months after the plant Substantial Completion Date.

5.2.8.13 HRSG Erection

Work shall include the following:

1. All expert and common labor, rigging, blocking, scaffolding, tools, construction materials and supplies to remove the Equipment from cars, haul, store, protect, erect, and install all the material furnished complete in place.
2. Grout and grouting, shims, grout forms, and blocking.
3. Erection of structural and miscellaneous steel.
4. Erection bracing, temporary struts, ties, cables, temporary flooring, planking, and scaffolding as required for the erection of the unit.
5. Furnishing and installation of miscellaneous pipe hangers and supports for piping installed with the Equipment. Installation of nipples, valves, and safety valves.
6. Welding of piping supplied with the Equipment by manufacturer's procedures acceptable to Owner, including testing of welds where required by codes and all costs in connection with welder qualification tests.
7. Installation of trim, instruments, control devices, start-up thermocouples, and bearing thermocouples furnished as specified.
8. Installation of setting, insulation, and lagging, including supplying all materials as required for a complete installation.
9. Cleaning up, testing and placing into operation the Equipment, including attendance by manufacturer's service representatives during preliminary operation, testing, boilout, blowout, and cleaning as required to make necessary adjustments and perform work to make unit acceptable.
10. Inventorying and turning all spare parts over to Owner.
11. Inventorying and delivering all special tools and devices furnished as part of

the Equipment to Owner in good condition after erection is completed.

12. Testing, adjusting boiler trim, including setting of safety valves under direction of valve manufacturer's representative.
13. Attendance for Owner's insurance inspector, including opening unit for inspection and as required.
14. Boiling out the unit.
15. Chemically cleaning the unit.
16. Steam line blowing.
17. Retouching of damage to shop prime and finished painted surfaces.
18. Protection of steam generator from freezing, including maintenance of temporary heating equipment.
19. Alignment of Equipment for smooth, trouble-free operation.
20. Preparation of Equipment and piping ready for external connections at terminal points.
21. Acceptance testing as specified.
22. Retightening flanges, valve bonnets, and repacking leaking valves.
23. Calibration of instruments and tuning of controls.
24. Disconnecting and reconnecting couplings for motor rotation check.

The installation of the Equipment shall be complete in all respects, to make the unit ready for commercial operation except for Owner's connections under other contracts. Provide Owner with copies of all data reports required by the ASME Boiler and Pressure Vessel Code and ANSI B31.1.

FIELD SUPERVISORS:

1. The services of erection supervisors shall be furnished to supervise and be responsible for the complete and correct erection, assembly, and installation of the Equipment furnished under this Contract.
2. Supervisors shall report to the jobsite prior to the commencement of erection to plan and coordinate the Work, and be present during unloading, storing, hauling, erecting of all Equipment, and at such other times that his services are required as determined by Owner.

3. Supervisors shall keep Owner informed on the progress of the Work during erection and testing and coordinate work with Owner on any problems that will affect progress of the Project.

MANUFACTURER'S FIELD SERVICE:

1. Contractor shall include in the Bid the cost of the services of competent manufacturer's servicemen for field testing and placing in operation all electrical devices and safety valves for inspecting and placing in operation control systems provided.

GROUTING:

1. Furnish and place all grout required to erect and install the Equipment and machinery.
2. Except where otherwise specified by the Equipment manufacturer, grout all equipment and machinery with a nonshrinking grout.
3. Prepare and place grout in accordance with the manufacturer's written instructions.
4. Furnish and install grout forms. Grout forms shall be tight and shall be caulked as required to prevent leakage.
5. Chip back and clean foundation surfaces as required for proper clearances and to obtain proper bonding.
6. Grout bed shall have at least 2 inches of thickness for every four feet of horizontal grout flow required, and shall be as required to properly align and position the Equipment and machinery in accordance with the Equipment manufacturer's requirements.
7. Protect anchor bolt sleeves from freezing using methods approved by Engineer. This requirement shall be Contractor's responsibility from the date the foundation is released to Contractor for his use until grout has been placed to prevent water from entering the sleeves.
8. Grout all anchor bolt sleeves, unless otherwise specified by the Equipment manufacturer.
9. Place grout under entire base plates, support plates, and bed plates. Drill

grout vent holes if necessary.

10. Protect grout for at least 24 hours against rapid water loss. Maintain grout between 65°F and 80°F until cured. After grout has hardened for at least six hours, remove grout forms, remove excess grout to a neat trim line, and apply a coat of an approved curing compound. Care shall be taken to prevent the transmission of vibration from operating machinery and construction activities to the Equipment being grouted.
11. Unless otherwise directed by Equipment manufacturer's instructions, grout leveling and support shims and wedges in place with nonshrink grout. The shims and wedges shall be completely encased in grout.

WELDING:

1. Perform all welding as required for the installation of the structure, Equipment, and piping.
2. Welding rod shall be the best quality rod, suitably shielded, designed and made for use with the specific material to which it is applied, and shall conform to the latest ASME specifications or AWS D1.1. Rod used on alloy materials shall be ordered by ASME or AWS specification and chemical composition.
3. Provide welding rod drying ovens when required. The use of wet or moist welding rod will not be permitted.
4. Welding procedures shall be in accordance with the ASME Boiler and Pressure Vessel Code and the applicable portions of ASME B31.1. Structural steel welding shall be in accordance with AWS D1.1 and the AISC specifications.
5. All welders and welding operators shall be qualified as required by the applicable codes. Submit three copies of qualification test records for each welder and welding operator. All costs for welders' qualification tests and certification shall be at Contractor's expense.
6. Heat treat welded joints in accordance with the ASME Boiler and Pressure Vessel Code and the applicable portions of ANSI B31.1.
7. All welds shall be inspected by the designated agencies as required by the

various codes including radiography of welds where required by code. All costs for the required inspections and radiography shall be at Contractor's expense.

8. All welding shall be in accordance with the best modern practices to reduce distortion to minimum. Include tack welds and alignment clips, as required.
9. For P-91 and T-91 materials, Contractor shall submit special welding procedures and NDE to be used to avoid weld joint failures in the field and during normal operation.

ERECTION AND INSTALLATION OF PRESSURE PARTS AND PIPING:

1. Erect and install all pressure parts and piping in accordance with the applicable portions of the ASME Boiler and Pressure Vessel Code and ASME B31.1.
2. Erect pressure parts and piping true to line, facing, and position and without strain on pipe, fittings, and Equipment.
3. Make final weld in piping systems only after stress relieving all other welds, and after obtaining correct alignment.
4. Keep foreign matter out of tubes, drum, piping, and other pressure parts. Clean, blow out and sound all pressure parts to assure they are clear and clean.
5. Connections to rotating Equipment shall be disconnected as required for alignment checks. Correct any misalignment of the piping.
6. Erect and install hangers and supports as follows:
 - A. Install hangers, supports, and anchors as required to adequately support the pressure parts and piping.
 - B. Adjust hangers as follows:
 - (1) Prior to putting the Equipment and piping systems into service, remove travel stops, adjust all spring hangers to the correct cold load, adjust all solid hangers to correct position, and remove all temporary hangers used in erection and testing.
 - (2) After and during the time the Equipment and piping systems are being

put into service, adjust all spring hangers for the correct hot load and align all hanger rods to the vertical position. Furnish and install additional hangers, sway braces, and bracing as required to stabilize piping systems.

C. Field fabricate piping as follows:

- (1) Field fabricate and erect piping for miscellaneous systems and small pipelines.
- (2) Field route small piping to avoid interference with other work and to provide a neat installation. Reroute and arrange as directed and as approved by the Engineer. Erect with off sets, fittings, unions, drip pockets, vents, drains, and hangers to make a complete installation.

D. Retighten flanged joints as follows:

- (3) Retighten flanged joints in pipelines and on Equipment after being exposed to working temperature and pressure for a sufficient length of time to ensure that flanges and studs have reached a point of constant temperature, and have attained such changes in dimension as will take place.
- (4) Where the operating temperature is 450°F or higher, retighten joints after 200 hours of service at operating pressure and temperature.
- (5) Tighten pressure seal valve bonnet studs or spanner nut with torque wrench per manufacturer's instructions before start-up and after one temperature cycle.

E. Make up flanged and threaded joints as follows:

- (1) Apply gaskets for low-pressure, low-temperature joints dry. Apply all other gaskets in accordance with the gasket manufacturer's instructions.
- (2) Use an antisieze compound to lubricate all flange bolt and stud-bolt threads and all threaded pipe joints, with the compound applied to male threads only. Antisieze compound shall be suitable for temperatures up to 1,000°F and shall be "Molykote G" or approved equal.

F. Furnish and install unions in piping systems using screwed joints as

follows:

- (1) Install in pipelines so lines may be broken for maintenance, valves may be removed and Equipment disconnected.
- (2) Install in lines which are erected without unions and which, in the opinion of Engineer, cannot be properly maintained.
- (3) Install dielectric unions wherever copper pipe is joined to iron or steel pipe or equipment. Install in positions which receive axial thrust only.

INSTALLATION AND APPLICATION OF BRICKWORK, REFRACTORY, INSULATION AND LAGGING:

1. Provide fire-resistant drop cloths and enforce their use to keep refractory and insulating materials off gratings, floors, structures, and Equipment not specified to be insulated.
2. Do not apply brickwork, refractory, insulation, and lagging over welded joints until Equipment has been hydrostatically tested.
3. Install and apply brickwork and refractory as follows:
 - A. Install clips or studs on Equipment as required to properly support and attach brickwork and refractory.
 - B. Thoroughly clean surfaces prior to installing brickwork and refractory to ensure secure bonding. Sandblast corroded surfaces where required.
 - C. Brickwork shall be installed complete with mortar and grout to form a continuous surface free of cracks and voids. Saw cut into special shapes where required to fit irregular areas. Grout and mortar mixtures shall be in strict accordance with the manufacturer's recommendations and instructions.
 - D. Refractory mixture and application shall be in strict accordance with manufacturer's recommendations and instructions. Furnish all equipment required to apply refractory.
4. Apply insulation and lagging as follows:
 - A. Install insulation pins, clips, and studs on Equipment as required to properly support and attach insulation.
 - B. Store all insulating and lagging materials indoors. Protect materials from

damage due to moisture, crimping, buckling, spotting, streaking, and similar causes.

- C. Provide weather protection for all insulation materials during and after application until such time as the insulation is lagged and enclosed to form final weather protection.
- D. Install all insulating materials in strict accordance with the manufacturer's recommendations, specifications and instructions, and as specified. Completely cover all surfaces to be insulated so there are no voids, cracks, or depressions. Adequately support insulating materials with wire mesh, expanded metal lath, and tie wires so that insulation will not shift, sag, or separate.
- E. Provide laps, seals and flashing to make lagging weathertight. Seal all penetrations through lagging weathertight. Install lagging so ribs form a smooth unbroken line and so that water is not pocketed in the ribs.

EQUIPMENT AND MACHINERY ERECTION:

- 1. Erect and install all Equipment and machinery in strict accordance with manufacturer's instructions and as directed by the manufacturer's field representatives.
- 2. Meet the requirements of the manufacturer and/or his field representative for the means employed for doing the various classes of work, all tolerances in alignment and leveling, and the quality of workmanship for each class and stage of the Work.
- 3. Protect all Equipment, machinery and Materials against corrosion, moisture deterioration, mechanical injury, and accumulation of dirt or other foreign matter to include the following:
 - A. Protect all bearings by field lubrication as required.
 - B. Keep all pipe and equipment connections closed until ready for connection.
 - C. Cover Equipment, machinery, and Materials with suitable covers and provide temporary heat where required.
 - D. Spot paint all Equipment and machinery where the shop coat of paint has

been damaged.

4. Provide access to motors in storage for the power wiring contractor to connect temporary power to the space heaters and to megger the windings.
5. Cover and protect Owner's concrete and floor surfaces from scarring and oil spots.
6. Furnish and install cinch anchors, grout, shim material, and the miscellaneous steel necessary for brackets, anchors, or supports required in the installation of the Equipment and machinery.
7. Replace any gaskets damaged during storage, inspection, cleaning, or placing into service.
8. Accomplish all field machining that might be required to fit Equipment and machinery together or to install Equipment and machinery.
9. Align Equipment as follows:
 - A. Make all measurements and determine elevations to position and align Equipment and machinery in accordance with the manufacturer's requirements.
 - B. Shim equipment, machinery, and motors as required to align Equipment and machinery at normal operating temperatures.
 - C. Align motors to Equipment and machinery with motor rotor at the mechanical center.
 - D. Tighten anchor bolts to proper stress level using torque wrench or by the turn-of-nut method.
 - E. Following initial alignment, pull and store coupling bolts, remove all shipping restraints, make all required inspections and checks, and tag motor as ready for rotational checks. Rotational checks will be performed by Contractor and witnessed by Owner.
 - F. After all connections are made and the Equipment and machinery is prepared for initial operation, set clearances as required and verify alignment. Have final alignment check and makeup of couplings observed by Owner.
 - G. Dowel motors to base plates after hot run in.
10. Lubricate Equipment as follows:

- A. Prior to initial operation of the Equipment, clean and flush bearings and lubricating oil systems until clean. Circulate oil, vibrate lines, clean strainers, and replace filters in accordance with manufacturer's instructions. Drain systems, wipe out reservoirs, and clean as required. Contractor shall furnish all flushing oils.
- B. After flushing fill all lubricating systems with oil and lubricate all Equipment with oil and lubricants provided by Contractor. Contractor shall provide a lubricant list for all Equipment using lubricants from Owner's supplier.

ERECTION OF FLUES, DUCTS AND PLATE WORK:

1. Furnish all erection bolts, clips, angles, and lugs required to align and position sections for welding.
2. Accurately align and position sections for welding and perform all welding in a manner to prevent warping and distortion.
3. Accurately align damper frames and install dampers without distortion. Adjust dampers for free operation and tight shutoff.

FIELD TESTS:

All field tests recommended by the manufacturers of the various items of Equipment shall be made by Contractor. Contractor shall provide all temporary testing equipment required.

1. Hydrostatic Tests:
 - A. After erection, all pressure parts and piping systems shall be given a hydrostatic test at a pressure 50% in excess of the design working pressure in accordance with the ASME Boiler and Pressure Vessel Code and the applicable portions of ASME B31.1.
 - B. Contractor shall provide cold water for the tests and suitable disposal facilities for wastewater after tests are complete. Contractor shall provide all piping, hoses, and drain lines to deliver water for testing and for disposal of water after testing. Water for hydrostatic testing shall be heated to a minimum temperature of 70°F. Contractor shall provide heat exchangers, chemicals, circulating pumps, and all piping required to heat

and treat cold water to the proper temperature and quality.

- C. Furnish all necessary equipment and materials required for testing including pumps, gauges, temporary blank-off plates, gaskets, anchors, and bracing required to conduct tests.
 - D. Furnish and install an accurate pressure recorder and continuously record the pressure during the complete hydrostatic test.
 - E. Immediately repair or replace all tested Material or Equipment found leaking or defective.
 - F. Protect plant equipment and materials from damage resulting from leaks during testing. Protect instruments and appurtenances as required during testing and repair or replace if damaged. Clean fluid from leaks immediately after contact.
 - G. Provide all required attendance for Owner's insurance inspector, including opening the unit for inspection.
2. Boilout:
- H. On completion of erection, inspect, and mechanically clean the unit. Inspect drums, headers, supply pipes, and tubes and remove all debris. Blow out and sound all parts which cannot be visually inspected.
 - I. Boilout the unit with chemicals furnished by Contractor. Provide heat source necessary to heat water to proper temperature. Provide all piping, hoses, and drain lines required to deliver water and chemicals to the unit for boilout and for disposal of wastes after boilout.
 - J. After boilout, open the unit, wash down, and inspect. Replace gaskets, gauge glasses, and other parts damaged by boilout with new material provided by this Contract.
4. Instrument Calibration:
- A. Provide instrument technician to field calibrate all instruments furnished by this Contract.
 - B. Provide instrument technician to check and tune all control loops furnished by this Contract, including checking valve action.
5. Setting Safety Valves:
- A. Set all safety valves under the direction of the safety valve manufacturer's

service personnel. Provide service personnel from the safety valve manufacturer under this Contract.

- B. Provide all labor and attendance as required for setting all safety valves.
 - C. Schedule and coordinate the setting of safety valves with other contractors' work and the overall Project schedule. The superheater safety valves cannot be set until the blowing of steam lines is completed.
 - D. Operated drain valves as required to remove condensate from the main steam lines while setting the superheater safety valves.
5. Chemical Cleaning:
- A. Provide the services of specialists in chemical cleaning of boilers to chemically clean the water sides of the unit. Chemical cleaning shall utilize citric acid followed by passivation.
 - B. Provide all labor, chemicals, compressed nitrogen gas, piping, valves, hoses, lances, pumps, and heaters required to supply and monitor cleaning solutions.
 - C. Provide all labor, pumps, piping, valves, and hoses required for disposal of wastes offsite. Contractor shall be responsible for locating disposal site off Owner's property and transporting wastes to a disposal site.
 - D. Provide all labor and attendance on a round-the-clock basis, if required, during the chemical cleaning operations.
 - E. Flush complete unit after chemical cleaning to include all tubes, headers, and downcomers. Provide all piping, hoses, and lances required for flushing. Contractor shall dispose of wastewater resulting from flush.
 - F. Remove, replace and seal weld hand holes, access openings, and pipe connections as required for chemical cleaning and flushing operations.
 - G. Wherever practical, parts subject to damage during acid cleaning shall not be installed until acid cleaning is completed. Replace any parts damaged by acid cleaning.
6. Conduct complete testing of combustion control system and burner safeguard system, including the following tests:
- A. Out-of-case bench testing of all protective relays in accordance with relay manufacturer's instructions for testing. This testing includes such tests as

checking of relay timing, restraint, calibration, and contact operation.

- B. In-case testing of all protective relaying systems before energization to assure that relays trip (and lockout, if required) the proper breakers or devices. These tests shall include operation of relay contacts electrically or manually and checking breaker or device operation, and shall include introducing currents and potentials at their source and observing relay operation.
- C. Conduct all field tests in the presence of Owner.
- D. Provide all labor and test equipment required for field testing.

PLACING EQUIPMENT IN OPERATION:

- 1. Prepare unit for initial operation by testing, flushing and making operational checks as required to prepare all equipment and systems for operation at times required to meet the Owner's schedule for the initial operation of the complete steam generator unit.
- 2. Provide the services of competent start-up service personnel during the start-up and initial operation of the unit to perform the following:
 - A. Direct the starting operation of all equipment furnished.
 - B. Direct the operation of the equipment until it is placed into successful operation and is ready for commercial operation.
 - C. Coordinate starting, stopping and loading of unit with Owner's existing steam, electric and natural gas utilities.
 - D. Instruct the Owner's personnel in the operation, care and maintenance of the equipment.
 - E. Consult with manufacturer's field service personnel and providing them assistance as required to conduct the necessary tests and make any required adjustments.
 - F. Observe initial operation and direct Contractor's personnel to make adjustments as required for proper operation of the unit and its accessories and appurtenances.
 - G. Provide detailed written instructions for proper operation of unit, if such detailed instructions are not contained in the Instruction Books.

3. Procedures and work performed shall be as directed by the manufacturer's published procedures and service representative's instructions.
4. Repack valves, clean strainers, make repairs, and make adjustments as required until complete unit and all auxiliaries and appurtenances are in continuous successful operation.

5.2.8.14 Ammonia Equipment

Contractor shall provide one (1) aqueous ammonia (19% solution) storage tank with a minimum design pressure as required by Contractor's design. Tank shall be sized to contain two weeks worth of ammonia under 100% base load conditions. Provide a containment dike for the area surrounding the tank consistent with ANSI K61.1 guidelines. Ammonia system shall be in accordance with ANSI K61.1 and OSHA standards.

Provide an ammonia unloading skid with break away truck connections and with automatic emergency shut-off valves on the liquid and vapor connections on tank. Provide all instrumentation required by ANSI K61.1 and as required to provide for a safe, unmanned operation. Provide one (1) level transmitter and two (2) pressure transmitters on tank for remote monitoring and control. Provide a local float type level gauge on tank.

Provide a platform and ladder to access all the manual valves and excess flow valves at the top of the tank and to maintain the relief valves and other instrumentation installed at the top of tank.

5.2.9 **Steam Systems**

The steam system shall be based on a three-pressure reheat cycle. The steam system shall be designed to provide HP, IP, and LP steam from the HRSGs to the steam turbine generator as shown on the Conceptual Process Flow Diagram in Appendix D.

Pressure relief valves with silencers shall be provided on the HP, reheat, and low pressure steam headers to meet code requirements for overpressure protection. Upon steam turbine trip, the primary release of steam shall be to the condenser through the steam bypass system. The secondary release shall be through modulating start-up vent

valves to the atmosphere. Locate the start-up vent valves close to the HRSG isolation valves and select the set points of these valves sufficiently below the steam drum relief valve setting to prevent lifting of the steam drum relief valves during overpressure transients.

The high pressure and reheat systems shall be provided with stop valves to allow isolation for safe maintenance and repair of either HRSG with the other HRSG in operation.

The steam systems shall be provided with a high-pressure drain system to remove condensate from stop and control valves and piping low points to prevent water induction into the steam turbine. Drains that require quick action during startup shall be supplied with air operated, severe service, metal-seated, ball valves. Drains not requiring quick action but are required for steam piping drains shall be supplied with inverted bucket type traps or air-operated valves. All high-pressure drains shall be discharged to the condenser or to the blowdown tank. All manual drains shall be piped to a drain header system that discharges to either the condenser or the blowdown tank if inadequate pressure exists to transport the condensate to the condenser. Steam piping shall be pitched in the direction of steam flow. All motor-operated valves, air operated valves, and steam traps shall be provided with a block valve on each side. Steam traps shall be provided with a valved bypass.

The design and construction for the drain system shall comply with the ANSI/ASME TDP-1, Recommended Practices for the Prevention of Water Damage to Steam Turbines.

The maximum pressure drop between the HRSG and the steam turbine generator interface shall be 5% of the upstream line pressure for the HP, 3% of the upstream line pressure for the Hot and Cold Reheat lines, and 10% for the LP steam line. This maximum allowable pressure drop includes pressure drop across the piping, valves, and all other components in the piping.

All main steam piping shall meet the requirement of ANSI B31.1 and the ASME Boiler and Pressure Vessel Code.

5.2.9.1 HP (Main) Steam System

HP steam shall be piped from each HRSG HP superheater outlet to the steam turbine. Each HRSG supply header shall be provided with a non-return stop check valve and a motor operated stop valve. A dedicated HP steam turbine bypass system to the cold reheat system shall be provided on each HRSG HP header for operating flexibility. HP steam bypass system shall be provided with combination pressure reducing and desuperheating valve or separate pressure reducing valve and desuperheater. The bypass piping shall be high temperature alloy pipe up to the downstream desuperheating temperature measurement. The bypass system shall be sized for the maximum HRSG output without duct firing and shall be designed for continuous operation. Each HRSG HP superheated steam line shall also be provided with a low-pressure drop type flow element and transmitter for measuring steam flow. The HRSG supplier shall provide a start-up vent valve for each HP steam header to facilitate unit startup and relieve steam pressure buildup during peak load Steam Turbine trips.

5.2.9.2 Reheat Steam System

Cold reheat steam from the HP steam turbine exhaust shall be piped from the steam turbine to the individual HRSGs. The cold reheat lines to each HRSG shall be provided with a modulating valve to proportion the cold reheat flows between the HRSGs and isolate the HRSGs from the common line. Contractor shall evaluate the steam turbine manufacture's entrain energy threshold to determine if relief valves are required for the cold reheat pipe between the steam turbine and the main isolation valve. Therefore, Contractor's shall include in the bid an allowance for these relief valves. IP steam from each HRSG shall be combined with the HRSG cold reheat steam return from the turbine and piped to each HRSG reheater section. The IP superheated steam line shall be provided with a non-return valve and motor operated stop valve prior to connection to the cold reheat line for isolating the HRSG IP drum. Each HRSG IP superheated steam line shall also be provided with a low-pressure drop type flow element and transmitter for measuring steam flow. The HRSG supplier shall provide a start-up vent valve for each IP steam header to facilitate unit startup and relieve steam pressure buildup during peak load Steam Turbine trips.

The hot reheat steam shall be piped from each HRSG to a common header feeding the

steam turbine. Each HRSG hot reheat line shall be provided with a dedicated steam turbine bypass system consisting of a combination pressure reducing, desuperheating valve or separate pressure reducing valve and desuperheater for operating flexibility. Each reheat bypass line shall be routed to the Parallel Condensing System ductwork and provided with a diffuser for installation in the PCS ductwork. The bypass system shall be sized for the maximum HRSG output without duct burning and shall be designed for continuous operation. Provide a motor-operated stop valve on the hot reheat line from each HRSG.

5.2.9.3 LP Steam System

LP steam from each HRSG shall be piped through a common header to the steam turbine and admitted to the LP steam turbine section. Each HRSG LP steam line shall be provided with a non-return valve and motor-operated stop valve prior to connection to the common header. The LP steam system shall be designed to bypass the entire steam flow to the air-cooled condenser during startup, shutdown, steam turbine trip, sudden load changes, and when the steam turbine is out of service. The bypass system shall be sized for the maximum HRSG output without duct firing and shall be designed for continuous operation. Each LP steam bypass line shall be routed to the Parallel Condensing System ductwork and provided with a diffuser for installation in the PCS ductwork. Each HRSG LP superheated steam line shall also be provided with a low-pressure drop type flow element and transmitter for measuring steam flow. The HRSG supplier shall provide a start-up vent valve for each LP steam header to facilitate unit startup and relieve steam pressure buildup during peak load Steam Turbine trips.

5.2.9.4 Auxiliary Steam System

All required auxiliary steam systems shall be furnished and installed to result in a complete, fully operational plant. The primary source of auxiliary steam shall be the Block 1 Auxiliary Boiler. Block 1 and Block 2 auxiliary steam systems shall be cross-tied together to provide steam to either unit. Auxiliary steam shall be used for start-up steam seal supply to the steam turbine, Intermediate Pressure steam to the Cold Reheat Steam System, steam jet air ejectors, and for deaerator pegging steam. The auxiliary boiler shall be backed up with desuperheated main steam from either operating unit and supplemented with cold reheat steam for the steam jet air ejectors.

5.2.10 Condensate System

The condensate systems shall be provided as shown in the Conceptual Process Flow Diagram contained in Appendix D. Condensate shall be collected in the Condensate Receiver Tank. The condensate system shall pump condensate from the Condensate Receiver Tank through the gland steam condenser to the LP steam drum and other related plant systems. Makeup to the Condensate Receiver Tank shall be provided from the demineralized water storage tank.

Major equipment quantity and capacities shall be as follows:

Equipment	Quantity	Design Capacity
Condensate Pumps	2	100% Peak Load system demand

The Condensate Pumps shall take suction from the Condensate Receiver at the Air Cooled Condenser and supply condensate to the LP economizer and LP drum. A control valve shall be provided to regulate the condensate flow based on LP drum level using a three-element control system. Provide a vortex breaker and dam on the condensate pump suction connection to prevent sediment from entering the pump suction lines. Provide a factory calibrated ASME flow nozzle meter on the Condensate Pump feed to each HRSG. All steam flows shall be corrected to match the flow from this meter.

Provide condensate pumps with stainless steel wetted parts and include duplex type suction strainers at the inlet of each pump. Condensate pumps shall be multistage, vertical, open line-shaft canned pumps with suction nozzles in the discharge head. Design pumps to operate continuously and include a minimum of 3 feet NPSH margin on pump assuming zero (0) NPSH at the suction nozzle.

A condensate system minimum flow recirculation line shall be provided and shall

connect downstream of the gland steam condenser and discharge into the condensate receiver above the maximum water level. This line shall be designed to provide a minimum flow re-circulation protection for the Condensate Pump and the gland steam condenser. Each Condensate Pump discharge and suction connection shall be vented by individual lines back to the condensate receiver. During normal operation, makeup to the condensate receiver shall be supplied by vacuum drag from the demineralized water storage tank. The demineralized water pumps shall also be designed to supply the condensate receiver when condenser vacuum is not available. Provide taps off of the discharge of the condensate pumps to allow for future installation of full stream filter for iron removal.

All piping and components from the demineralized water system shall be made from corrosion-resistant stainless steel capable of handling this type of water.

5.2.11 Boiler Feedwater System

The boiler feedwater system shall be provided as shown in the Conceptual Process Flow Diagram in Appendix D. The system shall be designed to deliver feedwater from the LP drum to the corresponding HRSG HP and IP drums through their respective economizers over the full range of plant operation. The feedwater pumps shall also supply spray water to plant desuperheaters and attemperators.

Two identical boiler feedwater pumps shall be provided for each HRSG. Each pump shall be designed to provide 100% of the HRSG feedwater demand and other system demands at Base Load operation. Each pump shall be supplied with a Voith variable speed fluid coupling. For maximum Peak Load operation, both feedwater pumps shall operate to provide the total system demand for one HRSG. The HRSG feedwater pumps shall be segmented ring pumps with a main discharge providing HP feedwater and an inter-stage bleed port providing IP feedwater to the system. Using pressure letdown valves to reduce the pressure of the HP feedwater for IP service is not acceptable. The feedwater pumps shall be provided with all required auxiliary systems including warm-up system; vibration monitoring and alarms; seal water system; forced lubrication system; and NPSH protection. Provide suction strainers on each boiler feedwater pump suction inlet. Design feedwater pumps with a minimum ratio of $NPSHA / NPSHR$ of 2 to 1 at the worst case operating or transient conditions.

Boiler Feedwater Pumps shall be equipped with Bentley Nevada vibration monitoring system - X-Y Prox Probes (2 per pump bearing) and the Key Phasor Probe (1 per pump). The boiler feed pump vibration monitoring system shall be tied in to the existing main Bentley Nevada System 1.

The feedwater pumps shall be variable speed, electric motor driven, with hydraulic couplings. A flow element, check valve, and isolation valve shall be provided in the HP and IP discharge piping of each pump. A three-element feedwater control system shall be provided to regulate the flow of feedwater to maintain IP and HP drum level. Each pump shall have a minimum flow recirculation system that discharges into the LP drum. The recirculation system shall include a modulating control valve, with a pressure break down orifice located at the LP drum, controlled from a flow element measuring flow through each pump. During low load, the control valve shall maintain minimum flow required for safe pump operation.

Boiler feedwater pumps shall be provided with mechanical seals. Basket type strainers shall be installed in the suction lines to protect the pumps from damage.

A pump warm-up line shall be provided downstream of each pump discharge isolation valve to maintain an idle pump in a ready condition while the other pump is in operation. The line shall be designed to recirculate warm water from the discharge header through the idle pump casing back to the suction piping. A restriction orifice shall be provided in each warm-up line to maintain the warm up flow and reduce the pressure.

5.2.12 Raw Water Supply System

The raw water supply system shall be provided to receive raw makeup water from the off-site wells for use as firewater, service water, makeup to the evaporative coolers and makeup to the Demineralizer System. Raw water analysis is provided in Appendix I.

Provide a raw water tank with minimum capacity as required by Contractor's design. Block 2 raw water tank shall not include additional storage for Fire Protection Water. The tank shall be lined or coated carbon steel and shall be provided with a level transmitter. Provide a level transmitter with an indicator on the tank and a level control valve on the

water supply to the tank to regulate make-up water from wells to the tank. Control valve shall close on high water level in the tank. The control valve shall open after the water level drops below a preset level.

5.2.13 Service Water System

The service water system shall be provided to receive service water from the raw water tanks and distribute the water to the demineralized water system, water treatment system, service water users and stations.

Provide service water stations within 100 feet of all areas needing service water for routine maintenance or cleaning. Provide a minimum of two service stations at the boiler water treatment skids. Provide service water to all equipment requiring service water for seal flushes or other purposes.

Provide a 100-foot service water hose and hose bib at all service water stations.

5.2.14 Raw Water Treatment System

The Raw Water Treatment System shall be designed to receive and treat water from the on-site wells. Raw water treatment shall consist of filtration by multimedia filters.

A complete filtration system shall be provided including but not limited to backwash pumps and air scour blowers. The Raw Water Treatment System shall treat the well water supply for use as makeup to the evaporative coolers and makeup to the Demineralized Water System.

Equipment	Total Quantity	Design Capacity
Multimedia Filters	3	50% of System Capacity (with one spare 50% multimedia filter)
Backwash Pump	2	100% of Design Capacity
Air Scour Blowers	2	100% of Design Capacity

5.2.15 Demineralized Water System

The Demineralized Water System shall consist of inlet cartridge filters, a 2-pass reverse osmosis system, a first pass permeate break tank with a minimum retention time of 20 minutes, offsite regenerated mixed bed ion exchangers and all necessary pumps, piping, valves, etc. for a complete system. System capacity shall be such that all plant requirements are satisfied at peak water requirements providing no less than 5% of makeup main steam flow.

The Demineralized Water System shall be designed to produce high quality demineralized water that will not exceed the following maximum guarantee limits in the effluent of the demineralization system:

Cation Conductivity:	0.2 $\mu\text{mho/cm}$
Silica:	10 $\mu\text{g/l}$
Sodium:	10 $\mu\text{g/l}$

Major equipment capacities shall be as follows:

Equipment	Total Quantity	Design Capacity
Feed Pumps from Storage	2	100% of System Capacity
Cartridge Filters	2	100% of System Capacity
1 st Pass RO Feed Pumps	3	50% of System Capacity (Including one common spare pump)
1 st Pass RO Units	2	50% of System Capacity
2 nd Pass RO Feed Pumps	3	50% of System Capacity (Including one common spare pump)
2 nd Pass RO Units	2	50% of System Capacity
RO Chemical Cleaning Skid	1	100% Capacity of One Unit
RO Permeate Break Tank	1	20-minute RO permeate retention storage
Offsite Regenerated Mixed Bed Bottles	As required	As required to support RO product flowrate plus 50% spare capacity

Demineralized Water Pumps	2	As required to supply demineralized water users
---------------------------	---	---

Provide horizontal, centrifugal, RO feed pumps. Each pump shall be sized to provide the full capacity flow rate of the RO units.

Provide two pre-assembled, skid mounted, cartridge filter(s) at the inlet to the RO system. Provide filter housing constructed of type 304 stainless steel, minimum. Each filter shall consist of replaceable 2-inch diameter, 10-micron absolute, filter cartridge elements. Provide differential pressure transmitters across each filter to alarm control system upon detection of high differential pressure. Each filter shall be sized for 100% of the RO inlet flow rate.

Provide horizontal, centrifugal, RO feed pump(s) constructed of stainless steel wetted parts. Provide 2-pass RO units with all piping factory assembled, permeate discharge, and reject header for each unit.

Design each RO unit for in-place cleaning and provide necessary facilities to facilitate the cleaning, including but not limited to, a chemical solution tank, heater, cartridge filter, and horizontal centrifugal cleaning pump. Provide a post shutdown brine flush on each unit that bypasses the reject control valve while flushing is taking place and uses RO product water as the flushing source. Construct RO element housings of FRP. Use stainless steel piping for all interconnecting piping and headers. Provide sample connections on the inlet and each housing outlet to facilitate the collection of grab samples. Provide RO membranes with a minimum guaranteed life of three years in the intended service and with a minimum salt rejection of 99.5% at the beginning of membrane life with an annual salt passage increase of no more than 10% through membrane life. Provide pressure and flow transmitters on the inlet and permeate header on the reject connection of each RO system, and as required to allow automatic trending of membrane performance per ASTM D-4516, Standard Practice for Standardizing Reverse Osmosis Performance Data. Provide pH and conductivity meters on the RO inlet and permeate headers.

An RO permeate break tank shall be provided with capacity to hold at least 20 minutes of storage of 1st Pass RO permeate.

Off-site regenerated mixed bed ion exchangers shall be provided to polish the 2nd Pass RO effluent. The system shall be sized at 150% of flow for redundancy during exchanger change-out. Each bank of modules shall be furnished with effluent conductivity and flow monitoring.

The Demineralized Water Storage Tank shall be common to both Block 1 and Block 2. The new Block 2 demineralizer system shall be installed adjacent to the existing Block 1 Demineralized Water Storage Tank and demineralizer system, or at a location approved by Owner.

Provide horizontal, centrifugal, demineralized water make-up pumps constructed of stainless steel wetted parts. Provide a pH probe, conductivity probe, silica analyzer, and a temperature probe on the pump outlet header. Provide a flow meter on the demineralized make-up water line to each condenser.

The cycle makeup system shall be located outdoors.

5.2.16 Air Cooled Condensing System

Contractor shall provide an Air Cooled Condenser (ACC) System for turbine exhaust and by-pass, complete with all auxiliaries and accessories including the following:

1. Galvanized steel or aluminum fin tube bundles (with integral condensate collection/crossover headers and jacking bolts) or single row tubes
2. Lifting beam for tube bundles
3. Galvanized steel A-Frame support structure for fin tube bundles, including partition walls and doors
4. Galvanized steel fan deck
5. Galvanized steel ACC support structure, including perimeter walkway, hand-rails, and one (1) escape ladder
6. One (1) galvanized stairway from grade level to fan deck

7. Galvanized steel fan support bridges, including handrails
8. Fan rings with inlet bells
9. Galvanized steel fan guard grills
10. Axial-flow, aluminum fans
11. Gearboxes, including couplings, backstops, oil level pressure switch, and a AGMA service factor of 2.0 or greater
12. Variable speed TEFC electric motors, including space heaters and a 1.15 service factor
13. Transfer beam monorail and hoist for motor removal
14. Steam distribution header for each ACC row (with integral blanking plates for testing purposes)
15. Mechanical vibration switches (one per air moving assembly), temperature sensors, and pressure transmitters
16. Rupture disk assembly, including a platform and one (1) moveable ladder
17. Condensate collection piping and drain piping
18. Air removal headers and piping
19. Windwall (above fan deck level) and associated galvanized steel support structure
20. Steam duct from the turbine to the ACC, including expansion joints, inspection manhole, supports, and bypass connections
21. Steam duct drain pot and drain pot pumps, including level transmitters
22. Skid-mounted liquid ring vacuum pump system including integral piping, integral instrumentation, and automatic inlet valve
23. Vacuum deaeration system
24. Interconnecting bolting hardware and gaskets
25. Complete system control logic narrative
26. Training (5 days, one trip)
27. Freight (all material and equipment, FOB project site)

28. Thermal, hydraulic, mechanical, and structural design of equipment
29. Wind mitigation design and material supply.
30. Three jigs for modular construction of the cells at grade level

Liquid Ring Vacuum Pumps

1. 2 x 50% Hogging pumps, with all accessories as required, to hog condenser to 6" Hg in 30 minutes

Steam jet air ejector holding systems

Freeze protection features

Instrumentation sensors, transmitters, and control actuating devices

Complete system logic specification in narrative form for incorporation into plant DCS.

Noise attenuation features/devices, as required.

All bolting and gaskets.

Surface coatings, as follows:

1. Structural steel and fan deck platework to be galvanized.
2. Stair treads, support steel, grating, handrails and walkway surfaces to be galvanized.
3. Steam ducting, steam headers and piping to be outside primer coated.
4. Partition walls, windwalls and siding shall be finish painted with manufacturers standard coatings.

Special maintenance and erection tools

Submittals: Contractor shall provide ACC certified performance correction curves for all applicable design parameters including, but not limited to:

1. Steam flows of 50, 90, 100 and 110 percent of guaranteed steam flows for Parallel Condensing System.
2. Steam flows of 50, 90, 100 and 110 percent of guaranteed steam flows for Air Cooled Condenser.
3. Ambient Temperature.
4. Wind velocity.

Factory Tests:

1. Include all manufacturer's standard factory tests on Equipment and Material.
2. Notify Engineer at least two weeks in advance of tests so that a Engineer representative can be present if desired.
3. Submit copies of reports on all factory tests conducted.
4. The ACC Condensate Tank shall be hydrostatically tested by manufacturer at 1.5 times the working pressure per ASME Section VIII.

Pressure Tests: The ACC and steam distribution ducts will be subjected to pneumatic pressure test after erection is complete.

5.2.16.1 Design Parameters

The Air Cooled Condenser shall maintain the guaranteed maximum backpressure at Steam Turbine exhaust flange under the following conditions (Performance will be corrected to ambient temperature, condensing capacity, and wind speed in accordance with guaranteed correction curves):

- | | |
|--------------------------------------|----|
| 1. Ambient dry bulb temperature (°F) | 95 |
| 2. Relative Humidity (%) | 18 |
| 3. Wind Speed (mph) | 10 |
| 4. All Ambient Wind Directions | |

Turbine Bypass Guarantee Conditions: The Air Cooled Condenser shall be capable of maintaining the maximum guaranteed backpressure at the Steam Turbine exhaust flange while condensing full Hot Reheat Turbine Bypass and Low Pressure Steam Turbine Bypass steam flows (Performance will be corrected to ambient temperature, condensing capacity, and wind speed in accordance with guaranteed correction curves contained):

- | | |
|--|--------|
| 1. Ambient Dry Bulb Temperature Range (°F) | 15-120 |
| 2. Relative Humidity (%) | 16 |
| 3. Wind Speed (mph) | 10 |
| 4. Any ambient wind direction. | |

Liquid Ring Vacuum Pump Guarantee: The vacuum pumps operating in parallel shall be capable of hogging PCS down from atmospheric pressure to 6" Hg Abs. in no more than

30 minutes.

Maximum O₂ and non-condensable gases in the condensate sampled at the Condensate Pump discharge shall be less than seven (7) ppb at all operating conditions.

Equipment noise shall not exceed requirements specified in Section 1 .

ACC performance shall remain in accordance with Guaranteed Correction Curves at all operating and ambient conditions. STG exhaust steam shall be condensed in the ACC at all ambient conditions.

5.2.16.2 Air Cooled Condenser (ACC)

The air cooled condenser will be supported from grade. The condenser, accessories and components shall be supported on braced structural steel columns designed and fabricated in accordance with codes, standards, seismic and wind load conditions as required and specified. The condenser and its components shall be of proven, dependable design, of high quality new materials with first class workmanship throughout, and arranged to minimize maintenance work.

Platforms, stairs, and ladders shall be furnished to provide access to the condenser Sections, valves, controls, motors, fans and accessories. Access platforms, stairs and ladders shall be steel.

The Air Cooled Condenser shall be arranged as follows:

1. The condenser shall be designed for full vacuum and a positive pressure of standard atmospheric pressure for elevation at the jobsite.
2. Contractor shall determine the steam inlet size which results in the most economical overall condenser and auxiliaries design.
3. Adequate provision shall be made for thermal movement under the range of temperatures and pressures that will be encountered in operation. No leakage of steam or water shall be allowed. Air in-leakage shall be below industry codes and standards and within the limits to maintain the guaranteed performance. No bypassing of air around the heat transfer surfaces shall be allowed. Expansion joints with gaskets and fasteners, guides, braces, and

stiffeners, etc. shall be provided as required.

4. The condenser shall be designed to allow freeze proof operation at specified minimum steam flow and concurrent minimum ambient temperature. The tubes, headers, drain pots, and piping shall be sized and designed to drain freely and completely to prevent damage due to freezing. Freeze protection features shall be described in detail in the proposal.
5. The condenser shall be designed to accommodate plant load swings from maximum to minimum (1 GTG at OEM minimum load) as specified herein throughout range of ambient temperatures at the plant site. The condenser shall be capable of operating with modules shut down to maintain optimum turbine exhaust pressure.
6. The condenser shall be capable of maintaining optimum turbine exhaust pressure and plant efficiency by incorporation of various design features such as sectionalizing, etc.
7. The condenser shall be of the A-frame type with A-frames elevated sufficiently for proper air inlet distribution. Jacking bolts shall be provided on all A-frames to permit proper alignment of bundle tube sheets for purposes of seal welding.
8. The condenser and related components shall be of proven design, utilizing new materials and arranged to facilitate maintenance. Provisions shall be made in the design and construction of the condenser, condenser components, exhaust duct, piping, headers, supports and accessories for thermal movement under the range of temperatures and pressure encountered in operation. Expansion joints at the turbine exhaust, in the ducts and piping, and at the condenser shall be designed for the service.
9. All portions of the condensing system that are associated with containing steam and condensate shall be of seal welded construction. This includes ducting, piping, tube sheet and tube-to-tube sheet connections. Gasketed joints and threaded connections are not acceptable.
10. Welding procedures, processes, equipment and craftsman shall be qualified

in accordance with applicable Sections of the ASME or AWS Codes.

11. Contractor shall maintain a high level of quality control to minimize debris and other contamination entering the system during erection of the ACC in order to facilitate cleaning of the system during start-up.
12. Reverse buckling rupture disc type pressure relief device for each isolatable condenser section shall be provided.

Components:

Fans:

1. Fan blades shall be secured to a common hub and shall be constructed of fiberglass reinforced polyester (FRP) or extruded aluminum, and have adjustable pitch.
2. Blades shall be axial flow aerodynamically designed type.
3. Fan blades shall be weight and moment balanced and shall be interchangeable. Fan hubs and blades shall be statically balanced prior to shipment to the jobsite.
4. A fan guard shall be provided below each fan. The fan guard shall be designed so that it can be used as a maintenance platform using plywood or wooden planks.
5. Provide a fan ring of molded fiberglass duct to house the fan and provide accurate adjustment of the blade tip clearance for optimum efficiency.
6. The fan shall be provided with means to stop backward rotation prior to fan startup.
7. Fans shall be supplied with motors in accordance with SECTION 8.
8. Fan motors shall not exceed 250 horsepower.
9. Two single pole double throw vibration switches of the manual reset type, shall be provided for each fan drive for input into the plant (DCS) alarm

system and for motor shut down. One switch shall be set at high level and the second switch shall be set at high-high level to shutdown each respective fan.

10. Each fan shall be driven through a speed reduction gearbox suitable for continuous service in a dry air cooled condenser environment.
11. The gearbox shall be designed in accordance with AGMA standards.
12. The minimum mechanical design service factor shall be 2.0 referred to motor nameplate rating.
13. A sight gage shall be incorporated to indicate oil level.
14. Bearings shall have an L-10 life of 50,000 hours or greater.
15. An oil pressure or flow switch shall be provided for each gear box.
16. Fans shall not stall under any operating or ambient conditions.
17. Maximum vibration level at fan deck shall not exceed 0.1 inch/sec.

Windwalls:

1. Windwalls shall be provided for installation around the perimeter of the A-frame Section of the air cooled condenser, minimally extending from fan deck level to the top of heat exchanger bundles, to minimize air recirculation, tube freeze-up, or excessive noise.
2. If louvers and/or operable dampers are required, these shall be furnished sized and designed to withstand wind, seismic and operating loads as specified herein. Damper blades shall be horizontal, with maximum length of 6 ft. Damper actuating motors shall be supplied for each Section, sized for wind and fan loads as required by design and this specification. Louvers shall be heavy duty industrial type, suitable for outdoor operation.
3. Wind mitigation shall be provided at the perimeter of the cells, below the fan deck level, as required, to minimize fan inlet air starvation due to high ambient wind conditions.

Controls:

1. The air cooled condenser system shall be designed for automatic operation at all loads and ambient conditions.
2. The air cooled condenser controls shall be implemented through the plant's distributed control system (DCS).
3. ACC Control System shall be designed to prevent freezing of equipment.

Fin Tubes:

1. Shop installed into tube sheets by the condenser manufacturer. The manufacturer should make the method of tubing clear in the proposal.
2. Furnish and deliver the specified number of tubes suitable for the application and in conformance with the design parameters and specifications.
3. Tubes shall be constructed of hot dipped galvanized carbon steel tubes.
4. Fins shall be constructed of carbon steel with all exterior fin tube surface hot dipped galvanized or aluminum.
5. Fin tubes shall be designed such that the interspace between the fin flange and the tube is filled with zinc during the galvanizing process.
6. Fin tube bundles shall be designed to allow free thermal expansion of the tubes. Single row tubes may be supplied by Contractor.
7. Tubes shall be easily cleaned using automatic cleaning equipment provided by Contractor. System shall be furnished complete to include, but not limited to, pumps, nozzles, piping, valves, controls and instruments. System shall utilize raw make-up water for washing tubes.
8. Fin tube bundles shall be arranged to facilitate cleaning and minimize air side pressure drop.
9. Fins shall be capable of withstanding, without damage or deformation, frequent applications of high pressure water jet sprays directed on fins for

cleaning purposes.

10. The fins shall also be capable of withstanding hail up to 1.25 in. in diameter, and localized loads applied by personnel stepping on the fins during erection or maintenance.
11. Fin pitch shall not exceed 11 fins per inch.
12. Air evacuation system shall be designed to continuously remove non-condensibles and maintain performance at all ambient conditions.

5.2.16.3 Steam Duct:

Contractor shall furnish a carbon steel steam duct from the turbine exhaust connection to the air cooled condenser inlets, including duct transition piece at turbine interface, expansion joints and structural supports and/or hangers, as required.

Steam duct connections shall be butt or socket welded except where bolted or flanged connections are required for maintenance and equipment connection. Flanges shall be, as minimum, steel ring flanges in accordance with AWWA Class D (150 psi). Where flanges are employed, associated fasteners and gasketing shall be provided. Access manhole(s) in the steam duct to allow for internal inspection and maintenance of the steam duct system between turbine and condenser shall be provided. Manholes shall be 24" steel pipe nozzles including an ANSI 150 lb. flange plus blind flange. Duct sections shall be shipped in the maximum size allowable from shipping regulations. Ends shall be machine beveled suitable for field welding except where field trimming is required.

Contractor shall add a flanged connection to the main duct to allow for the future addition of a heat exchanger using supplemental cooling from an evaporative type cooling tower. Connection shall be sized to allow for supplemental cooling up to 30% of the total heat load.

Low point drain pot(s) sized to collect condensation during start-up and normal operation shall be provided. Condensate shall be automatically returned to the condensate tank using two (2) 100% drain pumps.

The steam duct shall be designed for full vacuum and for a pressure up to 14.9 psi.

Expansion joints shall be incorporated in the steam ducting to accommodate thermal movements and to minimize loads on connection points. The expansion joints shall be metal bellows type stainless steel welded construction with tie bolts, lifting lugs and accessories, designed in accordance with Standards of the Expansion Joint Manufacturers Association, Section C. The expansion joint located at the turbine connection point may be an elastomeric type. Expansion joints shall be sized and designed to accommodate at least two (2) times the calculated lateral, axial and offset movements.

A spray curtain shall be provided in the vertical section of the main steam duct to protect the Steam Turbine from by-pass steam high temperature. Inlet water piping and control shall be supplied by others.

5.2.16.4 Condensate Receiver Tank

Contractor shall provide a Condensate Receiver Tank sized to provide a minimum of 5 minutes of storage capacity based on 0°F fired case design condensate flow. Normal water level of the tank shall not be higher than 50% of the total volume of the tank. Provide adequate volume in the condensate receiver tank above normal operating level to allow all condensate in the condenser to flow into the condensate receiver tank without overflowing. Condensate Receiver Tank shall be insulated and heat traced.

Condensate Receiver Tank shall be designed for standard atmospheric pressure for elevation at the jobsite to full vacuum with immersion heaters, and designed in accordance with Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code.

Condensate Receiver Tank shall be designed to include a sparger for water make up to reduce the oxygen content to 14 ppb or less at steady state operation. Maximum water make up shall be no more than 3% of the condensate flow.

5.2.16.5 Piping and Valves:

As a minimum, the following ducting and piping shall be furnished:

1. Steam distribution ducting from the main steam duct to individual air condenser sections.
2. Condensate collection and drain piping

3. Air removal piping
4. A pressure equalizing pipe between the main steam duct and the condensate receiver shall be provided.

To minimize the amount of field welding, shop assembled components shall be of the largest size possible commensurate with transportation and handling limitations.

Motorized condenser sectionalizing valve(s) shall be provided as required with related components, two (2) motorized fast acting (6 minutes to atmospheric) condenser vacuum breaker valves. Valves shall be sized for full line size and furnished with motor-operated actuators, including position indication. The valve body and disc shall be carbon steel and designed for tight shutoff.

5.2.16.6 Cold Weather Operation

Condenser shall be designed to allow safe operation at the specified minimum continuous steam flow and winter ambient design temperature and shall be able to operate with 10% steam flow during start-up period. Tubes, headers, drain pots, and piping shall be sized and designed to drain freely to prevent damage due to freezing.

Motor operated louvers and/or operating sectionalizing valves shall be furnished for cold weather operation as required.

5.2.16.7 Steam By-pass System:

The air cooled condenser shall be designed and constructed to receive full bypass steam flow from the heat recovery steam generators (HRSGs) during startup and trip conditions.

The bypass system shall be designed for the maximum HRSG steam output without duct burning and shall be designed for continuous operation.

5.2.16.8 Air Removal Equipment:

Contractor shall provide 2 x 50% capacity vacuum pumps for hogging and a steam jet air ejector (SJAE) holding system for condenser air removal. Design capacity shall be sufficient to reduce pressure to 6 inches of Hg in the entire Air Cooled Condensing

system in less than 30 minutes. Provide a 1 x 200% Inter/After condenser. All venting and discharge lines shall be routed to a safe area.

Each vacuum pump unit shall include the following:

1. Two-stage rotary vacuum pump with cast-iron construction, steel shaft, liquid ring, and electric motor drive.
2. Structural steel base to accommodate pump, motor, and accessories.
3. Flexible coupling, gear-type or Falk Steelflex.
4. Coupling guard complying with all state and federal safety requirements.
5. Steel plate separator with gauge glass, automatic makeup valve, and overflow connection.
6. Automatic inlet valve for main vacuum line from condenser.
7. System vacuum switch to start standby unit.
8. Balanced check valve for separator discharge with soft seat and lever arm for air leakage test.
9. Solenoid valves for valve actuators.
10. All required vacuum and differential pressure and temperature switches.
11. Rotameter for air leakage measurement.
12. A manually operated siltation valve shall be provided at the inlet of each vacuum pump for maintenance.
13. Automated valve, strainer, rotameter, and pressure gauge for water service.
14. Heat exchanger with stainless steel double-grooved, rolled tubes sized for 100°F cooling water.
15. PRV for instrument air control.
16. Complete set of integral interconnecting piping, fittings, tubing, and valves.
17. Complete interconnecting wiring with terminal box and terminal blocks for Owner's connecting wiring.
18. Painting: Shop coat all carbon steel surfaces with manufacturer's standard metal coating suitable for the outdoor service intended.

5.2.17 Chemical Injection Systems

Chemical feed equipment shall be provided to supply water-conditioning chemicals to the boiler steam/water cycle systems. Each system shall be skid-mounted and shall include chemical pumps, piping, instrumentation and controls. All chemical tanks and totes shall be provided with containment to prevent contamination due to chemical leakage. All containment areas shall be sloped to drain to a sump providing convenient suction for the use of portable sump pump or vacuum truck hose. All chemical feed systems shall be monitored, controlled and injection rate adjusted from the plant DCS. Wherever possible, chemical feed pumps shall be identical. All chemical feed systems shall be designed for 100% redundancy at Peak Load.

5.2.17.1 Boiler Water Chemical Systems

The boiler steam/water cycle chemical injection systems shall provide phosphate treatment and include the ability to inject phosphate to the IP and HP drums individually, and oxygen scavenger and aqueous ammonia to the condenser pump discharge. Chemical feed equipment and tanks shall be located inside a heated and ventilated building and shall be arranged to allow clear access to the chemical tanks with a fork truck or other suitable maintenance equipment. Chemical feed system shall be segregated from all other systems in the building with a barrier wall. Provide adequate ventilation to prevent the accumulation of chemical fumes per Industrial Ventilation Standards. Provide facilities suitable for stacked 500-gallon aqueous ammonia and oxygen scavenger supply totes and for a minimum of two carboys of dry phosphate storage in the chemical treatment building.

Provide a dedicated chemical feed system and chemical feed system enclosure for each HRSG. The descriptions included in the following paragraphs are typical of the chemical feed systems.

A phosphate feed system shall be provided for each HRSG to control hardness by minimizing calcium carbonate formation in favor of calcium phosphate formation. Each phosphate system shall consist of a solution tank with mixer and three 100% metering pumps. One dedicated pump will supply phosphate to the HP drum and a second pump to the IP drum. The third pump will serve as a spare.

The oxygen scavenger injection system shall consist of two 100% metering pumps with automatic stroke positioners and variable speed drives. One pump shall feed oxygen scavenger directly from a portable chemical tote to the condensate pump discharge with the second pump acting as a spare. A day tank shall also be provided with a demineralized water connection for dilution of oxygen scavenger provided by tote (if operationally desired). The chemical supplier will supply the portable tote. Control of oxygen scavenger feed shall be in proportion to condensate. The system shall be cross-tied to the condensate pump to prevent operation when the condensate pumps are out of service.

The aqueous ammonia feed system shall be provided to maintain a high pH level and shall have two 100% metering pumps with automatic stroke positioners and variable speed drives. One pump shall feed aqueous ammonia directly from a portable tote to the steam cycle with the second pump acting as a spare. A day tank shall also be provided with a demineralized water connection for dilution of aqueous ammonia provided by tote (if operationally desired). The chemical supplier will supply the portable totes. Control of the aqueous ammonia feed will be in proportion to the condensate flow.

5.2.18 Closed Cooling Water System

Provide a closed cooling water system to supply cooling water to the various generation plant equipment heat exchangers and transfer the heat to air-cooled Component Cooling Water Heat Exchangers. The system must be capable of producing water temperature of 125°F or less at the maximum ambient temperature of 98°F. System shall be provided with all required equipment that will result in a complete, fully functional system.

Provide closed cooling water pumps with sufficient pumping capacity to supply cooling water to both GTG/HRSG trains, the steam turbine generator, and associated balance of plant equipment, at all operating conditions.

The Component Cooling Water System shall, as a minimum, utilize the following major equipment:

Equipment Item	Quantity	Capacity of Each Unit
Closed Cooling Water Pump	2	100% maximum system demand
Component Cooling Water Heat Exchangers	As Required	100% maximum system demand
Component Cooling Water Expansion Tank	1	As required

Rated water flow and system capabilities shall be based on sufficient cooling capacity for GTG/HRSG trains, the steam turbine generator, and associated balance of plant equipment, at all operating conditions.

All components shall be designed in accordance with the latest OSHA requirements. A vibration switch shall be supplied with the Component Cooling Water Heat Exchanger fan system to protect mechanical equipment against excessive damage due to malfunction of the rotating members. Containment shall be provided for the component cooling water pumps, heat exchangers and expansion tank.

Design the component cooling water system for a mixture of no less than 45% propylene glycol solution. Provide concrete containment with drains around the CCW pumps with a 6-inch curb all around.

The system shall be designed and constructed so that one pump is started manually from the main control room and runs continuously during normal operating conditions. System operation shall be a permissive for GTG / STG operation. The other pump shall be on auto standby. A pressure switch in the pump discharge header shall be provided to initiate an automatic startup of the standby pump if discharge pressure is below a predetermined pressure setting. Selection as to which pump will be on standby shall be a manual operation.

The component cooling water expansion tank shall be designed to maintain the required system pressure, provide system make-up and accommodate flow variations, and allow system thermal expansion. The expansion tank shall be vented to the atmosphere and

shall be located at the highest point in the system to provide adequate pump NPSH.

In order to prevent or minimize corrosion of any of the component cooling water system components, a corrosion control system shall be provided. The system shall be designed as a batch system in which the required chemicals are flushed into the system by means of a manually operated slug feeder.

5.2.19 Fuel Gas System

The fuel gas system shall receive gas from the plant metering station in a range of pressures indicated in Section 2 of these specifications. Provide all gas heating, moisture removal, particulate filtration, and pressure regulation required to deliver the gas to each individual GTG fuel gas control system and HRSG duct burner and pilot at the proper conditions as required by GTG and duct burner manufacturers.

Provide a check meter on the main gas supply to the Site as a secondary check to the natural gas supplier's revenue meter. Connect the meter to the DCS for historical trending of the information and totalizing of the flow.

Fuel gas supply system shall be designed to ensure that the GTG manufacturer's fuel gas requirements for contaminants are met, given the worst case fuel that may be delivered to the facility; and to provide filtered, dry natural gas to the GTG and HRSG.

The Fuel Gas System shall be designed to meet all requirements and recommendations of NEC, NFPA, Factory Mutual, and local codes.

The fuel gas distribution system shall have sufficient capability to operate all GTGs and HRSG duct burners simultaneously at Peak output at any ambient condition with the design basis fuel gas composition defined in Appendix J.

Provide a fuel gas scrubber, primary and secondary (if required) fuel gas heaters, and a filter/separator for each GTG. The fuel gas scrubber shall be installed upstream of fuel gas heaters. Filter/separator should be installed downstream of the fuel gas heaters. Provide a filter/separator that is designed to satisfy the GTG manufacturer's limits on particulate matter and liquids. Each fuel gas scrubber and filter/separator shall come

complete and skid mounted with automatic level control to maintain a safe level of accumulated liquids. Separated liquids shall be drained to collection tanks for subsequent removal. The drain tanks shall have level indication that is provided to the plant DCS. All materials in contact with the clean gas stream inside the filter/separators and downstream of the filter/separators shall be constructed of 300 series stainless steel materials.

Provide dedicated primary fuel gas heaters on each GTG unit. Primary fuel gas heaters shall be shell and tube heat exchangers, utilizing waste heat or low energy heat where possible as a heating medium. Design system to preheat fuel gas to a temperature required by the OEM under all load and ambient conditions prior to supply to the GTG fuel gas skid. Provide a temperature probe in the heated gas stream and temperature control valve in the condensate return line to afford temperature control of the natural gas. Scope of supply for the fuel gas heating system shall include, but not be limited to, heaters, heat exchangers, piping, valves, controls, drain tanks, expansion tanks, and safety relief valves.

Provide a secondary electric fuel gas heater on the fuel gas stream to each GTG, designed to provide fuel at the temperature required by the GTG manufacturer during startup (dewpoint heating).

Provide DCS controls and all instruments necessary to monitor temperature of fuel gas supply from the primary fuel gas heaters and automatically initiate and control the secondary fuel gas electric heaters to maintain the fuel gas temperature above the minimum allowed by the GTG manufacturer during start-up. Provide an alarm in the DCS for low fuel gas temperature.

Supply regulated gas, at the required GTG inlet supply pressure, to the GTG fuel gas control system. Provide all pressure regulation equipment required. Provide a branch line to the HRSG duct burners with pressure reduction control valves to reduce the inlet gas supply pressure to that required by the HRSG duct burners.

Provide flow measurement instruments on each fuel gas supply line to each GTG (meters are supplied with the GTGs) and each fuel gas supply line to each HRSG duct

burner. Fuel gas metering to each duct burner and to each GTG shall meet the requirements of 40 CFR 75 for reporting.

The system shall be sized to meet the design capacity requirement with the gas supply pressures at minimum levels. The system design pressure downstream of regulators shall be at least 550 psig, but shall be selected by Contractor during detailed design based on the maximum gas supply pressure. Pressure safety relief valves shall be included as required to prevent the pressure from exceeding maximum system design pressure (including safety valve accumulation) or as required to protect supplied equipment or systems. Design temperature shall be equal to the maximum operating temperature plus a 10°F margin. Provide an automated emergency vent valve in addition to the safety relief valves. Provide a pressure switch with a set point sufficiently below the relief valve set pressure to close the site pressure regulators and open the emergency vent valve prior to lifting the relief's during a system upset. Locate and direct all vents (emergency and reliefs) away from buildings or occupied areas.

Natural gas supply to the Site will not be odorized. Therefore, provide natural gas detectors throughout the facility as required or recommended by NFPA, applicable codes, and as required by the local fire marshall.

Route all fuel gas piping so that piping is not below any ponds or permanent structures.

5.2.20 Compressed Air System

The compressed air systems shall be designed and constructed to supply filtered, dry, and oil-free compressed air to the plant service air system and to instrumentation and pneumatic control devices via the instrument air system. In addition, the following major equipment shall be provided to supply compressed air when the plant is out of service and during system start-up. Compressor and dryer shall be located next to the existing Block 1 air compressors skids. Both service air and instrument air shall be provided from a common air receiver. Air receivers shall be located as required by Contractor's design for Block 2 Equipment. New equipment shall tie into and be located adjacent to the existing Block 1 equipment.

Equipment	Quantity	Capacity
Air Compressor	1	100% Peak system demand
Service / Instrument Air Receiver	1	To level out demand on the Air Dryers and 10 minutes of demand (See Below)
Instrument Air Dryer	1	100% peak system demand

The air compressor shall have sufficient capacity to supply the maximum service air and instrument air required during normal operation and maintenance outages including adequate air to clean one of the GTG inlet air filter systems when the GTGs are shut down. The compressor shall provide oil-free (less than 0.05 ppm oil) air at a discharge pressure of 125 psig. Design system to maintain a normal supply header pressure of 115 psig and design all components to operate properly at a minimum supply pressure to each instrument and air user of 80 psig. Service air supply shall be provided with a low pressure cut-off.

Provide service air hose stations including 100 feet of hose within 100 feet of all areas requiring routine or periodic maintenance with compressed air tools or with compressed air.

Compressed air receivers shall be supplied with a relief valve and shall be ASME Section VIII, Division 1 code stamped and designed for 150 psig. Compressed air receivers shall be provided with sufficient volume to provide 10 minutes of air supply at the design demand rate without the pressure falling below 70 psig with all compressors failed.

The compressor shall be supplied with an inlet filter-silencer and discharged through an aftercooler and moisture separator. The compressor, intercooler, and aftercooler shall be air-cooled. The compressors shall discharge to the common dessicant type air receiver that is sized so that the compressors do not run continuously or in short cycle. The air receiver shall be designed to remove additional moisture.

The air compressors shall operate automatically to maintain the air receiver pressure

within an acceptable range and shall be tied into the Block 1 system. In AUTO mode, the lead compressor shall start on low air receiver pressure and shall stop on high pressure. In the event that the lead compressor cannot maintain the minimum allowable pressure, the standby compressor shall start automatically, and a low-pressure alarm shall be activated in the main control room. A selector switch shall be provided in the DCS to establish the lead compressor and the standby compressors. Remote indication and set point selection capability shall also be provided in the DCS. Air compressor load shall be served off a critical service panel so that the compressor can be operated when the plant is down.

The compressed air stream shall be filtered and dried to a dew point of -40°F . A second receiver shall be supplied to level out instantaneous demand on the instrument air dryers. The dessiccant type dryers shall be fully automatic and permit uninterrupted flow through the desiccant charge during regeneration. The instrument air stream flows through the heatless dryer, which shall include prefilters, afterfilters, and an arrangement of piping and manual isolation valves to allow continuous filtering during the replacement of one set of filter cartridges.

A pressure-regulating valve shall be provided to shutoff air supply to the service air system when low compressed air system pressure jeopardizes operation of the instrument air system.

5.2.21 Sampling and Analysis System

A sampling and analysis system shall be provided to monitor the performance and operation of the steam, condensate, and feedwater cycles; to monitor the quality of various process fluids; and to provide sufficient data to operating personnel for detection of any deviations from control limits so that corrective action can be taken. Sampling and analysis system shall be located in a heated and ventilated enclosure near and readily accessible from the control room.

Each system shall be designed to condition samples by pressure and temperature reduction and to measure flow, temperature, pressure, cation conductivity, specific conductance and pH, silica, O_2 , and sodium.

Samples shall be taken from various process points in each power block and routed to centrally located sample panels. At the panel, pressure reduction shall be accomplished by pressure reducing valves. Isolation valves shall be provided for each sample point on the sample panel to facilitate maintenance. Temperature reduction shall be accomplished by using sample shell and tube coolers utilizing closed loop cooling water for primary cooling of samples over 120°F. Provide a water-cooled (same cooling water as primary sample cooling water) chiller system for secondary cooling to control temperature to 77°F (+/- 1°F). Liquid sample tubing velocities will be approximately 3 to 6 ft/sec. Make provisions at the sample panel for pulling grab samples to allow the operator to perform wet chemical analysis in the laboratory. Sample wastes shall be directed to the boiler blowdown collection system.

The samples shall be directed to automatic analyzers mounted in a NEMA 12 panel and the results displayed and recorded. The following sample points shall be included for monitoring, however all samples shall also have grab samples.

Currant Creek Water Sampling System

Service	GS	SC	CC	DC	DO	pH	Si	Na	ORP
HRSB-A									
Condensate	X					P			
Boiler feed pump suction	X					P			
LP steam	X		X			X	P	P	
IP boiler drum	X	X	X			X			
IP boiler steam	X		X			X	P	P	
HP boiler feed water	X	X	X	X	X	X			X
HP boiler drum	X	X	X			X			
HP boiler main steam	X		X	P		X	P	P	
Hot reheat	X		X						
Evap Cooler Sump*	X	P				P			
HRSB-B									
Condensate	X					P			
Boiler feed pump suction	X					P			
LP steam	X		X			X	P	P	
IP boiler drum	X	X	X			X			
IP boiler steam	X		X			X	P	P	
HP boiler feed water	X	X	X	X	X	X			X
HP boiler drum	X	X	X			X			
HP boiler main steam	X		X	P		X	P	P	
Hot reheat	X		X						
Evap Cooler Sump*	X	P				P			
Common									
Condensate pump discharge	X	X	X	X	X	X	P	P	X
Common hot reheat	X		P					P	
Make-up Demin	X	X					P	P	
Main steam	X								
Evap Cooler Makeup Tank*	X	P				P			
Common LP steam	X								
GS Grab Sample						Si Silica			
CC Cation Conductivity						SC Specific Conductivity			
DC Degassed Cation Conductivity						DO Dissolved Oxygen			
Na Sodium						P Patch Point			

All dissolved oxygen analysis' shall be patched into one oxygen analyzer.

In addition to display of monitored values, each analyzer output shall be hardwired to the DCS. Recording and alarming shall be accomplished by the DCS for display in the main control room.

Sample lines and valves shall be designed and fabricated in accordance with requirement of systems from which they originate. The sampling and delivery piping, sample coolers, tubing, valves, and the sampling sink shall be of stainless steel construction to minimize corrosion. Direct all blowdown from the sample analysis system to the boiler blowdown system. Steam sample connections shall be provided with isokinetic sample probes.

Include personnel protective devices to protect personnel from all hazards.

5.2.22 Fire Protection System

Contractor shall connect to the existing Block 1 underground fire water loop and provide a complete fire protection system that includes Block 2 distribution system, low-pressure CO₂ systems, FM 200 Systems, portable fire extinguishers, fire detection, alarm, actuation, and signaling systems. The fire water system capacity shall be at least equal to the flow rate required for the largest single fire hazard, plus a 500-gpm allowance for two hose streams. Contractor shall confirm that the existing system will meet this criteria with the addition of Block 2. In the event additional capacity is needed, Contractor shall add equipment as required and include the costs for this equipment in their proposal.

All fire protection systems and components shall be designed and supplied in accordance with the appropriate recommendations and requirements of NFPA, UL, FM, and the local Fire Marshall. The systems shall receive the approval of the Owner's insurance carrier.

The engineer responsible for the fire protection system shall be a practicing fire protection engineer registered as a Professional Engineer in the State of Utah. All drawings and specifications shall be signed and sealed by the Professional Engineer.

Should additional Fire Pumps be required, pumps shall be UL listed/FM approved and designed in compliance with NFPA 20 and 850 recommendations.

The underground fire main shall be a minimum of 10 inches in diameter and shall supply fire water throughout the generation plant area. The fire main shall be looped and shall supply water to fire hydrants, hose stations and fixed water suppression systems installed in buildings and elsewhere around the plant. Provide fire hydrants at a maximum of 250-foot spacing and protective ballasts around all hydrants.

The fire protection and detection systems requirements for specific plant locations are summarized in Table 5-2.

Fire protection during plant construction shall meet the requirements of NFPA 241. All fire protection systems shall be subject to review and approval of the local fire department authorities.

Fire walls, if required in Table 5-2, shall be in accordance with NFPA 850. All fire water piping and components that are exposed to freezing conditions shall be freeze protected.

Portable CO₂ and dry chemical fire extinguishers shall be provided in all areas requiring handheld fire protection.

All local alarm, detection and suppression panels shall report status to the main fire alarm panel located in the control room. All alarms shall be indicated in the control room, as well as locally and as required by Code.

In addition to the other requirements, the following fire protection system features are to be incorporated into the design of the plant:

1. Oil Filled Generator Step-up and Auxiliary Transformers
 - A. Transformers shall be provided with oil containment and drainage to the

plant oily water separator. Drain lines shall be provided with normally closed manual drain valves.

- B. Transformers less than 50 Ft from buildings and other major equipment shall be provided with fire walls and automatic deluge system.
- C. Fire walls shall be used between adjacent GSU and auxiliary transformers.

2. Steam Turbine Generator

- A. Steam turbine lube oil tank/console shall be provided with automatic deluge system.
- B. Steam turbine lube oil tank/console area shall be provided with oil containment and drainage to the plant oily water separator.
- C. Steam turbine generator bearings shall be provided with automatic deluge system. Deluge system shall be designed to spray the bearings and the under deck area below the bearings where oil can accumulate.
- D. Under deck area below the bearings shall be provided with containment and drainage to the plant oily water separator.

3. Buildings

- A. Control room and electronic cabinets room (DCS I/O room) shall be provided with automatic FM 200 system. System shall be designed to also protect area under computer floor.
- B. All electrical rooms shall be provided with automatic FM 200 system.

4. Fuel Gas System

- A. Gas detectors shall be provided for areas with non odorized fuel gas.
- B. Duct burner management systems shall meet the requirements of NFPA 8506 and of the NEC code.

**TABLE 5-2
Plant Fire Protection and Detection Systems**

Plant Location	Type of Fire Protection	Fire Detection
Water treatment / chemical storage buildings	Fixed, automatic, wet-pipe sprinkler, closed head	Smoke/heat detectors
Chemical Feed Shelters	Handheld extinguishers*	Smoke/heat detectors
Sample analysis / CEM enclosure	Handheld extinguishers*	Smoke/heat detectors
Boiler Feed Pumps Enclosure	Handheld extinguishers*	Smoke/heat detectors
Steam turbine lube oil tank and lube oil piping	Fixed, automatic, dry-type, open head, deluge system	Heat detectors
Main (Generator Step-up) and station service transformers	Provide fire walls if located within 50 feet of other facilities, between adjacent GSU & auxiliary transformers or other major equipment	Fire walls
Gas turbine generator	CO ₂ system supplied by the GTG manufacturer	Supplied by the GTG manufacturer
Switchyard control building (Building is provided by others. Fire protection shall be provided under this Contract).	Handheld extinguishers or as required by the local fire marshal.	Smoke/heat detectors
Cable spreading vault/room	FM 200	
Gas Metering Building		

(*) or as required by local fire marshal

5.2.23 Potable Water System

Contractor shall tie the Block 2 potable water system to the existing Block 1 water treatment plant. Provide a potable water system for Block 2 to distribute potable water to various users located around the generation plant (See Conceptual Process Flow Diagram FD-2, Appendix D). Areas requiring potable water include various chemical storage areas and battery rooms requiring eyewashes and or showers around the plant. The operating pressure shall be controlled between 60 and 90 psig. Drinking fountains shall be included. The maximum potable system demand shall be determined in accordance with the Uniform Plumbing Code for the fixtures and shall include a 30-gpm allowance for eyewash stations and safety showers.

The potable water system shall be designed to provide potable water, both hot and cold as required, at the proper pressure, temperature, and flow rate to all plumbing fixtures and equipment. All instrumentation shall be controlled by the DCS. Potable water piping shall be insulated as required.

Provide back flow preventers on all service water branches off the potable water system.

Provide safety showers and eyewash station at all chemical storage locations, ammonia storage locations, in the battery room, at SCR ammonia injection skids, and otherwise where emergency showers are required per OSHA and where normally installed in a combined cycle power plant. Safety shower system shall be designed and constructed to meet OSHA requirements. Water supplied to the safety showers and eyewash stations shall be tepid per ANSI Z358.1 guidelines. Provide thermal relief valves on all safety showers and eyewash stations. Provide flow switches on all eyewash stations and safety showers. These flow switches shall alarm in the control room when flow is detected.

5.2.24 Process Bulk Gas Storage and Distribution System

The process bulk gas storage and distribution system described in this section is for use in the plant process systems and is in addition to the CO₂ fire protection system provided with the GTG or any other CO₂ fire protection systems provided at the request of the local fire marshal.

All process bulk storage systems shall be located under cover for sun protection.

The hydrogen storage and distribution system shall be provided to supply hydrogen for generator makeup during normal operation and for initial filling. Hydrogen will be stored in cylinders mounted on a mobile trailer to be provided by Owner's hydrogen supplier. Contractor shall provide a hydrogen storage trailer pad sized for two trailers. Contractor shall coordinate the design of the hydrogen storage system with the Owner's hydrogen supplier, install the complete system, including foundations and utility requirements, ready to receive the hydrogen gas and shall commission the complete system.

Contractor shall provide a bottled carbon dioxide distribution system to supply carbon dioxide for purging the generator casing to remove air and hydrogen during outages to prevent an explosive hydrogen mixture. Carbon Dioxide will be stored in cylinders mounted on a mobile trailer to be provided by Owner's carbon dioxide supplier. Contractor shall provide a carbon dioxide storage trailer pad sized for two trailers. Contractor shall coordinate the complete design of the carbon dioxide storage and distribution system with the Owner's carbon dioxide supplier, install the complete system ready to receive the carbon dioxide gas and shall commission the complete system with assistance as required from Owner's carbon dioxide supplier. The bottle storage trailers for Block 2 shall provide sufficient storage for four gas turbine generator purges. The Contractor shall provide a sun shelter over the bottle storage trailers.

Storage racks, manifolds, and pressure regulating stations for nitrogen gas bottles shall be provided and installed at each HRSG for the supply of nitrogen inerting gas. The nitrogen storage racks shall have sufficient capacity to blanket one wet HRSG for one month. The systems shall have sufficient capacity to adequately blanket a wet HRSG within 4 hours.

Nitrogen may also be supplied to the closed cooling water system head tank for pressurization as necessary for the Contractor's design. If required for other than long-term lay up of equipment, Contractor shall provide permanent facilities for Nitrogen storage.

Pressure control units shall be provided to regulate gas flow to meet system capacity requirements and satisfy minimum inlet pressure requirements at each user. The system design pressures upstream of the pressure control valves shall be equal to the storage system's design pressure. The header pressure of each bulk gas system shall

be monitored on the plant DCS. Provide relief valves downstream of the pressure control valve as required to protect the piping from a regulator failure.

5.2.25 Wastewater Collection and Transfer System

The wastewater collection and transfer system shall be provided to collect, treat, and dispose of the facility wastewater streams including the following:

1. Sanitary wastewater.
2. Oily wastewater.
3. Gas turbine water wash.
4. Process wastewater.
5. Wastewater discharge to evaporation pond(s).

All waste lift stations shall be open concrete sumps covered with solid dust tight covers. Sump pumps shall be installed in 100% capacity pairs. Sump pumps shall be vertical sump pumps with the motor installed above the sump solid dust tight covers.

5.2.25.1 Sanitary Wastewater

The sanitary wastewater shall be collected from the various points of origin in the facility and disposed of in the existing drain field septic system. Contractor shall confirm whether existing Block 1 facilities are adequate for the addition of Block 2. The system shall be sized to meet the requirements of local code. A pumped system shall not be used unless a gravity system is impractical. Contractor shall tie into the existing Block 1 system as required.

5.2.25.2 Oily Wastewater

Plant wastewater that has the potential for oil contamination shall be collected and routed through an oil/water separator. An oil/water separator shall be provided in accordance with the following paragraph:

Oil/water separator shall be a double-wall vessel in accordance with API 421 standards and UL 58. Separator shall include sufficient corrosion protective coatings or shall be fiberglass and shall be provided with a minimum of two manways for access to the front and back portions of the separator. Extend manways to grade and provide gasketed covers. Design internal components requiring maintenance to be removable from the

manways. Provide separator capable of removing entrained oil to a maximum instantaneous concentration of 10 ppm or as required by the plant permits, whichever is more stringent, and hardwired to the DCS if historical data archiving and/or trending is required by the permit. Provide level probe and high level switches and interstitial leak detection devices between the vessel walls. This system shall be designed so that a vacuum truck can remove separated oily waste.

5.2.25.3 GTG Water Wash

The GTG water wash system shall be provided with two (2) concrete sumps, one for each GTG, sized to contain the wastewater from two complete GTG water wash cycles. The tank system shall be provided with connections and designed for vacuum truck removal.

5.2.25.4 Process Wastewater

Process wastewater including waste from the water treatment system, RO reject from the cycle makeup treatment system, oil/water separator, and HRSG blowdown shall be drained to a collection sump. Hot process drains shall be cooled before introduction into the hot drain system. Hot drain piping shall be designed to accommodate temperatures up to 212°F.

The plant wastewater discharge shall be monitored and measured as required by the plant wastewater permits and all applicable federal, state, and local codes. Provisions shall also be made to provide grab samples. Provide sample connections on the waste discharge piping to each pond to facilitate the collection of grab samples. All other waste streams shall be directed to the locations indicated above.

5.2.26 Heating, Ventilating, and Air Conditioning System

The heating, ventilating, and air conditioning (HVAC) systems for the plant shall satisfy the workspace environmental requirements for personnel occupancy and equipment operation. Temperatures shall be maintained well below operating limits so that equipment reliability will not be jeopardized.

The ambient design conditions for the HVAC Systems shall be selected by the Contractor based on ASHRAE data for the plant location.

HVAC systems shall be designed to maintain the indoor conditions listed in the table shown below based on the maximum ambient temperatures.

Building/Area	Indoor										System Configuration
	Outdoor Ambient Design		HVAC Design Temperature		Humidity Control (%RH)	Ventilation Rate Based on a 10F rise	Particulate Filtration Efficiency (%)	Pressurization	Redundancy (Note 4)	Noise Criteria	
	Winter (F)	Summer (F)	Winter (F)	Summer (F)							
Electrical Equipment Area	Note 1	72	75	30-65	N/A	N/A	High/Low	Positive	2 x 100%	NC 45	AC for equipment requirements
Battery Room	Note 1	60	Note 2	N/A	As required For 2% hydrogen Dilution	None	None	Negative	2 x 100%	85 dBA	Heated and ventilated for equipment requirements. Explosion-proof construction
Electronics Room	Note 1	72	75	30-65	N/A	N/A	High/Low	Positive	2 x 100%	NC 45	AC for equipment requirements
Water Treatment Building	Note 1	60	Note 2	N/A	Note 2	None	None	None	None	85 dBA	Heated and ventilated for equipment.
Chemical Storage	Note 1	60	Note 2	N/A	Note 2	None	None	None	None	85 dBA	Heated and ventilated for equipment.

Instrument Shop & Prefabricated Electrical Enclosures	Note 1	72	75	30-65	N/A	Medium	Positive	None	NC 45	AC for personnel comfort and equipment requirements
CEMS Shelters	Note 1	72	75	30-65	N/A	Medium	Positive	2 x 100%	NC 45	AC for personnel equipment requirements
Boiler Feed Pumps Building	Note 1	60	Note 2	N/A	Note 2	Medium	None	None	85 dBA	Heated and ventilated for equipment
Sample Analysis Shelters, Chemical Feed Shelters	Note 1	60	Note 2	N/A	Note 2	None	None	None	85 dBA	Heated and ventilated for equipment.
Offices (outside of admin area)	Note 1	72	75	30-65	N/A	ASHRAE STD-62	Positive	None	NC 45	AC for personnel comfort and equipment requirements

Notes:

- 1997 ASHRAE Fundamentals, 1% summer/99% winter for Salt Lake City, UT.
- Indoor temperature is the greater of the following: Ambient temperature plus 10F or the equipment temperature limit.
- Evaporative "swamp" cooler shall be designed for a minimum of 85% effectiveness.
- Redundancy is included to specify the amount of redundancy required (e.g. 2x100% requires a primary system with a 100% back-up system and None requires only a primary system). Redundancy does not specify the number of units required to accomplish the intended duty. However, unless approved otherwise by the Owner, a maximum of three air-conditioning units shall be used to accomplish any single application for which no redundancy is specified and a maximum of four air-conditioning units shall be used to accomplish any single application for which redundancy is specified.

The design table indicates the level of redundancy for HVAC equipment in the indicated areas. When redundancy is indicated, only the major active components require backup equipment. Static components such as ductwork do not require duplication.

Minimum ventilation rates shall be provided in normally occupied areas in accordance with local codes. In the absence of applicable local codes, ASHRAE Standard 62 requirements will be met.

The air conditioning for control and electrical equipment shall be designed to meet the filtration levels indicated in table shown below. Tabulated filtration levels are indicated as low, medium, or high. These levels are according to the following filtration efficiencies as defined by ASHRAE Standard 52, Method of Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter:

<u>Level</u>	<u>Efficiency (percent)</u>
High	80 to 90
Medium	55 to 65
Low	Less than 20

Noise criteria are indicated in the design table as NC levels, decibels, or as background. Noise criteria (NC) values are as indicated in the ASHRAE Handbook series for acoustical design criteria. Decibels are sound pressure levels, A-weighted, to a reference of 0.0002 microbar (0.00002 Pa), at 5 feet (1,500 mm) from the equipment as measured in a free field with a single reflecting plane. Background indicates that the HVAC equipment will be designed such that the contribution shall be 2 dB or less than the overall room noise at 6 feet (1,800 mm) above the floor with normal plant equipment in operation.

Mechanical equipment rooms containing refrigerants will be designed in accordance with the requirements of ASHRAE Standard 15, Safety Code for Mechanical Refrigeration.

A minimum of five air changes per hour of ventilation or recirculation air will be provided for effective mixing during heat removal ventilation or air conditioning.

Laboratory design ventilation rates shall be based on local codes. If local codes are not available, ASHRAE STD-62 will be used.

Maximum design temperatures represent the average building temperature. Cooler temperatures may occur near the ventilation inlets and higher temperatures may occur at relief and exhaust points.

The indoor temperature design conditions in the control building and electronics enclosures shall be in accordance with equipment operating requirements. The indoor and outdoor design temperatures in non-process areas shall comply with applicable local energy code requirements. As a minimum air-conditioning systems be designed to maintain and indoor temperature of 70 degrees F. Heating systems shall be designed to maintain comfortable space temperatures during normal winter plant operations

Ventilation systems shall be designed to provide adequate ventilation air to dissipate the excess heat developed by the plant equipment and components during plant operations. Ventilation systems for chemical storage areas shall be designed in accordance with Industrial Ventilation Standards to keep chemical concentrations in the air within acceptable limits.

The battery room ventilation system capacity shall be based on limiting the maximum hydrogen concentration to 2% or less of the total battery room volume while maintaining an acceptable internal temperature. Battery room air shall be exhausted continuously by a spark-proof exhaust fan (with a spark-resistant fan wheel and explosion-proof motor) to maintain a low level of hydrogen concentration. Provide a hydrogen detector for the battery room and connect to the DCS, either directly or through the fire detection system.

Air velocities in ducts and from louvers and grills shall be sufficiently low so to maintain acceptable noise levels in areas where personnel are normally located. Roof ventilators shall be low noise type to minimize impact of plants overall noise emissions.

Thermal insulation with vapor barrier shall be provided on ductwork surfaces with a temperature below the dew point of the surrounding atmosphere to prevent vapor condensation. All ductwork used for air conditioning purposes shall be insulated: ductwork used for ventilation purposes shall not require insulation.

Exhaust systems shall be provided for toilet and shower areas. Outdoor ventilation air shall be based on normal room occupancy or local codes, whichever is more stringent.

5.3 PLANT PIPING REQUIREMENTS

5.3.1 General Requirements

This criteria covers the requirements for the design, fabrication, installation, and protection of all plant piping. Contractor shall be responsible for the mechanical design of the piping system, pipe stress analysis, and pipe supports. Upon request, all design criteria and calculations shall be provided to Owner for review.

All piping shall be designed, fabricated, installed, examined, and tested in accordance with applicable local codes and the applicable sections of ANSI B31.1 for power piping, B31.3 for fuel piping, and the ASME Boiler and Pressure Vessel Code, Section I for critical boiler related piping

Process pipe sizing shall be based on the following factors:

1. Maximum line velocity as defined in Table 5-1.
2. Piping layout and configuration.
3. Economic evaluation considering piping material cost and pumping energy costs.
4. Quality of material handled (clean, sedimentation, other).
5. System operation (continuous or intermittent).
6. Minimize flashing, noise, vibration, water hammer, deflection, and erosion over the full range of operation, including startup and shutdown.
7. Minimum pipe size shall be 3/4 inch, except for connections to equipment. Pipe sizes 1-1/4 inch, 3-1/2 inch, 5, 7 and 9 inch shall not be used except for connections to equipment.

All potable water piping shall be sterilized in accordance with AWWA standards for disinfecting purposes prior to filling.

Run all lines parallel to building lines and equipment centerlines. Group parallel lines to the greatest extent possible for support from a common pipe support system.

General service piping shall be installed with north/south runs at one elevation and east/west runs at another elevation. Where change in direction occurs a minimum of 1 foot 6 inches (3 feet on lines above 6-inch NPS) elevation change shall be provided. Exceptions to this requirement will be allowed on the main steam piping (HP steam, Hot Reheat, Cold Reheat, and LP steam.)

Provide sufficient unions and flanged connections to permit dismantling of equipment, automatic valves, and instruments for routine maintenance.

Slope all vent lines and gravity drain lines to provide a minimum of 1/8 inch per foot slope in the direction of liquid flow.

Pump suction and discharge piping shall be at least one pipe size larger than pump connection. Provide spool pieces between pump and isolation valves to permit removal of the pump without removing block valves. Install eccentric reducers with flat side on top at all pump suction. Do not install pockets in piping on pump suction that would trap liquids. Pump suction piping shall be in accordance with Hydraulic Institute recommendations.

Provide steam drain assemblies at all pocketed low points, at dead ends, and at intervals along main steam lines to be determined by Contractor to ensure adequate condensate removal during system warm-up and compliance with ASME TDP-1.

Provide spare valved instrument air taps on instrument air line a minimum of every 20 feet where instrument air headers are routed through or along equipment. Provide valved taps every 50 feet in general pipe rack runs.

Provide service air and water hose stations within 100 feet of all areas around the plant that may require air or water for maintenance or washdown. Route 1-inch minimum lines to the hose stations. Terminate all hose stations with a quarter turn ball valve and "Chicago type" hose coupling.

Provide plugs or caps in all valved connections open to the atmosphere.

All lines filled with a liquid that could freeze under extended shutdowns which are not freeze protected as required in the Insulation and Jacketing section of these Specifications, shall be designed and provided with sufficient drains and vent valves to allow fully draining as a means of freeze protection. Drains and vents on such piping shall be designed to be safely accessible from grade or elevated platforms.

All above ground piping shall be metallic unless specifically approved by the Owner. Above ground pipelines 2-1/2 inches and larger shall be provided with an identification system indicating the pipe contents and direction of flow. The identification system shall be easily visible and readable from floors or platforms. The system used by the contractor shall be approved by the Owner.

The exterior of exposed carbon steel piping that is not insulated or galvanized shall be cleaned and painted.

Piping shall be carried on overhead pipeways, sleeperways, or lined trenches. Space for electrical and instrument conduit runs shall be provided on the pipeways and sleeperways as required. Space for electrical and instrument conduit runs shall be segregated to eliminate electrical interference.

Underground metallic piping shall be provided with corrosion protection based on the recommendation of a certified corrosion engineer for the piping material and measured soil resistivity. Underground piping shall be routed following designated corridors, rather than the shortest path. The firewater loop piping and potable water piping shall normally be routed underground. All underground piping shall be provided with brightly colored marking tape installed per manufacturer's recommendations along entire length of pipe with colors and markings appropriate for its service. Non-metallic piping shall utilize metal detectable marking tape.

Condensate, feedwater, and steam lines shall not be installed below grade.

5.3.2 Piping Classes

The Contractor shall furnish specifications identifying the piping classes for the major systems. The class description shall include service description, pressure/temperature

rating values and materials, descriptions, types, and ASTM specifications for fittings, flanges, branch connections, welding, gaskets, bolting, pipe, and bends:

A general listing of minimum piping materials that shall be used for each service is provided in the following table. To the extent that there is any conflict between the piping materials listed below and any other provision of these Specifications, except code, the piping materials shall have priority. Contractor is responsible for ensuring the materials specified are suitable for the intended service and shall substitute higher quality materials where required to meet the intended service life of the plant. All substitutions shall be approved by the Owner.

PIPING MATERIALS		
<u>Service</u>	<u>Media</u>	<u>Material</u>
Ammonia	Aqueous Ammonia	ASTM Type 316 SS
Boiler Blowdown	Treated Water	ASTM A53 GR. B or A106 Gr. B or Alloy Piping as required for the application, SMLS
Chemical Treatment Acid Tubing	Sulfuric Acid	ASTM B468 UNS N08020, Alloy 20, Fully Annealed, SMLS with a hardness of Rb95 or less. Fittings to be flareless type.
Closed Cooling Water	Treated Glycol Solution	Above Grade: ASTM A53 GR. B or A106 Gr. B., ERW or SMLS Below Grade: ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C.
Compressed Air Piping	Air	ASTM A312-TP304, Fully Annealed, Stainless Steel or ASTM B88 Hard Tempered (Soft annealed if used with ferrule tube fittings), Type K, Copper
Compressed Air (Instrument tubing)	Air	ASTM A213, Type 316, Fully Annealed, SMLS, Stainless Steel with a hardness of Rb80 or less or ASTM B75, Soft Annealed, SMLS, Copper Fittings to be flareless type or Victaulic Stainless Steel

		Pressfit piping system.
Condensate	Water	ASTM A106 Gr.B, SMLS.
Demineralized Water	Water	Above Grade: ASTM A312-TP304L, seamless, Fully Annealed, Stainless Steel Below Grade: ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C
Drains – Cold	Water	ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C
Drains – Hot	Water	Ductile-Iron, AWWA C151, Soil Pipe, Mechanical Joints or A53 Gr. B ERW
Feedwater	Water	ASTM A106 Gr.B, SMLS.
Firewater	Water	Above Grade: ASTM A53 GR. B or A106 Gr. B, ERW or SMLS, Galvanized Below Grade: ASTM D1248, D3350, & F714 High Density Polyethylene (HDPE) per ASTM D3350 class 345434C and Factory Mutual Approved for 200 psig W.W.P.
Lube Oil, seal oil (Supply Piping)	Oil	ASTM A312 GR.B, TP 304 H, SMLS, Stainless Steel
Natural Gas	Natural Gas	<u>Upstream of Filter Separator</u> ASTM A106 Gr.B, SMLS <u>Downstream of Filter Separator</u> ASTM A312-TP 304 L, SMLS, Stainless Steel
Potable Water	Water	Above Grade: ASTM A53 GR. B or A106 Gr. B, ERW or SMLS, Below Grade: ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C
Raw Water	Water	Above Grade: ASTM A53 GR. B or A106 Gr. B ERW or SMLS, 2-inch diameter and

		less to be Galvanized. Below Grade: ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C.
RO Water	Water	Above Grade: ASTM A312-TP304L, seamless, Fully Annealed, Stainless Steel Below Grade: ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C
Sample Tubing & General Chemical Tubing	Steam & Condensate Samples and General Chemicals	ASTM A213, Type 316, Fully Annealed, SMLS, Stainless Steel with a hardness of Rb80 or less Below Grade: ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C.
Sanitary Waste	Sanitary Waste	Cast-Iron Soil Pipe, Hub & Spigot or ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C.
Softened Water	Water	Above Grade: ASTM A53 GR. B or A106 Gr. B ERW or SMLS, 2-inch diameter and less to be Galvanized. Below Grade: ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C.
Steam	Steam	Seamless Steel or Seamless Alloy Piping as Required for the Application
Wastewater	Wastewater	Above Grade: ASTM A53 GR. B or A106 Gr. B, ERW or SMLS Below Grade: ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C.

All tubing shall be free of scratches and suitable for bending and flaring. ASTM B88 copper tubing used with ferrule type connections shall not be embossed on the exterior.

Tubing wall thickness shall meet or exceed the recommendations of Swagelock for use with Swagelock tube fittings.

Carbon steel lines 2 inches and smaller shall be schedule 80 minimum. For 2 inch and smaller alloy steel lines, minimum wall thickness shall be calculated based on design conditions. For 2-½ inch and larger, the minimum wall thickness for carbon steel pipe shall be standard weight.

Design pressure of piping systems shall be a minimum 20 psig above the maximum pressure anticipated during operation or 50 psig, whichever is greater. Where piping is directly or indirectly connected to the discharge of a pump, the maximum operating pressure shall be the maximum pump shut-off head. Design temperature of piping systems shall be a minimum of 15°F above and below the maximum and minimum temperatures anticipated during operation.

Include a 1/16-inch corrosion allowance on all carbon steel piping.

Piping 2-½-inch NPS and larger shall utilize butt-welded construction unless flanges are required. Fire water piping does not require butt-welded construction.

Ammonia piping shall be of welded construction. Connections to equipment and instruments may be threaded. All other piping shall be of welded construction, except small bore service water and potable water. Victaulic couplings are allowed on above grade fire protection systems.

All above ground piping shall be metallic unless specifically approved by the Owner.

5.3.3 Line List

During the project design phase the Contractor shall prepare a piping line list showing line number, originating P&ID number, points of origin (i.e. line or equipment), points of destination, classification, size, insulation symbol and materials, flowing media, operating and design pressure and operating and design temperature.

5.3.4 Clearances

Good design practice shall be followed to assure proper clearance between piping equipment and passageways for operation and maintenance. Proper space shall be

provided to service control valves and their operators. Special attention shall be given to provide access for cranes or other equipment handling devices. Clearances shall be provided as specified in the Access and Clearances section of these Specifications.

Provide sufficient clearance between lines to permit access for repair or removal. Clearance between pipe and flanges, fittings, or insulation on adjacent pipe shall not be less than 6 inches. Where pipe is insulated, clearance shall be between insulation and flanges, fitting or insulation on adjacent piping.

5.3.5 Piping Stress Analysis

As a minimum, all piping having a design temperature of 250°F or greater shall be subjected to the piping stress analysis.

Piping analyses shall be performed either by computer or by simplified methods as allowed by piping codes and shall consider:

1. Thermal expansion.
2. Deadweight and hydrotest loads.
3. Steam hammer and relief valve thrust.
4. Equipment manufacturer's allowable nozzle loads.
5. Wind load for piping routed outside.
6. Seismic requirements.

The piping flexibility analysis shall be based on a system's design conditions of pressure and temperature encountered during startup, normal operation, or shutdown. To these operating design conditions, industry accepted conservative margins (safety factors) of temperature and pressure shall be added. Also, the analysis shall consider the maximum temperature differential. The effect of installation temperature and solar temperatures shall be considered in determining the maximum temperature differential.

Computer analysis shall be performed on all piping covered by ASME Boiler and Pressure Vessel Code, Section I and all condensate, feedwater, and steam piping 2-1/2 inches and larger. Other pipe stress analysis methods may be used for the analysis of

other plant piping systems. The following industry accepted methods can be used: Grinnel, Tube-Turn, Kellogg, Spielvogel, Flex-Anal Charts, Guided Cantilever.

The piping loads at the equipment nozzles shall be limited to equipment manufacturer's allowable loads. If equipment manufacturer's allowable loads are not available, the piping loads shall be limited to the following levels: Cast connections - 50 pounds per nominal inch; forged connections - 200 pounds per nominal inch (not to exceed 2000 pounds). The actual calculated load shall be forwarded to the manufacturer for concurrence.

5.3.6 Pipe Bending

Pipe bends may be used. Carbon steel pipe may be hot bent or cold bent. Field bending of stainless steel pipe will not be allowed. Bending of carbon steel below 1,300° F is considered cold bending. For hot bending, pipe shall be heated to a temperature not exceeding 2,000°F. No hot bending or forming shall be performed at temperatures below 1,650°F. Bending radius shall not be less than five times nominal pipe size unless approved by Owner. Wall thickness of pipe and metallurgy after bending must meet applicable code requirements for specified design conditions.

5.3.7 Pipe Sleeves

All pipes passing through walls, floors, roofs, decking, and grating shall have sleeves provided. Sleeves shall be sized and have clearances to allow for packing and sealant installation. Sleeves shall be 18-gage carbon steel except that sleeves 8 inch and larger shall have ¼-inch minimum wall thickness. Where pipe movement is anticipated or pipe size is subject to change, larger sleeves shall be used. All floor sleeves shall be anchored with lugs or similar devices. The annular space between the pipe and sleeve at wall and floor penetrations shall be packed with fiberglass. Where penetrations are in walls or floors designed for fire separation, special sealants and packings designed specifically for the application and to meet the fire separation requirements as required by the applicable NFPA codes shall be used. Firestopping materials shall be in accordance with applicable ASTM or UL standards.

5.3.8 Dissimilar Metal Joints

In all cases (except for air systems) when a piping connection is made between steel and aluminum or copper, the mating surfaces shall be electrically isolated. For 2 ½-inch and larger piping, flanges shall be used, and the flanged joint shall be made using an

electrically non-conducting gasket and flange bolts fitted with plastic ferrules and plastic washers under the bolt heads. Two-inch and smaller connections may be made using flanges, as stated above, or with dielectric type couplings, bushings, or unions.

Electrically isolated joints shall also be employed at all points where above ground piping meets piping from below ground.

5.3.9 Equipment for Plant Start-up

Temporary piping and supports shall be furnished for chemically cleaning the HRSG and steam blowing. The piping that connects to the steam turbine valves shall be turned over to the Owner for future use.

Silencers shall be used during all steam blowing operations to minimize noise. Silencers are not required to be turned over to the Owner.

All pumps shall be furnished with start-up strainers and with the fittings for their easy installation and removal.

5.3.10 Sewer and Underground Piping

The Contractor shall ensure the entire plant Site is adequately and properly drained. Paved plant operating area shall be sloped from high points and catch basins shall be provided for storm runoff where required.

Vessel and other equipment drains shall interconnect with the plant drainage system and not the storm system. Sewers and drain lines shall run in the general direction of collection or disposal without sharp angles or turns. The minimum size of underground drain lines shall be 4 inches. Buried steel lines shall be coated and wrapped for corrosion protection. Cathodic protection and/or coating and wrapping shall be provided for all underground piping such as vessels and metallic equipment in contact with the earth. Cathodic protection methods shall be recommended by a Corrosion Engineer after reviewing the Geotechnical data for the Site and shall be approved by the Owner

5.3.11 Vents and Drains and Manholes

All piping high points shall be vented and all piping low points shall have drains. The minimum vent and drain line size shall be ½-inch or larger as required. Manholes shall be provided as required by final design.

5.3.12 Root Valves

Root valves shall be of standard gate or globe pattern, mounted with stem upright or horizontal, unless otherwise specified. Root valves shall be positioned as follows:

1. Gate valves – stem upright (preferred), or as nearly upright as conditions permit, but in not case below the horizontal.
2. Y-pattern globe valves – stem upright (preferred), or as nearly upright as conditions permit, but in no case below the horizontal.
3. Special valves – including remotely operated solenoid and control valves, shall be mounted in accordance with manufacturers' recommendations.
4. No valve shall be mounted with the stem below the horizontal centerline.

Root valves shall be double blocked in services greater than 600 psig or 800°F.

5.3.13 Root Connections

Root connections on horizontal or sloping lines shall not be located below the horizontal center of the line. The following rules shall be observed:

1. Root connections for service on steam and condensable vapors or wet gas shall be taken from the top or side of the pipe or from any point between the top and the side.
2. Root connections for service on liquids shall be taken only from the side of the pipe, with the root nipple horizontal.
3. Root connections for service on dry gases shall be taken from the top of the pipe.
4. All root nipples shall be as short as possible, in standard lengths. Room shall be allowed for free manual operation of the valve without the hand or fingers coming into contact with the surface of the pipe or its insulation. Root nipples, longer than 6 inches end-to-end shall not be used.

Welded thermowells shall be installed according to code requirements. Threaded thermowells shall be installed in threaded bosses. Thermowells and piping in which thermowells are installed shall be designed specifically for the application to prevent

cycling and fatigue of the thermowells.

5.3.14 Fabrication Requirements

Fabrication shall be in accordance with the specified Codes. All piping materials shall be in accordance with good engineering practice and all piping and fittings shall be new and clean.

Fabrication tolerances shall be in accordance with good engineering practice. Tolerances shall cover general dimensions such as face to face, end to end, or end to center. Tolerances shall not be cumulative.

Weld reinforcements shall be held to a minimum and edges shall merge smoothly with the basic metal without undercutting. All repairs shall be made with matching weld metal and edges shall merge smoothly with the basic metal with no undercutting. The welding procedure shall be established by Contractor and submitted for review to Owner and shall be in conformance with applicable codes.

5.3.15 Shop Cleaning

Cleaning of surfaces, which are not to be painted or coated shall be done according to the supplier's best recommended practice, and it shall achieve the cleanliness level described by the acceptance criteria and the specific requirements described below.

Parts of subassemblies that may have crevices or inaccessible surfaces after assembly shall be cleaned as well as practicable, prior to assembly.

All cleaning operations shall be conducted so that stainless steel and nickel alloys are not contaminated with lead, copper, mercury, and/or other low melting point metal; chlorides, sulfur, halogens, as well as ferritic steel materials.

Abrasive blasting may be used on raw, unmachined casting, forging, or plate only.

5.3.16 Inspection

Contractor shall be responsible for inspection of all fabricated piping material. Owner reserves the right to inspect fabrication at any time. Contractor shall maintain qualified personnel to inspect shop and field fabrication for material specifications, dimensional accuracy, fabrication techniques, and quality.

5.3.17 Protection for Shipment and Construction

All flange faces, machined surfaces, and threads shall be clean and shall be protected from damage during shipment. Flange faces and machined surfaces shall be protected with wood or metal covers. Couplings and threads shall be protected by steel pipe plugs or by plastic protectors. Pipe shall be cleaned and supplied with end caps prior to shipping. All protective coverings and end caps shall be maintained in place until the component is erected and open ends or faces replaced between installation shifts.

5.3.18 Welding

All welding, welding procedures, and welder qualifications shall be in accordance with all applicable and specified Codes. Contractor shall qualify all welders. Each welding procedure shall include a welding procedure qualification test report.

Welding shall not be performed on materials that are below a minimum temperature of 50°F (at the weld-affected zone) and surfaces to be welded shall be free of moisture prior to welding.

The maximum interpass temperature when welding austenitic stainless steel shall be 350°F.

Field butt weld ends on shop fabricated piping and components shall have end preparations dimensioned in accordance with ANSI B31.1 and B16.25. All welding end preparations made in the field shall be in accordance with the requirements stated above.

Integral attachments welded to piping shall be of the same P-number material groups as the piping material. Attachments, which are shown on the piping Drawing or which require post-weld heat treatment shall be welded in the piping fabricator's shop. All other integral attachments shall be welded in the field. Integral attachment on piping having design temperatures of 600°F or higher shall be attached by full penetration welds except riser clamp shear lugs which may be attached with fillet welds.

Backing rings shall not be used in any service.

All root passes on butt-welded steam, boiler feedwater, condensate, and cycle make-up

water shall be made using the gas tungsten arc (GTAW) process.

5.3.19 Field Installation

Piping shall be assembled and installed in accordance with the applicable sections of the specified Codes. Contractor shall take special care that the installed piping is free and clear of all foreign materials, construction debris, etc. All welds shall be clean and free of burrs and slag.

Installation and orientation of all gauge glasses, live controllers, thermometers, thermocouples, pressure gauges, and similar items shall be arranged for convenience of operation and ease of maintenance.

Pipe insulation shoes shall be adjusted so that they are centered over pipe supports in the hot position after the line is completely installed and brought into operation.

5.3.20 Pipe Supports, Guides, Restraints, and Anchors

The following requirements shall govern the installation of pipe supports for large bore and small bore piping systems.

5.3.20.1 General Requirements

All pipe supports shall be installed in accordance with MSS-SP58, MSS-SP69, ANSI B31.1 and B31.3, AISC, and AWS D1.1.

Pipe supports shall be constructed of ASTM A36, ASTM A992, Grade 50, or ASTM A500 carbon steel, or alloy steel components as required by pipe materials or process conditions.

Surfaces to be welded and surfaces up to 1 inch from the edge of the weld shall be clean and free from oil, rust, scale, paint, and other deleterious materials.

Installation of the permanent hangers at the time of pipe installation is required. Hangers shall be installed so that their nameplates are visible and accessible.

All hanger components shall be given a 3-mil prime coat of inorganic zinc paint.

The spacing of hangers and supports for steel piping shall not exceed the values

recommended by ANSI B31.1.

All hanger components shall support the piping in the normal operating position and during hydrostatic test, shall allow for the expected expansion or contraction except where anchored and guided, and shall not cause excessive stresses in the piping or excessive loads on the connected equipment.

Standard stock or production parts shall be used where possible. The recommended load ratings and limitations in manufacturer's hanger catalogs shall not be exceeded.

For critical systems accurate weight balance and thermal movement calculations shall be made to determine the required supporting force of each hanger and the limits imposed upon each equipment connection. The weight balance for all hangers shall include the weight of the pipe, fittings, valves, the medium transported, the insulation used, and the suspended portion of hanger assemblies and pipe attachments. Spring hanger assemblies shall be designed to support the piping under normal operating conditions. All hangers and components, however, shall be designed to supporting the piping system during hydrostatic test.

No support shall utilize other piping systems for attachment. Hangers shall not be attached to flange, valve, or equipment bolts or to equipment. Hangers shall be a minimum of 6 inches away (in either a hot or cold position) from any flange and shop or field pipe welds.

Adjustable type pipe supports shall be used at all pump suction and discharges.

Supports installed on concrete slabs or pads shall be installed on a minimum of 1 inch of grout. Use shims to bring supports to elevation. Jack nuts shall not be used.

5.3.20.2 Attachments to Piping

Integral attachments shall be used only where non-integral attachments are impractical at Owner's discretion. Where necessary, symmetrically loaded clamps with shear lugs welded to the pipe 90 degrees apart shall be used. Localized stresses, induced by external forces into the pipe wall, shall be analyzed in combination with all existing pipe stresses to ensure that total stress levels are within code allowable values.

Integral attachments shall be of the same P-number material group as the piping.

Non-integral attachments to piping shall be of design and materials suitable for the entire range of operating temperatures of the piping system.

Clamps used as the attachment to piping components in a strut assembly shall have a minimum spring rating equal or greater than five times the strut spring rating.

For insulated lines at 750°F and below, pipe clamp MSS Type 3 or clevis hanger MSS Type 1 with an MSS Type 39 insulation protection saddle shall be used. All voids in the pipe covering protection saddles shall be filled with insulation. Supports on insulated piping shall not penetrate the insulation lagging. For lines with no insulation, pipe clamp MSS Type 3 or 4 or clevis hanger, MSS Type 1 may be used. Riser clamp MSS Type 8 shall be used on all risers.

For lines that are heat-traced and lines that have an operating temperature below 70°F, the use of clamps or attachments in direct contact with the pipe shall be minimized to the greatest extent possible. Except for unusual situations, which require attachments in direct contact with the pipe, the attachments or clamps shall be outside the thermal insulation. For horizontal pipe, the thermal insulation shall be protected by means of pipe covering protection saddles, MSS Type 39, and pipe clamps or clevis hangers sized to fit on the insulation OD. All voids in the pipe covering protection saddles shall be filled with insulation.

5.3.20.3 Attachments to Structure

Reduction of the effective strength of any structural member shall not be permitted. Structural attachments to steel shall be designed to support the maximum calculated loads. For attachments to the supporting steel on hangers for pipe sizes 2 ½-inches and larger, beam attachments MSS Type 22 shall be used within the limitations of loads. For piping 2 inches in diameter and less, where relatively small movements are expected and where hangers are normally not engineered, MSS Type 23 may be used. Where sliding supports or other integral base attachments are supported on a concrete floor, an anchored or fixed steel base shall be provided as a sliding surface.

Structural attachments should be made to steel whenever possible, whether to structural steel or to steel embedment plates or inserts in structural concrete. When necessary to

use drilled-in-place bolts in concrete, only wedge type anchor bolts such as HILTI Kwik-Bolts, or equal shall be used, and the connection shall be carefully designed using the allowable loads including the effect of combined tension and shear loads, spacing, and embedment depths.

No attachments should be made to anything but structures.

Anchors, supports, restraints, and guides shall be designed to prevent the transmission of temperatures in excess of 300°F to building steel and 150°F to concrete. This determination may be made by using a reduction factor of 100°F/inch from the outside surface of the uninsulated pipe for all parts in direct contact with or welded to the pipe.

5.3.20.4 Spacing

Support points shall be selected on the basis of proper location and spacing for optimum load distribution and weight balance, taking into consideration the available building structure and load distribution from which hangers can be suspended.

The spacing of hangers and supports for steel piping operating at temperature above 750°F shall not exceed the values given in ANSI B31.1. The above maximum spacing figures are applicable to straight piping runs. Additional supports shall be provided for concentrated loads such as valves, strainers, or other in-line items. At changes in piping direction, supports shall be located at, or immediately adjacent to, the change in direction to the greatest extent feasible, and the spacing to the next support beyond the change in direction shall be appropriately less than the maximum spacing of supports permitted for straight piping runs.

Vertical pipe should be supported directly with riser type hangers rather than having the weight of the riser supported by adjoining horizontal pipe.

The maximum support spacing recommendations of the nonmetallic or nonferrous pipe manufacturer shall not be exceeded.

5.3.20.5 Pipe Support Identification

The Contractor shall submit the pipe support identification system to the Owner for its approval.

5.3.20.6 Anchors, Restraints, and Sliding Supports

Anchors, guides, and restraints shall be capable of supporting the pipe and resisting dead loads plus any expansion or contraction thrusts that may be imposed by the piping.

Anchors required for expansion joints shall withstand the longitudinal pressure force plus the joint-spring force and sliding friction force. The longitudinal pressure force shall be calculated as the product of the hydrostatic test pressure and the maximum internal transverse area of the joint. Guides for expansion joints shall direct piping movement into the joint within the joint manufacturer's allowable lateral and angular misalignment limits.

Sliding supports and guides shall be designed to withstand the induced friction force in addition to other loads on the support. Dry lubricant surfaces (i.e., Teflon or UHMW) may be used to reduce the friction force. Preformed graphite or carbon shall not be used.

Corners and edges of metal slides and guides in sliding supports shall be rounded or chamfered, and guide parts shall be designed with sufficient length so that binding within the necessary clearance will not occur.

5.3.20.7 Hanger Rods

Hanger rods shall be sized in accordance with ANSI B31.1. Hanger rod diameters shall be 3/8-inches minimum on 2-inch and smaller pipe and 1/2-inch minimum on piping 2-1/2-inch and larger and shall be compatible with the other component parts of the hanger assembly and subjected to tension stresses only. Where horizontal movement is anticipated, the rod shall be fitted with eyes, links, or swivels to permit unrestrained swinging of the rod. Un-welded eye rods shall not be used. Where anticipated piping movement would cause hanger rods to be more than four degrees out of plumb, the hangers shall be offset in the erected position to provide vertical alignment when the piping system is in operation. Hanger rod lengths shall be calculated to provide for at least plus or minus 3 inches of rod adjustment subsequent to hanger erection.

Maximum length of rods shall be 20 feet. Minimum rod length shall be 15 inches for each inch of horizontal movement.

5.3.20.8 Variable Spring Hangers

All variable spring hangers shall be selected for operation at or about the mid-load range. The length of spring and the spring scale shall be selected so that variation in the supported load due to temperature differences does not exceed 25% of the dead load; otherwise, constant support hangers shall be used.

The working range of variable spring hangers shall account for all load movements as well as for thermal movement. A minimum of ½-inch additional travel beyond the maximum and minimum values at the working range shall be provided after final field adjustments.

Variable spring hangers shall be of the enclosed helical, pre-compressed type with the end coils ground flat and square with the spring axis. Travel stops shall be factory installed, so that the piston cap is set at the "cold" position. The travel stop shall be easily identified and removable but shall act as a "rigid" hanger during erection and hydrostatic testing. To avoid misplacement of a travel stop, it shall be attached to the spring unit by means of a cotter pin and chain or equivalent. Variable spring hangers shall be calibrated by a dynamometer and the load affixed to the housing. The unit shall then be adjusted to the proper ambient position to suit the travel it is to accommodate and the position plates locked. The locked unit shall be capable of supporting at least two times the normal operating load. When the loads induced by hydrostatic testing exceed the spring capability, temporary supports shall be installed. Each variable spring hanger shall have a travel and load scale plate, red and white markers to indicate the design hot and cold positions, respectively, and a travel indicator. The red and white markers and the travel indicator shall be easily visible at a distance of not less than 30 feet and visible from the ground or platform. The hanger type, mark numbers, and calibrated load shall be die-stamped on each hanger nameplate.

5.3.20.9 Adjustment and Locking Devices

All supports shall have screw adjustments accessible and workable when fully loaded. Threaded members shall have a true and complete depth of thread. Nuts, clevises, sleeves, turnbuckles, and related items, shall have their full length of thread in complete service while in use and the amount of male thread available for adjustment plainly visible; sight holes shall be provided for visibility in parts where necessary. Eight pitch series threads will be permitted only when the supplier furnishes both mating parts. All

bolts on hangers shall be double-nutted. Hanger rods shall have a locking nut on each end of the turnbuckle.

5.3.20.10 Inspection

When the piping is being put into service, the hangers shall be inspected by Contractor's qualified inspectors to insure the pipe is moving as intended and is not causing the hangers to deflect against travel stops or exceed load or travel scale.

When the system has reached maximum normal operating temperature, the spring hangers shall be inspected and, if necessary, adjusted to the hot or calibrated position indicated on the hanger. If a hanger is deflected to its stop, it shall be adjusted immediately so that it will carry load on the spring and not on the stop. In making such adjustments, care shall be exercised to avoid adjustments which will result in a hanger deflecting against stops or off-the-load or travel scale as the pipe cools during a shutdown. If such a condition is unavoidable, the hanger must be replaced with one of proper size.

5.3.21 **Painting**

Un-insulated, above grade, structural and miscellaneous carbon surfaces shall be shop blasted and primed in accordance with Section 7. Surfaces shall also be finish painted and color coded with colors selected by the Owner.

Carbon steel piping which is installed underground shall be coated with one of the following:

1. Prime with Type B primer and coat with coal tar enamel and non-asbestos felt wraps per AWWA C203. Finish with one coat of water resistant whitewash.
2. 12-inch and smaller: Coat with mill applied polyethylene plastic coating, Entec or X-Tru-Coat, or owner approved equal.
3. Shop applied tape wrap. Tab shall consist of butyl-based adhesive with polyethylene backing (similar to Polyken 930, Protecto Wrap 310, or Tapecoat CT)

Consult the services of a corrosion engineer to recommend further corrosion protection based upon the soils condition. Submit the corrosion engineer's recommendations to the Owner for information and acceptance of the recommendations. Provide cathodic Exhibit A

protection for underground piping as recommended by the corrosion engineer and as approved by Owner.

All labeling of piping will be provided by Contractor with an Owner approved system.

5.3.22 Testing

Hydrostatic testing shall be performed after piping is completely installed. Test pressure shall be in accordance with the specified codes. Care shall be exercised by the Contractor to protect vessels, equipment, and instrumentation which can be damaged during pipe pressure testing through the use of slip blinds or other suitable means.

5.4 VALVES

This section details the technical requirements for furnishing, delivering, and installing butterfly, globe, gate, check, plug, and ball valves. The Contractor will complete valve data sheets and specify all valves in accordance with the requirements of this section.

5.4.1 General Requirements

All hand operated valves 2-inch and smaller for throttling service shall be globe valves unless service requires other specific types.

All control valves shall have a bypass valve and isolation block valves. Bypasses installed around liquid service equipment shall use globe type.

Isolation valves shall be provided for all piping connections to equipment.

Isolation valves for pump suction and discharges shall be located in the larger piping sections.

Wherever practical, manually operated valves shall be located to be accessible from grade or elevated platforms such that operation can readily be performed. Valves shall be provided with a minimum of one handle length or handwheel diameter clearance between handle or handwheel in all positions and the nearest obstruction.

Install valves with stems vertical, wherever practical. Where not practical, stems shall be horizontal or above.

Install valves with indicators visible from accessways or elevated platforms wherever possible.

All instruments and gauges that are not in-line, except flow switches and temperature elements, shall be supplied with root valves for isolation during maintenance.

All temperature elements and gauges shall be provided with thermowells constructed of materials suitable for the service.

5.4.2 Valve Materials

All valves and valve materials shall be chosen as to be suitable for the intended service fluid, temperatures, pressure, and flows. Good engineering judgement shall be used at all times. The yoke or intervening structural member(s) between the valve and operator shall be of an ASTM material.

A graphite packing system (e.g., Grafoil ribbon pack with corrosion inhibitor, using end rings of braided graphite filament) is preferred. Alternate asbestos-free packing systems compatible with the intended service, shall be submitted to the Owner for approval.

5.4.3 Valve Shop Painting

Corrosion-resistant valve surfaces shall not be painted or treated with a rust preventative.

Exposed external ferritic steel surfaces of the valve assembly shall be painted with one coat of the manufacturer's standard primer, except for machined working surfaces or adjusting nuts, bolts, or studs which shall be coated with a rust preventative, suitable for providing up to 1-year corrosion protection under outdoor storage conditions.

5.4.4 Lubricant Materials

Replacement lubricants, where required, shall be in accordance with manufacturer's requirements.

5.4.5 Design Requirements

Butterfly valve design shall be to, and meet the requirements of, MSS SP67, Type I, for tight shutoff.

Steel gate, globe, and check valves 2-½ inch and larger shall be designed and constructed in accordance with ANSI B16.10 and B16.34.

Steel gate, globe and check valves 2 inches and smaller shall have their pressure ratings in accordance with ANSI B16.34 and shall be of forged material.

Gate and globe valves shall have bolted packing gland and a fixed backseat.

Bronze valves shall be designed, manufactured, and inspected in accordance with MSS-SP80.

The stem finish in the area which will contact the packing shall be 32 rms or better. The stuffing box wall shall have a 125 rms or better finish. When required, seals shall be provided to retain grease and keep dirt and moisture out of bearings. Alemite lubricating fittings shall be furnished to lubricate bearings, yoke nuts, or bushings.

All forgings shall be clean and free from unacceptable defects. Repair of unacceptable defects is not allowed on forgings.

Valves of the same size, type, material, and pressure/temperature rating shall have interchangeable parts in order to reduce spare parts inventory.

Ball valves shall be in accordance with MSS SP72, and ANSI B31.8.

Ball, plug, and butterfly valves shall have blowout proof stems whose retention shall comply with ANSI B16.34, Paragraph 6.5.

Preferably, all ball valves shall be of top entry type so that the ball and seals can be replaced in the body without removing the valve from piping during maintenance. However, alternate types will be considered, provided the design does not require cutting piping to remove the ball and seals. Submit alternates for Owner's approval.

Plug valves shall be designed to the requirements of the API-6D. Plug valves shall be wrench or gear-operated, and of the tapered plug, self-lubricating sleeve, or reinforced seat type.

Flanged and weld-end valves shall conform to the face-to-face and end-to-end dimensions of ANSI B16.10 for each respective pressure class.

The valve and operator assemblies shall be designed and assembled so critical parts cannot become disengaged due to vibration and/or assemble orientation. Particular attention should be given to drive keys to assure that they are locked or "captured" by means other than press fits or the use of adhesives.

5.4.6 Valve Operators

Select valve operator and install valve to allow operation of valve without interference with adjacent piping or equipment without valve operator disassembly.

Provide gear operators for ball, plug, and butterfly valves 6 inches and larger.

If smaller valves require more than 60 lb of force applied to the manufacturer's standard lever, the Owner shall be advised as to the force required to operate and options available (e.g., lever length), so it can be determined whether a gear actuation is required.

Gate and globe valves shall be provided with the manufacturer's standard operator or handwheel for seating the valve.

Valves with gear operators shall be provided with a protective pipe and/or pipe plug on the operator, as appropriate, to protect the stem/stem nut from dirt, debris, and other matter. Operating valves installed at an elevation of more than 6 feet 9 inches between the bottom of the handwheel and grade or an elevated platform shall be furnished with a chain operator for operation from grade or elevated platforms. Install chain operators such that chain hangs within 2 feet of the operating level and can be "tied off" on a nearby structure so as to keep the chain out of the operating aisles.

Block valves used only for isolation in shut downs or repairs that are accessible by portable ladder need only be supplied with chain operators if installed at an elevation of more than fifteen feet between the bottom of the handwheel and grade.

Operating valves installed with handwheels under platforms shall be supplied with

extensions for operation above the platform.

Supply quarter turn valves with locking devices on the handles.

Provide valve handle extensions of extended bonnets on valves installed in pipelines designated to be insulated. Handle extensions shall be suitable to provide a minimum of 2 inches clearance between the handle and the outside of the insulation jacket.

5.5 INSULATION AND JACKETING

5.5.1 General Requirements

This section covers the requirements for the selection and application of insulation systems for plant equipment and piping. Contractor shall be responsible for determining the economical insulation thickness and selecting the appropriate insulation material.

Provide illustrations and instructions for field installation of insulation for piping, valves, vessels, and equipment that is not pre-insulated by the supplier.

Provide removable insulation and jacketing sections at all flanged joints in insulated piping. Install removable sections to allow entire flange studs to be removed from either side of joint.

Insulation on valves shall be extended to include the valve bonnet.

5.5.1.1 Insulation

Minimum insulation thickness shall be 2 inch.

Provide an insulation specification thickness table and specification summary sheet indicating materials, manufacturer, material thermal properties, and application requirements for each insulation system proposed. Table shall indicate required heat conservation insulation thickness for each nominal size of piping and duct and for equipment for each 100°F temperature increment in the range of 200°F to 1100°F. Table shall also include insulation thickness for burn protection for each NPS and equipment components in the same temperature range and for anti-sweat insulation for each NPS and for equipment.

All outdoor piping shall be insulated and freeze protected OR self draining unless approved by Owner. Use removable insulated jackets on control valves and large isolation valves. Freeze protection should be extended at least 12" below the frost line for the site. Insulation and jacketing to be repaired after construction.

All piping or equipment filled with a liquid that could freeze under normal operation or during a shutdown at the coldest ambient temperatures recorded during a consecutive 3 day period over the last 10 years, shall be heat traced and insulated as required to prevent freezing under such conditions. Such lines shall include, but not be limited to instrument tubing, chemical tubing, sample analysis piping, boiler trim piping, boiler and steam line drain piping, and service water piping to utility stations. All heat traced tubing shall be integrally heat trace tubing / heat tracing bundles.

Provide heat conservation insulation on all piping and equipment operating above 200°F for which heat loss is not desirable. Insulation thickness shall be determined by an economic analysis of the cost vs. energy savings for the ambient conditions. Provide insulation to maintain an average surface temperature of any insulated lines below 140°F with an ambient temperature of 80°F, an emissivity of 0.09, no incident solar heating, and a 5 mph wind. Components requiring insulation shall include, but not be limited to, the following:

1. All steam piping.
2. Boiler feedwater pumps and piping.
3. Condensate piping (after condensate enters the preheaters).
4. Natural gas pre-heater gas side piping downstream of the heater.
5. Feedwater piping feeding and returning from natural gas pre-heater.
6. HRSG steam drums and trim.
7. HRSG casing including all transitions.
8. HRSG exhaust stack.
9. All other lines with an operating temperature above 140°F.

Provide anti-sweat insulation on piping installed in areas where the ambient dew point could be below the surface temperature of the piping at any conditions within the operating range of the plant.

Provide personnel protection insulation on all surfaces operating above the OSHA limit

which are accessible from grade, ladders, or elevated platforms. Personnel protection insulation shall extend to a level of 7 feet (minimum) above grade or platforms and 3 feet (minimum) beyond any handrail.

Insulation materials shall have a flame spread rating of 25 or less, when tested in accordance with ASTM E84. Where installed inside building, insulation shall have a smoke density of 50 or less, when tested in accordance with ASTM E84. Select insulation materials to be suitable for the intended service in accordance with the National Insulation Association standards. Ceramic fiber insulation should be used where temperatures exceed the allowable limits of calcium silicate. Use elastomeric rubber, polyethylene, or polyisocyanurate foam insulation on cold service piping for anti-sweat applications. Anti-sweat applications shall include a continuous, unbroken, vapor seal. Outdoor anti-sweat insulation not provided with a jacket, shall be painted in accordance with insulation manufacturer's recommendations.

Use cellular glass insulation on all hot piping requiring insulation, which is installed in an area prone to flooding (either due to rainfall or from process upsets).

Insulation installed on stainless steel shall be limited in chloride content and shall meet the latest revision of military specification, Mil-1-24244B. Certification test is not required; however, manufacturer shall guarantee that insulation meets this standard.

Provide removable blanket insulation on all manways, removable covers, control valves, automated valves, engineered valves, and instrumentation installed in insulated piping systems. Transmitters and other remote mounted instrument shall be supplied with O'Brien, pre-fabricated, insulated instrument enclosures with quick opening latches. Removable blankets shall be 1-inch minimum thickness for temperatures to 250°F, 2-inch minimum thickness from 250°F to 500°F, and 3-inch minimum thickness above 500°F. Use stainless steel speed lacing hooks or stainless steel D-rings with fabric straps.

Insulation application including mastics and coatings shall be in accordance with insulation manufacturer's recommendations and the National Insulation Association standards.

Insulation installed in areas subject to foot traffic shall be designed to prevent collapse of

the insulation.

Provide insulation support rings on vertical piping 6 inches and larger with spans greater than 10 feet. Maximum spacing between support rings shall be 10 feet.

Acoustic insulation shall be designed and applied to piping and equipment where required to meet the noise limits specified in Section 1.

5.5.1.2 Jacketing

Provide jacketing systems on all insulated equipment and piping, except those insulated with elastomeric rubber or polyethylene. Install jacketing to prevent the entry of moisture. Jacketing materials shall be as follows:

Equipment:	0.036 inch thick (minimum), corrugated, embossed, aluminum with vapor barrier
Piping and valves:	0.02 inch thick (minimum), corrugated, embossed, aluminum with vapor barrier

Use stainless steel or aluminum bands with wing seals to hold jacketing in place.

Seal all penetrations in jacketing with mastic cement and weather tight flashing.

Seal all breaks in insulation that would be exposed upon removal of flange insulation, equipment insulation, instrument insulation, or removable jacket insulation. Seal end caps using aluminum flashing and mastic.

Apply jacketing in accordance with insulation and jacketing manufacturer's installation instruction.



SECTION 6.0

CIVIL SCOPE

6.1 GENERAL REQUIREMENTS

This section covers the minimum scope and quality for the plant civil design and construction.

Contractor is responsible to inspect the Site, obtain all necessary Site data, perform all required additional geotechnical investigations, and determine all Site data for the design and construction of the power plant. This shall include determination of local code requirements for seismic and wind design loads. It is Contractor's sole responsibility to ensure that the building foundations and Site work comply with all federal, state, and local code requirements and all industry codes and standards.

All waste material removed from the Site shall be properly disposed of by Contractor.

The scope shall include, but not be limited to the following:

1. Clearing and grubbing.
2. All subgrade facilities and preparation.
3. Site drainage during construction.
4. Permanent drainage system.
5. Construction wastewater disposal.
6. Site grading including rough grading of the switchyard area.
7. Construction of all foundations and structures.
8. Permanent and temporary roads.
9. Evaporation Ponds.
10. Site Security.
11. Off-site Road Improvements and repair (if required to transport or receive equipment or if required as a result of construction work).

The Project design shall take into account existing Site conditions with respect to soil

characteristics, Site clearing, grading, and drainage. The Contractor shall be responsible for all Site preparation including any demolition, soil stabilization, grading, drainage, fencing, roadways, and parking areas.

6.2 SITE PREPARATION AND MAINTENANCE

Contractor is responsible for all Site preparation, backfill, and excavation. Cut and fill for the entire site, including the ponds and switchyard, shall be managed by Contractor.

6.2.1 Site Preparation

The Site shall be properly leveled with no construction debris or dirt piles. Contractor can store native material on Site that is suitable for use as backfill. Consideration shall be given to drainage to ensure no low lying areas are left, which would accumulate water. Installation of Site construction utilities shall be planned and constructed by Contractor. Location shall be approved by Owner.

6.2.2 Site Clearing and Grubbing

Selectively clear the Site of all trees, debris, rubbish, shrubs and vegetation as required for construction of new facilities. Effort shall be taken to ensure that as much as possible existing vegetation remains undisturbed. All debris from clearing and grubbing shall be removed from the Site. All root mats and stumps shall be completely removed and holes refilled with select material and compacted adequately for the ultimate expected loading for the material used.

6.2.3 Drainage

The working areas of the Site shall be well drained during and after construction. The Site drainage plan and discharge of drainage from the Site shall conform to federal, state, and local laws and regulations. All drainage shall be away from the buildings at a minimum of 1/4-inch per foot for the first ten feet. Design storm for culverts and storm sewer shall be for the peak flow rate for the 25-year 24-hour duration storm and shall be checked for flooding for a 100-year 24-hour duration storm.

6.2.4 Erosion

Contractor shall provide for erosion control during and after construction in accordance with Project permits, local and state laws and regulations, and local practice. Best management practices such as check dams and sedimentation basins shall be used during construction to minimize erosion. Drainage facilities shall be designed and

constructed in a manner to minimize erosion.

6.2.5 Debris

All construction-related debris and unsuitable material shall become the immediate property of Contractor and shall be removed from the premises and lawfully disposed of off-Site by Contractor.

6.2.6 Road Maintenance

All temporary access roadways used by Contractor shall be maintained in serviceable condition. Contractor shall keep the surfaces of those roadways free from spills, mounds, depressions, and obstructions which might present a hazard or annoyance to traffic. Block 1 and Block 2 roads shall be tied together.

6.2.7 Excavation, Filling, and Backfilling

Excavated native material may be used on the construction Site for embankment, if suitable. All rock, concrete, wood, metal, and other materials from the excavation shall be removed from the Site by Contractor. To the extent possible, backfill and subgrade fill will utilize excavated materials. Under-slab and bedding material, topsoil, and other materials from off Site borrow areas shall be the responsibility of Contractor. Site dewatering during construction is the responsibility of Contractor.

6.2.8 Site Grading

Grades shall be established to minimize the amount of earthwork required to construct the facilities. All areas disturbed during construction shall be graded to a smooth surface and (covered with appropriate material as conditions require). Finish grading will be performed to conform to the finished design elevations for surface drainage and to prepare the areas to receive the specified surface finishes.

6.3 SITE IMPROVEMENTS

Paving and fencing improvements shall be in accordance with the Site plan and detail drawings included in the Appendices. Final design shall be shown in detail on Contractor's final plot plan. Paving design criteria shall be:

1. Subgrades shall be constructed of material with CBR of 4 or better, if available.
2. Design life shall be 35 years.

3. The construction period will produce 70 to 80 percent of the maximum wheel loads for the design life.
4. Structures supporting pavement shall be designed to support H-20 standard highway loads.
5. Pavement design shall be in accordance with AASHTO or other Owner approved procedures.

6.3.1 Storm Water Drainage System

A storm water drainage system shall be used to collect all rain water from the Site that is not potentially contaminated by oil and or other chemicals (non-active areas). Building roof drains will drain into this system. The storm water drainage system shall drain into the local drainage system. Provide suitable facilities and access for sampling of the storm water leaving the Site.

All rain water collected from active areas that can be contaminated by oil shall be contained and routed through an oil/water separator as described in the Mechanical Scope Section before release to evaporation ponds.

6.3.2 Sanitary System

The sanitary sewer system shall consist of drain piping, septic tank, and leaching fields on the Owner's property, if required. Contractor shall confirm whether existing Block 1 facilities are adequate for the addition of Block 2.

6.3.3 Fencing and Gates

Security fences, where applicable, are to be constructed 7-foot high standard galvanized chain link fence with 3 strands of barbed wire. Gates, as required for vehicular access, will be a minimum of 2 sections, each 10 feet wide.

6.3.4 Crushed Stone Surfacing

All general plant areas that do not require paving or landscaping shall be surfaced with compacted aggregate finish 6 inches thick. The areas within the substation fence will be finished by Others with crushed stone or gravel.

6.3.5 Buildings and Equipment Foundation

Building and equipment foundations shall be of reinforced concrete including all formwork, rebar, waterstop, and related items.

6.3.6 Tank Foundation

Tank foundations shall be either reinforced concrete slabs or reinforced concrete ring wall foundations with a compacted sand bottom within the ring walls.

6.3.7 Manholes

Manholes shall be provided as required by final design.

6.3.8 Duct Banks

Underground banks of power and instrument conduit shall be encased in concrete. Encasements shall be reinforced when ducts pass under roadways, traffic, or heavy maintenance areas. The top of the concrete shall be colored red.

6.3.9 Landscaping

Areas to be disturbed but does not contain foundations, paving, or other surfacing shall be stabilized and protected from erosion by topsoil and seed or other erosion control measures. Seed mixture shall be suitable for local conditions.

6.3.10 Roads and Parking

Subgrade preparation and compaction shall be in accordance with Sound Geotechnical Engineering Practice. Geogrid and limestone may be used for subgrade improvements. Paved roads and surfaces shall be paved as described below, unless state or local codes and standards specify more stringent requirements.

Roadways and paved areas shall be designed for AASHTO HS20 loading as a minimum. Paving may be either reinforced concrete or asphalt concrete and shall be designed based on the value of the modulus of subgrade reaction (k) determined for the site. Concrete paving shall be used in maintenance areas and for roadways subject to heavy maintenance cranes, parked trailers, or delivery trucks. Asphalt paving will be acceptable for roadways not subject to heavy load traffic. The laydown areas shall also be designed with consideration for concentrated loading due to handling of loads such as turbine rotor removal. Temporary construction roadways will be designed and surfaced to meet the heavy loads of moving the turbine and generators on steel wheeled dollies.

In general, roads shall have a minimum one way lane width of 12 feet, and a two-way

total width of 24 feet. All roads shall have 3 feet wide shoulders. Minimum radius of curvature shall be 45 feet. All roads shall have a 2% slope from the crown with shoulders sloped at 2%. All other paved areas shall pitch a minimum of 2% to drains.

6.3.10.1 Roads

Roads on-site shall conform to the following:

Description	No. Lanes	Lane Width	Shoulder Width	Surface
Access Road	2	12 ft	3 ft.	Paved
Plant Island Perimeter	2	12 ft.	3 ft.	Paved
Building Driveways	1	Width of Door Plus 2'	-	Paved
Equipment Access	1	10 ft.	-	Paved

Applicable Specifications:

Utah Department of Transportation's Standard Specifications for Road and Bridge Construction

Subgrade Preparation:

Subgrade shall be proof rolled five (5) passes of a 10-ton vibratory roller (minimum), or as required by additional geotechnical analysis.

Pavement:

Road pavement shall be in accordance with the State of Utah Department of Transportation's Standard Specifications for Road and Bridge Construction, and final geotechnical report.

Design Traffic Number, DTN = 50

Design Vehicle = HS20

Construction Loading

Horizontal and Vertical Curves:

Horizontal and vertical curves shall meet the Federal Highway Administration and AASHTO standards.

The inside edge of paved surfaces at intersections shall have a minimum radius of 45 feet inside the plant.

Vertical curves shall be as flat as practicable; minimum sight distance shall be 500 feet inside the plant roads.

6.3.10.2 Parking Areas

Parking facilities shall be provided for plant personnel and visitors. Parking shall meet requirements for the physically handicapped as required by federal regulations such as the American with Disabilities Act. Car stops, parking lines, and lighting shall be provided. Contractor shall provide additional parking stalls as directed by Owner.

Provision shall be made within the fenced areas for parking in accordance with the local zoning ordinances.

6.3.10.3 Plant Area Surfacing

Asphalt Paving –	Roads and Parking Areas
Crushed Limestone Base (minimum 8"), Crushed stone shall be clean, uniform with a minimum of 95% of stone greater than ¾"	Area inside loop road, air cooled condenser and transformer area, and other equipment areas as required
Rip Rap – As a minimum, stone shall have an average of weight of 120lbs/cubic feet and average size of 6" diameter.	At Storm Drain inlets and outlets and as required for erosion protection

6.3.10.4 Bollards

Above ground piping, valves, fire hydrants, and accessories adjacent to traffic areas shall be protected with minimum 6" diameter steel pipe guard post, minimum height of 42" above ground and painted yellow.

6.3.11 Oil/Water Separation

Work areas, equipment area, unloading areas, roads, and other areas subject to oil

spills, shall drain to an oil/water separator(s) system designed to prevent oil-contaminated runoff from leaving the site or contaminating the site. Other areas will be designed to drain out through the natural site drainage system. Treated water from the oil/water separator(s) shall be routed to the evaporation pond.

6.3.12 Unloading Areas

All oil, diesel, fuel and chemical tank loading/unloading areas shall be designed to provide for secondary containment of 110% of the largest single compartment of the relevant delivery truck. All diesel fuel oil and oil loading/unloading areas shall be designed and constructed in compliance with the EPA Spill Prevention, Control, and Countermeasure (SPCC) requirements.

6.4.12 Evaporation Ponds

Evaporation Pond layout shall be in accordance with the Site plan drawings included in Appendix C. Final design and sizing shall be shown in detail on Contractor's final plot plan. The ponds shall accommodate evaporation of wastewater inflows and storm water that has passed through the oil/water separator. The following design criteria shall apply:

1. Evaporation pond shall be designed to conform to UDEQ's "Design Requirements for Wastewater Collection, Treatment, and Disposal Systems (R317-3.1)."
2. Provide adequate storage for freeboard and fluctuations in water level due to wave action.
3. Provide storage capacity for solids deposits over a 30-year design life.
4. Provide three cells, each storing a minimum of 50% of the total maximum storage required.
5. Utilize the worst three consecutive years of historical precipitation data.
6. Evaporation rates shall be as published in the National Oceanic and Atmospheric Administration (NOAA) Technical Report 34, "Mean Monthly, Seasonal, and Annual Pan Evaporation for the United States."
7. Pond design shall allow for surplus storage of construction wastewater in addition to inflow from plant operations.

The ponds shall be double membrane lined with a minimum 60-mil high density polyethylene (HDPE) geomembrane for the primary and secondary liner.

A minimum 200-mil thick HDPE geonet shall be utilized for the leak detection layer between the two geomembrane layers. The leak detection layer shall drain to a drainage trench at the bottom of each cell that shall carry any leakage to a rock-filled collection sump at the end of each cell. Each sump shall contain a self-actuating pump with water level sensor to pump accumulated water back to the cell. Each sump pump system shall also have a run time logging device to monitor the volume of water transferred.

The primary liner shall be covered with a 12-inch thick layer of protective soil cover. Geotextile and riprap shall be placed above the primary liner on the pond side slopes to prevent wind and water erosion.

The entire pond shall be fenced with a minimum six-foot high chain link fence with three strands of barbed wire.

Maximum side slopes shall be 3:1. Slope stability and seismic concerns shall be evaluated per Utah DEP requirements. Ponds shall be provided with a gravel-surfaced access road around the top perimeter of the pond berms and the top of the intermediate berms. Top width of dikes shall be wide enough to accommodate roads and to provide sufficient access for monitoring, inspection, and maintenance.

Provide engineering support and documentation for all applicable permits including but not limited to Ground Water Discharge Permit, Dam Safety Permit, and Construction Stormwater General Permit. Permits will be obtained by the Owner. Work shall be in accordance with all applicable agencies including but not limited to the Utah DEP and Utah DWR. Work shall also be in accordance with any existing permits obtained by Owner.

Subgrade preparation and compaction shall be in accordance with sound geotechnical engineering practice and as recommended by the liner manufacturer.

Provide operation and maintenance manual for the evaporation ponds.

