



**2008 Draft Integrated Resource
Plan**

October 1, 2008

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Section 1
Executive Summary

Cascade's resource planning continues to focus on ensuring that the Company can meet the needs of our firm gas sales customers in a way that minimizes costs over the long term. By the 2010-2011 winter heating season, primarily as a result of Cascade's continued growth in its residential and commercial customer base, Cascade's capacity will fall short of its design peak day demand forecast. Therefore, Cascade is entering a period where it will need to acquire additional resources to meet the growing needs of these core customers. The following summarizes key findings from this plan.

Adequacy of Gas Supply

Physical gas supply is expected to be adequate to meet growing demand in the Pacific Northwest and North America, however, at a cost. To meet growing demand for end-use, many industry experts predict imports of liquefied natural gas (LNG) will be needed, and will be developed on a nationwide basis in order to allow supply to keep pace with growing demand. Additionally, new supply development technologies continue to provide additional resources in British Columbia and the Rocky Mountain regions. Shale gas from the Horn River Basin and new finds such as the Pierre Shale in the Rockies are likely to keep sufficient supplies available in North America through 2012. Still, due to on-going financial and regulatory issues, there is still some question as to whether or not a new pipeline will transport Alaskan gas into the North American market, or if it will be completed within the Company's planning period. It should be noted that most independent forecasts (such as that developed by the Energy Information Agency (EIA)) assume that an Alaskan pipeline will be completed between 2017 and 2021. While there appears to be sufficient supply to meet the nation's and northwest's growing needs, long-term gas prices are expected to remain high as well as volatile for the foreseeable future. Higher prices provide the financial incentive for development of new sources in North America along with the importation of LNG.

Load Resource Balance

During this planning cycle, Cascade examined the impacts on both its load and resources and portfolio costs associated with its peak day planning criteria. Cascade has historically utilized a system average of 65 heating degree days (dd) for its peak demand forecast as it represented the coldest day recorded in Cascades' 60 plus years of weather history. Since the Company has only experienced a 65dd once in its history (which occurred in 1968), in this planning cycle the Company modified its design day criteria to utilize the coldest day during the past 30 years. This modification reduced the peak day to 61dd which occurred as recently as 1990.

Analytical Methods

Cascade continues to utilize the SENDOUT model to assist with the analysis of resource alternatives. SENDOUT is a linear optimization model that helps identify the long-term least cost combination of resources to meet stated loads. The model determines the optimal portfolio of resources that will minimize costs over the planning horizon based on a set of assumptions regarding resource alternatives, resource costs, demand growth and gas prices. Linear optimization models, such as SENDOUT, are basically deterministic. In other words, they solve the "least cost problem" based upon the assumptions provided

to the model. As a result, the Company, beginning with its 2007 IRP, expanded its uncertainty analysis through the purchase of VectorGas (an add-on product) that facilitated the ability to model gas price and load (driven by weather) uncertainty. The monte-carlo functionality was integrated in SENDOUT Version 12.5, which is the platform that Cascade prepared its integration analysis. The monte-carlo modeling capability provides additional information to decision-makers under conditions of uncertainty. The monte-carlo analysis was used in this plan to test the physical and financial risks associated with the optimal portfolio from the basecase planning scenario. This tool provides a valuable enhancement to the robustness of the Company's resource planning.

Generic Resources

One of the purposes of Integrated Resource Planning is to identify an illustrative resource portfolio to help guide specific resource acquisitions. In this planning cycle, the Company considered a host of resource alternatives that can be added to its resource portfolio, including additional conservation programs, incremental off-system storage alternatives at MIST and AECO, additional transportation capacity on both Williams and GTN pipeline systems, several of the proposed pipelines to move Rockies gas to the northwest, along with on-system satellite LNG facilities, biogas, and imported LNG. Typically, utility infrastructure projects are "lumpy", since demand grows annually at a small percentage rate, while capacity is typically added on a project-by-project basis. Utilities often have surplus capacity and must "grow into" their new pipeline capacity, because it is more cost effective for pipelines to build for several years' worth of load growth at one time than to make small additions each year. However, the Company can minimize the impacts through the acquisition of citygate peaking resources which include both the supplies and the associated pipeline delivery for a certain number of days or through the purchase of other's excess capacity through short or medium term capacity releases.

Analytical Framework

Traditional integrated resource planning would include analyses targeted at identifying the optimal long-term resource portfolio to meet the demand of the gas utility's customers across a few customer growth and gas price scenarios. In this plan, Cascade's resource analysis includes 5 different scenarios that focus solely on gas utility operations. In addition to scenario analysis, Cascade performed two different kinds of Monte-Carlo analysis to examine a variety of risks as noted above.

Summary of Key Findings

- The basecase results indicate energy efficiency programs with a levelized cost of 76 cents per therm or less are cost-effective over the planning horizon, with the price uncertainty analysis indicating that the levelized costs will likely range between 69 to 85 cents per therm. However, if a carbon tax adder is established by 2010 similar to that described in section 5, the cost-effectiveness limits could increase between 28 to 46 cents depending upon the level of the tax. As discussed in Section 5, Cascade uses a levelized cost of 85 cents per therm in its conservation analysis, which the company believes is still appropriate in light of the uncertainties surrounding carbon legislation over the planning horizon. Although some measures

in the conservation stack may exceed the cost-effectiveness threshold, the overall conservation program will remain cost-effective.

- Even with energy efficiency programs, Cascade will need to acquire additional capacity resources to meet anticipated peak day requirements, primarily due to continued growth in the company's residential and commercial customer base. It appears that the Sunstone and Blue Bridge project(s) are the best solution for addressing Cascade's growing peak day needs. Sunstone will allow Cascade to move additional supplies from the Rockies to address the capacity shortfalls and also provides additional supply diversity to Cascade's Oregon customers who have been traditionally served for the most part with natural gas from Alberta. Additionally, Sunstone combined with Blue Bridge pipeline provides the means to bring Rockies supplies to the I-5 corridor.
- Both Bio-gas projects and Satellite LNG facilities that are located within Cascade's distribution system may also be attractive alternatives. They may alleviate the need for incremental pipeline capacity and to the extent the facility could be strategically located on a portion of the distribution system they could provide the further benefit of eliminating or reduce distribution system constraints. Prior to any Bio-gas supplies being added to the portfolio, gas quality issues will need to be satisfactorily addressed.
- None of the proposed LNG projects are within Cascade's distribution system. Many of the proposed LNG import facilities located in the Pacific Northwest (Bradwood Landing, Jordan Cove) would require backhaul capability or additional infrastructure on upstream pipelines in order to reach Cascade's distribution system. However, the Kitimat project located in Northwest British Columbia is the most attractive option for Cascade as the company could use its existing Westcoast system transport agreements to move the supplies to Cascades service territory. LNG supplies sourced at Kitimat were selected as part of the least cost-portfolio mix, however, on September 19, 2008, Kitimat LNG announced that the development focus of the facility would switch from a regasification to a liquefaction facility, making Kitimat an exporter, rather than an importer of natural gas. In light of the announcement, the company will have to re-analyze the impact of this new event, as well as consider other imported LNG options.
- 20 year portfolio costs, on a Net Present Value (NPV) basis, are expected to range between \$3,309,990,000 to \$3,401,470,000 for the planning period, with an average cost per therm ranging between \$.4544 and \$.4662.

Use and Relevance of the Integrated Resource Plan

Cascade's Integrated Resource Plan provides the strategic direction guiding the Company's long-term resource acquisition process. The plan does not commit Cascade to the acquisition of a specific resource type or facility, nor does it preclude the Company from pursuing a particular resource or technology. Rather, the plan identifies key factors

related to resource decisions and provides a method for evaluating resources in terms of their cost and risk. Cascade recognizes that integrated resource planning is a dynamic process reflecting changing market forces and a changing regulatory environment.

Section 2

Introduction and Planning Overview

Company/Service Area Profile - Customers, Resource Maps

Beginning in 1953, Cascade Natural Gas Corporation began acquiring small local gas distribution companies in anticipation of the construction of an interstate pipeline to bring natural gas into the Pacific Northwest in 1956. The pipeline began in New Mexico and moved northwesterly into the northeast corner of Oregon and on into Washington, to the Canadian border near Sumas, Washington. Cascade's distribution system tapped into the pipeline at many places in Oregon and Washington. Usually, an industrial operation located in the area made it economically feasible for Cascade to construct its initial distribution system to serve the industrial customer and then branch out from there to serve the residential and commercial communities in the nearby area.

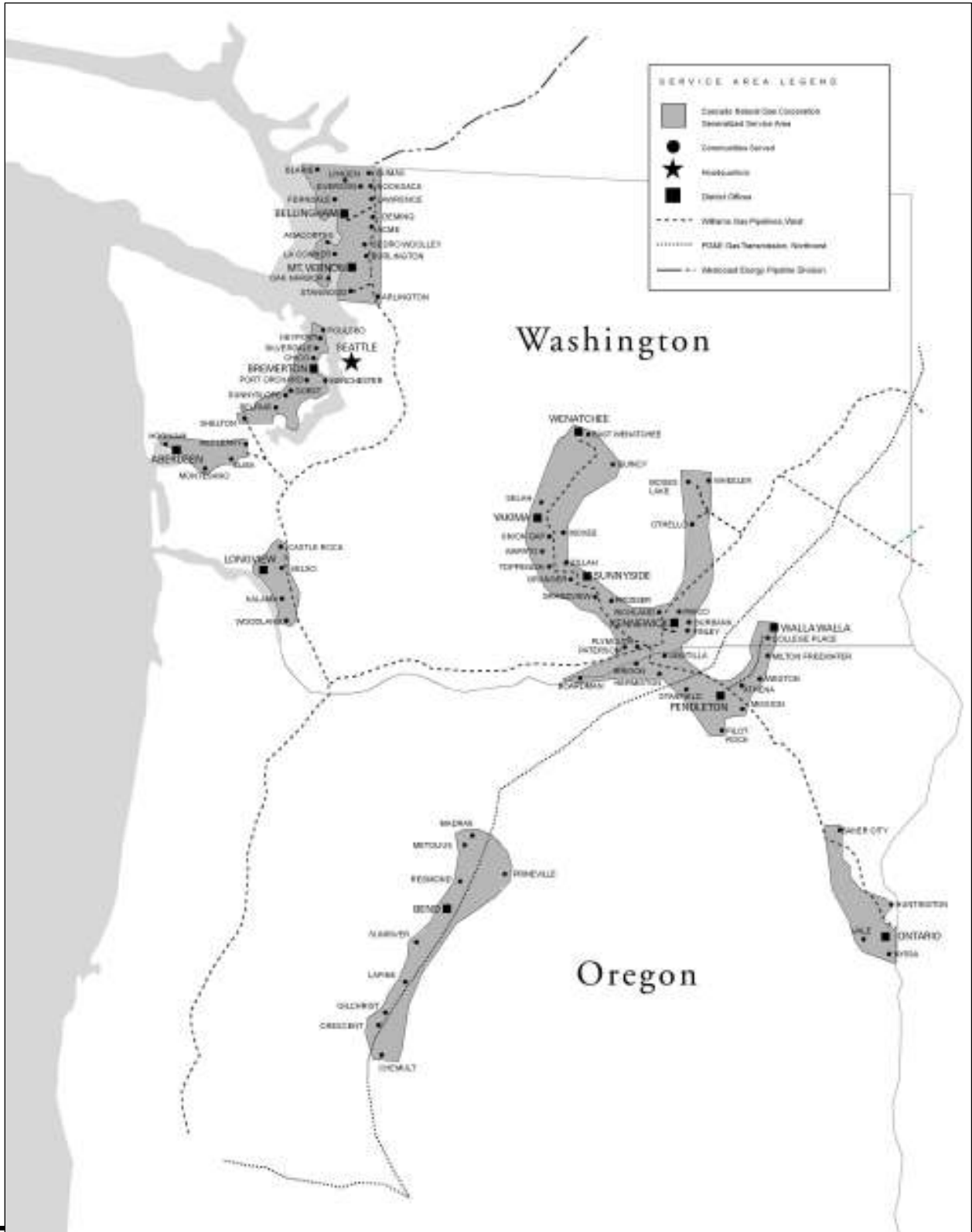
Today, Cascade's service territory covers about 32,000 square miles and extends over 700 highway miles from end to end, encompassing a richly diverse economic base as well as varying climatological areas (see service area map, Figure 2-A). Cascade serves over 90 communities throughout Washington and Oregon consisting of about 250,000 customers. All of the communities Cascade serves are small cities and towns. This makes Cascade unique in the gas distribution business in the Pacific Northwest. Cascade's customer base currently includes approximately 217,000 residential customers, 32,000 commercial customers, and 700 industrial customers. Cascade's sales volumes reflect the ratio of approximately 75% in Washington and 25% in Oregon.

Bundled vs Unbundled Service

Since Cascade began distributing natural gas in the Pacific Northwest, the Company has offered its customers a "bundled" natural gas distribution service. This bundled service included purchasing the gas supply, transporting that supply to Cascade's city gate, and distributing that transported supply to each Cascade customer through the Company's local distribution system. Customers receiving traditional bundled services are referred to as core customers. In 1989, Cascade "unbundled" its rates and as a result approximately 200 of the 700 industrial customers have elected to become "non-core" customers. These customers have made the choice to rely on alternative methods of service rather than the traditional bundled gas supply and pipeline transportation services available to core customers for their gas requirements. Therefore, providing gas supply and transportation capacity resources to non-core customers is not considered part of this Integrated Resource Plan as such resources are separate from the supply and capacity contracts for the core customers who continue to utilize Cascade's bundled system gas supplies and capacity. Although the resource needs for non-core customers are not included in either the conservation or supply side resource analysis, their contracted peak day delivery is considered in the distribution system planning analysis discussed in Section 4.

For the Calendar year ended December 2007, Cascade's 217,000 residential customers represented approximately 13% of the total natural gas delivered on Cascade's system, while the 32,000 commercial customers represented approximately 10% and the 500 core market industrial customers consumed approximately 2% of total gas throughput.

FIGURE 2-A



The remaining 200 non-core industrial customers represented about 74% of total throughput.

Cascade purchases natural gas from a variety of suppliers and transports gas supplies to its distribution system via two natural gas pipeline companies. Williams' Northwest Pipeline GP (NWP) provides access to British Columbia and domestic Rocky Mountain gas while the Gas Transmission Northwest (GTN) provides access to Alberta gas. Cascade also holds transportation contracts upstream of these systems on TransCanada Pipeline's Foothills Pipeline (formerly ANG) and Alberta Systems (also known as NOVA), as well on Westcoast Energy, Inc. (Spectra Energy).

IRP Guidelines and Policies

Cascade utilizes integrated resource planning to maximize the efficiencies of the Company's utility operations. The planning process includes an assessment of current and future gas load requirements, the possible resource options for serving the projected load requirements, and a selection of the set of least cost resource alternatives with acceptable level of reliability through the use of an optimization model. Monte-Carlo simulation tools are utilized to further analyze the results of the optimization model to quantify the range of uncertainty in market price and demand due to changes in weather.

Cascade is subject to regulatory oversight by the Washington Utilities and Transportation Commission (WUTC) and the Oregon Public Utility Commission (OPUC). Each commission has established a set of guidelines or rules, which the company's plan must meet. In Washington those guidelines are contained in WAC 480-90-238, in Oregon the guidelines are found in the Commission Order No. 07-002 in docket UM 1056. In general, both commission guidelines require that the utility develop a range of demand forecasts, examine all feasible resources for meeting that demand whether they supply-side or demand side and compare them on an equal basis, considering uncertainty over the planning horizon, develop a 2 year action plan and involve the public and the various stakeholders in the planning process.

Cascade believes that its IRP meets the substantive requirements of both the Washington and Oregon Commissions. This IRP includes a range of demand forecasts that encompass the anticipated forces, both economic and weather-driven, that will impact the load forecasts over the planning horizon. The demand side resource section includes an assessment of technically feasible improvements in the efficient use of natural gas. The supply resource section includes a discussion of the supply side resource options available including an assessment of conventional and commercially available nonconventional gas supplies, an assessment of opportunities for additional company-owned and contracted storage, and an assessment of the Company's existing pipeline transportation capability and reliability along with the opportunity for incremental pipeline transportation resources. The integration section provides a comparative

evaluation of the cost of the various resource options on a consistent and comparable method. The resource integration section also describes the integration of the demand forecast and resource evaluations into a long range resource plan describing the strategies designed to reliably meet current and future needs at the lowest reasonable cost to Cascade's ratepayers. The short-term action plan describes the specific actions the utility will take to implement the long-range integrated resource plan during the next two years and reports on the Company's progress in meeting its prior 2-year action plan goals.

Cascade believes all resources described in this IRP have been evaluated on a consistent and comparable basis through the use of its optimization model. Uncertainty has been considered in each component of this plan. The demand forecast includes a reasonable range of uncertainty as quantified in the low, medium and high load growth scenarios along with the additional simulation analysis calculated through Sendout's monte-carlo functionality that assesses the impacts of weather on the load forecasts. The demand side and supply side resource sections describe relative uncertainties regarding reliability, cost and operating constraints and external costs. Uncertainties associated with the environmental effects of carbon emissions have also been included through an analysis of the impact of a carbon tax on the portfolio. Price volatility and market risks and their impacts on the Company's long-term resource portfolio have been assessed through the use of the Sendout model.

To involve public interests in the development stages of this IRP, Cascade has a Technical Advisory Group (TAG). Three meetings were held to discuss the major IRP topics including the demand forecast, distribution system planning, demand side resources, supply side resources, and resource integration and uncertainty analysis. The TAG meetings were helpful to Cascade as questions were answered and varying points of view were explored. Appendix A-2 contains an outline of the meeting content and a list of participants. Additionally, customers and interested parties are invited to comment on Cascade's Draft 2008 IRP. Based on comments received, Cascade will make modifications to its Plan prior to filing the final text in December 2008.

Appendix A-3 provides additional information regarding the specific requirements or guidelines for each commission and how the company has met those requirements.

Resource Decision Making Process Overview

Cascade makes resource decisions based on the best quantitative and qualitative information available. The IRP tools that are continually evolving assist Cascade in formulating energy resource decisions in a logical, consistent and comparable manner. The steps outlined below are those utilized by Cascade for both its short-term and long-term resource decisions.

1. Construct a range of possible demand forecasts for the core market.

2. Calculate avoidable distribution system enhancement costs.
3. Provide the optimization model the existing supply side and demand side resource options to meet demand.
4. Run the optimization model to identify resource needs including the types of resources and their timing requirements. The existing portfolio is modeled under a range of demand forecast conditions.
5. Identify incremental supply and demand side resources to satisfy a range of incremental growth scenarios.
6. Run the optimization and Monte-Carlo simulation models to identify the best-fit portfolio given an expected range of forecasted core loads and operating conditions.

The resource decision-making process is dynamic and ongoing and the Company's resource strategy must constantly evolve to reflect dynamic market forces and a continually changing regulatory environment. This IRP document represents a snapshot in time similar to a balance sheet. It is not meant to be a prescription for all future energy resource decisions as conditions will change over the planning horizon and will impact areas covered by this IRP. Rather, this document is meant to describe the currently anticipated conditions over the long-term planning horizon, the anticipated resource selections and most importantly the process for making resource decisions.

Disclaimer –Important notice

Cascade makes the following cautionary statements in its Integrated Resource Plan and appendices to make applicable and to take advantage of the safe harbor provisions of the Private Securities Litigation Reform Act of 1995 for any forward-looking statements made by or on behalf of Cascade. This Plan, its appendices, and any amendments or supplements to it, include forward-looking statements, which are statements of expectations, beliefs, plans, objectives, assumptions of future events or performance. Words or phrases such as “anticipates”, “believes”, “estimates”, “expects”, “intends”, “plans”, “predicts”, “projects”, “will likely result”, “will continue” or similar expressions identify forward-looking statements.

Forward-looking statements involve risks and uncertainties, which could cause actual results or outcomes to differ materially from those expressed. Cascade's expectations, beliefs and projections are expressed in good faith and are believed by the Company to have a reasonable basis, however, there can be no assurance that Cascade's expectations, beliefs or projections will be achieved or accomplished.

Any forward-looking statement speaks only as of the date on which such statement is made and except as required by law, Cascade undertakes no obligation to update any forward-looking statement to reflect events or circumstances after the date on which such

statement is made or to reflect the occurrence of unanticipated events. New factors emerge from time to time and it is not possible for management to predict all such factors, nor can it assess the impact of any such factor on the business or the extent to which any factor, or combination of factors, may cause results to differ materially from those contained in any forward-looking statement. These materials and any forward-looking statements within them should not be construed as either projections or predictions or as business, legal, tax, financial, or accounting advice and should not be relied upon for any such purpose.

Section 3

Demand Forecast

Each year, Cascade develops a 20-year forecast of customers, therm sales and peak demand which the company uses for both short-term planning activities, such as the Company's annual budgeting process, along with long-term planning activities such as distribution planning and integrated resource planning.

The demand forecast is Cascade's best estimate of future core market firm energy resource requirements over the 20-year planning horizon. The core market firm demand forecast is a necessary initial step toward defining the level of resources required under a range of anticipated economic, demographic and marketplace conditions. The range of anticipated conditions is encapsulated in the low, medium and high forecasts. The forecasts are used both for determining future system enhancements required for the distribution system as well as utilized in the optimization model for determining the least cost portfolio of supply and demand side resources.

Annual Growth and Use per Customer Forecasts

Cascade utilizes econometric models for developing the core residential, commercial, and industrial forecasts. Econometric models allow the Company to predict the number of customers based on historical relationships of growth in customers and therm usage to economic variables. Forecasts are developed for each of Cascade's 90 towns based on county demographic data since the economic variables used to estimate the model parameters are not consistently available at the town level.

In an effort to increase the level of detail and accuracy over previous year's plans, the forecasts developed for each town are then combined to develop projections on a zonal basis. Given the diverse territory that Cascade serves, modeling by zones allows factors such as weather patterns to be better tailored to the relevant populations. Appendix B-1 provides a table of the towns and districts that compose each zone utilized in the model. Forecasted customer growth and use per customer growth for specific zones are provided in Appendix B-2.

Cascade utilizes two models per customer sector to develop the annual load forecast; one to forecast the number of customers in the particular sector, and the second to forecast the annual usage per customer. The results of the customer growth forecast and the usage per customer forecasts are combined to calculate the annual load projections for each customer class.

The economic variables used to forecast residential customer growth are population, employment and housing market conditions, (as measured by 30 year mortgage rates). Both the commercial and industrial customer growth forecasts are based on population, employment and prime interest rates. Cascade continues to use Woods & Poole Economics as the data source for much of the economic figures, primarily because it provides economic data at the county level for all of Cascade's service territory. For this plan, the Company has used the 2007 State Profile which contains county level data for the 1969 through 2028 time period. The Woods & Poole State Profile provides population, number of households, personal income and employment figures used in

developing the medium growth scenario. In order to develop the high and low growth forecasts, variants were applied to the Woods and Poole data in order to develop a range of economic statistics. The escalation rate assumptions are provided in Appendix B-1. The 30-year mortgage rate and prime interest rate forecasts assumptions are based on applying the long-term Treasury bond growth rate from the Northwest Power Planning Council's Fifth Power Plan to recent interest rate data.

The annual use per customer forecasts are based on heating degree days, natural gas prices and real personal income, with heating degree days and income being the primary drivers. When developing the annual load forecast, the Company utilizes the 20-year average heating degree days for its base forecasts and therefore use per customer forecasts included in the low, medium, and high forecasts estimate customer use under normal weather conditions. In order to determine the impact of weather on the demand forecast, the company has utilized the Monte-Carlo simulation functionality contained in SENDOUT which is discussed in detail in Section 7. As mentioned previously, each town is subject to the weather patterns of their respective zone, and therefore the impact of changes in weather is now being analyzed on a regional basis, as opposed the higher level analysis performed in the previous plan.

To estimate Cascade's retail rates for the planning horizon, the Company applied real gas price escalation rates to the company's then current retail rates (rates that were effective in April 2008). Real gas price escalation rates are based on the Northwest Power Planning Council's (NPPC) fuel price forecast from their Fifth Power Plan issued in 2008 NPPC's plan provides escalation factors under a number of growth assumptions and the Company utilized the council's medium growth forecast for its medium load forecast.

Peak Day Forecast

In addition to forecasting number of customers and therm usage on an annual basis, the Company also forecasts peak day usage. The peak day forecast information is utilized for both distribution system planning and peak capacity planning requirements. Cascade must be able to ensure reliable natural gas service to meet its core customers' requirements on a peak day. Cascade believes it has a fundamental responsibility to provide firm service to those customers who pay for and expect gas under all but force majeure conditions. This is especially true for our space-heating customers, primarily residential and commercial customers, who have limited or no alternative heating source. For this reason, Cascade has historically developed its peak day forecast based on a 65 degree day (0 degrees Fahrenheit average temperature) for design weather conditions which represented the coldest day recorded in Cascade's 60 plus years of weather history. However, for this plan, Cascade has modified its design day criteria to utilize the coldest day during the past 30 years. This modification has reduced the peak day to 61 degree days which most recently occurred on December 21, 1990.

The coincident peak day demand forecast was developed from regional weather and purchase point (citygate) therm consumption data observed on January 5, 2004. The gas use on this date represents Cascade's best peak day demand approximation in recent

history. The average temperature on this date produced a system wide 56 degree day. The consumption was then adjusted to reflect estimated consumption during a system wide 65 degree day.

Peak day therm consumption was developed for each town based on the respective regional weather data and weighted average peak day therm consumption. The peak day usage was then escalated each year by the annual therm consumption growth rate. Utilizing the annual therm growth rate assumes that the core market load shape does not significantly change throughout the planning horizon.

Forecast Results

Appendix B-2 contains the detailed results of the low, medium and high growth demand forecasts. The following table provides the system wide annual growth rates for the 20-year planning horizon for customers, annual therm demand, daily baseload, and peak day therm demand.

DEMAND FORECAST HIGHLIGHTS COMPOUND ANNUAL GROWTH RATES 2009 - 2028 HEATING SEASON PLANNING HORIZON				
SYSTEM				
FORECAST	CUSTOMERS	TOTAL ANNUAL THERMS	BASELOAD THERMS	PEAK DAY THERMS
High	3.67%	3.19%	3.25%	3.22%
Medium	2.39%	1.91%	2.11%	2.08%
Low	1.37%	0.89%	0.95%	0.92%

Based on the results of the medium growth demand forecast, Cascade’s annual firm core market demand for 2009 is expected to be 301,417,972 therms. By the end of 2028, annual core market demand is forecasted to be 431,783,892 therms. This represents an increase of 43.3 percent over the 20 year planning period and an average annual growth rate of 1.88 percent. Peak day demand requirements for 2009 are estimated at 3,639,919 therms. Peak day requirements are forecasted to increase to 5,014,000 therms by 2028.

Residential customers represent 87 percent of Cascade’s customers and about 53 percent of core market therm sales volumes. Residential customers are expected to increase from 223,131 for the 2009 heating season to 364,724 in the 2028 heating season under the medium growth scenario. Commercial and industrial customers represent 13 percent of Cascade’s customers and about 45 percent of core market therm sales volumes. Commercial customers are forecasted to increase from 33,381 for the 2009 heating season to 46,328 in the 2028 heating season under the medium growth scenario. Figure 3-1 shows the anticipated growth in customers over the planning horizon, and Figure 3-2 depicts the most likely anticipated growth in each class of customer.

Figures 3-3 and 3-4 show the relative range of expected annual and peak day therm consumption over the planning horizon. Although the overall forecast increases over the planning horizon, the rate of increase slows down due to declining usage on a per customer basis. This trend of decreasing therms per customer makes intuitive sense for the future as new customers make further investments in conservation, building codes are enhanced and customers replace old gas equipment with new higher efficiency gas appliances. Attesting to such circumstances, Cascade has modified the forecast for the Oregon service territory to reflect recent changes in building code standards in that state, which increase the efficiency of newly constructed buildings and gas equipment. It should be noted this baseline forecast does not include the impacts of incremental utility sponsored conservation programs that will be discussed later in this document. Additionally, Appendix B-2 contains additional forecast details including forecasted growth on a zonal and state basis.

Figure 3-1

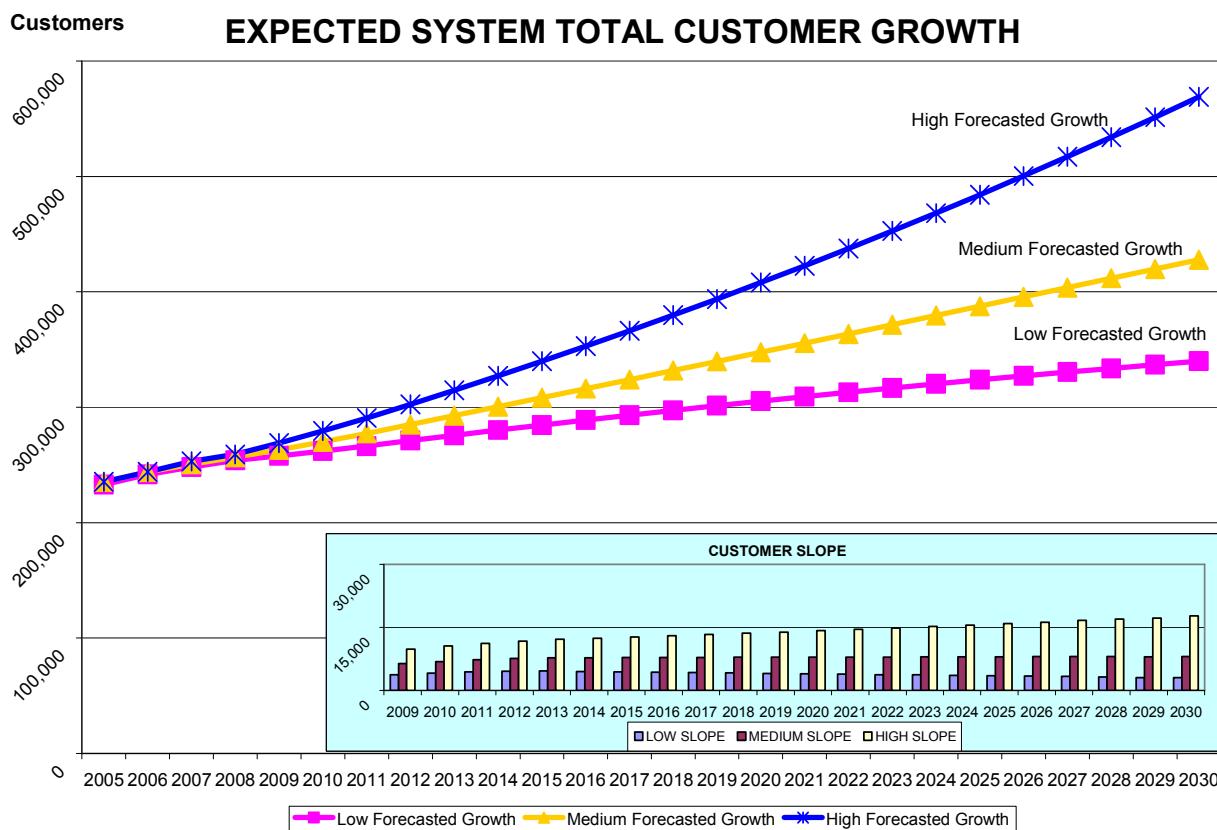


Figure 3-2

Customers

TOTAL CUSTOMER FORECASTED GROWTH

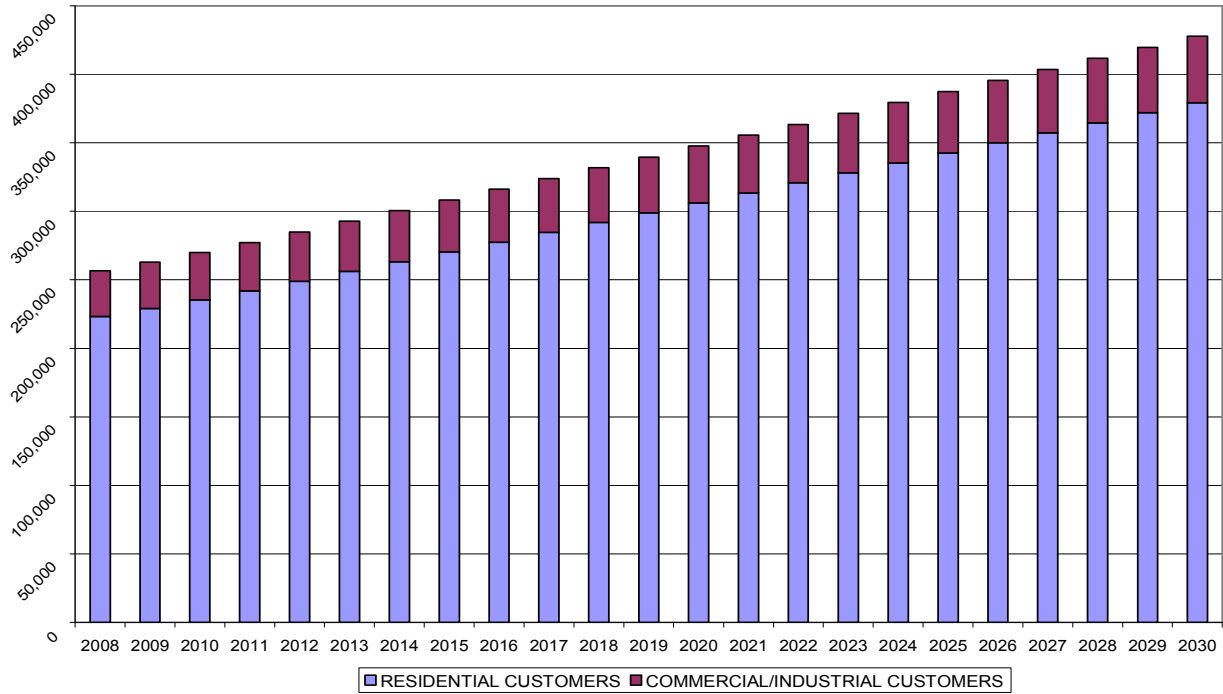


Figure 3-3

Therms

EXPECTED SYSTEM TOTAL THERM USAGE

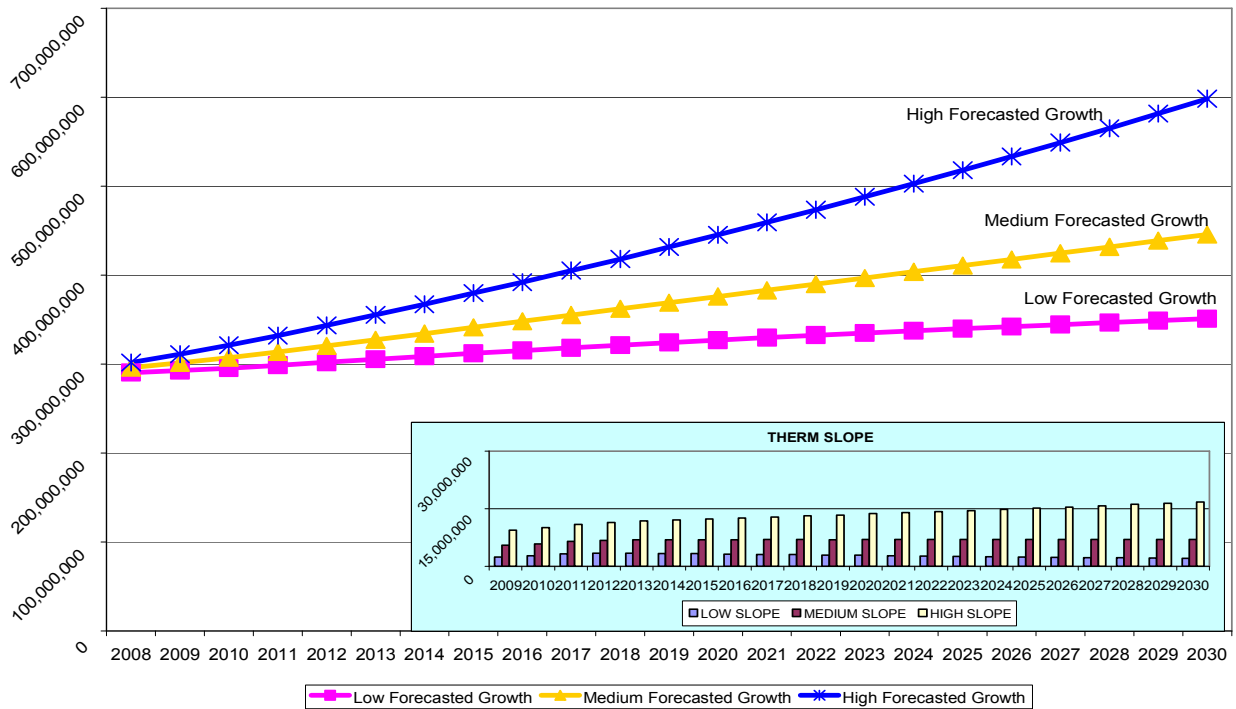
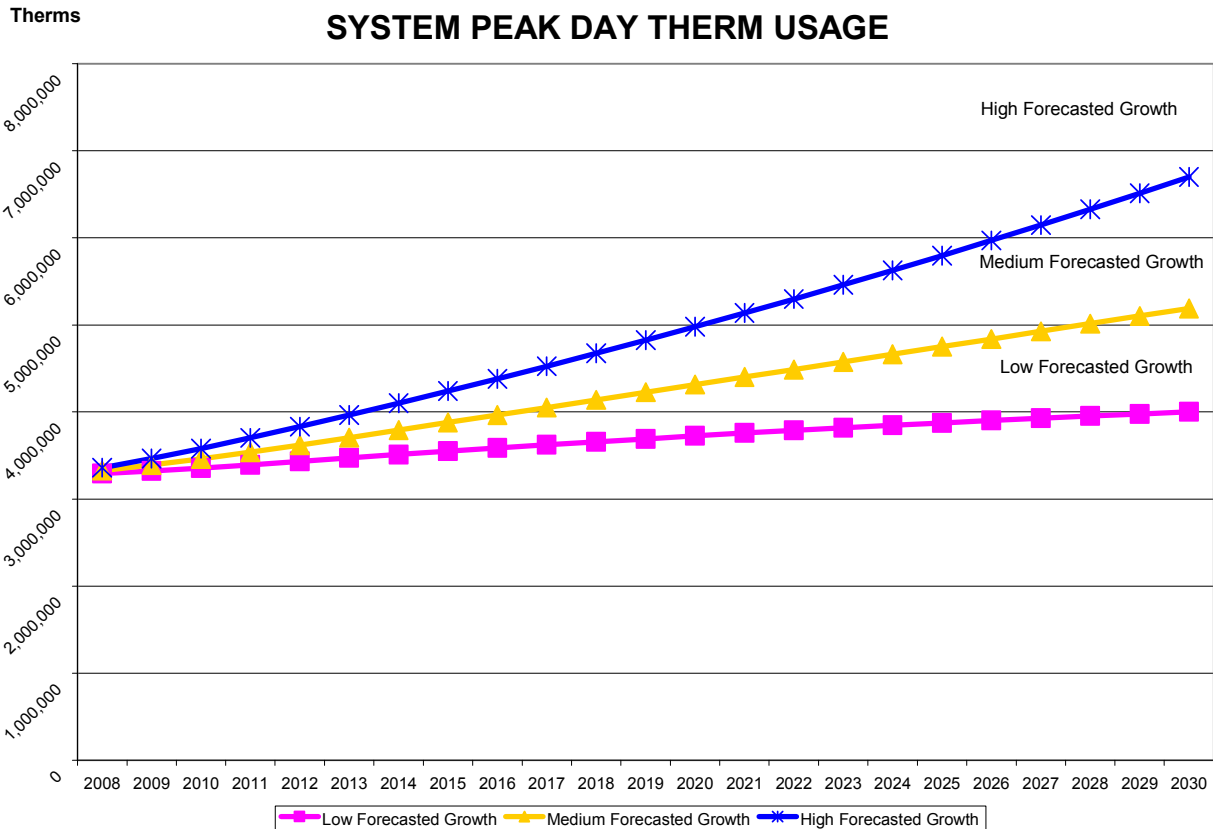


Figure 3-4



The Company regularly monitors the results of its demand forecast models rather than monitoring the forecast assumptions and their relationship to customers and usage estimates utilized by the econometric models. Based on this analysis, the Company believes its forecast is reasonable.

Demand Forecast Uncertainties

Cascade considered planning uncertainty in developing its demand forecast requirements and integrated resource portfolio strategies by developing a wide range of potential scenarios that reflect uncertainty in various sectors. By creating a high, medium and low set of scenarios, the Company has set a range of possibilities for demand to occur. Additionally, as will be discussed in section 7, the Company has analyzed the impact of weather on the medium growth forecast through the use of Monte-Carlo analysis. This analysis allows the Company to provide an expected range of annual load for the planning horizon that reflects the variations in weather likely to occur throughout the planning horizon.

That said, Cascade believes the potential building code changes in Washington and Oregon are worth specific mention as uncertainties. Given the impact such legislation has upon future customer therm usage, further upgrades to residential and commercial

building codes could dramatically reduce Cascade's load even if customer counts do not decline. Although forecasting and timing such measures is extremely difficult, once building codes are established Cascade is capable of modeling this decline in customer usage (as is the case with the recent code changes in Oregon). Future code changes, however, are unknown.

Another specific uncertainty that could significantly impact this forecast is the increased push toward "Direct Use" campaigns. If "Direct Use" is strongly emphasized and sees even moderate success, Cascade's customer base and core demand would increase. Such campaigns are largely out of the Company's control, and so are under close scrutiny given the considerable effect it may have on this forecast.

With respect to customer reactions to Cascade's retail rate increases/decreases, historical observation has shown that noticeably negative therm usage is only recorded for a short period following rate increases. In the same way, rate decreases bring about noticeably positive therm usage, but again for only a limited time. As such, Cascade has not included a factor for price elasticity directly into this year's forecast model given the "revision to mean" nature of previous rate increases and decreases coupled with the strong influence of weather patterns in the Pacific Northwest. Additionally, gas costs have proven to be a more significant driver in forecasting the effects of Demand Side Resources, which are ultimately removed from the gross numbers produced by the Demand Forecast. However, Cascade plans to further research price elasticity effects within its territories and possibly incorporate any significant results in the next demand forecast model.

Other uncertainties such as significant economic, political, environmental, demographic and regulatory events that could have an effect on natural gas demand in Cascade's service area represent uncertainties that cannot be reasonably quantified in this forecast. As the forecast is refined in subsequent years, many of these uncertainties will become more quantifiable and either implicitly or explicitly incorporated at that time.

Section 4

Distribution System Enhancements

Forecasting by town allows Cascade to estimate the need for distribution system enhancements with a reasonable level of accuracy in the near term of the planning horizon. A localized forecast approach also allows a non-coincidental peak forecast to be developed which is necessary when estimating distribution system enhancement needs. Gas supply and pipeline transportation become secondary issues if the distribution system is constrained. An important part of the planning process is to determine potential areas of distribution system constraints, analyze possible solutions, and estimate costs for eliminating constraints.

Distribution System Modeling

Gas distribution networks rely on pressure differentials to move gas from one place to another. If the pressure is exactly the same on both ends of a pipe, the gas will not flow. Therefore, it is important that gas engineers design the distribution network such that the pressure in the pipe will always be high enough that a differential can be created when gas leaves the system. As gas flow increases, pressure is lost due to friction. Using the laws of fluid mechanics, engineers determine the maximum flow of gas through a pipe of a certain diameter and length that will not cause pressure drops that are too great. This process is known as "gas distribution system modeling".

The modeling process is important because it lets the engineer determine how much flow can be delivered at various places on the distribution system. For instance, when large customers are added to a distribution network, the engineer must determine if the network capacity is large enough to provide the additional flow needed to fulfill customer requirements. Modeling is also important when planning new distribution systems. The correct size main distribution pipes must be installed to allow for the flow needed to meet the requirements of current customers, and reasonably anticipated future customers at reasonable costs.

It is desirable to know if an existing distribution system has enough capacity to satisfy new loads due to increasing numbers of customers in the future. The model can also be used to simulate increasing the gas flows through the existing pipes until the pressure loss in the pipes becomes unacceptable.

Engineering Modeling by Town

Utilizing computer software, individual models were created for each of Cascade's different systems. These models include both high-pressure lines and distribution system networks. As gas loads are simulated to increase according to the forecasts, the pressures within each system are checked. When the simulation shows the pressure dropping to an unacceptable level, that system and the surrounding area is determined to be a constraint area. When constraint areas are found, the analyst determines the most effective way of solving the problem. The solutions sometimes entail increasing the pressure in the system. However, in most situations where future constraint areas are identified, some amount of looping is also needed. The costs for the loops are determined based on system wide averages of past system reinforcements and extensions. An average cost per foot is established for each area,

and then the most cost-effective alternative to solving the pressure problem is found. After these costs are tabulated, potential reductions of demand within constraint areas due to conservation will be included in the analysis to determine whether any of the costs can be avoided or delayed.

The modeling output is compared to and, where appropriate, supplemented with data from local field personnel to provide forecasts by town. This allows the analyst to specifically determine, town by town, what reinforcement would be necessary to each system for each year. These town by town costs are then grouped together by gate station.

Key Findings

The results of the distribution system analysis are shown in Table 4-1. The table shows the estimated costs of distribution system enhancements necessary to eliminate constraint areas over the 20 year planning horizon. Appendix C contains further information regarding the possible solutions to alleviate the distribution system constraints. It should be noted that the proposed solutions are preliminary estimates of reinforcement solutions and actual solutions may be different due to differences in actual growth patterns and/ or construction conditions from those assumed in the initial modeling.

These results were based on the best information available and included both the anticipated load growth for the core market from the medium demand forecast along with the contracted peak delivery for each of the non-core customers.

Equally important is to review the impacts of proposed conservation resources on anticipated distribution constraints. Although the Company historically provides utility sponsored conservation programs throughout a particular jurisdiction (i.e. all of Washington or all of Oregon), there may be instances where a more targeted approach could reduce or delay the estimated reinforcement for a specific area. However, as will be discussed in section 5, the acquisition of conservation resources is entirely dependent upon the individual consumers' day-to-day purchasing and behavior decisions. Although the utility attempts to influence these decisions through its conservation programs, the consumer is still the ultimate decision maker regarding the purchase of a conservation measure. Therefore, the Company does not anticipate that the peak day load reductions resulting from incremental conservation will be adequate enough to eliminate distribution system constraint areas at this time. However, over the longer term, (the 2011 through 2025 timeframe) the opportunity for targeted conservation programs to provide a cumulative benefit that offsets potential constraint areas may be an effective strategy.

2008 Cascade Natural Gas IRP Forecast Yearly Reinforcement Costs by Gate																			
Gate	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2025	2027	Grand Total
Arlington	\$370,597			\$118,826			\$1,400		\$65,579	\$31,973	\$233,852	\$186,086		\$35,018					\$1,043,330
Bellingham I		\$40,000			\$349,192					\$34,800			\$149,616						\$573,608
Bend	\$1,053,775	\$2,671,000		\$1,699,000	\$1,057,000	\$710,200		\$128,915		\$29,145		\$67,260	\$43,283					\$51,765	\$7,511,343
Burbank Heights	\$145,730		\$373,293							\$62,776						\$113,782			\$695,581
East Stanwood	\$182,954																		\$182,954
Grandview	\$44,840																		\$44,840
Hermiston	\$90,480			\$61,553		\$30,450							\$5,425						\$187,908
Kalama								\$41,978											\$41,978
Kennewick		\$886,500		\$34,800	\$12,615	\$37,845	\$45,240												\$1,017,000
McCleary				\$1,488				\$113,782					\$36,105		\$56,333	\$25,448			\$151,374
Mount Vernon									\$20,880										\$102,660
Moxee			\$3,588																\$3,588
Othello						\$97,420													\$97,420
Pendleton	\$120,278																		\$120,278
Prineville	\$117,705																		\$117,705
Redmond	\$75,668	\$46,328		\$134,438	\$209,067	\$81,833	\$113,782				\$44,806			\$35,872	\$208,640	\$39,235			\$696,940
Sedro Woolley	\$218,595	\$81,345		\$35,888	\$209,067	\$1,138		\$141,561					\$12,180	\$45,675	\$121,274				\$696,560
Selah						\$1,138													\$1,138
Shelton	\$4,292,383		\$48,700	\$892,953	\$1,550,000	\$372,011	\$40,000		\$90,000	\$5,580,075			\$205,143	\$60,900	\$215,793				\$13,347,957
Stanfield												\$9,013							\$9,013
Stanwood	\$35,018	\$51,983			\$106,773				\$174,876			\$40,000							\$408,649
Sumas	\$298,493	\$119,843	\$313,642	\$156,962	\$170,000	\$1,003,758	\$364,325	\$369,625	\$81,000	\$234,790	\$60,465	\$938,382	\$41,543	\$153,990	\$32,625				\$4,339,442
Sunnyside						\$1,400													\$1,400
Sunriver	\$306,050			\$43,718															\$349,767
Walla Walla	\$7,178																		\$7,178
Woodland		\$130,474																	\$130,474
Yakima	\$1,815,000	\$1,780,000	\$1,319,500																\$4,914,500
Grand Total	\$8,956,146	\$5,058,221	\$3,089,808	\$3,179,624	\$3,347,873	\$2,442,827	\$564,747	\$795,860	\$146,579	\$679,239	\$5,919,198	\$1,240,741	\$493,294	\$331,455	\$673,899	\$113,782	\$25,448	\$51,765	\$37,110,503

Section 5

Demand Side Resources

Introduction and Overview

Demand Side Management (DSM) resources are generally thought of as conservation measures or actions that offset or defer the need for additional gas supplies or other supply side resources. Oregon and Washington Utility Commissions require gas utilities to consider cost-effective DSM resources in their energy portfolio on an equal and comparable basis with supply side resources. In the gas industry, DSM resources are conservation measures that include but are not limited to ceiling, wall and floor insulation, higher efficiency gas appliances, insulated windows and doors, ventilation heat recovery systems and weather stripping to name a few. By prompting customers to change their demand for gas, Cascade can displace the need to purchase additional gas supplies, displace or delay contracting for incremental pipeline capacity and possibly displace or delay the need for reinforcements on the Company's distribution system.

There are two basic types of demand side resources. These are baseload resources and heat sensitive resources. Baseload options are those that displace the need for baseload supply-side resources. They will offset gas supply requirements day in and day out regardless of the weather. Baseload DSM resources include high efficiency water heaters, higher efficiency cooking equipment and horizontal axis washers. Heat sensitive DSM resources are measures whose therm savings increase during cold weather. For example, a high efficiency furnace will lower therm usage in the winter months when the furnace is utilized the most and will provide little if any savings in the summer months when the furnace is rarely used or is turned off. Examples of heat sensitive DSM measures are ceiling/floor/wall insulation measures, high efficiency gas furnaces, and improvements to duct work. These types of measures will offset more of the peaking or seasonal gas supply resources, which are typically more expensive than baseload supplies.

Due to differences in the approach to DSM acquisition between Cascade's Oregon and Washington jurisdictions, each of the states will be addressed individually. In Oregon, the Company has been tasked with evaluating the funding adequacies of its public purpose charges that go to the Energy Trust as well as the Company's own low-income programs. In Washington, Cascade is updating the technically achievable conservation potential in its Washington service territory.

2-Year Action Plan Update

Due to timing of IRP filings, Cascade will report on its progress in achieving its Oregon 2004 Action Plan as well as report on the progress in meeting the Company's 2007 IRP Action which was filed with the WUTC.

Oregon 2-Year Conservation Action Plan Update

Cascade's 2004 IRP was acknowledged by the OPUC in August 2005, which based on the 2 year filing requirement, another plan was not due to be filed until August 2007. In January 2007, the OPUC issued Order 07-002 in docket UM 1056 which established a detailed set of guidelines for IRPs. The new guidelines required an annual update, which Cascade submitted to the Commission in August 2007, which requested an extension of

the next plan until December 2008 to coincide with the Washington bi-annual filing requirements.

In the 2007 update to the OPUC, the company reported on the progress it had made in meeting its 2004 2-year action plan. A complete copy of the 2007 Update is included in Appendix G-1. In the update the company reported on major changes that had taken place since the development of the 2004 IRP, primarily the outsourcing of its conservation administration and program delivery to the Energy Trust of Oregon which was to be funded through 80% of the Public Purpose Funding with the remaining 20% going to Community Action Agencies to support expanded Weatherization Programs and bill assistances in the Company's Oregon service territory.

Oregon Conservation Programs and the Energy Trust of Oregon

Since July 2006, Cascade has relied on the Energy Trust of Oregon (ETO) for the delivery and administration of its conservation programs in Oregon. As mentioned above, 80% of the public purpose funding is transferred to the ETO to design, promote and administer Natural Gas energy efficiency programs on behalf of Cascade. During 2007, therm savings attributed to Cascade's Oregon service territory amounted to 151,291. Through July 2008, ETO has achieved 49,263 and estimates that 2008 annual therm savings will be approximately 235,660.

Oregon Low Income Weatherization Program

From January 1st through December 31 2007, 24 homes had been weatherized in Oregon with an annual cumulative therm savings of 3,573 with \$33,164 provided in rebates. This figure may not represent the full savings achieved though the program as there is currently no viable therm savings number associated with furnace tune-ups. Moving forward, this figure will be taken directly from an agency's TREAT audit, where provided.

As of September of calendar year 2008, Cascade's Oregon Low Income Weatherization Program has served 41 homes and achieved a savings figure of 5,277 therms with a total expenditure of \$46,497.47. Expended funds reflect only a small portion of the \$293,659.61 still available as of August 30, 2008. This surplus suggests that while program funding is plentiful there may be potential limitations within the Low Income Weatherization Assistance Program (WAP), the current delivery mechanism of our program.

Therefore Cascade is currently working with its Oregon Conservation Advisory Group (CAG) to better understand the capacity of WAP to serve Cascade homes and evaluate strategies designed to increase the level of participation in the program either through modifications to the program measures, incentives, or delivery approach. Such program alternations will be critical as we strive to achieve greater therm savings in the years to come.

Washington 2-Year Conservation Action Plan Update

Cascade’s IRP contained several action items that were to be addressed with the filing of a Conservation & Low Income Weatherization Plan (Conservation Plan). The Conservation plan was initially filed with the WUTC on May 5, 2007. The Conservation Plan was eventually approved on October 1st of the same year after some revisions, primarily the increasing of the original therm targets for the 2008, 2009 and 2010 period. The revised therm savings targets are higher than those originally listed in the 2007 IRP, and detailed below.

**Table 5-1
CONSERVATION AND LOW INCOME WEATHERIZATION PLAN
THERM SAVINGS TARGETS**

YEAR	RES & COMM/IND	LOW INCOME WEATHERIZATION	TOTAL ANNUAL SAVINGS
2008	322,500	13,125	335,625
2009	415,000	26,250	441,250
2010	530,000	35,500	565,500

Cascade’s IRP contained several action items that were to be addressed in the Conservation & Low Income Weatherization Plan, beginning with the modification of the then-current Low-Income Weatherization Program. The Conservation Plan also called for the implementation of additional prescriptive measures for residential customers, implementation of a custom program for commercial/industrial customers; and outsourcing program delivery to third party vendors. In this way, Cascade essentially aimed to establish a mini network of contracted agencies mirroring the business model of the Energy Trust of Oregon. Finally, Cascade’s 2007 IRP Action Plan called for Cascade to monitor the progress of Washington’s Climate Change Challenge and analyze its potential impacts. Each of these areas are in more detail below

Washington Low Income Weatherization Program Modification

Among the proposed modifications to the Low Income Weatherization programs, the most significant change was to allow for incentives of up to 100% of the cost-effectiveness limit on qualifying measures. During the first 15 months of the original program, the company had seen limited participation in this program with only 10 homes being weatherized. Comments on the program indicated that the lack of participation was primarily due to the original limitation of the rebate to 50% of the cost effectiveness limit, which required the agencies to find other funding sources to bridge the gap between the funding provided by Cascade and the actual costs to weatherize the home. In response to these comments, the Plan was modified to allow up to 100% of the cost effectiveness limit on qualifying energy efficiency measures and the change was implemented on October 1, 2007 in conjunction with the approval of the Conservation Plan.

The program modifications have resulted in a gradual but steady increase in weatherization completions through calendar year 2008 resulting in a total of 27 homes served by September 2008 with a total savings of 8,437 therms. It is anticipated that the end of the calendar year will yield savings near or within the established target of 13,125 therms.

It should be noted that although 12 agencies are qualified to deliver energy conservation measures in Cascade's service territory 77% (21) of the 27 weatherization jobs delivered by the network to date were delivered by only two agencies. The remaining 23% (6) were delivered by two additional agencies, including one, which only began participating in Cascade's rebate program in July of 2008. This suggests that there are obstacles still remaining before full implementation can be achieved by the weatherization delivery network.

Washington Residential Program Expansion

Cascade's 2007 IRP Action Plan specifically noted the implementation of a prescriptive program in Washington that would incentivize new construction customers to utilize Energy Star insulation and duct standards, as well as a program to encourage residential customers to weatherize their existing homes. The expanded program was implemented on October 1, 2007 upon approval of the Conservation Plan and as a result residential customers are eligible for utility rebates for improved insulation and ducts in both new construction and the retrofit markets.

Washington Commercial/Industrial Programs.

Along with the noted residential program improvements, Cascade's 2007 IRP Action Plan listed the implementation of a custom conservation program aimed at the commercial/industrial sector. The addition of the custom program is that it provides incentives to customers installing energy efficiency measures that are cost-effective but do not fit into the existing prescriptive program such as O&M, controls, or other specialty measures. Overtime, if the company continues to receive requests for similar measures, prescriptive programs maybe expanded to include these measures and carved out of the custom program. The custom program is also the best opportunity to reach the small industrial customers who likely would not be eligible to participate in the company's prescriptive measures.

Third Party Program Delivery

Another commitment in both the IRP and the Conservation plan was the outsourcing of the program delivery to a third party vendor in order to improve participation in both the residential and commercial/industrial programs. The company sent out separate RFP's for the Residential and the Commercial/Industrial Programs on October 31, 2007 to 13 vendors based on input from the company's Conservation Advisory Group. Although only 3 vendors responded to the RFP, all three had experience in providing similar programs for other utilities/agencies including the Energy Trust of Oregon.

The company selected Conservation Services Group (CSG) to perform the role of program management contractor (PMC) for the residential conservation program and Lockheed Martin Services, Inc. (LM) was selected as the PMC for the commercial and industrial conservation programs.

Impacts of Washington's Climate Change Challenge

Since Governor Gregoire announced the Executive Order creating Washington's Climate Change Challenge in February 2007, Cascade has monitored the progress of the Challenge as it pertains to the utility. On September 23, 2008 the Western Climate Initiative (WCI) released its Greenhouse Gas Cap and Trade design recommendation. Although the WCI participants, which includes both Washington and Oregon, have a certain amount of flexibility in setting requirements for implementation, compliance and enforcement of the program below are some of the key recommendations:

- Reduce GHG emissions to 15% below 2005 levels by 2020
- GHG measurements and monitoring begin 1/1/10 for reporting in early 2011
- First compliance period begins 1/1/12--electric generation (including imports); industrial and commercial combustion; industrial process non-combustion emissions
- Second compliance period begins 1/1/15--residential, commercial, and industrial fuel combustion below 25,000 metric ton threshold; transportation fuel
- No set date for allowance allocations, but they will be established prior to 2012
- Encourage entities to reduce GHG emissions 1/1/08-12/31/11 by issuing Early Reduction Allowances that are in addition to allocated allowances and are treated like allocated allowances

Since many of the specific requirements are still unknown, the company anticipates that new regulations will be determined during 2009 so the 2010 monitoring timeline can be met. During this time period it will be easier to determine how the initiative will impact Cascade and its customers. One possible outcome could be a greater push by electric utilities for "Direct Use" campaigns which would likely increase Cascade's therm load. Depending upon the ultimate legislation, a carbon tax, similar to the one recently enacted in British Columbia is another possible outcome that would result in further increases in natural gas costs to residential, commercial and small industrial customers that may encourage customers to participate in the utility sponsored conservation programs. Another possible outcome would be modifications to the building codes to require higher levels of energy efficiency. If realized, a greater number of energy efficient buildings could capture high percentages of the savings potential outlined in Cascade's conservation potential study, however they would not be attributable to the Company itself.

Potential DSM Measures and Their Costs

The first task in designing any DSM program is to analyze and determine costs and the associated energy savings for conservation measures along with estimating their applicability within Cascade's service territory. Evaluating specific measures involves ranking measures by levelized cost per therm saved. Each measure's cost and estimated therm savings are compared to supply side costs over a 20-year planning horizon. Administration expenses are included only in total program costs, not in measure costs and are expected to vary by program type and duration.

A total resource cost (TRC) approach is used to evaluate the cost-effectiveness of all DSM resources. The TRC method compares total net costs of DSM resources to the total net cost of supply side resources displaced. A program or measure is cost-effective if the present value of energy savings and non-energy benefits derived from installing that measure is greater than the total resource cost (TRC) of the program or measure. Non-energy benefits may include, for example, water savings from low-flow showerheads and higher efficiency clothes washers or reductions in maintenance costs.

During 2006, the company hired Stellar Processes to prepare a study of the technical and achievable conservation potential for Cascade's Washington and Oregon service territories. Stellar Processes, working with Ecotope, provided a similar study to the Energy Trust of Oregon. In 2008, the ETO approached Stellar to update their Oregon study, which provided an opportunity for Cascade to apply the relevant revisions to the Washington study prepared in 2006. It should be noted that, at the time of this writing, Cascade had utilized the most up-to-date draft version of Stellar's study to ETO to update their Washington study and Oregon achievable estimates. Although the study used was still called a draft, Cascade is fairly confident in its findings after working with the ETO to address questions and concerns. In both studies, the goal of the project was to provide Cascade with an estimate of the energy saving measures for the residential, commercial and industrial markets, an estimate of the costs for those measures and even more important, their potential applicability in Cascade's service territory. Below is a description of the process utilized by Stellar to identify the potential savings for each market segment.

Prior to discussing Stellar's process, one must first understand the difference between the "technical" potential energy savings and the "achievable" potential energy savings. The technical potential is the estimate of all energy savings that could be accomplished without the influence of any market barriers such as cost and customer awareness. Therefore, it provides a snapshot of all measures that could be done. Technical potential is a starting point and does not represent what can be saved through programs since it would be impossible to get every customer to install every possible measure. Achievable potential represents a more realistic assessment of expected energy savings since it accounts for some economic constraints. Stellar estimated achievable potential by multiplying technical savings by 85%, a standard established by the Northwest Power Planning Council that has historically been used to determine the achievable potential for electric conservation measures. From the resulting achievable potential, the next step is to estimate attainable program ramp-up rates that consider marketing, technology delivery channels, and other program constraints to develop a 20-year DSM deployment scenario with year-by-year achievable savings,

The approach used by Stellar, to develop the technical potential was as follows:

- Quantified the current energy use by sector and customer type.
- Estimated energy consumption by end use for each customer type.
- Applied the forecasted growth rate to estimate the customer base available in future years.

- Reviewed information on specific measures for applicability to Cascade’s Washington customers.

In order to quantify the Energy Use, Stellar utilized the Company’s estimate of sales by customer group and market segment along with estimates of Energy Use Index (EUI energy/sqft) factors to calibrate their estimates to match the utilities actual sales data.

The methods used to estimate energy consumption by end use varied depending upon the customer group. For the residential sector, Stellar applied prototype models in three climate zones to estimate major end use consumption, which was then calibrated to actual sector consumption. Table 5-2 shows the climate zones and the areas of Cascade’s service territory in Washington and Oregon assigned to each zone. For the commercial sector, the EUI factors provided consumption by end-uses and were based on information developed from a Washington Natural Gas study prepared in 1995. For the industrial sector, Stellar developed sharedown fractions that allocated therm sales to specific end-uses.

**Table 5-2
CLIMATE ZONES**

WASHINGTON			OREGON	
ZONE 1	ZONE 2	ZONE 3	ZONE 1	ZONE 2
Bellingham Mount Vernon	Aberdeen Bremerton Longview	Sunnyside Tri-Cities Walla Walla Wenatchee Yakima	Bend	Baker Ontario Pendleton

Stellar then applied the company’s forecasted growth rate to estimate the customer base available in future years. As a part of updating the Washington study mentioned above, Cascade revised Stellar’s original forecasted growth with the current expectations for the growth in both residential and commercial/industrial sectors. The forecasted growth rate is based on the demand forecast information discussed in Section 3 earlier in this plan.

Lastly, Stellar reviewed information on specific measures for applicability to Cascade’s customer base. This information includes estimates of incremental cost and savings but also assesses the market potential for specific measures. Applicability of some measures might depend on the fuel for space heating, for example. Also, the amount of remaining potential is affected by the extent to which the market for a specific product is currently saturated. Stellar’s team used a wide variety of resources to estimate information for the individual measures. Where available, the Northwest Power Planning Council’s (NPPC) Regional Technical Forum (RTF) data was utilized in the residential sector to collect costs and energy benefits. In addition, the NPPC libraries provided cost and benefit data for many of the commercial sector measures. In some cases, technical papers or data provided by manufacturers was used. To determine the applicability of measures to the service territory and to assess market conditions,

economic and census data was collected from Economy.com and from the U.S. Census Bureau and the Department of Housing and Urban Development.

Oregon Conservation Study Results

The complete list of the measures and their applicability to Cascade's Oregon Service territory is included in Appendix D. However, before developing the achievable potential and ultimately the 20-year DSM supply curves, the technical potential needs to be screened based on some level of estimated avoided costs. For purposes of the Oregon study, the ETO chose to include measures screen at \$.70 avoided costs, however, they included the Solar measures, which have costs above that threshold as the Trust already includes those measures in their conservation resource stack. Table 5-3 shows the group of residential measures and their technical applicability in Cascade's Oregon service territory.

On the commercial side and industrial side, measures were also screened at \$0.70 per therm. Table 5-4 shows the list of measures and their technical applicability to Cascade's commercial/industrial market sector in Oregon.

With the list of measures established, the next step was to determine the achievable potential and the 20-year DSM deployment scenario along with the associated annual utility costs to determine the level of funding that will be necessary to obtain those therm savings. As mentioned earlier, Stellar estimated achievable potential by multiplying technical savings by 85%, a standard established by the Northwest Power Planning Council that has historically been used to determine the achievable potential for electric conservation measures. The measures were then grouped into categories (SF New construction, SF Retrofit, etc) to show a total achievable potential and deployment curves were developed utilizing the following key assumptions:

- In the area of Residential New Construction and Replacement it was assumed that the achievable potential would be spread equally over the 20 year planning horizon. Participation levels each year would ramp up from 15% in 2009 up to 75% by 2016.
- Participation in the Residential Retrofit was also assumed to continue to ramp-up over the 20 year planning horizon. It was assumed that over the 20 year horizon, that 80% of the achievable potential would be realized through the residential programs. Participation levels were assumed to range from 4% in 2009 reaching a maximum of 6% in 2014.
- In the Commercial retrofit market, similar to the residential retrofit market, it was assumed that participation levels would range from 4% in 2009 to a maximum of 6% in the 2014 period.

**Table 5-3
RESIDENTIAL CONSERVATION MEASURES
TECHNICAL POTENTIAL BY 2030**

OREGON			
Measure Code	Measure Description	Gas Savings Therms	Levelized Cost (\$/th)
R-GH115	AFUE 90 to hydrocoil combo, Z 1	308,136	\$0.09
R-GH118	AFUE 90 to hydrocoil combo, Z 2	302,706	\$0.09
R-GH116	Boiler to Polaris Combo radiant, Z 1	715,671	\$0.55
R-GH119	Boiler to Polaris Combo radiant, Z 2	684,763	\$0.57
R-GH125	Duct Sealing and AFUE 90+ , Z 2	1,728,412	\$0.20
R-GH114	Duct Sealing, Z 1	80,756	\$0.28
R-GH117	Duct Sealing, Z 2	73,292	\$0.30
N-GH133	Ducts Indoor, DHW, Lights (Gas Z 1)	2,686,054	\$0.24
N-GH138	Ducts Indoor, DHW, Lights (Gas Z 2)	2,024,871	\$0.31
N-GH129	E* Insulation, Ducts, DHW, Lights (Gas Z 1)	2,130,840	\$0.40
N-GH134	E* Insulation, Ducts, DHW, Lights (Gas Z 2)	1,522,719	\$0.56
N-A103	Estar Dishwasher, New	886	\$0.63
R-A103	Estar Dishwasher, Replacement	65,592	\$0.63
N-GH130	Heating upgrade (AFUE 90) (Z 1)	198,215	\$0.16
N-GH135	Heating upgrade (AFUE 90) (Z 2)	149,424	\$0.21
N-A105	Hi-eff Washer	2,033	-\$2.15
N-GH132	HRV, E* (Gas Z 1)	1,963,928	\$0.22
N-GH137	HRV, E* (Gas Z 2)	1,480,499	\$0.29
N-A102	MEF 2.0 Washer, New	4,611	-\$1.63
R-A102	MEF 2.0 Washer, Replacement	154,270	-\$1.63
R-GD113	Solar hot water heater (50 gal) - With gas backup.	134,556	\$0.93
N-GH139	Tank upgrade (50 gal gas)	390,983	\$0.63
N-GD106	Tank upgrade (50 gal gas) Hi Eff Alternative, New	223,054	\$0.02
R-GD111	Tank upgrade (50 gal gas) Hi Eff Alternative, Replacement	872,299	\$0.02
N-GD108	Tankless Gas heater	1,258,603	\$0.83
R-GD110	Tankless Gas heater replace	229,289	\$0.32
N-GD109	Upgrade to Navien Tankless Gas heater	182,129	\$0.39
N-GD109	Upgrade to Navien Tankless Gas heater	33,492	\$0.39
R-GW123	Wx insulation (add walls), Z 1	143,816	\$0.19
R-GW128	Wx insulation (add walls), Z 2	952,980	\$0.18
R-GW122	Wx insulation (ceiling, floor), Z 1	156,318	\$0.24
R-GW127	Wx insulation (ceiling, floor), Z 2	1,028,694	\$0.24
TOTAL TECHNICAL POTENTIAL		21,883,891	

**COMMERCIAL/INDUSTRIAL CONSERVATION MEASURES
TECHNICAL POTENTIAL BY 2030**

OREGON COMMERCIAL		
Measure Description	Gas Savings Therms	Levelized Cost (\$/th)
Shell Measures	673,000	\$0.30
Retrofit Ventilation	327,000	\$0.36
Heat Reclaim	207,000	\$0.45
Replace Heaters	319,000	\$0.82
O&M and Controls	151,000	\$0.39
DHW Measures	92,000	\$0.66
Replace Windows	73,000	\$0.90
Replace Boiler	70,000	\$0.59
Cooking	39,000	\$0.29
Solar Hot Water	4,000	\$0.77
New HVAC	448,000	\$1.19
New Heaters	144,000	\$0.65
New Heat Reclaim	104,000	\$0.45
New Boilers	57,000	\$0.49
New DHW Measures	47,000	\$0.96
New Windows	38,000	\$0.85
New Cooking	10,000	\$0.29
TOTAL TECHNICAL POTENTIAL	2,803,000	

- In the Commercial/Industrial New Construction and Replacement markets, the achievable potential was spread evenly over the 20 year planning horizon. On the new construction side, participation levels ramp up from 50% in 2009 to 75% program in 2015. In the replacement market, the ramp up period is a little slower beginning at 40% in 2009 and reaching the maximum participation level of 75% in 2016.
- In developing the estimated costs to achieve the annual therm savings targets, it was assumed that ETO could achieve the therm savings targets for \$5/therm.
- Annual therm savings targets associated with the Low Income WAP have been included in the deployment curves as a separate line item as they are separate from the ETO’s targets. The Resource Assessment prepared by Stellar, includes the Conservation potential associated with the Low Income housing stock.

Based on the assumptions outlined above, the estimated annual therm savings targets for Cascade’s Oregon service territory over the 20 year planning horizon are shown in Table 5-5 below.

TABLE 5-5

ANNUAL THERM SAVING TARGET				
	Residential Sector	Commercial Sector	Low Income	Oregon Total
2009	220,597	52,060	10,000	282,657
2010	261,219	56,718	12,000	329,937
2011	329,054	62,700	15,000	406,754
2012	390,440	68,683	15,000	474,122
2013	451,826	74,665	15,000	541,491
2014	513,212	78,548	15,000	606,760
2015	533,523	83,205	15,000	631,728
2016	553,834	85,763	15,000	654,597
2017	553,834	85,763	15,000	654,597
2018	553,834	85,763	15,000	654,597
2019	569,955	85,763	15,000	670,717
2020	569,955	85,763	15,000	670,717
2021	569,955	85,763	15,000	670,717
2022	569,955	85,763	15,000	670,717
2023	569,955	85,763	15,000	670,717
2024	525,740	83,113	15,000	623,852
2025	481,525	80,463	15,000	576,987
2026	437,310	77,813	15,000	530,122
2027	415,202	76,488	15,000	506,690
2028	415,202	76,488	15,000	506,690

It should be noted, that the figures shown for the residential and commercial sector represent the ETO’s best case scenario annual therm savings targets for the planning horizon. In their annual budgeting process the ETO will typically develop their minimum target by applying 75% to their best case scenario to develop their a range of therm savings to be achieved. For the 2009 period, the estimated range of annual therm savings for Cascade’s program would be between 204,493 and 272,657 and the estimated costs to achieve those therm savings would range between \$1,022,465 and \$1,363,285. Comparing the estimated funding requirements to Cascade’s estimated public purpose funding it is anticipated that the current level of funding will be adequate for the 2009 period, somewhat due to estimated 2008 carry-over of approximately \$200,000. However, both the Company and ETO agree that both the public purpose funding revenues and program expenditures will need to be monitored closely. By 2010, it is anticipated to achieve therm savings between 238,453 and 317,937 will result in costs of \$1,192,265 to \$1,589,685 and the adequacy of the current public purpose funding levels will need to be revisited for the 2010 period.

As Table 5-5 suggests, Cascade anticipates its Oregon Low Income Weatherization Program will be able to achieve a savings of 10,000 therms in CY09, 12,000 in CY10, leveling of to a savings of 15,000 therms in CY11 and beyond. These numbers were determined by analyzing the capacity and limitations of the weatherization delivery

network as well as the potential for alternative avenues of therm savings during the years ahead.

The Oregon weatherization delivery network has helped Cascade identify a missed opportunity for potentially significant therm savings in multifamily dwellings primarily designated for the long-term habitation of low-income individuals. Such housing stock, often developed as new construction by 501c3 nonprofit organizations, cannot be reached by the state's current weatherization program. These projects would provide an opportunity to more readily achieve our target savings of 15,000 therms by CY11. CNGC is exploring tariff modifications that would allow custom rebates for projects such as these where proven reasonable and cost effective.

Meanwhile, Oregon's WAP network has also revealed a thriving customer-education program which has been effective in altering the long-term energy usage behavior of weatherization-qualified households. Cascade is currently working with the agencies that deliver this program to develop a long-term study to more easily quantify the savings resulting from such educational efforts.

Washington Conservation Study Results

As mentioned earlier, in 2008 the ETO approached Stellar to update the 2006 Oregon study. This Oregon update provided Cascade the opportunity to apply the relevant revisions seen in the Oregon assessment to the Washington study prepared in 2006. The resulting complete list of measures and their applicability to Cascade's Washington service territory are included in Appendix D-3 & D-4. For purposes of the Washington Study, the technical potential was screened at approximately \$0.85 per therm which is based on the levelized cost per therm from the Company's 2007 IRP.

Table 5-6 shows the group of residential measures and their technical applicability in Cascade's Washington service territory. In some cases, the measure cost in one zone may be greater than the \$0.85 threshold, however, when the measure is done in conjunction with an overall program, the Company believes the program will still be cost effective. In those circumstances, promotion of that measure in the less cost-effective zone may be limited.

Table 5-7 shows the list of measures and their technical applicability to Cascade's commercial/industrial market sector. It should be noted that more than 1/3 of the commercial/industrial technical potential is associated with Refrigeration Heat Reclaim measures. Based on discussion with the ETO these measures are predominately utilized in electric applications. The company is concerned that such installations are outside the means of the majority of the small commercial customers that occupy the Company's Washington service territory.

Table 5-6

**RESIDENTIAL CONSERVATION MEASURES
TECHNICAL POTENTIAL BY 2030**

WASHINGTON			
Measure Code	Measure Description	Gas Savings Therms	Levelized Cost (\$/th)
R-H104	AFUE 90+ Furnace, Zone 1	1,031,683	\$0.80
R-H106	AFUE 90+ Furnace, Zone 3	1,859,161	\$0.66
R-GH116	Boiler to Polaris Combo radiant	6,454,454	\$0.55
R-H110	Combo with Hot Water delivery, Zone 1	17,378	\$0.79
R-H111	Combo with Hot Water delivery, Zone 2	33,944	\$0.82
R-H112	Combo with Hot Water delivery, Zone 3	28,301	\$0.72
R-H113	Duct Sealing and AFUE 90+, Zone 1	168,839	\$0.54
R-H114	Duct Sealing and AFUE 90+, Zone 2	316,149	\$0.58
R-H115	Duct Sealing and AFUE 90+, Zone 3	305,125	\$0.44
R-H101	Duct Sealing, Zone 1	117,936	\$0.68
R-H102	Duct Sealing, Zone 2	209,331	\$0.78
R-H103	Duct Sealing, Zone 3	226,742	\$0.53
N-H101	E* Insulation, Ducts, Zone 1	2,001,279	\$0.54
N-H102	E* Insulation, Ducts, Zone 2	4,342,203	\$0.50
N-H103	E* Insulation, Ducts, Zone 3	3,955,216	\$0.41
N-H114	E* Plus (FTC) Insulation, Zone 2	4,469,564	\$0.81
N-H115	E* Plus (FTC) Insulation, Zone 3	4,143,104	\$0.64
N-A103	Estar Dishwasher, New	302,308	\$0.63
R-A103	Estar Dishwasher, Replacement	5,105	\$0.67
N-H104	Heating upgrade (AFUE 90), Zone 1	681,235	\$0.69
N-H105	Heating upgrade (AFUE 90), Zone 2	1,811,898	\$0.52
N-H106	Heating upgrade (AFUE 90), Zone 3	1,079,008	\$0.64
N-A105	Hi-eff Washer	11,714	-\$2.15
N-H112	HRV, E*, Zone 3	889,527	\$0.81
N-A102	MEF 2.0 Washer, New	26,566	-\$1.63
R-A102	MEF 2.0 Washer, Replacement	711,016	-\$0.19
N-GD109	Upgrade to Navien Tankless Gas heater, New	1,049,264	\$0.81
R-GD112	Upgrade to Navien Tankless Gas heater, Replacement	154,360	\$0.39
R-WG 104	Wx insulation 1 added measure Zone 1	295,663	\$0.14
R-WG 105	Wx insulation 1 added measure Zone 2	577,721	\$0.14
R-WG 106	Wx insulation 1 added measure Zone 3	500,847	\$0.12
R-WG 101	Wx insulation 2 measures Zone 1	486,530	\$0.58
R-WG 102	Wx insulation 2 measures Zone 2	951,120	\$0.60
R-WG 103	Wx insulation 2 measures Zone 3	820,810	\$0.51

TOTAL TECHNICAL POTENTIAL

40,035,102

**Table 5-7
COMMERCIAL/INDUSTRIAL CONSERVATION MEASURES
TECHNICAL POTENTIAL BY 2030**

WASHINGTON COMMERCIAL		
Measure Description	Gas Savings Therms	Levelized Cost (\$/th)
Shell Measures	11,606,000	\$0.19
Refer Heat Reclaim	9,410,000	\$0.03
Cooking	2,646,000	\$0.31
Replace Heaters	1,717,000	\$0.49
O&M and Controls	1,245,000	\$0.35
DHW Measures	839,000	\$0.35
Replace Boiler	437,000	\$0.60
Solar Pool Heat	147,000	\$0.09
New Refer Heat Reclaim	5,556,000	\$0.03
New Windows	4,625,000	\$0.19
New Heaters	975,000	\$0.42
New Cooking	944,000	\$0.31
New Boilers	673,000	\$0.53
New DHW Measures	405,000	\$0.44
New Solar Pool Heat	32,000	\$0.24
TOTAL COMMERCIAL	41,257,000	
INDUSTRIAL		
Boilers	442,000	\$0.18
Shell Measures	294,000	\$0.22
Unit Heater	176,000	\$0.18
Process Hot Water	47,000	\$0.10
Specialty Hot Water	16,000	-\$0.81
TOTAL INDUSTRIAL	975,000	
TOTAL TECHNICAL POTENTIAL	42,232,000	

Based on the above technical potential, the Company has developed an estimate of the incremental conservation resources that can be acquired through 2028 on an annual basis. The company followed the approach used to develop the targets for Oregon, making modifications when necessary to recognize the differences associated with Cascade’s Washington service territory.

One of the modifications, similar to that made with the original study was to the use an achievable potential of 75% rather than the 85% assumed by Stellar. The 75% achievable potential represents an increase from the achievable levels assumed in the prior IRP, however, is lower than that used by NPPC for electric conservation planning. The lower achievable potential is necessary since gas efficiency measures have not been as widely accepted, primarily due to the incremental costs that must be born by the customer to install those measures compared to the amount of incentive the utility could

provide. Consistent with the development of the Oregon deployment curves, Cascade grouped the measures into categories (SF New construction, SF Retrofit, etc) to show a total achievable potential and deployment curves were developed utilizing the following key assumptions:

- In general it is assumed that the participation level percentages will be lower than in Oregon as the program is only in its second year and new programs are assumed to have a slower start up since it takes time to build the network of trade allies to deliver these programs.
- In the area of Residential New Construction it was assumed that the achievable potential would be spread equally over the 20 year planning horizon. Consistent with results seen by the ETO in the first few years of their gas programs, the participation levels gradually ramp up assuming 5% participation in 2009 and reaching maximum participation of 75% in 2018.
- In the area of Residential replacement market, similar to the new construction sector, it was assumed that the achievable potential would be spread equally over the 20 year planning horizon. Participation levels begin at 20% in 2009 reaching maximum participation of 80% in 2017.
- Participation in the Residential Retrofit was also assumed to continue to ramp-up over the 20 year planning horizon. Similar to the Oregon approach, it was assumed that over the 20 year horizon, that 80% of the achievable potential would be realized through the residential retrofit program. Since 2009 is only the second year retrofit measures being included in the Company's residential program participation levels were assumed to range from 2% in 2009 reaching a maximum of 6% in 2017.
- In the Commercial retrofit market, similar to the residential retrofit market, it was assumed that participation levels would range from 2% in 2009 to a maximum of 6% in the 2017 period.
- In the Commercial/Industrial New Construction and Replacement markets, the achievable potential was spread evenly over the 20 year planning horizon. On the new construction side, participation levels ramp up from 10% in 2009 to 75% in 2022. In the replacement market, the ramp up period is begins at 15% in 2009 and increases 5% per year until reaching the maximum participation level of 75% in 2022.
- Refrigeration heat reclaim in new and existing facilities represents a significant portion of the technical potential in the Commercial Sector. As mentioned earlier, Cascade has concerns about the validity of these estimates, particularly considering Cascade small commercial basis. However, the Company is hesitant to completely discount it and has assumed that some level, although

quite small, can be achieved on an annual basis beginning in 2010 through its custom program.

- Annual therm savings targets associated with the Low Income Weatherization program have been included in the deployment curves as a separate line item. The Low Income Weatherization program is delivered by the Community Action agencies rather than the third party contactor who delivers the residential program and therefore separate targets are necessary. The Resource Assessment prepared by Stellar, includes the conservation potential associated with the Low Income housing stock.
- In developing the estimated costs to achieve the annual therm savings targets, it was assumed that commercial therm savings could be achieved at \$4/therm while the residential sector would require approximately \$7.50/therm.

Based on the assumptions outlined above, the estimated annual therm savings targets for the Washington Residential and Commercial/Industrial programs are shown in Table 5-8 below.

TABLE 5-8

ANNUAL THERM SAVING TARGET				
	Residential Sector	Commercial Sector	Low Income	Washington Total
2009	240,737	230,469	26,250	497,456
2010	332,180	329,403	35,500	697,083
2011	423,622	428,337	45,000	896,959
2012	515,065	537,854	45,000	1,097,919
2013	648,185	668,858	45,000	1,362,043
2014	797,502	799,861	45,000	1,642,364
2015	946,820	930,865	45,000	1,922,685
2016	1,096,137	1,061,869	45,000	2,203,006
2017	1,245,455	1,192,873	45,000	2,483,327
2018	1,287,132	1,302,284	45,000	2,634,416
2019	1,287,132	1,411,695	45,000	2,743,827
2020	1,287,132	1,521,106	45,000	2,853,239
2021	1,287,132	1,630,518	45,000	2,962,650
2022	1,287,132	1,739,929	45,000	3,072,061
2023	1,287,132	1,739,929	45,000	3,072,061
2024	1,219,997	1,696,744	45,000	2,961,740
2025	1,152,861	1,653,559	45,000	2,851,420
2026	1,085,726	1,610,374	45,000	2,741,099
2027	1,052,158	1,588,781	45,000	2,685,939
2028	1,052,158	1,588,781	45,000	2,685,939

It should be noted, that the figures shown for the residential and commercial sector represent the Cascade's best case scenario annual therm savings targets for the planning horizon. In setting targets subject to penalty provisions under the Company's 2007 Conservation, the company believes that the targets initially established in that Plan for the 2009 and 2010 period are appropriate as they represent roughly 89% of the above best case scenario.

Table 5-8 illustrates that Cascade anticipates its Low Income Weatherization program will be able to achieve a savings target of 26,250 in CY09, and 35,500 in CY10, leveling off to a savings of 45,000 therms in CY11 and beyond. These numbers were determined by analyzing the capacity and limitations of the weatherization delivery network, as well as the potential for alternative avenues of therm savings during the years ahead.

According to the most recent evaluation of the Washington State Low Income Weatherization Program (WAP), released in March of 2008, 77 percent of the homes weatherized by the 10 largest WAP agencies are electrically heated with the remaining 16 percent heated through natural gas. Half of these gas-heated homes are served by weatherization agencies within Cascade's service territory. All remaining Cascade-eligible homes are served by smaller agencies with less capacity to deliver our program. Thus it is essential that the company work closely with eligible agencies not yet integrating the resources available through Cascade into their larger weatherization programs.

The report further illustrates the challenges faced by agencies who must often walk away from housing stock in poor or unsafe conditions. These homes are often in critical need of health and safety repairs before they are able to receive weatherization services and achieve therm savings. The WAP study reveals that low-income natural gas heated homes are often a decade older than their electrically heated counterparts, increasing the likelihood of additional needs within the structure. Therefore it is critical to recognize that the completion of therm saving measures in CNGC homes is often contingent upon the ability of the agencies to receive an adequate amount of home repair funds from the state.

Upon the request of the WAP delivery network, CNGC has drafted and circulated a contractual agreement designed as an assurance of available rebate funds for qualified therm-saving measures throughout the program year. Although this document will not be mandatory for participation in our program, Energy Project staff is confident that such a contract will encourage previously reluctant agencies to leverage funds, hire additional staff and ramp up their capacity to serve our homes through the program year.

Cascade anticipates the participation of two additional agencies in CY2009 and several more following thereafter. Our program will experience a slow but steady period of growth as new agencies join our program and as currently participating agencies increase their public information efforts to encourage greater saturation of our program to our qualified customers. Over the 20-year period outlined below, the number of homes served will continue to rise and fall based on the state of the economy, the price of natural gas, and

the energy burden experienced by those within 60% of the state median income. Agencies that have been early adopters of our program will be the first to peak and level off to a steady number of homes within the next several years.

In the meantime, Cascade will explore the inclusion tariff language facilitating the installation of natural gas conservation measures within affordable housing projects run through 501c3 nonprofit housing organizations such as (but not limited to) Habitat for Humanity and Rebuilding together. Such projects are currently a missed opportunity to mitigate the energy burden of low-income households within our service territory.

Further savings may be achieved through the inclusion of energy savings kits recently approved by the Commission for Cascade's Residential Conservation Program. Such kits may either be circulated directly to Low Income Agencies, distributed through targeted "blitz" campaigns (high volume, low cost), or integrated via partnership with Pacific Power's conservation education efforts targeted towards 5th graders in our mutual service territory. If such initiatives are successful, they will ensure the ability of the Company to achieve the therm saving target of 45,000 by CY11. If growth appears unsatisfactory for achieving this goal, Cascade may also explore the inclusion of a supplemental or alternative delivery network to reach homes which may be less accessible through the WAP.

Conservation Summary

Based on the deployment curves developed for each state as described above, Cascade estimates that the cumulative therm savings targets for the 2 Year Action Plan period (2009 – 2010) represents the displacement of 3,670 residential customer's annual load requirements. By the end of the 20-year planning horizon, the cumulative savings shown in Table 5-9 below represents approximately 13% of the Company's overall core load requirements and 52% of the combined technical potential reflected in the earlier tables (Tables 5-2, 5-3, 5-6 and 5-7).

Table 5-9
Estimated Achievable Therm Savings

	Washington			Oregon			Annual Savings	Cumulative Therm Savings
	Residential	Comm/Ind	Low Inc.	Residential	Comm/Ind	Low Income		
2009	240,737	230,469	26,250	220,597	52,060	10,000	780,114	780,114
2010	332,180	329,403	35,500	261,219	56,718	12,000	1,027,020	1,807,134
2011	423,622	428,337	45,000	329,054	62,700	15,000	1,303,713	3,110,847
2012	515,065	537,854	45,000	390,440	68,683	15,000	1,572,041	4,682,888
2013	648,185	668,858	45,000	451,826	74,665	15,000	1,903,534	6,586,421
2014	797,502	799,861	45,000	513,212	78,548	15,000	2,249,123	8,835,544
2015	946,820	930,865	45,000	533,523	83,205	15,000	2,554,413	11,389,957
2016	1,096,137	1,061,869	45,000	553,834	85,763	15,000	2,857,603	14,247,560
2017	1,245,455	1,192,873	45,000	553,834	85,763	15,000	3,137,924	17,385,484
2018	1,287,132	1,302,284	45,000	553,834	85,763	15,000	3,289,013	20,674,496
2019	1,287,132	1,411,695	45,000	569,955	85,763	15,000	3,414,545	24,089,041
2020	1,287,132	1,521,106	45,000	569,955	85,763	15,000	3,523,956	27,612,997
2021	1,287,132	1,630,518	45,000	569,955	85,763	15,000	3,633,367	31,246,364
2022	1,287,132	1,739,929	45,000	569,955	85,763	15,000	3,742,778	34,989,142
2023	1,287,132	1,739,929	45,000	569,955	85,763	15,000	3,742,778	38,731,920
2024	1,219,997	1,696,744	45,000	525,740	83,113	15,000	3,585,593	42,317,513
2025	1,152,861	1,653,559	45,000	481,525	80,463	15,000	3,428,407	45,745,920
2026	1,085,726	1,610,374	45,000	437,310	77,813	15,000	3,271,222	49,017,142
2027	1,052,158	1,588,781	45,000	415,202	76,488	15,000	3,192,629	52,209,771
2028	1,052,158	1,588,781	45,000	415,202	76,488	15,000	3,192,629	55,402,400

DSM Implementation Issues and Uncertainties

The amount of DSM potential identified for the plan relies on the best available information today about prices, efficiency, consumer behavior and preferences, and projects with information 20 years into the future. As with other resources, DSM resource assessments depend heavily on energy load forecasts and projected growth rates with all of the associated uncertainties. Also similar to supply side resource, assessments of DSM potential are limited by what is currently available in the marketplace in terms of cost-effective technologies for improving energy efficiency. The impacts of new technologies and new energy efficiency codes and standards are difficult to accurately predict. This uncertainty is mitigated through the biennial updates of the IRP, which provide the opportunity to incorporate improvements in demand side technologies and programs

However, somewhat unique to the demand side resources is the utility’s dependence on a large number of small purchases with each tied to the individual consumers’ day-to-day purchasing and behavioral decisions. The utility attempts to influence these decisions through its programs, but the consumer is the ultimate decision maker regarding the purchase of DSM resource. Cascades assessments of DSM make the best possible estimates of participation and costs, however, like any new program, the amounts are likely to vary from planning estimates.

Many specific details are required to implement successful programs. As discussed above, actual implementation design, delivery, and market conditions will cause energy-efficiency program savings and costs to vary. Customer participation in a program is heavily influenced by the level of incentive paid by the utility versus the cost to the customer. External infrastructure considerations must also be addressed, such as product availability to utility customers and an adequate network of contractors, retailers, and other trade allies to support a program. As new measures or expanded programs are developed and added to the current program mix, internal and external resources and capabilities need to grow accordingly and progress through a “learning curve”. For this reason, the company estimated conservation acquisition schedule would increase over time. Additionally, revisions to the company’s existing programs may be necessary and will result in additional impacts on the company’s projected participation levels.

Other uncertainties relating to conservation resources include the risk of free riders, and lost opportunities. Free riders are those individuals that would have undertaken some form of conservation action even if a program had not existed. Measuring free rider impacts makes program evaluation difficult since it requires information on a hypothetical situation that, by definition, will never be observed. Lost opportunities assumes that the opportunity to install cost-effective conservation measures occurs only once in the life of a home, office, or industrial plant. If all potential cost-effective conservation is not installed at one time, future DSM opportunities may be lost as a result. This is most likely true for commercial/industrial resources since it is unlikely that a business would close down or curtail operations for any period just to install conservation measures.

The potential for building code changes over the planning horizon represent another uncertainty that could impact the ability of the company to achieve its therm savings goals. Should code changes be enacted, as they were recently in Oregon, both the Company’s programs and targets will need to be adjusted.

Cascade will also continue to monitor the developments in the area of Carbon legislation. At the state level, specific requirements resulting from the Western Climate Initiative’s (WCI) Greenhouse Gas Cap and Trade design recommendation are still unknown. Since both Washington and Oregon are participants in the WCI, the company anticipates that new regulations will be determined during 2009 so the 2010 monitoring timeline can be met. At the Federal level, legislation such as the “Cap-and-trade” legislation proposed in the Lieberman-Warner bill would create a federal cap-and-trade market as early as 2011.

Environmental Externalities

When evaluating DSM resources, the company also includes an evaluation of the impacts of environmental externalities. The impact of utilizing energy on the environment continues to be a subject of societal concern and debate. If there are impacts that cannot be repaired naturally within a reasonable period of time, damage cost to the environment occurs for which society will have to pay in some, as yet undetermined, form. The

question of who pays, how much and when payment should be made, are complicated issues.

For many years, The Northwest Power Planning Council (NPPC) has utilized a 10% cost advantage for electric utilities acquiring conservation resources to realize the benefits of not using supply side resources. Such electric utility benefits include reduced fish and wildlife impacts, load stability, load predictability and improved air quality. Cascade has also included the 10% cost advantage for conservation resources as Oregon has also required gas utilities for mandated residential weatherization programs.

The OPUC issued Order 93-965 (UM-424) to address how utilities should consider the impact of environmental externalities in planning for future energy resources that goes beyond the 10% cost advantage discussed above. The required analysis, as specified in OPUC Order 93-965, showed the potential cost impacts to range from \$0.080 per therm to \$0.315 per therm under the various scenarios. This range is based on the emission cost adders as specified in the OPUC order updated for inflation. This range was based on the emission cost adders as specified in the OPUC order. The analysis considers the natural gas cost impacts from emitting carbon dioxide (CO₂) and nitric-oxide (NO₂). Since these guidelines are over a decade old, the company compared the estimated carbon emissions discussed in the EIA International Outlook for natural gas use to the estimated levels utilized in the OPUC order. Based on information contained in the EIA's 2007 International Outlook, natural gas emissions are approximately 11.64 lbs/therm.

In an effort to create a more realistic and robust assumption with regard to potential "Carbon Tax" legislation, Cascade looked to the recent carbon tax enactment in British Columbia for preliminary insight. Given the timing and geographic proximity, Cascade utilized the growth rate of the British Columbia carbon tax to forecast potential Externality Adder costs up to five years after such a tax is passed. Table 5-10 shows the updated analysis and forecast.

Table 5-10

Natural Gas Environmental Externality Cost Analysis
(OPUC Order 93-695)

Updated with EIA's Estimated Emission Factors & Inflation

Emission	Emission (Lbs/Therm)	Cost (\$/Lb)	Externality Adder (\$/Therm)	Forecasted Externality Adder (\$/Therm) (Years After Enacted)				
				1	2	3	4	5
SCENARIO 1								
NO2 \$2500/Ton	0.008	\$1.250	\$0.010	\$0.010	\$0.015	\$0.020	\$0.025	\$0.030
CO2 \$12/Ton	11.640	\$0.006	\$0.070	\$0.070	\$0.105	\$0.140	\$0.175	\$0.210
TOTAL			\$0.080	\$0.080	\$0.120	\$0.160	\$0.200	\$0.240
SCENARIO 2								
NO2 \$2500/Ton	0.008	\$1.250	\$0.010	\$0.010	\$0.015	\$0.020	\$0.025	\$0.030
CO2 \$30/Ton	11.640	\$0.015	\$0.175	\$0.175	\$0.262	\$0.349	\$0.437	\$0.524
TOTAL			\$0.185	\$0.185	\$0.277	\$0.369	\$0.462	\$0.554
SCENARIO 3								
NO2 \$2500/Ton	0.008	\$1.250	\$0.010	\$0.010	\$0.015	\$0.020	\$0.025	\$0.030
CO2 \$50/Ton	11.640	\$0.025	\$0.291	\$0.291	\$0.437	\$0.582	\$0.728	\$0.873
TOTAL			\$0.301	\$0.301	\$0.452	\$0.602	\$0.753	\$0.903
SCENARIO 4								
NO2 \$6000/Ton	0.008	\$3.000	\$0.024	\$0.024	\$0.036	\$0.048	\$0.060	\$0.072
CO2 \$12/Ton	11.640	\$0.006	\$0.070	\$0.070	\$0.105	\$0.140	\$0.175	\$0.210
TOTAL			\$0.094	\$0.094	\$0.141	\$0.188	\$0.235	\$0.282
SCENARIO 5								
NO2 \$6000/Ton	0.008	\$3.000	\$0.024	\$0.024	\$0.036	\$0.048	\$0.060	\$0.072
CO2 \$30/Ton	11.640	\$0.015	\$0.175	\$0.175	\$0.262	\$0.349	\$0.437	\$0.524
TOTAL			\$0.199	\$0.199	\$0.298	\$0.397	\$0.497	\$0.596
SCENARIO 6								
NO2 \$6000/Ton	0.008	\$3.000	\$0.024	\$0.024	\$0.036	\$0.048	\$0.060	\$0.072
CO2 \$50/Ton	11.640	\$0.025	\$0.291	\$0.291	\$0.437	\$0.582	\$0.728	\$0.873
TOTAL			\$0.315	\$0.315	\$0.473	\$0.630	\$0.788	\$0.945

Section 6

Supply Side Resources

Cascade's core market residential and small volume commercial and industrial customers expect and require the highest reliability of energy service. Because of the Company's obligation to provide gas service to these customers, the Company must determine and achieve the needed degrees of service reliability and attain the lowest costs possible while providing an infrastructure that responds to the customers' concerns, meets customer growth and provides all necessary administrative services to provide the stated services. Assuming such an infrastructure is in place and operating effectively, the most important functions necessary for reliable natural gas service are planning for, providing and administering the gas supply, interstate pipeline transportation capacity, and distribution service components that constitute the "bundled services" required by core market customers.

Cascade's 20-year supply side resource goal is to continue to meet the energy needs of its core market customers with a package of services that combine adequate gas supplies and cost-effective winter peaking services with long-term pipeline transportation contracts and sufficient distribution system capacity at the lowest possible cost.

This section describes the various gas supply resource and transportation resource options that are available to the Company as supply side resources.

Gas Supply Resource Options

Gas supply options available to Cascade to meet the core market demand requirements generally fall into two groups 1) Firm gas supplies on a short or long-term basis, and 2) a best efforts 30-day gas supply purchased on the spot market. A separate and important source of gas supply is natural gas storage service, which is required to meet the needs of the broad seasonal peak and the needle peaks of the heating season in order to provide economical service to low load factor customers.

Firm Supply Contracts

Firm supply contracts commit both the seller and the buyer to deliver and take gas on a firm basis, except for *force majeure* conditions. From Cascade's perspective, the most important consideration is the seller's contractual commitment to make gas available day in and day out, regardless of market conditions. Firm supplies are a necessary component of Cascade's core market portfolio given the obligation to serve and the lack of easily obtainable alternatives for consumers during periods of peak demand. Firm contracts can provide baseload services, provide seasonal peaking services during the winter months, or can be used to meet daily needle peaking requirements. Each of these services is discussed briefly below.

Baseload resources are those that are taken day in and day out, 365 days a year. As a result, baseload gas tends to be the least expensive of the firm supply contracts because it matches the production of gas and guarantees the producer that the volumes will be taken. Cascade's ability to contract for baseload supplies is limited because of the relatively low summer demand on the system. Baseload resources are

used to meet the non-weather sensitive portion of the core market requirements, or may be used to refill storage reservoirs during periods of lower demand.

Winter gas supplies are firm gas supplies that are purchased for a short period during the winter months to cover increased loads, primarily for space heating. The contracts are typically 3 to 5 month durations (primarily November through March). This enables the Company to ensure firm winter supplies without incurring obligations for high levels of take during periods of low demand in the summer months. Winter supplies combined with baseload supplies will be adequate to cover the moderately cold days in winter.

Peaking gas supplies, similar to storage, are firm contracts purchased only as load actually materializes due to high winter demand. That is, the producer must deliver the gas when the Company requires it, but the Company is not required to take gas unless needed to meet customer load requirements. Peaking resources typically allow the Company to take between 15 and 20 days of service during the winter period. These resources are more expensive than baseload or winter supplies and typically include fixed charges to cover the costs for the producers to stand by to deliver the supplies.

Needle peaking resources are utilized during severe or "arctic" cold experiences when demand can increase sharply. These resources are very expensive and are available for a very short period of time. One source of needle peaking gas supply, that is actually a form of demand side management, may be obtained from Cascade's industrial customer base. These customers would be required to maintain standby or alternate fuel capability that Cascade would contract the right to request the customer to switch to so Cascade could utilize (divert) their gas supply and transportation capacity to meet the Company's core market requirements. The benefits associated with this type of resource would include lowering the demand of the industrial facility, and providing a like amount of additional gas supply with pipeline capacity to meet core demand. Needle peaking requirements can also be met through the use of propane air plants, or on-site liquefied natural gas (LNG) facilities.

Contract terms for firm commodity supplies vary greatly. Some contracts specify fixed prices, while others are based on indexes that float from month to month. Some contracts have fixed reservation charges assessed each month, while others may have minimum daily or monthly take requirements. Most contain penalty provisions for failure to take the minimum supply gas according to the contract terms. Contract details will also vary from year to year, depending on company and supplier needs and the general trends in the market.

Spot Market Supplies

Gas that is purchased for a short period of time (1 to 30 days) when neither the seller nor the buyer has a longer-term firm commitment to deliver or take the gas is referred to as a spot market purchase. Spot market supplies differ from firm resources in that they

are more volatile, both in terms of availability and price, and are largely influenced by the laws of supply and demand.

In general, spot market supplies are provided from gas supplies not under any long-term firm contract, as mentioned above. Therefore, as firm market demand decreases, more gas becomes available for the spot market. Prices for spot market supplies are market driven and may be either lower or higher than prices under firm supply contracts. In warmer weather, as firm market demand requirements decrease, usually more gas becomes available for the spot market, resulting in lower prices. In colder weather, as firm markets demand their gas supplies, the remaining spot market supplies can carry higher prices until the price equates or exceeds that of alternate energy supplies (such as oil or electricity). Spot supplies can be expected to move to the markets that offer the highest price, which in turn can affect delivery reliability.¹

Due to the potential for interruption of the spot market, these supplies are not considered as reliable a source of gas supply for the winter peaking requirements of Cascade's core market. The role for spot market gas supply in the core market portfolio is based upon economics. Spot market supplies may be used to supplement firm contracts during periods of high demand or to displace other volumes when it is cost-effective to do so. For example, should prices in one basin drop radically compared to another basin, a contract may allow the flexibility to reduce takes in order to take advantage of supply from a lower priced basin. Depending upon availability and price, spot market volumes may be used in place of storage withdrawal volumes to meet firm requirements on a given day or for mid-heating season refills of storage inventory during periods of weather moderation.

Other Unconventional Gas Supply Resources

Cascade considers Unconventional Gas Supply Resources such as supplies from an LNG Import Terminal, bio-gas or other manufactured gas supply opportunities as speculative supply side resources at this point in time. In most cases Unconventional Gas Supply Resources would become an alternative to traditional gas supplies from the conventional gas fields in Canada or the Rockies and would have to compete for inclusion in the Company's portfolio planning.

For example, there are four LNG Import Terminal projects currently in various stages of development in the Pacific Northwest. These projects include Kitimat LNG in Northwest British Columbia; Bradwood Landing on the Columbia River near Clatskanie, Oregon; Oregon LNG in Warrenton, Oregon, and Jordan Cove LNG in Coos Bay, Oregon. These projects also include planned pipeline infrastructure to move gas supplies. The LNG pipeline projects included for discussion during this planning horizon are identified below:

¹ It should be noted that in an rare instances, a combination of pipeline capacity constraints, excess supply, high storage levels can lead to unusual spikes in natural gas prices during the summer months, as witnessed during 2008, when natural gas prices soared to \$13 per MMBtu in early July, 2008

- Kitimat LNG: Pacific Trail Pipelines will connect a 291 mile pipeline from the proposed facility to WEI's pipeline (Spectra) at Summit Lake.
- Bradwood Landing: Palomar Pipeline would extend 110 miles north from near Molalla, Oregon to the proposed facility near Willamette.
- Oregon LNG: A 117-mile pipeline to connect the proposed LNG terminal in Warrenton, Oregon, to the existing Williams Northwest Pipeline system near Molalla.
- Jordan Cove: The 221-mile Pacific Connector Gas Pipeline would extend from the proposed LNG terminal in Coos Bay across southwest Oregon to the California border at Malin to serve the Pacific Northwest and California markets.

Another alternative is bio-gas. Bio-gas continues to receive increased attention as a possible resource. Biogas typically refers to a gas produced by the biological breakdown of organic matter in the absence of oxygen. Biogas originates from biogenic material and is a type of biofuel. One type of biogas is produced by anaerobic digestion or fermentation of biodegradable materials such as biomass, manure or sewage, municipal waste, green waste and energy crops. This type of biogas comprises primarily methane and carbon dioxide. The principal type of biogas is wood gas which is created by gasification of wood or other biomass. This type of biogas is comprised primarily of nitrogen, hydrogen, and carbon monoxide, with trace amounts of methane.

The gases methane, hydrogen and carbon monoxide can be combusted or oxidized with oxygen. Air contains 21% oxygen. This energy release allows biogas to be used as a fuel. Biogas can be used as a low-cost fuel in any country for any heating purpose, such as cooking. It can also be utilized in modern waste management facilities where it can be used to run any type of heat engine, to generate either mechanical or electrical power. Biogas is a renewable fuel, that can also used in transport, and an electricity produced, so it attracts renewable energy subsidies in some parts of the world.

In many cases, there is currently not enough pricing and availability information available to be considered in this planning cycle; however, where possible, we have endeavored to analyze those situations where we feel sufficient data is available.

Storage Resources

Cascade also utilizes natural gas storage to meet a portion of the requirements of its core market. Storing gas supplies, purchased and injected during periods of low demand, is a cost-effective way of meeting some of the peak requirements of Cascade's firm market. Natural gas can be stored in naturally occurring reservoirs, such as depleted oil or gas fields, salt caverns or other geological formations with an impermeable cap over a porous reservoir. Gas can also be stored in vessels or tanks

under pressure as compressed natural gas, or cooled to a liquid state, which is liquefied natural gas (LNG).

Natural gas storage service is not only an excellent supply source for meeting peak winter demand, but it can also be an important gas supply management tool. Storing excess or unused supply during periods of low demand increases the annual utilization rate of a supply contract, therefore improving the annual load factor for the Company's gas supplies. Improving the annual load factor of a supply contract improves the Company's ability to purchase gas supplies on a more economical basis. Purchasing natural gas for storage during periods of low demand generally yields prices at the low point on the seasonal price curve. The lower cost of supply helps to offset the costs associated with the storage facility.

Depending upon the location of the storage facility, pipeline transportation may also be required. Storage facilities located within the Company's distribution system or on the interstate pipeline are preferable to those located "off-system". Off-system storage requires additional pipeline transportation and may limit the flexibility of the resource. In 1994, Cascade had two contracts for utilization of underground storage located at Jackson Prairie (SGS-1). SGS-1 service is contracted directly from NWP and an additional SGS-1 service was assigned from Avista Corporation for Cascade's use. Both of these contracts provided daily deliverability and seasonal inventory capacity. However, Avista declined to extend its agreement with Cascade and the Avista storage service was no longer available following the 2006/07 heating season.

Consequently, Cascade has entered into an Agreement with Northwest Pipeline for additional Jackson Prairie storage service beginning early as November 1, 2008, that will replace the access to storage that was available through the Avista storage contract. The new Agreement will provide Cascade with twice the amount of daily deliverability than the Avista agreement (30,000 Dth/d vs. 15,000 Dth/d) with approximately the same annual storage quantity. Cascade has also entered into a companion transportation Agreement with Northwest Pipeline for the transportation of gas supplies stored under this Agreement to Cascade's service area.

The Company also has contracted for service (LS-1) from NWP's Plymouth, Washington LNG facility. Both Jackson Prairie facilities and the Plymouth facility are located directly on NWP's transmission system. Therefore, storage withdrawal rates can be changed several times during an individual gas day to accommodate weather driven changes in core customer requirements. This type of operating flexibility would not necessarily be available with off system storage.

Withdrawal capabilities must also be accompanied by firm capacity on the transporting pipeline(s) to be of any value as a reliable source of gas supply. Cascade's SGS-1 and

LS-1 service requires TF-2 firm transportation service for storage withdrawals, and Cascade has sufficient firm TF-2 service to meet its storage daily deliverability levels.

Capacity Resource Options

Capacity options are either interstate pipeline transportation resources or capacity on Cascade's local distribution system. Cascade's local distribution system was built to serve the entire connected load in its various distribution service areas, on a coincidental demand basis, regardless of the type of service the customer may have been receiving. Cascade generally has the distribution capacity available to deliver the gas to customers if the pipeline delivers the gas to the Company's citygate stations. Core interruptible service relates to the spot market supplies and interruptible interstate pipeline transportation contracted to serve these markets. Cascade does not contract for firm supply or interstate transportation for these interruptible customers. Cascade's interruptible rates also reflect the fact that no firm supply or transportation services are purchased on behalf of interruptible customers.

As noted previously, available capacity exists on two of the three upstream pipelines serving the region: Spectra Energy's T-South Mainline from Northeast BC to the BC-Washington Border at Sumas, and TransCanada's GTN System that takes natural gas from Alberta at Kingsgate, Idaho and ships it to and through the region. The Company constantly reviews existing capacity options and works to negotiate contract terms that make sense for both parties, whenever we determine a project is viable.

Currently, five pipeline projects have been proposed by a variety of developers to serve the region: two to expand westward access to Rockies' production areas; three to enhance supply diversity within the region. These projects include:

- Blue Bridge Pipeline – Williams Gas Pipeline Company and Puget Sound Energy are the partners developing this project which will include the installation of additional compression horsepower at existing Northwest Pipeline stations and the construction of up to 172 miles of 30-inch pipeline and 16 miles of 36-inch pipeline. The project will deliver about 500 MMcf/d from Stanfield, Oregon to the I-5 Corridor and will generally follow Northwest Pipeline's existing pipeline corridor for the majority of the route.
- Inland Pacific Connector – Terasen Gas is proposing to build this 153-mile, 24-inch diameter pipeline as an extension of its Southern Crossing Pipeline from southern Alberta near Kingsgate, Idaho to Huntingdon, BC near Sumas, Washington. Initial capacity is projected to be about 350 MMcf/d.
- Palomar Pipeline (Cascade Segment) – Palomar Gas Transmission is a partnership between NW Natural and TransCanada. The proposed 212 mile, 36-inch-diameter underground pipeline will extend from TransCanada's GTN system near Madras, Oregon to NW Natural's system near Molalla, Oregon. It will be a bi-directional pipeline with an initial capacity of 1,200 MMcf/d.
- Ruby Pipeline - El Paso Corp. plans to apply to the Federal Energy Regulatory Agency in January 2009 to move forward with its 670 mile, 42-inch natural gas transmission pipeline beginning at the Opal Hub in Wyoming and terminating at a Malin, Oregon interconnect, near California's northern border. Initial capacity on the pipeline will be between 1,300 and 1,500 MMcf/d. As proposed, the

pipeline will cross a portion of four states including Wyoming, Utah, Nevada and Oregon.

- Sunstone Pipeline – Project partners include Williams Gas Pipeline Company, LLC and TransCanada PipeLine USA Ltd. The proposed 585-mile, 42-inch diameter pipeline would transport up to 1,200 MMcf/d from the Rockies to markets in the West and Pacific Northwest. Pending approval, the pipeline will mostly parallel Williams' existing Northwest Pipeline (NW Pipeline) system from Opal Wyoming, through southern Idaho, and connecting with TransCanada's GTN system in Stanfield, Oregon.

Interstate Pipeline Transportation Services

Pipeline transportation resources are utilized to transport the gas supplies from the producer/supply sources to Cascade's system. Cascade currently purchases supplies from three different regions or basins: U.S. Rockies, British Columbia, and Alberta, Canada. Unless the gas supplies have been "bundled" by the supplier, these resources will require pipeline transportation to deliver them to Cascade's local distribution system.

Cascade has three long-term annual contracts with NWP, one long-term annual contract and three long-term winter-only contracts with GTN (including the upstream capacity on Trans Canada Pipeline), and one long-term annual contract with Duke in British Columbia, Canada. These contracts do not include storage or other peaking services that provide additional delivery capability rights ranging from 9 to 120 days.

Cascade's utilization of pipeline transportation and peak day capacity for core and contracted for non-core firm transportation gradually changes over the planning horizon. Current company-acquired firm supplies utilize existing core firm transportation capacity. Future core market growth utilizes non-core firm transportation capacity that will be converted to core market firm transportation capacity as core market growth occurs.

Transportation resources historically have been purchased from the pipeline at the time of an expansion under long-term (twenty to thirty year) contracts. As a result, the Company may find that it has capacity excess to its core market needs, especially in the early years following an expansion. Since late 1989, Cascade has, through its Optional Firm Pipeline Capacity tariffs, allowed its non-core customers to utilize Cascade's firm pipeline capacity that is excess to current core customer requirements. By accepting all of the obligations associated with the underutilized pipeline capacity, the non-core customers have relieved Cascade's core customers of the costs associated with holding the pipeline capacity for future growth.

Additionally, pipeline capacity is a tradable commodity through the Electronic Bulletin Board (EBB). Should a utility have temporarily underutilized transportation capacity it can release that capacity to third parties. Such activities allow holders of pipeline

capacity contracts to recoup a portion of the fixed costs incurred. The value of the capacity will fluctuate depending upon market conditions, however according to FERC rules, the capacity may not be released at a price above the max tariff rate of the interstate pipeline.

Any pipeline capacity in excess of core requirements for periods exceeding 30 days is offered to qualified buyers. The capacity is first offered to Cascade's customers, secondly to any broker, marketer or aggregator for service to Cascade customers and third to any broker, marketer or aggregator for service to non-Cascade customers. Absent a sale to these markets, the excess capacity is offered to any market through the respective pipeline's EBB.

As Cascade's customer count and loads continue to grow, the Company will need to acquire additional capacity resources. Some of the growth will result in the need for additional pipeline mainline capacity or alternatives to pipeline mainline capacity such as LNG satellite facilities located near or within the Company's distribution system. The Company is continuing to study the viability of LNG satellite facilities to meet these needs.

The Wenatchee lateral is an example where an LNG satellite facility may be more cost effective than the traditional solution of pipeline expansion for solving the upcoming capacity constraints on the lateral. Preliminary cost studies indicate that an LNG satellite facility solution may be 1/3 to 1/2 the cost of a pipeline expansion project that would provide the same peak day incremental capacity.

Additionally, the load growth the Company is enjoying throughout much of its service areas is beginning to create the need to increase the physical capabilities of some of the pipeline's citygates. Even though Cascade may have an adequate amount of pipeline capacity available on the pipe, it may not have the contractual or physical capabilities at the citygate to meet the new load requirements. LNG satellite facilities or trucked in LNG re-gasification facilities or other similar type solutions may provide lower cost alternatives to the cost of city gate rebuilding projects. The Company will continue to study the viability of these alternatives.

Supply Side Resource Uncertainties

Several uncertainties exist in evaluating supply-side resources. They include regulatory risks, deliverability risks, and price risks. Regulatory risks include the unknown impacts of future Federal Energy Regulatory Commission rulings that may impact the availability and cost of interstate pipeline transportation. Deliverability risk is the risk that the firm supply will not be available for delivery to the Company's distribution system.

Purchasing resources from larger producers or marketers who typically have gas reserves in multiple locations may minimize this risk. The risks associated with prices rising or falling during any winter period represents another supply-side uncertainty. To the extent the company purchases firm contracts that are tied to an index price, it may be at risk for paying more than was initially anticipated for the resource when the

decision was made. Price risks associated with climbing prices can be minimized through the use of fixed price contracts or through the use of financial derivatives.

Financial Derivatives

Cascade constantly seeks methods to ensure ratepayers of price stability. In addition to methods such as long-term physical fixed price gas supply contracts and storage, another means for creating stability is through the use of hedges, or financial derivatives. The general concept is to lock-in a forward natural gas price with a hedge, consequently eliminating exposure to significant swings in rising and falling prices. Financial derivatives include futures, swaps, options on futures or some combination of these.

Natural gas futures contracts are actively traded on the New York Mercantile Exchange (NYMEX). The use of futures allows parties to lock-in a known price for extended periods of time (up to 6 years) in the future. Contracts are typically made in quantities of 10,000 dekatherms to be delivered to agreed-upon points (e.g., Sumas, Station 2, AECO, Northwest Pipeline Rockies, etc.). In a “swap”, parties agree to exchange an index price for a fixed price over a defined period. In this scenario, Cascade would be able to provide its customers with a fixed price over the duration of the swap period. In theory, the idea is to level the price over the long term. Futures and swaps are typically called “costless” because they have no up front cost.

Unlike futures and swaps, an option on futures only provides protection in one direction—either against rising or falling prices. For example, if Cascade wanted to protect itself against rising gas prices but keep the ability to take advantage of falling prices, Cascade can purchase a “call” option on a natural gas future contract. This arrangement would give the Company the right (but not the obligation) to buy the futures contract at a previously determined price (“strike price”). Similar to insurance, this transaction only protects the company from volatile price spikes, via a premium. The premium is typically a function of the variance between the strike price compared to the underlying futures price, the period of time before the option expires, and the volatility of the futures contract.

Portfolio Purchasing Strategy

Cascade’s Gas Supply Oversight Committee (GSOC) has oversees the Company’s gas supply purchasing strategy. Beginning with the 2004/05 gas supply portfolio, Cascade has employed a more rigorous gas procurement strategy for both physical gas supplies and for hedging the price of the core portfolio. Cascade has contracted for physical supplies for up to five years (based on a warmer-than-normal weather pattern). The Company’s current gas procurement strategy is to have physical gas supplies under contract for 100% of year one’s warmer than normal core needs, 80% of year two, 60% of year three, 40% of year four and 20% of year five. This strategy results in the need to contract annually for approximately 20% of the core portfolio supply needs for the upcoming five-year period.

Currently, the Company is moving towards a more seasonable approach versus securing annual, baseload contracts. In addition, based on current market conditions, the Company is not locking in new long term supplies during the summer months. This allows us to take better advantage of pricing opportunities regardless of basin.

The Company's ongoing hedging strategy is to lock in prices in a manner such that roughly 30% of the gas supply portfolio contains locked-in prices for three years, another 30% is locked in for two years, another 30% is locked in for one year, and the remaining 10% will be at index pricing. Fixed prices will consist primarily of financial derivatives with institutions (financial swaps), but may also include some locked-in prices for physical supplies. This hedging strategy results in the need to annually hedge approximately 30% of the core portfolio needs for the upcoming three-year period.

Additionally, the Company is utilizing a programmed buying approach for locking in or hedging gas supply prices. For the 2008/09-contract year, Cascade locked in prices with banks and/or suppliers during three specific time periods (Spring, Summer, and Fall). Utilizing the consistency of a programmed buying method as described above should help ensure that any locked-in prices provide stability over time, in addition to preventing Cascade from being over or under hedged. In the 2009/10 contract year and beyond, Cascade plans to annually review our gas procurement physical and hedging strategy and, if unchanged, the company would continue its physical and hedging strategies as outlined above.

Cascade believes its gas procurement strategy is achieving diversity and flexibility in its gas supply portfolio through a combination of physical and financial structures. This goal encompasses not only supply basin origination and capacity limitations, but also includes a combination of pricing options that will assist Cascade in minimizing exposure to price volatility. The programmed buying approach to locking in a significant portion of gas prices maintains a market sensitive and balanced supply portfolio that continues to represent stable pricing as well as secure physical supplies for the Company's core customers.

Section 7

Resource Integration

Resource integration is the last step in Cascade's IRP process. It involves finding the least cost mix of demand and supply side resources given the forecasted load requirements of the core customers. The tool used to accomplish this task is a computer optimization model known as SENDOUT®. This model permits the Company to quickly develop and analyze a variety of resource portfolios to help determine the type, size, and timing of resources best matched to forecast requirements. SENDOUT® is very powerful and complex. It operates by combining a series of existing and potential demand side and supply side resources and optimizes their utilization, at the lowest net present cost over the entire planning period, for a given demand forecast.

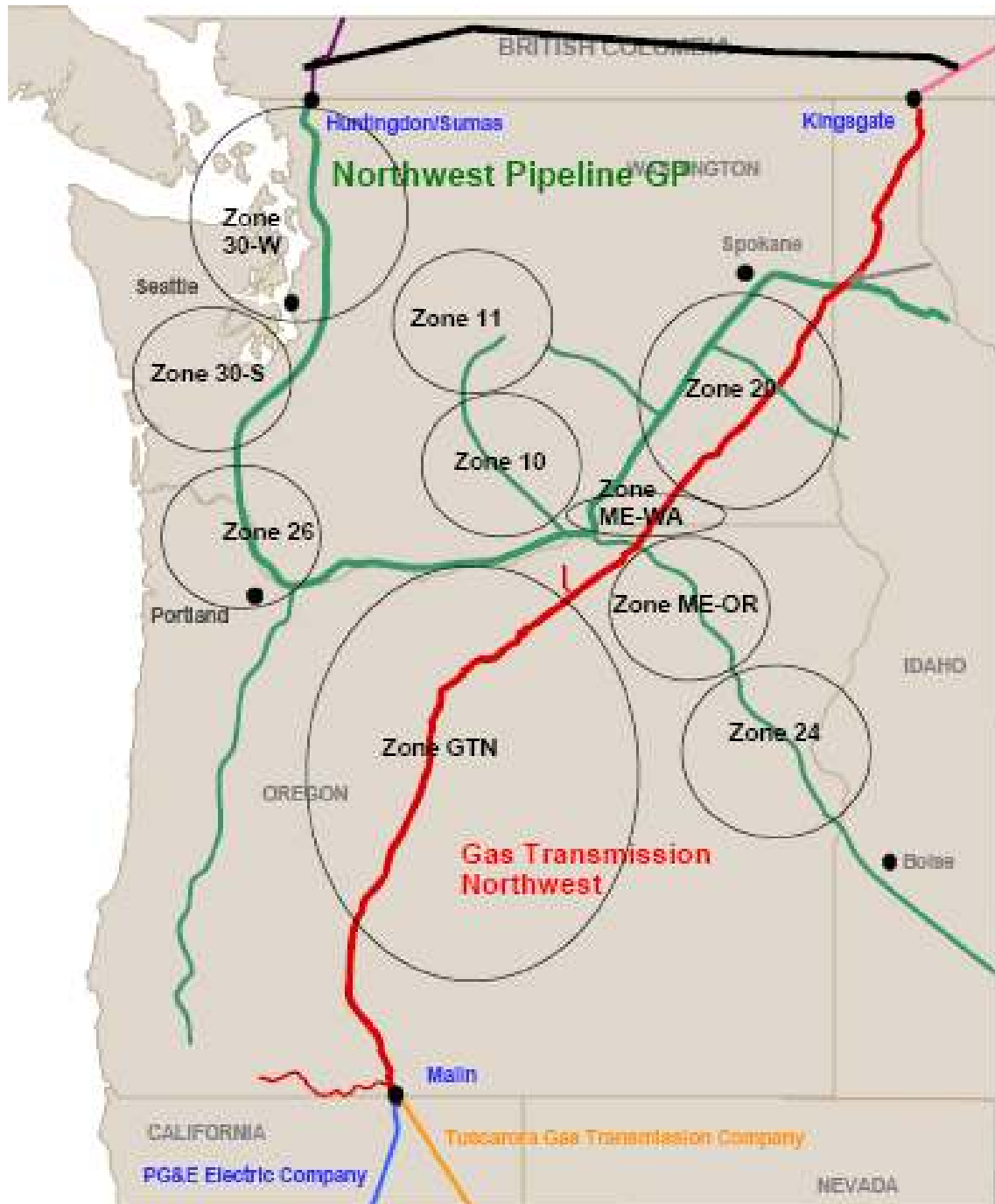
Resource Optimization Analysis Tools

SENDOUT's broad capabilities allow the Company to develop supply and demand relationships that closely mirror Cascade's existing operations. One of the significant enhancements in this year's IRP is that demand areas are now broken down by the various pipeline zones, as opposed to the two basic demand areas utilized in past IRPs. A copy of the network diagram is shown in Figure 7-A on the following page. These demand centers reflect on a daily basis, the aggregate 20 year load forecasts of all Cascade's core market customers being served from either Northwest Pipeline GP (NWP) or Gas Transmission Northwest (GTN) interstate pipeline facilities. Individual transportation segments, storage, supply and demand side resources, both existing and potential, are targeted to these pipeline zones. This level of precision allows SENDOUT® to consider each resource on an individual basis within the portfolio while also recognizing where physical system limitations exist. Resource characteristics such as a supply contract's daily delivery capability, minimum take requirements, maximum daily transport capability by individual segment, and storage inventory limitations and withdrawal and injection curve characteristics can be part of each resource's basic model inputs. The ability to model resources in this fashion allows SENDOUT® to tailor its optimization within envisioned constraints and ensures that the model's optimal solution can work under anticipated operating conditions.

However, because SENDOUT® utilizes a linear programming approach, it is important to acknowledge that it is a tool to help build decisions, but because the model has "perfect knowledge" based upon the assumptions provided to it, the theoretical results may or may not be achievable. For this reason the analytical results are considered "deterministic". For example, the model knows the exact load and price for every day of the planning period and can therefore minimize costs in a way that would not be possible in the real world. Real world decisions must be made where a number of critical factors about the future will always be uncertain. Linear programming analysis provides helpful but not perfect information to guide decisions.

Since decisions are made in the context of uncertainty about the future, in 2006 Cascade purchased VectorGas™. VectorGas™ was an add-in product to the SENDOUT® model that facilitates the ability to model gas price and load uncertainty (driven by weather) into the future. VectorGas™ utilizes a Monte Carlo approach in combination with the linear programming approach in SENDOUT®. The VectorGas functionality was integrated in

FIGURE 7-A



the SENDOUT software with Version 12.5 which is the platform that cascade prepared its integration analysis. The addition of the monte-carlo modeling capability provides additional information to decision makers under conditions of uncertainty. This tool will prove a valuable enhancement to the robustness of the Company’s long-term resource planning and acquisition activities.

Scenarios versus Simulations

Prior to discussing the modeling process, inputs, and ultimately the results of the analyses, a brief discussion of the term scenarios versus simulations is necessary. As stated earlier, SENDOUT relies on a series of inputs or assumptions and then solves for the least cost solution based on the information provided to the model. Each group of assumptions is considered a scenario. For example, the company models medium load growth under average weather conditions where the assumed daily weather pattern is input into the SENDOUT model. The company also runs scenarios utilizing the low and high growth forecasts and historically has run several different price assumption scenarios. The results of each of these scenarios provide an answer or a least cost solution, which the optimization model has solved based on its perfect knowledge. Historically, this has provided the range of expected outcomes. However, with the addition of the Monte-Carlo functionality, the company can now run simulations to determine if the scenario results are reasonable and to provide an expected range of results based on a statistical analysis.

Below is Table 7-1 that provides the list of scenarios included in this IRP and their key assumptions. The company ran Monte-Carlo simulations on the Basecase scenario as it represents the scenario Cascade considers most likely to be experienced over the planning horizon.

**TABLE 7-1
2008 IRP Scenario Analyses**

Scenario Name	Key Assumptions
Basecase	Medium Load Growth, Medium Gas Price Forecast, Average weather
High Growth	Strong Economic Growth result in High Load growth, Average Weather, Medium Gas Prices
Low Growth	Economic Conditions result in Low Load growth, Average Weather, Medium Gas Prices
Environmental Externalities Case 1	Medium Load Growth, Average Weather, Assumes Carbon Tax Added in 2010 for CO2 emissions at \$.80/mmbtu ramping up to \$2.40/mmbtu over a 5-year period
Environmental Externalities Case 2	Medium Load Growth, Average Weather, Assumes Carbon Tax Added in 2010 for CO2 emissions at \$3.01/mmbtu ramping up to \$9.03/mmbtu over a 5-year period

Decision Making Tool

Analysis of optimization model results and other operational and contractual constraints allows Cascade to make more informed resource decisions. The IRP optimization model output and Monte-Carlo simulation analysis will provide the quantifiable output from numerous model inputs. The model does not prescribe the ultimate resource portfolio. It can only determine the least cost set of resources given their specific pricing and quantifiable constraint characteristics. However, there are many other combinations of resources that may be available over the planning horizon. Cascade must still make subjective risk judgments about unquantifiable and intangible issues related to resource selections. These will include future flexibility, supplier deliverability risk, pipeline(s) risk, financial risk to the utility and its ratepayers, operational constraints, regulatory risk, etc. The risk judgments are combined with the quantitative IRP analysis to form actual resource decisions.

Key Inputs

Demand Forecast Items & Weather Assumptions

The optimization process compares a portfolio of resources against a specific demand requirement. SENDOUT® generates a daily demand forecast by combining base load and temperature sensitive usage factor inputs with a specified daily temperature pattern input. As previously mentioned, this is an area where the company enhanced its modeling by developing usage factors for each of the NWP zones which in prior IRP's had been considered on an aggregate basis. The company continues to have one demand center on GTN, which is utilized to meet Cascade's Central Oregon load. In order to develop the temperature sensitive usage factors on a zone by zone basis, the company reviewed pipeline deliveries for the 2004 through 2007 period and developed monthly use per customer per degree day factors. The annual customer growth rates from the low, medium and high forecasts discussed in Section 3 were developed for each of the zones was applied to 2007 monthly core customer counts. Weather patterns for each of the zones were developed based on 5 distinct weather areas.

Prior to the 2007 IRP, the company had developed daily temperature patterns to estimate the impact of weather ranging from warmer than normal to design conditions, with the expected portfolio being one with average weather. The average weather pattern historically had been based on the 20 year average excluding the high/low annual degree day totals to develop an annual total for each area. These totals were then allocated to the daily readings based on the 90/91 winter pattern since that was the most recent year in the company's weather history with a peak day reading of 61 dds. However, with the ability to run Monte-Carlo simulations, the company developed its "average" weather pattern based on the company's 60+ year weather history, and the expected degree days for each month. The average pattern for each area was approached on a month-by-month expected value and then the degree days were allocated within the month based on the past years' average daily distribution. Since a peak event can occur in an otherwise normal weather year, the average weather scenario includes one 3-day peak event, which includes a design day reading of 61 degree days system wide.

Demand Side Alternatives

For purposes of this IRP, the Company has utilized the annual achievable potential schedule shown on Table 5-9 in section 5 as an input to the optimization model. Due to the revisions in the modeling approach to show demand by zone, conservation has been treated as a “must-take” supply alternative available at the pipeline citygate level. For purposes of modeling, 80% of the identified Oregon Conservation resources are assumed to occur on the GTN pipeline with the remaining 20% occurring on Northwest pipeline. Washington conservation was modeled as a must-take resource at the NWP citygate. Because the acquisition of DSM is dependent upon a number of small purchases, determining which pipeline zones will procure the most conservation at this point is premature. In future planning cycles, the company will review the results of the participation levels and determine if more detailed assumptions on conservation acquisition can be modeled. Under the basecase scenario the company has assumed that conservation resources could be purchased, on a levelized cost per therm basis of \$6. The cost per therm figure of \$6 is an estimate of the combined Total Resource Cost for the all measures included in the program, including program delivery and administration costs.

Supply Side Resource Alternatives

For modeling purposes, supply side alternatives are grouped into one of three categories, gas supply, storage facilities, or pipeline transportation. As discussed in section 6, some of the supply alternatives include one or more of these categories. For example, a gas supply resource may be delivered at Cascade’s citygate, essentially reducing the requirement for firm pipeline capacity. A satellite LNG facility (whether trucked in or liquefied on site) located within Cascade’s distribution system can reduce the need for pipeline capacity on a peak day as the supplies will be available to be directly flowed into Cascade’s local system. The following table provides a high level summary of the resource alternatives considered over the planning horizon.

Table 7-2
Supply Side Alternatives Modeled

Resource	Scenario Considered
Conventional Gas Supply Contracts with annual, seasonal or winter only characteristics delivered to Northwest Pipeline & GTN Systems	All
Conventional Gas Supply Peaking Contracts Delivered to Northwest Pipeline & GTN Systems	All
Gas Supply Peaking Contract delivered to Cascade's citygates	All
LNG Import Supplies Delivered to Northwest Pipeline System	All
Satellite LNG Storage within Cascade's distribution sytem	All
Unconventional Supplies (BIOGAS) available within Cascade's distribution sytem	All
Additional Pipeline Capacity secured through medium--long term capacity agreements	All

Integration Results and Key Findings

As described earlier in this section, Cascade performed five different scenarios. The results are summarized below. However, it should be noted that the results of these analyses should be considered broadly. Like all analyses, the results of the resource optimization models are dependent upon the input assumptions provided. Scenario and Monte-Carlo analysis help by providing information on the ranges of input assumptions. Whether Cascade eventually secures these particular resources, acquires ones of comparable size and characteristics, or decides on an alternative approach is subject to ongoing resource investigation and evaluation activities. Specific resources made available to the model at this time may or may not be physically available at the time they are needed nor economically attractive in comparison to alternatives that may become available in the future. Therefore, prior to securing any of these resources, additional analyses of the specific resource must be completed.

The results of the five scenarios are fairly consistent and reveal the following general trends:

- The basecase results indicate energy efficiency programs with a levelized cost of 76 cents per therm or less are cost-effective over the planning horizon, with the price uncertainty analysis indicating that the levelized costs will likely range between 69 to 85 cents per therm. However, if a carbon tax adder was established by 2010 similar to that described in section 5, the cost-effectiveness limits could increase between 28 to 46 cents depending upon the level of the tax. As discussed in Section 5, Cascade uses a levelized cost of 85 cents per therm in its conservation analysis, which the company believes is still appropriate in light of the uncertainties surrounding carbon legislation over the planning horizon. Although some measures in the conservation stack may exceed the cost-effectiveness threshold, the overall conservation program will remain cost-effective.
- Even with energy efficiency programs, Cascade will need to acquire additional capacity resources to meet anticipated peak day requirements, due to Cascade's continued growth in its residential and commercial customer base. A number of Cascade's existing transportation agreements will expire over the next several years. In most cases, Cascade has the unilateral right to extend or cancel the expiring contracts upon one year's notice. As a result, the company will have the opportunity to review alternatives to extend or replace those contracts.
- In all scenarios, Sunstone was selected to meet Cascade's pipeline capacity shortfall, starting in 2011. Sunstone allows Cascade to move Rockies supplies to the Pacific Northwest, and combined with incremental transportation on GTN, will address capacity shortfalls. Additionally, Sunstone will provide supply diversity to Cascade's customers in Oregon, who have been traditionally served for the most part with natural gas supply from Alberta. Additionally, Sunstone combined with Blue Bridge pipeline provides the means to bring Rockies supplies to the I-5 corridor. It should also be pointed out that we did conduct a sensitivity analysis to

see if the model would take Blue Bridge without Sunstone. The model did not select Blue Bridge in this instance.

- A small volume of bio-gas appears to be a potential resource to address shortfalls in zones 10 and/or 11 (the Wenatchee lateral). Assuming any gas quality issues are satisfactorily addressed, bio-gas could also eliminate or reduce distribution system constraints.
- Satellite LNG facilities located within Cascade's distribution system may also be an attractive alternative to incremental pipeline capacity in areas where physical limitations at the gate stations would result in even higher costs associated with a pipeline solution. There may be additional advantages to such a strategy to the extent a facility could be strategically located on a portion of the distribution system that will eliminate or reduce distribution system constraints.
- Imported LNG at Kitimat appears to be a potential source of additional supplies beginning in 2012. Many of the proposed LNG import facilities in the Pacific Northwest would require backhaul capability or additional infrastructure on upstream pipelines in order to reach Cascade's distribution system. However, imported LNG at the Kitimat facility would be transported along existing right-of-ways belonging to Pacific Northern Pipeline, which connects to Westcoast's system. Cascade then could use its existing Westcoast transport to move the supplies to Cascade's service territory.
- As indicated above, imported LNG from Kitimat was selected as part of our portfolio mix. However, on September 19, 2008, Kitimat LNG announced that the development focus of the facility would switch from a regasification to a liquefaction facility. Therefore, Kitimat would become an exporter, not an importer of natural gas. While Kitimat did indicate that a regasification facility might still be built at some point; as of this writing, it would appear that with this change of direction, the likelihood of LNG imports from British Columbia has declined considerably. Instead, this change in facility development points to the probability of less British Columbia gas being exported to the United States. We believe this creates an even greater need to enhance supply diversity, and develop the necessary infrastructure to deliver that supply to the Pacific Northwest. The other proposed LNG import facilities, will require incremental transportation via NWP or GTN. The Company has insufficient information available as to the likelihood and costs associated with acquiring additional transport capability to move supplies from the proposed Northwest facilities to Cascade's distribution system.
- We considered the impact of possible reductions in exports of gas supplies physically produced in British Columbia and Alberta, by limiting the amount of physical Canadian supplies that could be exported via existing infrastructure at Station 2, Sumas or AECO to 80%. Under this scenario, the model chose to increase the amount of imported LNG at Kitimat. In light of the recent

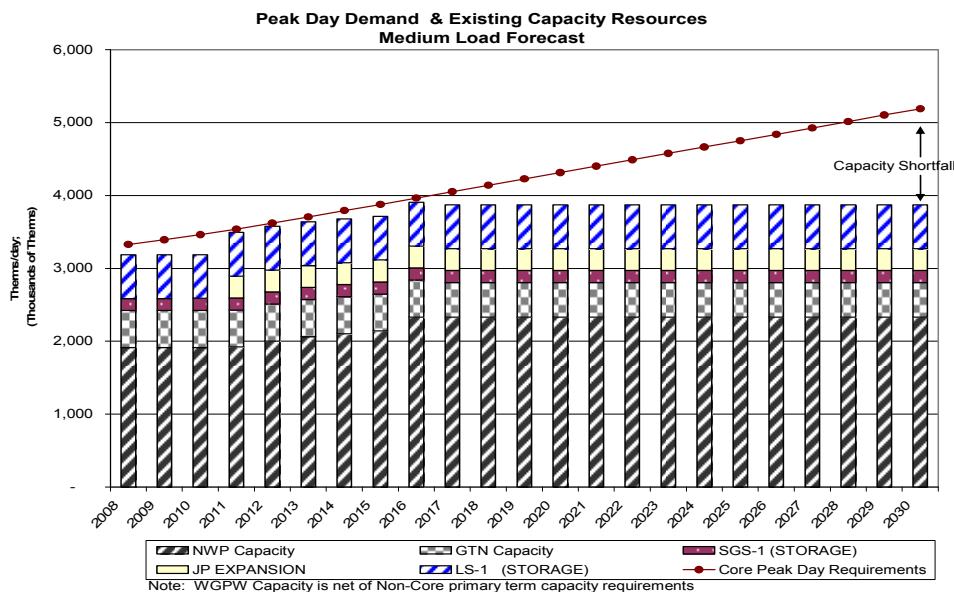
announcement by Kitimat discussed above, the company will have to re-analyze the impact of this new event, as well as consider other imported LNG options.

- 20 year portfolio costs on a Net Present Value (NPV) basis, are expected to range between \$3,309,990,000 to \$3,401,470,000 for the planning period, with an average cost per therm ranging between \$.4544 and \$.4662.

Peak Day Planning Results

Figure 7-B shows the projected peak day requirements compared to the company’s existing capacity resources under the medium load growth forecast. This same comparison was completed for both the high and low load growth forecasts and results of the zone by zone analysis are included in Appendix F. Under all growth scenarios, the company will require incremental peak day delivery in order to meet Cascade’s anticipated peak loads located on the Northwest Pipeline system as soon as the 2010/2011 heating season. This shortfall results from the expiration of a leased storage agreement that will end in April 2007. The company has acquired incremental Jackson Prairie storage inventory and withdrawal capability through the participation in the JP expansion open season, which took place during early 2006, however, the company has not yet replaced the TF-2 delivery that was included with the leased storage agreement.

Figure 7-B



For modeling purposes, the company included several capacity alternatives to meet peak planning needs. Based on the analysis, peak day requirements will be met through a blend of resources. For purposes of the graphical depiction, the company has shown the

incremental conservation resources as a capacity resource. As shown in Figure 7-C, incremental pipeline capacity on NWP along with a combination of citygate peaking, imported LNG, bio-gas, and satellite LNG alternatives will be used to meet growing peak requirements.

Annual Load Requirements and Weather Uncertainty

The annual load requirements will vary dramatically based on the weather assumptions. Through the use of SENDOUT’s monte-carlo functionality, the company has the ability to analyze the impacts of weather on its load forecast. Figure 7-D shows the overall expected range of the load forecasts, before considering load reductions that can be achieved through incremental conservation programs. The chart provides the upper parameter, which is based on the assumption that the high load growth forecast occurs, with the lower parameter occurring under the low load growth forecast. Capturing the uncertainty around the medium load growth forecast was done with ‘. The monte-carlo simulation performed 200 draws, with each draw calculating the monthly load based on the weather as randomly determined by the model for each of the weather zones. Figure 7-E provides a more in depth look at the medium scenario results. The absolute maximum and absolute minimum amounts depict the minimum or maximum system demand from the 200 draws for a particular year. The absolute maximum/minimum do not represent any single results for the 20 year planning horizon.

FIGURE 7-C

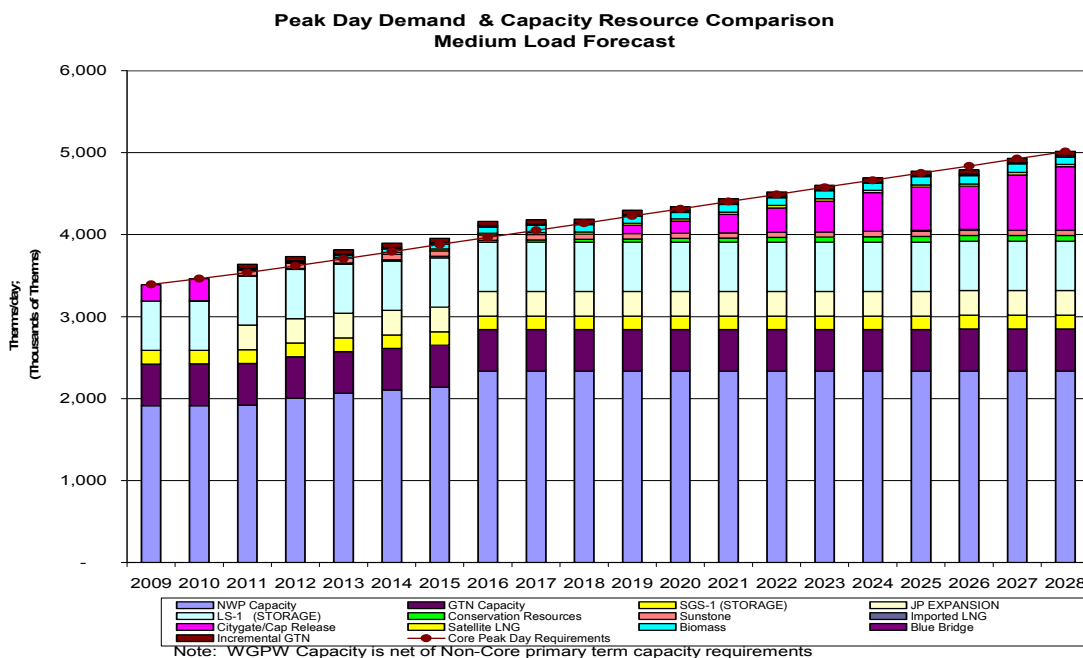


Figure 7-D

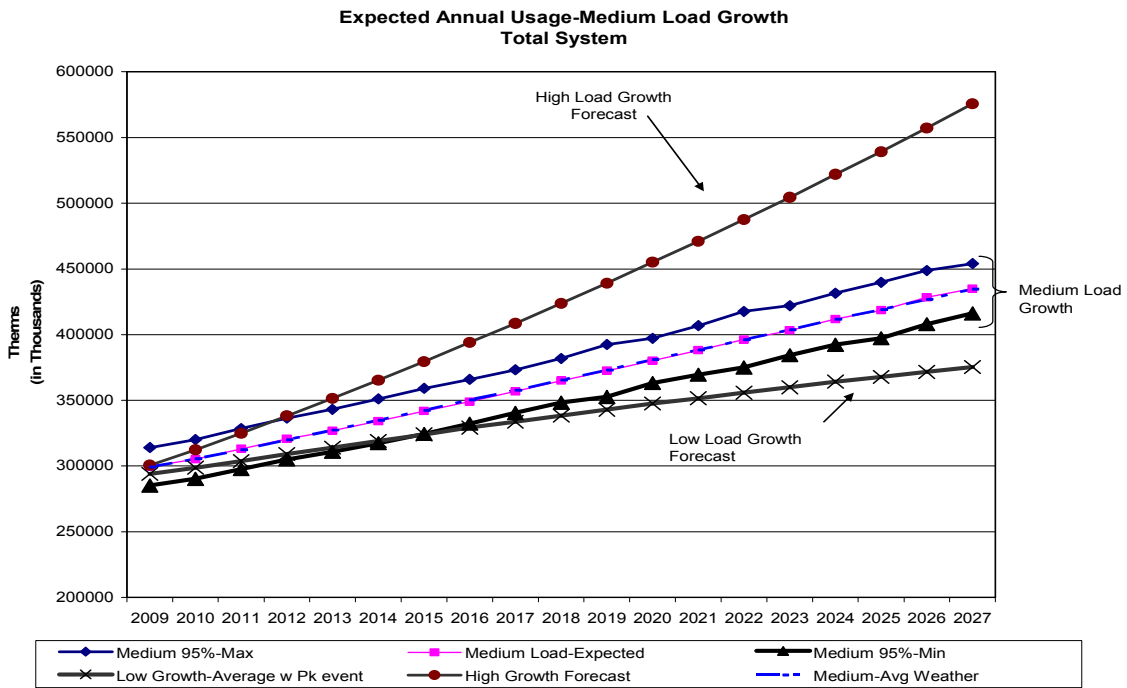
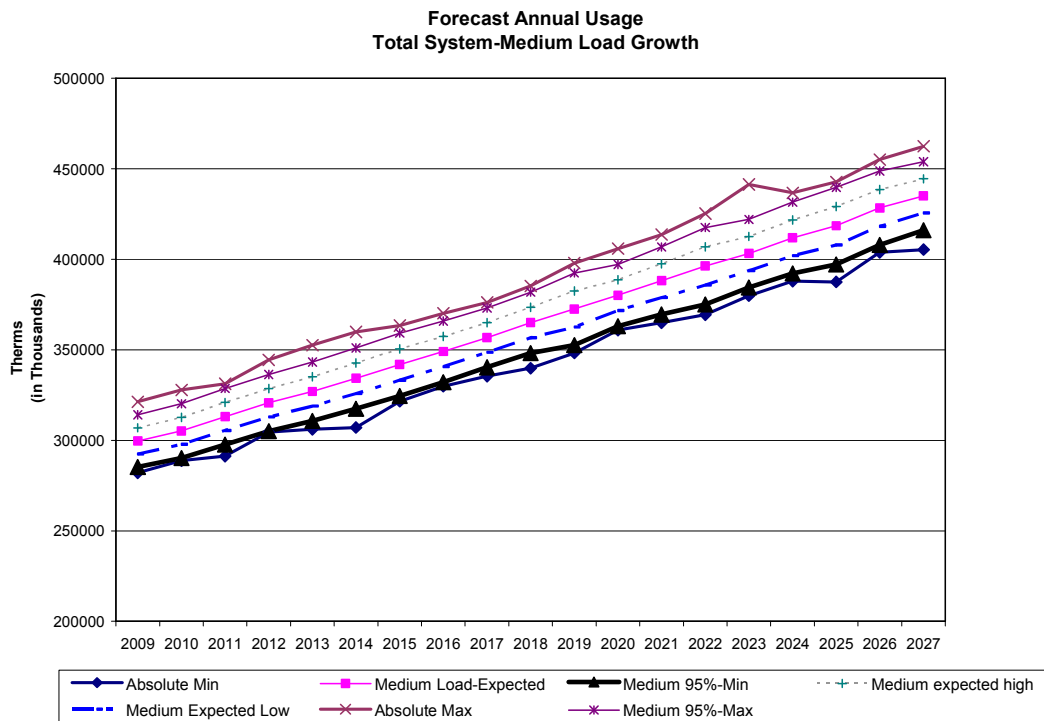


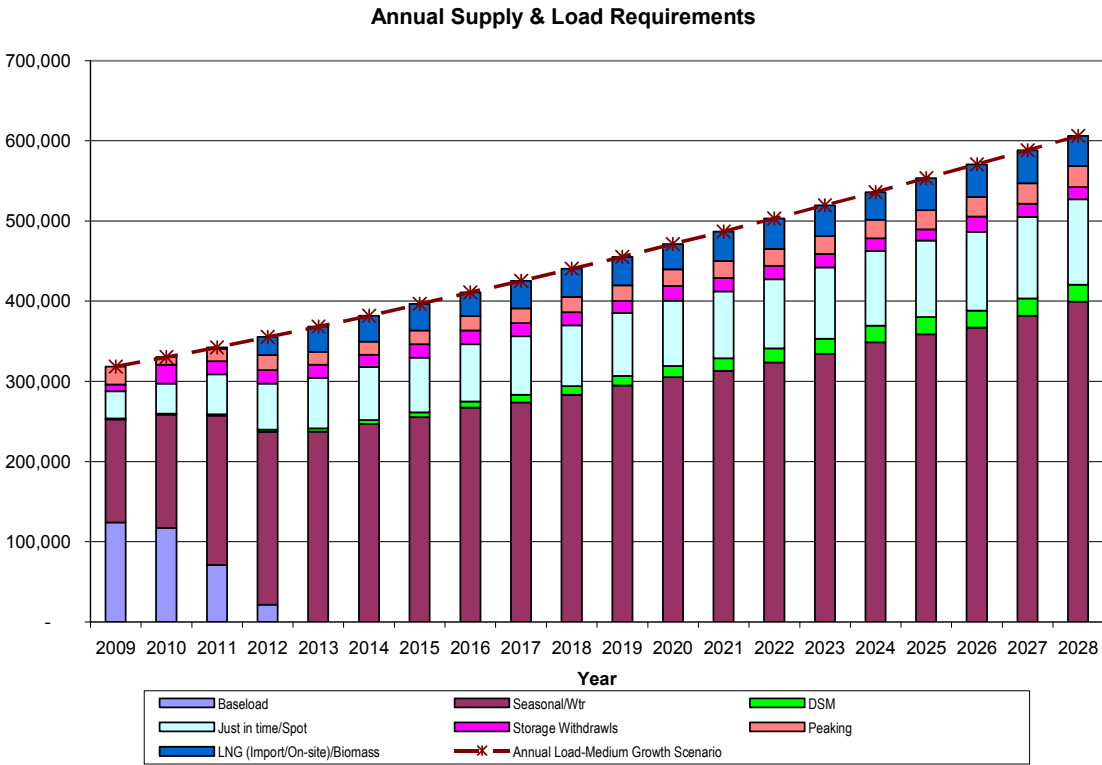
FIGURE 7-E



Additional tables and graphical analyses summarizing the weather and its impact on the annual load forecast are included in Appendix G-1.

To meet this demand, the company will need to acquire a blend of gas supply and conservation resources. For purposes of this plan, the company has estimated the level of conservation that is achievable over the course of the planning horizon which was discussed at length in section five. Figure 7-F shows how the company anticipates meeting the projected load over the planning horizon under the basecase scenario. Variations in the portfolio in order to meet actual load requirements during any year will occur primarily through the purchase of just-in-time, or spot gas purchases.

FIGURE 7-F



Impacts of Price Uncertainty and Overall System Costs

The ability to accurately forecast long-term gas prices is influenced by two different types of uncertainty: uncertainty related to long-term changes in the industry and uncertainty related to short-term gas price variability. Contributing to long-term uncertainty are long term supply and demand issues, including growth in demand for electric generation, changes in LNG import infrastructure, possible pipelines to bring Alaskan and other frontier gas supplies to market. Short-term price variability also affects the long-term predictability of gas prices. Even if long-term supply and demand outcomes are exactly

as projected, actual prices in future months will still reflect variability due to short-term market conditions. In order to estimate this uncertainty, the Company utilized SENDOUT's Monte-Carlo functionality, to analyze the impacts of price on the portfolio costs. Since natural gas is becoming more of a national market the company believes that volatility in the NYMEX prices will have a far larger influence on the portfolio's price volatility compared to the volatility in the AECO, Sumas and Rocky Mountain basin differentials. Figure 7-G shows the overall expected range of the NYMEX prices over the planning horizon. The absolute maximum and absolute minimum amounts depicts the minimum amount or maximum amount from the 200 draws for a particular year. The Absolute maximum/minimum do not represent any single draw result for the 20 year planning horizon.

FIGURE 7-G

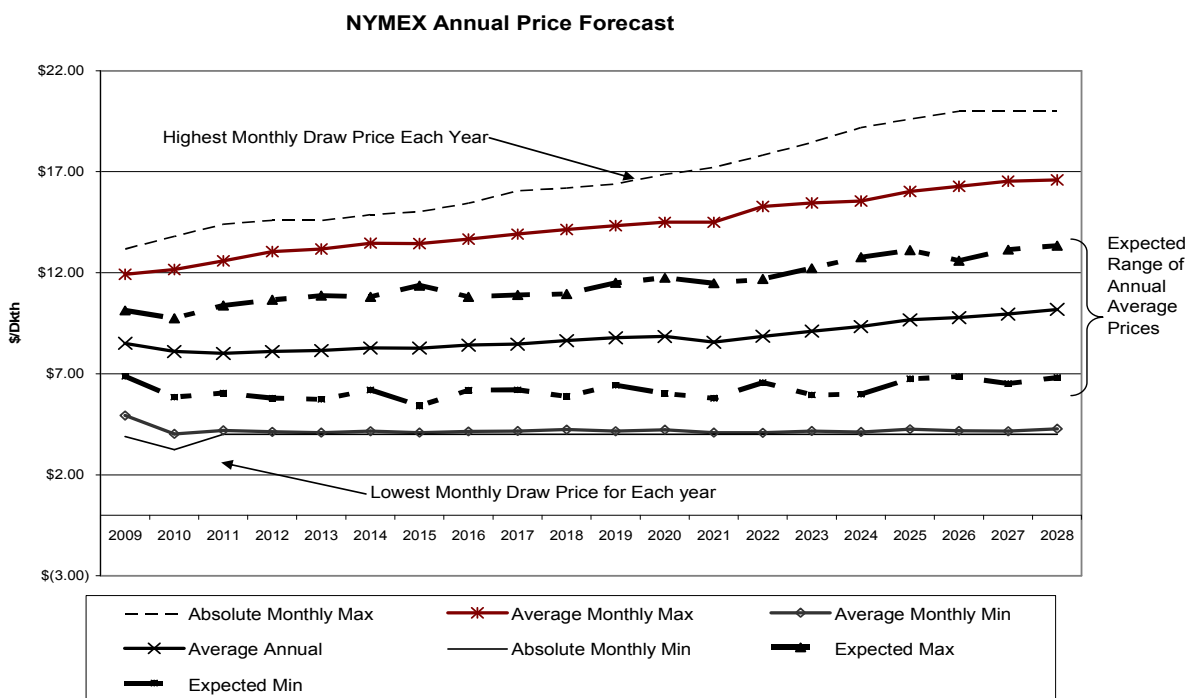


Figure 7-H compares the expected range of NYMEX prices from the Monte-Carlo analysis including the Environmental Externality costs that were discussed in section 5. The highest anticipated NYMEX prices would result if the Scenario 3 Carbon Tax was implemented in 2010. Under that scenario, the \$3.01/dkth tax would ramp up over a 5-year period and by 2014 the tax would be \$9.03/dkth. The impact of the price volatility on the overall cost of the long-term portfolio is shown below in Figure 7-I. Further tables and graphical analyses summarizing the pricing simulations are included in Appendix G-2.

Figure 7-H

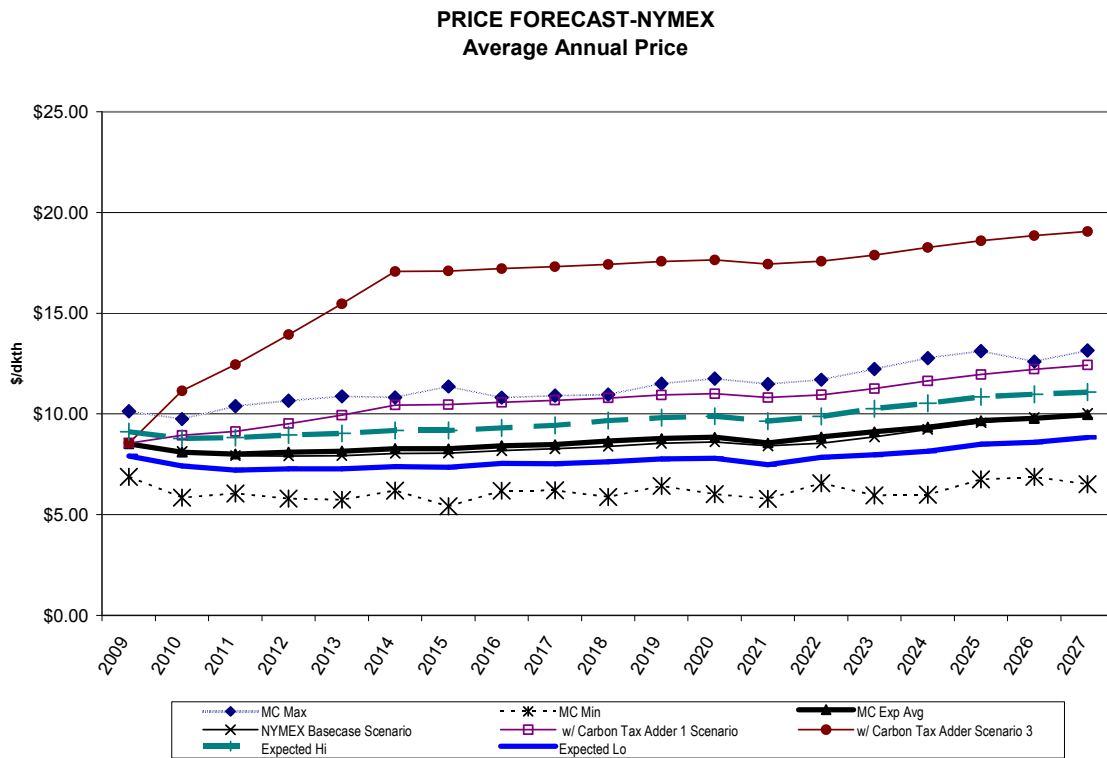


Figure 7-I

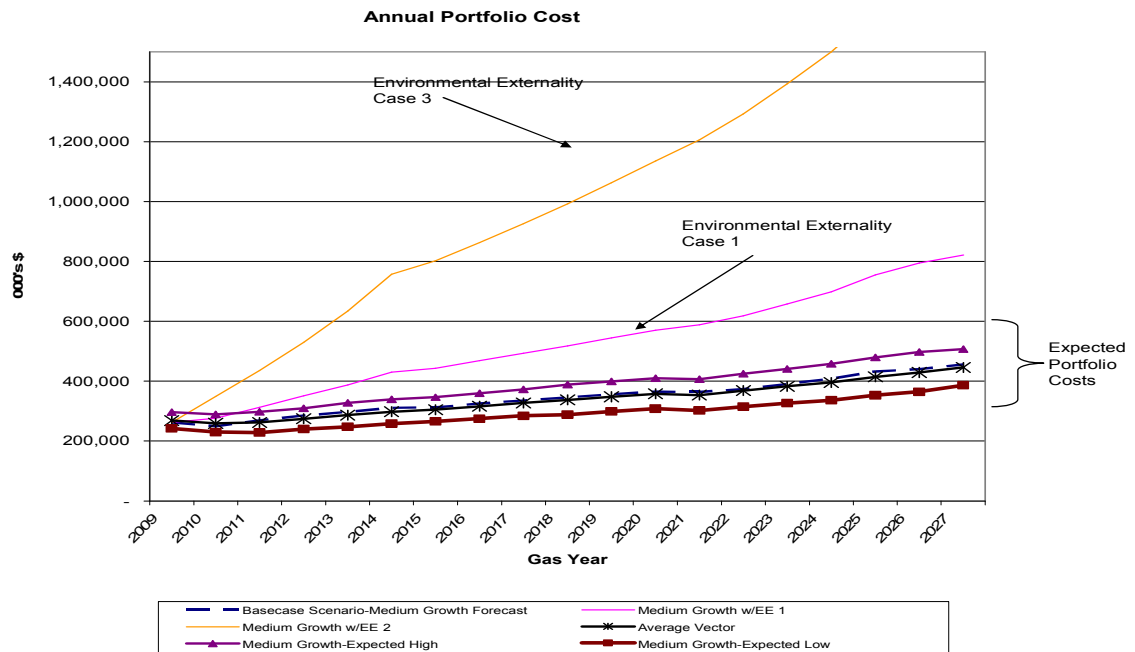


Table 7-3 summarizes the Net Present Value of the 20-year portfolio costs and average cost per therm for each of the scenarios and includes the anticipated range of costs from the monte-carlo modeling. Based on the annual costs from the basecase scenario, the company has estimated its avoided costs at 74 cents per therm. Results from the monte-carlo modeling indicate that the cost-effectiveness limits for conservation measures would range between 75 and 92 cents per therm. Additional information regarding the calculation of these avoided cost estimates is included in Appendix H.

TABLE 7-3

	NPV 20-Yr Portfolio Costs in \$000's	Average Cost Per Therm
Scenario Results:		
Basecase Scenario	\$ 3,435,471	\$ 0.4665
High Load Growth	\$ 4,119,026	\$ 0.4711
Low Load Growth	\$ 3,214,534	\$ 0.4741
Environmental Externalities Case 1	\$ 4,976,038	\$ 0.6756
Environmental Externalities Case 2	\$ 9,052,460	\$ 1.2291
Simulation Results:		
Monte-Carlo Average	\$ 3,401,470	\$ 0.4604
Monte-Carlo Expected High	\$ 3,492,950	\$ 0.4662
Monte-Carlo Expected Low	\$ 3,041,877	\$ 0.4544

Section 8
Two-year Action Plan

THE LIST OF ACTION PLAN ITEMS INCLUDED IN THIS DRAFT IS NOT COMPLETE AND MODIFICATIONS WILL BE MADE PRIOR TO FILING THE FINAL PLAN IN DEC 2008

Cascade's two-year action plan is structured to further the Company's IRP capability by completing the remaining work in progress items from the last two-year action plan and refining the basic analyses provided in this IRP to a more sophisticated and detailed level.

2007 Action Plan and Progress Review

Cascade filed its last Integrated Resource Plan in April, 2007. Since that time, Cascade has made significant progress in meeting its 2-Year Action Plan. Some highlights include:

- Expanded Washington Conservation programs consistent with the steps outlined in the Company's Conservation Plan that was approved by the WUTC in October 2007.
- Updated the independent assessment of the Conservation potential resources that could be acquired within the company's Oregon and Washington service territory
- Expanded IRP modeling to include 10 distinct demand areas

Appendix I includes the detailed 2007 Two-year Action Plan along with a description of the Company's progress on each of the items.

2008 Action Plan

Cascade's 2008 Action Plan is focused on the following five areas:

- Demand Forecasting
- Distribution System Constraint Analysis
- Demand Side Resources
- Supply Side Resources
- Integration

The summation of these components embody Cascade's commitment to maximizing the efficiency from its Integrated Resource Plan and to achieving the lowest cost resource portfolio of reliable natural gas services and conservation.

DEMAND FORECAST

1. In continuing efforts to create a more accurate forecast, Cascade will research the viability of determining therm usage per customer per degree day by customer class (residential, commercial, etc.). This is largely dependent upon the capabilities of the Company's new Customer Information System which is currently anticipated to "Go-Live" during mid-2009.
2. Cascade will continue to monitor outside determinants of natural gas usage, such as legislative building code changes and electrical "Direct Use" campaigns as they are determined to significantly affect the company's forecast.

3. The company will explore the incorporation of price elasticity for future forecasts of demand. The integration of this variable in future models will be dependent upon the practicality of its application and significance of its effect.

DEMAND SIDE RESOURCES

1. Cascade will continue to monitor the effectiveness of the Public Purpose Fund to ensure the funds are adequate to capture significant portions of achievable therm savings in Oregon. If it is determined that an increase in this Fund will create a subsequent increase in therm savings, the company will move to act appropriately.
2. The company will continue to follow and analyze the impacts of the Western Climate Initiative as they pertain to natural gas conservation, as well as other such acts that may arise from these efforts.

SUPPLY SIDE RESOURCES

1. Supply side resources will continue to be evaluated on an ongoing basis. The various options include firm supplies with contracts of varying lengths and pricing alternatives, spot market supplies, and customer peaking supplies. Pipeline capacity utilization along with future capacity requirements will also be evaluated on an ongoing basis to maintain the optimum cost of the resource portfolio and to stand ready with requests for incremental capacity if the need arises.
2. The company will continue to monitor proposed LNG import facilities and will evaluate the various options as specific cost and capacity information becomes available.
3. The Company will monitor the futures market for price trends and will continue to evaluate the effectiveness of its risk management policy.

Appendix A-1

IRP Work Plan



222 FAIRVIEW AVENUE N., SEATTLE, WASHINGTON 98109-5312 206-624-3900
FACSIMILE 206-654-4039

December 14, 2007

Washington Utilities & Transportation Commission
P.O. Box 47250
Olympia, WA 98504-7250

Attention: Ms. Carole Washburn
Executive Secretary

RE: Cascade Natural Gas Corporation's 2008 Integrated Resource Plan Work Plan

Pursuant to WAC 480-90-238, enclosed for filing is Cascade Natural Gas Corporation's Work Plan for its 2008 Integrated Resource Plan (IRP or Plan). This document provides an outline of the content for the 2008 Plan, the timing of the plan development and the method for assessing potential resources.

If you have any questions regarding the Work Plan, please contact me at (206) 381-6824.

Sincerely,

A handwritten signature in black ink that reads "Katherine J. Barnard".

Katherine J. Barnard
Senior Director, Regulatory Affairs

Enclosures

We make warm neighbors

www.cngc.com

Cascade Natural Gas Corporation 2008 IRP Workplan

Cascade Natural Gas Corporation's ("Cascade" or "the Company") Work Plan for its 2008 Integrated Resource Plan ("IRP") is filed pursuant to the Washington Utilities and Transportation Commission (WUTC) IRP rules (WAC 480-90-238).

Purpose of the Integrated Resource Plan/Key Issues for 2008 IRP

The uncertainty continues to make the decisions of long term planning difficult. Cascade will continue to develop long-term resource strategies in the face of such uncertainty. Analytical methods will be similar to those used to develop the Company's 2007 IRP Plan, which includes the use of a linear programming optimization model (SENDOUT) to solve natural gas supply and transportation optimization questions, along with the use of Monte-Carlo simulations (VECTORGAS) to estimate the impact of various uncertainty factors.

The primary purpose of Cascade's long-term resource planning process has been, and continues to be, to inform and guide the Company's resource acquisition processes, consistent with the rule (WAC 480-90-238). Input and feed back from the Company's Technical Advisory Group (TAG) will continue to be an important resource to help ensure Cascade's IRP is developed from a broader perspective than Cascade could have on its own.

Outline of IRP Content:

The following is an outline of the Company's 2008 IRP plan. This list is based on Cascade's 2007 IRP Plan. Organizational structure of the final IRP may be revised based on results of analysis and feedback received through the planning process.

- I. Executive Summary including Summary Charts & Graphs
- II. Introduction and Discussion of the Plan
- III. Demand Forecast
- IV. Demand Side Resource Alternatives
- V. Supply Side Resource Alternatives
- VI. Integration Analysis and Results including Risk Analyses
 - a. Scenario & Monte Carlo simulations
 - i. Weather Scenarios
 - ii. Gas Price Scenarios including Environmental Externalities (Carbon Tax Adders)
- VII. 2-Year Action Plan
- VIII. Technical Appendices

2008 IRP Timeline

The following is Cascade's tentative 2008 IRP timeline:

- December 14, 2007—Work Plan filed with WUTC
- Develop Demand Forecast: February through May 2008
- Distribution System Planning Analysis: May through Aug 2008
- Demand Side Resource Analysis: February through July 2008
- Gas Supply Analysis: February through June 2008
- Integration of Supply and Conservation Resources: June through July 2008
- Public Process—Technical Advisory Group meetings (specific dates TBD)
 - i. TAG 1; Key Assumptions (price forecast/economic indicators)--Early February 2008
 - ii. TAG 2: Resource Alternatives (Supply & Demand Side Resources) --Late March 2008
 - iii. TAG 3: Demand Forecast Results/Distribution System Modeling – Early May 2008

iv. TAG 4: Integration/ 2 year Action Plan – Early August 2008

- File Draft 2008 IRP: September 2008
- Comments to Company on Draft Plan from parties by November 2008
- Final Plan filed on December 15, 2008

Planning Assumptions

Information needed to perform analysis will be gathered and input assumptions developed by June 2008. This will include detailed definitions of alternative scenarios and all primary input assumptions for demand forecasting and resource modeling. Additional planning information will be assimilated into the analytical process and planning information that is not incorporated into the modeling process will continue to be assessed.

Resource Analysis:

Natural gas analysis will include long-term optimization and stochastic analysis under the same planning scenarios, including natural gas energy efficiency and supply alternatives.

Draft 2008 IRP and Review Period:

Cascade is planning to have its IRP draft plan distributed for initial feedback to the group members by September 30, 2008. Given Cascade's commitment to facilitate and communicate with members of the Technical Advisory Group, the draft IRP content and its key assumptions will be discussed with the Technical Advisory Group during the TAG sessions. Any feedback is due to the Company by November 2008 to give the Company sufficient time to incorporate such feedback as needed into the final plan.

Final 2008 IRP Filed December 15, 2008

Appendix A-2

Tag Meeting Participants & Agendas

Cascade Natural Gas Corporation Technical Advisory Group Meeting Participants

The following company and non-company individuals participated on one or more of the following Technical Advisory Group (TAG) meetings. The TAG meetings were held in February 2008, April, 2008, August, 2008.

Company Participants:

K Barnard	Senior Director Regulatory Affairs & Gas Supply
C. Kautzman	Conservation Program Administrator
P. Schmidt	Senior Rate Analyst
M. Sellers-Vaughn	Manager Gas Supply and Systems
C. La	Senior Gas Supply Planning Analyst
J. Lantoria	Field Customer Service Analyst
M. Hardesty	Engineer
J. McMaster	Sr. Engineer
L. Espinosa	Director Conservation
L. Tamayne	Rates & Conservation Analyst

Non-Company Participants:

S. Johnson	Washington Utilities & Transportation Commission
D. Reynolds	Washington Utilities & Transportation Commission
D. Kirkpatrick	Washington Utilities & Transportation Commission
V. Novak	Washington Utilities & Transportation Commission
L. Kittleson	Oregon Public Utilities Commission
B. Tatom	Oregon Public Utilities Commission
K. Zimmerman	Oregon Public Utilities Commission
P. Pyron	NW Industrial Gas Users
D. Kirschner	NW Gas Association
D. Dixon	NW Energy Coalition
C. Ebert	The Energy Project
C. Murray	CTEDS
S. Johnson	Attorney Generals Office

2008 IRP Technical Advisory Group Meetings

February 12, 2008 Agenda Items

- 2008 IRP Workplan Overview
- Action Plan Progress
- Demand Forecast Economic Drivers
- Natural Gas Price Forecasts

April 7, 2008 Agenda Items

- Conservation Resource Alternatives
- Supply Side Resource Alternatives

August 26, 2008 Agenda Items

- 2008 IRP Workplan Overview
- Demand Forecast Results
- Conservation Supply Curves
- Distribution System Planning
- Supply Side Analysis

Appendix A-3

IRP Guidelines & Rules

Text for Appendix A-3 to be included in Final IRP

Appendix B-1

Demand Forecast Model Escalation Rates

ZONES BREAKDOWN				
GTN	Zone 10	Zone 11	Zone 20	Zone 24
Bend Chemult Crescent Gilchrist La Pine Madras Metolius Prineville Redmond Sunriver	Grandview Granger Prosser Sunnyside Toppenish Wapato Zillah	E. Wenatchee Moxee City Quincy Selah Union Gap Wenatchee Yakima	Burbank Finley Kennewick Moses Lake Othello Pasco Richland Wheeler	Baker Huntington Nyssa Ontario Vale
WEATHER AREA Redmond	WEATHER AREA Yakima	WEATHER AREA Yakima	WEATHER AREA Walla Walla	WEATHER AREA Redmond
Zone 26	Zone 30-S	Zone 30-W	Zone ME-OR	Zone ME-WA
Castle Rock Kalama Kelso Longview	Aberdeen Belfair Bremerton Chico Elma Gorst Hoquiam Keyport Manchester McCleary Montesano Port Orchard Poulsbo Shelton Silverdale Sunnyslope	Acme Anacortes Arlington Bellingham Blaine Burlington Deming Everson Ferndale Laconner Lawrence Lynden Mount Vernon Nooksack Oak Harbor Sedro Woolley Stanwood Sumas	Athena Boardman Hermiston Irrigon Milton Freewater Mission Pendleton Pilot Rock Stanfield Umatilla Weston	College Place Walla Walla
WEATHER AREA Hoquiam	WEATHER AREA Hoquiam	WEATHER AREA Bellingham	WEATHER AREA Walla Walla	WEATHER AREA Walla Walla

Adams - WA

Year	Household Growth Rate		
	High	Medium	Low
2008-2009	0.33%	0.13%	-0.07%
2008-2013	0.33%	0.13%	-0.07%
2013-2018	0.26%	0.06%	-0.14%
2018-2019	0.14%	-0.06%	-0.26%

Year	Employment Growth Rates		
	High	Medium	Low
2008-2009	1.94%	1.24%	0.54%
2008-2013	1.91%	1.21%	0.51%
2013-2018	1.77%	1.07%	0.37%
2018-2019	1.76%	1.06%	0.36%

Year	Income Growth Rates		
	High	Medium	Low
2008-2009	3.26%	1.66%	-0.04%
2008-2013	3.36%	1.76%	0.06%
2013-2018	3.32%	1.72%	0.02%
2018-2019	3.77%	2.17%	0.47%

Baker - OR

Year	Household Growth Rate		
	High	Medium	Low
2008-2009	0.61%	0.01%	-0.29%
2008-2013	0.62%	0.02%	-0.28%
2013-2018	0.56%	-0.04%	-0.34%
2018-2019	0.42%	-0.18%	-0.48%

Year	Employment Growth Rates		
	High	Medium	Low
2008-2009	1.33%	0.83%	0.23%
2008-2013	1.34%	0.84%	0.24%
2013-2018	1.29%	0.79%	0.19%
2018-2019	1.30%	0.80%	0.20%

Year	Income Growth Rates		
	High	Medium	Low
2008-2009	1.69%	1.19%	0.49%
2008-2013	1.78%	1.28%	0.58%
2013-2018	1.85%	1.35%	0.65%
2018-2019	2.26%	1.76%	1.06%

Benton - WA

Year	Household Growth Rate		
	High	Medium	Low
2008-2009	2.29%	2.09%	1.89%
2008-2013	2.29%	2.09%	1.89%
2013-2018	1.88%	1.68%	1.48%
2018-2019	1.75%	1.55%	1.35%

Year	Employment Growth Rates		
	High	Medium	Low
2008-2009	3.14%	2.44%	1.74%
2008-2013	3.14%	2.44%	1.74%
2013-2018	2.66%	1.96%	1.26%
2018-2019	2.67%	1.97%	1.27%

Year	Income Growth Rates		
	High	Medium	Low
2008-2009	2.56%	0.96%	-0.74%
2008-2013	2.63%	1.03%	-0.67%
2013-2018	2.75%	1.15%	-0.55%
2018-2019	3.13%	1.53%	-0.17%

Chelan - WA

Year	Household Growth Rate		
	High	Medium	Low
2008-2009	1.50%	1.30%	1.10%
2008-2013	1.49%	1.29%	1.09%
2013-2018	1.25%	1.05%	0.85%
2018-2019	1.08%	0.88%	0.68%

Year	Employment Growth Rates		
	High	Medium	Low
2008-2009	2.60%	1.90%	1.20%
2008-2013	2.59%	1.89%	1.19%
2013-2018	2.29%	1.59%	0.89%
2018-2019	2.30%	1.60%	0.90%

Year	Income Growth Rates		
	High	Medium	Low
2008-2009	3.10%	1.50%	-0.20%
2008-2013	3.21%	1.61%	-0.09%
2013-2018	3.23%	1.63%	-0.07%
2018-2019	3.70%	2.10%	0.40%

FY08 IRP - CNG COUNTY GROWTH

Cowlitz - WA

Year	Household Growth Rate		
	High	Medium	Low
2008-2009	0.75%	0.55%	0.35%
2008-2013	0.75%	0.55%	0.35%
2013-2018	0.66%	0.46%	0.26%
2018-2019	0.55%	0.35%	0.15%

Year	Employment Growth Rates		
	High	Medium	Low
2008-2009	1.57%	0.87%	0.17%
2008-2013	1.56%	0.86%	0.16%
2013-2018	1.49%	0.79%	0.09%
2018-2019	1.49%	0.79%	0.09%

Year	Income Growth Rates		
	High	Medium	Low
2008-2009	2.40%	0.80%	-0.90%
2008-2013	2.47%	0.87%	-0.83%
2013-2018	2.58%	0.98%	-0.72%
2018-2019	2.90%	1.30%	-0.40%

Deschutes - OR

Year	Household Growth Rate		
	High	Medium	Low
2008-2009	3.59%	2.99%	2.69%
2008-2013	3.59%	2.99%	2.69%
2013-2018	2.86%	2.26%	1.96%
2018-2019	2.73%	2.13%	1.83%

Year	Employment Growth Rates		
	High	Medium	Low
2008-2009	2.97%	2.47%	1.87%
2008-2013	2.97%	2.47%	1.87%
2013-2018	2.48%	1.98%	1.38%
2018-2019	2.48%	1.98%	1.38%

Year	Income Growth Rates		
	High	Medium	Low
2008-2009	1.42%	0.92%	0.22%
2008-2013	1.50%	1.00%	0.30%
2013-2018	1.60%	1.10%	0.40%
2018-2019	1.94%	1.44%	0.74%

Douglas - WA

Year	Household Growth Rate		
	High	Medium	Low
2008-2009	1.37%	1.17%	0.97%
2008-2013	1.37%	1.17%	0.97%
2013-2018	1.17%	0.97%	0.77%
2018-2019	1.04%	0.84%	0.64%

Year	Employment Growth Rates		
	High	Medium	Low
2008-2009	1.87%	1.17%	0.47%
2008-2013	1.86%	1.16%	0.46%
2013-2018	1.74%	1.04%	0.34%
2018-2019	1.73%	1.03%	0.33%

Year	Income Growth Rates		
	High	Medium	Low
2008-2009	3.00%	1.40%	-0.30%
2008-2013	3.09%	1.49%	-0.21%
2013-2018	3.13%	1.53%	-0.17%
2018-2019	3.58%	1.98%	0.28%

Franklin - WA

Year	Household Growth Rate		
	High	Medium	Low
2008-2009	1.57%	1.37%	1.17%
2008-2013	1.55%	1.35%	1.15%
2013-2018	1.29%	1.09%	0.89%
2018-2019	1.11%	0.91%	0.71%

Year	Employment Growth Rates		
	High	Medium	Low
2008-2009	2.13%	1.43%	0.73%
2008-2013	2.13%	1.43%	0.73%
2013-2018	1.95%	1.25%	0.55%
2018-2019	1.95%	1.25%	0.55%

Year	Income Growth Rates		
	High	Medium	Low
2008-2009	2.58%	0.98%	-0.72%
2008-2013	2.67%	1.07%	-0.63%
2013-2018	2.80%	1.20%	-0.50%
2018-2019	3.21%	1.61%	-0.09%

FY08 IRP - CNG COUNTY GROWTH

Grant - WA

Year	Household Growth Rate		
	High	Medium	Low
2008-2009	1.05%	0.85%	0.65%
2008-2013	1.03%	0.83%	0.63%
2013-2018	0.88%	0.68%	0.48%
2018-2019	0.71%	0.51%	0.31%

Year	Employment Growth Rates		
	High	Medium	Low
2008-2009	2.40%	1.70%	1.00%
2008-2013	2.40%	1.70%	1.00%
2013-2018	2.15%	1.45%	0.75%
2018-2019	2.15%	1.45%	0.75%

Year	Income Growth Rates		
	High	Medium	Low
2008-2009	3.00%	1.40%	-0.30%
2008-2013	3.09%	1.49%	-0.21%
2013-2018	3.11%	1.51%	-0.19%
2018-2019	3.52%	1.92%	0.22%

Grays Harbor - WA

Year	Household Growth Rate		
	High	Medium	Low
2008-2009	0.84%	0.64%	0.44%
2008-2013	0.84%	0.64%	0.44%
2013-2018	0.74%	0.54%	0.34%
2018-2019	0.61%	0.41%	0.21%

Year	Employment Growth Rates		
	High	Medium	Low
2008-2009	1.70%	1.00%	0.30%
2008-2013	1.70%	1.00%	0.30%
2013-2018	1.61%	0.91%	0.21%
2018-2019	1.60%	0.90%	0.20%

Year	Income Growth Rates		
	High	Medium	Low
2008-2009	2.51%	0.91%	-0.79%
2008-2013	2.58%	0.98%	-0.72%
2013-2018	2.68%	1.08%	-0.62%
2018-2019	3.02%	1.42%	-0.28%

Island - WA

Year	Household Growth Rate		
	High	Medium	Low
2008-2009	2.00%	1.80%	1.60%
2008-2013	2.00%	1.80%	1.60%
2013-2018	1.67%	1.47%	1.27%
2018-2019	1.55%	1.35%	1.15%

Year	Employment Growth Rates		
	High	Medium	Low
2008-2009	2.14%	1.44%	0.74%
2008-2013	2.15%	1.45%	0.75%
2013-2018	1.96%	1.26%	0.56%
2018-2019	1.97%	1.27%	0.57%

Year	Income Growth Rates		
	High	Medium	Low
2008-2009	2.13%	0.53%	-1.17%
2008-2013	2.19%	0.59%	-1.11%
2013-2018	2.35%	0.75%	-0.95%
2018-2019	2.65%	1.05%	-0.65%

Jefferson - OR

Year	Household Growth Rate		
	High	Medium	Low
2008-2009	2.11%	1.51%	1.21%
2008-2013	2.10%	1.50%	1.20%
2013-2018	1.85%	1.25%	0.95%
2018-2019	1.75%	1.15%	0.85%

Year	Employment Growth Rates		
	High	Medium	Low
2008-2009	1.50%	1.00%	0.40%
2008-2013	1.46%	0.96%	0.36%
2013-2018	1.38%	0.88%	0.28%
2018-2019	1.37%	0.87%	0.27%

Year	Income Growth Rates		
	High	Medium	Low
2008-2009	0.88%	0.38%	-0.32%
2008-2013	0.97%	0.47%	-0.23%
2013-2018	1.15%	0.65%	-0.05%
2018-2019	1.45%	0.95%	0.25%

FY08 IRP - CNG COUNTY GROWTH

Kitsap - WA

Year	Household Growth Rate		
	High	Medium	Low
2008-2009	2.27%	2.07%	1.87%
2008-2013	2.29%	2.09%	1.89%
2013-2018	1.90%	1.70%	1.50%
2018-2019	1.79%	1.59%	1.39%

Year	Employment Growth Rates		
	High	Medium	Low
2008-2009	2.26%	1.56%	0.86%
2008-2013	2.26%	1.56%	0.86%
2013-2018	2.05%	1.35%	0.65%
2018-2019	2.05%	1.35%	0.65%

Year	Income Growth Rates		
	High	Medium	Low
2008-2009	2.45%	0.85%	-0.85%
2008-2013	2.52%	0.92%	-0.78%
2013-2018	2.63%	1.03%	-0.67%
2018-2019	2.97%	1.37%	-0.33%

Klamath - OR

Year	Household Growth Rate		
	High	Medium	Low
2008-2009	1.63%	1.03%	0.73%
2008-2013	1.64%	1.04%	0.74%
2013-2018	1.50%	0.90%	0.60%
2018-2019	1.39%	0.79%	0.49%

Year	Employment Growth Rates		
	High	Medium	Low
2008-2009	1.85%	1.35%	0.75%
2008-2013	1.83%	1.33%	0.73%
2013-2018	1.64%	1.14%	0.54%
2018-2019	1.63%	1.13%	0.53%

Year	Income Growth Rates		
	High	Medium	Low
2008-2009	1.34%	0.84%	0.14%
2008-2013	1.39%	0.89%	0.19%
2013-2018	1.48%	0.98%	0.28%
2018-2019	1.81%	1.31%	0.61%

Malheur - OR

Year	Household Growth Rate		
	High	Medium	Low
2008-2009	1.13%	0.53%	0.23%
2008-2013	1.15%	0.55%	0.25%
2013-2018	1.05%	0.45%	0.15%
2018-2019	0.78%	0.18%	-0.12%

Year	Employment Growth Rates		
	High	Medium	Low
2008-2009	1.22%	0.72%	0.12%
2008-2013	1.23%	0.73%	0.13%
2013-2018	1.24%	0.74%	0.14%
2018-2019	1.44%	0.94%	0.34%

Year	Income Growth Rates		
	High	Medium	Low
2008-2009	1.27%	0.77%	0.07%
2008-2013	1.34%	0.84%	0.14%
2013-2018	1.51%	1.01%	0.31%
2018-2019	2.02%	1.52%	0.82%

Mason - OR

Year	Household Growth Rate		
	High	Medium	Low
2008-2009	2.56%	2.36%	2.16%
2008-2013	2.56%	2.36%	2.16%
2013-2018	2.07%	1.87%	1.67%
2018-2019	1.95%	1.75%	1.55%

Year	Employment Growth Rates		
	High	Medium	Low
2008-2009	3.00%	2.30%	1.60%
2008-2013	3.00%	2.30%	1.60%
2013-2018	2.57%	1.87%	1.17%
2018-2019	2.57%	1.87%	1.17%

Year	Income Growth Rates		
	High	Medium	Low
2008-2009	2.21%	0.61%	-1.09%
2008-2013	2.29%	0.69%	-1.01%
2013-2018	2.44%	0.84%	-0.86%
2018-2019	2.76%	1.16%	-0.54%

FY08 IRP - CNG COUNTY GROWTH

Morrow - OR

Year	Household Growth Rate		
	High	Medium	Low
2008-2009	1.60%	1.00%	0.70%
2008-2013	1.60%	1.00%	0.70%
2013-2018	1.45%	0.85%	0.55%
2018-2019	1.35%	0.75%	0.45%

Year	Employment Growth Rates		
	High	Medium	Low
2008-2009	1.44%	0.94%	0.34%
2008-2013	1.46%	0.96%	0.36%
2013-2018	1.38%	0.88%	0.28%
2018-2019	1.40%	0.90%	0.30%

Year	Income Growth Rates		
	High	Medium	Low
2008-2009	1.23%	0.73%	0.03%
2008-2013	1.30%	0.80%	0.10%
2013-2018	1.42%	0.92%	0.22%
2018-2019	1.73%	1.23%	0.53%

Skagit - WA

Year	Household Growth Rate		
	High	Medium	Low
2008-2009	1.82%	1.62%	1.42%
2008-2013	1.82%	1.62%	1.42%
2013-2018	1.53%	1.33%	1.13%
2018-2019	1.40%	1.20%	1.00%

Year	Employment Growth Rates		
	High	Medium	Low
2008-2009	2.53%	1.83%	1.13%
2008-2013	2.53%	1.83%	1.13%
2013-2018	2.25%	1.55%	0.85%
2018-2019	2.25%	1.55%	0.85%

Year	Income Growth Rates		
	High	Medium	Low
2008-2009	2.54%	0.94%	-0.76%
2008-2013	2.61%	1.01%	-0.69%
2013-2018	2.71%	1.11%	-0.59%
2018-2019	3.04%	1.44%	-0.26%

Snohomish - WA

Year	Household Growth Rate		
	High	Medium	Low
2008-2009	2.43%	2.23%	2.03%
2008-2013	2.44%	2.24%	2.04%
2013-2018	1.99%	1.79%	1.59%
2018-2019	1.87%	1.67%	1.47%

Year	Employment Growth Rates		
	High	Medium	Low
2008-2009	2.56%	1.86%	1.16%
2008-2013	2.56%	1.86%	1.16%
2013-2018	2.27%	1.57%	0.87%
2018-2019	2.27%	1.57%	0.87%

Year	Income Growth Rates		
	High	Medium	Low
2008-2009	1.94%	0.34%	-1.36%
2008-2013	2.03%	0.43%	-1.27%
2013-2018	2.23%	0.63%	-1.07%
2018-2019	2.57%	0.97%	-0.73%

Umatilla - OR

Year	Household Growth Rate		
	High	Medium	Low
2008-2009	1.89%	1.29%	0.99%
2008-2013	1.90%	1.30%	1.00%
2013-2018	1.68%	1.08%	0.78%
2018-2019	1.49%	0.89%	0.59%

Year	Employment Growth Rates		
	High	Medium	Low
2008-2009	2.07%	1.57%	0.97%
2008-2013	2.07%	1.57%	0.97%
2013-2018	1.86%	1.36%	0.76%
2018-2019	1.87%	1.37%	0.77%

Year	Income Growth Rates		
	High	Medium	Low
2008-2009	1.41%	0.91%	0.21%
2008-2013	1.48%	0.98%	0.28%
2013-2018	1.58%	1.08%	0.38%
2018-2019	1.92%	1.42%	0.72%

FY08 IRP - CNG COUNTY GROWTH

Walla Walla - WA

Year	Household Growth Rate		
	High	Medium	Low
2008-2009	1.42%	1.22%	1.02%
2008-2013	1.44%	1.24%	1.04%
2013-2018	1.25%	1.05%	0.85%
2018-2019	1.05%	0.85%	0.65%

Year	Employment Growth Rates		
	High	Medium	Low
2008-2009	2.32%	1.62%	0.92%
2008-2013	2.32%	1.62%	0.92%
2013-2018	2.08%	1.38%	0.68%
2018-2019	2.06%	1.36%	0.66%

Year	Income Growth Rates		
	High	Medium	Low
2008-2009	2.57%	0.97%	-0.73%
2008-2013	2.63%	1.03%	-0.67%
2013-2018	2.71%	1.11%	-0.59%
2018-2019	3.06%	1.46%	-0.24%

Whatcom - WA

Year	Household Growth Rate		
	High	Medium	Low
2008-2009	2.62%	2.42%	2.22%
2008-2013	2.63%	2.43%	2.23%
2013-2018	2.12%	1.92%	1.72%
2018-2019	2.01%	1.81%	1.61%

Year	Employment Growth Rates		
	High	Medium	Low
2008-2009	2.85%	2.15%	1.45%
2008-2013	2.85%	2.15%	1.45%
2013-2018	2.47%	1.77%	1.07%
2018-2019	2.45%	1.75%	1.05%

Year	Income Growth Rates		
	High	Medium	Low
2008-2009	2.35%	0.75%	-0.95%
2008-2013	2.42%	0.82%	-0.88%
2013-2018	2.54%	0.94%	-0.76%
2018-2019	2.85%	1.25%	-0.45%

Yakima - WA

Year	Household Growth Rate		
	High	Medium	Low
2008-2009	0.91%	0.71%	0.51%
2008-2013	0.90%	0.70%	0.50%
2013-2018	0.77%	0.57%	0.37%
2018-2019	0.63%	0.43%	0.23%

Year	Employment Growth Rates		
	High	Medium	Low
2008-2009	1.93%	1.23%	0.53%
2008-2013	1.93%	1.23%	0.53%
2013-2018	1.80%	1.10%	0.40%
2018-2019	1.79%	1.09%	0.39%

Year	Income Growth Rates		
	High	Medium	Low
2008-2009	2.89%	1.29%	-0.41%
2008-2013	2.98%	1.38%	-0.32%
2013-2018	3.03%	1.43%	-0.27%
2018-2019	3.44%	1.84%	0.14%

NOTE

Medium: Woods & Poole Economics Inc.

Appendix B-2

Demand Forecast Model Summary Tables

CASCADE NATURAL GAS CORPORATION
CORE DEMAND LOW FORECAST SUMMARY TABLE

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
QTR (Bend Area)																								
Total Thems Pct. Growth	0.08%	1.78%	2.16%	2.42%	2.70%	2.75%	2.60%	2.49%	2.38%	2.26%	2.16%	2.06%	1.97%	1.88%	1.82%	1.75%	1.67%	1.60%	1.54%	1.48%	1.41%	1.25%	1.21%	
Residential Thems	27,945,907	28,757,567	29,676,033	30,657,189	31,726,103	32,825,115	33,866,102	34,942,534	35,963,530	36,988,987	37,929,060	38,873,433	39,794,303	40,691,699	41,566,717	42,419,543	43,248,673	44,055,995	44,841,290	45,606,517	46,349,742	47,025,099	47,681,942	
Commercial Thems	17,609,173	18,008,917	18,087,257	18,162,189	18,208,157	18,243,982	18,270,740	18,293,404	18,312,969	18,329,817	18,344,336	18,357,020	18,368,258	18,377,489	18,385,165	18,391,750	18,396,680	18,401,100	18,405,150	18,408,900	18,412,350	18,415,550	18,418,450	
Industrial Thems	2,598,288	2,490,878	2,311,315	2,126,536	2,135,268	2,058,417	1,986,386	1,918,466	1,856,270	1,792,173	1,735,356	1,682,021	1,632,729	1,575,115	1,483,400	1,454,862	1,419,737	1,387,070	1,361,110	1,340,770	1,323,210	1,292,230	1,263,780	
Int., Inst., & CmcI. Interrup. Thems	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Core Thems (Cust unchanged)	48,162,368	49,017,435	50,074,605	51,286,678	52,669,547	54,115,514	55,525,209	56,980,395	58,261,675	59,577,977	60,886,025	62,120,458	63,243,090	64,338,036	65,170,150	66,558,549	67,073,726	69,063,723	70,126,018	72,169,877	73,078,677	74,075,707	75,067,707	
Daily BaseLoad Thems	41,574	42,312	43,225	44,271	45,465	46,713	47,930	49,224	50,292	51,428	52,540	53,623	54,678	55,708	56,721	57,713	58,678	59,618	60,533	61,429	62,297	63,079	63,843	
Peak Day Thems	555,390	565,250	577,441	591,418	607,365	624,039	640,295	656,246	671,851	687,030	701,884	716,349	724,205	734,200	744,205	757,744	770,387	783,847	798,416	808,665	820,637	832,235	842,690	
Thems Per Residential Customer	740	737	733	729	726	722	719	716	714	711	709	707	705	703	701	699	697	696	694	693	691	690	689	
Thems Per Commercial Customer	3047	3047	3046	3045	3045	3044	3043	3043	3042	3041	3040	3040	3039	3038	3038	3037	3036	3035	3034	3033	3033	3033	3032	
Residential Customers	37,756	39,031	40,481	42,027	43,707	45,434	47,120	48,771	50,395	51,924	53,504	55,006	56,478	57,913	59,317	60,698	62,024	64,002	65,945	67,854	69,730	71,584	73,421	
Commercial Customers	5,778	5,845	5,938	6,046	6,167	6,314	6,455	6,589	6,720	6,848	6,973	7,094	7,213	7,329	7,444	7,555	7,664	7,771	7,874	7,976	8,076	8,164	8,250	
Industrial Customers	65	63	61	60	58	57	56	55	54	54	53	52	51	51	50	49	48	47	46	46	47	46	46	
Int., Inst., & CmcI. Interrup. Cust.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Total Core Customers	43,599	44,939	46,480	48,133	49,943	51,809	53,631	55,415	57,160	58,865	60,530	62,154	63,742	65,293	66,810	68,293	69,737	71,148	72,524	73,869	75,178	76,435	77,643	
Zone 11 (Yakima Area)																								
Total Thems Pct. Growth	0.68%	-0.27%	-0.35%	-0.23%	-0.25%	-0.24%	-0.27%	-0.27%	-0.29%	-0.28%	-0.31%	-0.34%	-0.33%	-0.34%	-0.37%	-0.38%	-0.40%	-0.41%	-0.42%	-0.43%	-0.43%	-0.45%	-0.45%	
Residential Thems	13,653,800	13,811,169	13,765,119	13,733,038	13,699,829	13,666,164	13,630,079	13,593,111	13,554,743	13,515,305	13,475,240	13,433,158	13,390,190	13,346,348	13,301,529	13,256,470	13,209,811	13,162,361	13,114,085	13,065,199	13,015,939	12,965,399	12,914,294	
Commercial Thems	16,616,685	16,801,722	16,882,956	16,967,394	17,054,988	17,145,777	17,239,729	17,337,807	17,439,968	17,546,256	17,656,720	17,771,408	17,891,260	18,015,320	18,143,620	18,276,200	18,413,100	18,554,360	18,700,020	18,850,220	19,005,000	19,164,400	19,328,500	
Industrial Thems	3,473,021	3,442,334	3,389,984	3,330,624	3,275,091	3,223,316	3,175,242	3,131,824	3,092,008	3,055,752	3,023,000	2,993,600	2,966,500	2,941,600	2,918,800	2,898,100	2,879,400	2,862,600	2,847,800	2,834,000	2,821,200	2,809,400	2,798,600	
Int., Inst., & CmcI. Interrup. Thems	428,240	422,493	418,283	414,127	410,007	405,927	401,888	397,880	393,930	390,011	386,133	382,288	378,484	374,718	371,089	367,587	364,213	360,965	357,843	354,845	351,967	349,201	346,546	
Total Core Thems	34,370,246	34,277,719	34,196,308	34,079,181	33,915,628	33,712,498	33,520,538	33,370,150	33,213,748	33,037,058	32,833,130	32,613,980	32,390,090	32,172,390	31,960,920	31,755,820	31,557,260	31,364,420	31,177,460	31,000,000	30,831,000	30,669,000	30,514,000	
Daily BaseLoad Thems	21,341	21,283	21,208	21,108	21,056	20,999	20,943	20,887	20,832	20,779	20,728	20,679	20,621	20,565	20,470	20,399	20,318	20,235	20,150	20,064	19,978	19,889	19,799	
Peak Day Thems	347,490	346,555	345,327	344,547	343,701	342,882	341,932	341,019	340,024	339,066	338,016	336,983	335,770	334,463	333,048	331,544	330,043	329,493	328,105	326,780	325,300	323,860	322,303	
Thems Per Residential Customer	681	680	678	677	675	674	673	671	670	668	666	664	662	660	658	656	654	652	650	648	646	644	642	
Thems Per Commercial Customer	4203	4195	4187	4179	4171	4163	4155	4147	4139	4131	4123	4115	4107	4099	4092	4084	4076	4068	4060	4053	4045	4037	4029	
Residential Customers	20,340	20,340	20,340	20,340	20,290	20,240	20,190	20,140	20,090	20,040	19,990	19,940	19,890	19,840	19,790	19,740	19,690	19,640	19,590	19,540	19,490	19,440	19,390	
Commercial Customers	3,958	3,958	3,961	3,973	3,971	3,975	3,981	3,983	3,984	3,984	3,984	3,984	3,984	3,984	3,984	3,984	3,984	3,984	3,984	3,984	3,984	3,984	3,984	
Industrial Customers	105	104	103	102	102	102	101	101	101	100	99	98	98	97	97	96	95	94	93	92	91	91	90	
Int., Inst., & CmcI. Interrup. Cust.	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
Total Core Customers	24,403	24,385	24,362	24,362	24,359	24,356	24,347	24,337	24,323	24,307	24,289	24,268	24,242	24,215	24,186	24,157	24,124	24,088	24,051	24,013	23,973	23,930	23,886	
Zone 10 (Sunmysis Area)																								
Total Thems Pct. Growth	-2.83%	-0.22%	-0.19%	-0.04%	-0.05%	-0.06%	-0.11%	-0.10%	-0.14%	-0.16%	-0.19%	-0.23%	-0.24%	-0.26%	-0.27%	-0.27%	-0.31%	-0.32%	-0.33%	-0.34%	-0.36%	-0.38%		
Residential Thems	3,147,330	3,155,631	3,171,281	3,174,686	3,177,859	3,180,766	3,182,211	3,183,687	3,184,117	3,183,958	3,183,838	3,180,410	3,177,631	3,174,256	3,170,583	3,166,538	3,161,475	3,156,032	3,149,981	3,143,692	3,136,652	3,129,138	3,121,359	
Commercial Thems	4,807,330	4,801,503	4,795,915	4,782,451	4,768,958	4,754,422	4,737,358	4,720,572	4,701,950	4,682,409	4,661,318	4,638,620	4,614,521	4,589,224	4,562,775	4,541,024	4,513,622	4,485,211	4,455,152	4,423,973	4,391,322	4,357,382	4,348,803	
Industrial Thems	1,373,145	1,351,029	1,324,225	1,331,181	1,338,229	1,345,086	1,351,202	1,357,684	1,363,604	1,369,013	1,374,202	1,378,073	1,381,629	1,384,933	1,387,929	1,391,666	1,395,161	1,398,329	1,401,219	1,403,869	1,406,294	1,408,504	1,410,587	
Int., Inst., & CmcI. Interrup. Thems	76,585	75,823	75,069	74,322	73,582	72,850	72,125	71,408	70,697	69,994	69,297	68,608	67,925	67,249	66,580	65,918	65,261	64,612	63,970	63,333	62,703	62,079	61,461	
Total Core Thems	9,404,390	9,385,987	9,366,491	9,346,640	9,328,324	9,313,114	9,303,331	9,300,399	9,306,374	9,308,374	9,308,724	9,296,133	9,283,570	9,270,924	9,258,294	9,245,664	9,233,034	9,220,404	9,207,774	9,195,144	9,182,514	9,169,884	9,157,254	
Daily BaseLoad Thems	61,720	61,714	61,702	61,690	61,678	61,666	61,654	61,642	61,630	61,618	61,606	61,594	61,582	61,570	61,558	61,546	61,534	61,522	61,510	61,498	61,486	61,474	61,462	
Peak Day Thems	96,030	95,822	95,643	95,604	95,560	95,507	95,454	95,390	95,326	95,262	95,198	95,134	95,070											

Zone 30-W (Bellingham/Vt Merron Areas)

2.34%	1.18%	1.20%	1.31%	1.21%	1.17%	1.14%	1.09%	1.05%	1.04%	1.02%	0.99%	0.97%	0.94%	0.89%	0.86%	0.84%	0.81%	0.78%	0.75%	0.72%	0.71%	0.68%	0.65%	
54,974,080	55,763,909	56,613,402	57,523,473	58,395,113	59,249,587	60,080,063	60,895,286	61,689,440	62,464,656	63,219,620	64,015,160	64,780,860	65,487,770	66,197,490	66,898,663	67,580,224	68,213,961	68,884,882	69,468,015	70,066,469	70,649,885	71,216,187	71,765,187	
28,637,776	28,911,126	29,181,824	29,462,408	29,735,826	30,001,270	30,250,235	30,494,035	30,728,821	30,945,527	31,154,285	31,348,037	31,534,432	31,711,946	31,882,282	32,045,326	32,196,257	32,340,224	32,475,760	32,605,779	32,726,839	32,839,450	32,947,065	33,050,685	
3,043,553	2,996,908	2,940,617	2,922,817	2,879,761	2,839,378	2,791,710	2,739,803	2,704,821	2,672,529	2,642,511	2,614,220	2,587,247	2,560,000	2,533,000	2,506,445	2,480,445	2,454,990	2,429,085	2,403,730	2,377,925	2,351,670	2,324,965	2,297,810	
927,484	921,240	915,059	908,939	902,883	896,893	890,962	885,092	879,281	873,477	867,712	861,994	856,323	850,700	845,125	839,600	834,125	828,700	823,425	818,200	813,025	807,900	802,825	797,800	
87,282,893	88,293,184	89,350,901	90,517,337	91,613,580	92,687,116	93,740,977	94,766,498	95,763,305	96,730,920	97,674,332	98,512,566	99,260,620	100,005,776	101,047,866	101,487,340	102,334,500	103,167,329	103,978,828	104,747,113	105,495,156	106,246,634	106,972,046	107,669,288	108,334,570
71,137	71,961	72,823	73,774	74,667	75,542	76,401	77,237	78,049	78,840	79,605	80,453	81,232	81,996	82,714	83,405	84,084	84,738	85,371	85,982	86,593	87,185	87,763	88,326	
982,089	995,447	1,005,349	1,016,626	1,030,249	1,042,887	1,054,641	1,066,514	1,077,426	1,088,387	1,099,411	1,110,426	1,121,432	1,131,461	1,141,811	1,151,722	1,161,021	1,169,841	1,178,582	1,187,021	1,195,454	1,203,616	1,211,461	1,219,000	
736	736	734	733	732	731	730	729	728	727	726	725	724	723	723	722	721	720	719	718	717	716	715	714	
3189	3182	3175	3168	3161	3154	3148	3141	3134	3127	3121	3114	3108	3101	3094	3088	3081	3074	3068	3061	3054	3048	3041	3034	
74,377	75,007	77,162	78,503	79,795	81,066	82,307	83,531	84,729	85,903	87,097	88,261	89,403	90,522	91,620	92,697	93,746	94,774	95,779	96,764	97,725	98,662	99,580	100,485	
9,891	9,986	9,299	9,406	9,510	9,610	9,708	9,803	9,894	9,982	10,066	10,148	10,227	10,304	10,379	10,450	10,500	10,566	10,614	10,674	10,714	10,774	10,833	10,893	
156	155	154	156	158	161	164	166	170	173	177	182	186	191	196	200	206	211	217	223	229	236	243	250	
4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
83,877	85,152	86,511	87,962	89,362	90,740	92,094	93,409	94,704	95,974	97,260	98,512	99,741	100,944	102,124	103,290	104,455	105,599	106,566	107,647	108,672	109,672	110,655	111,620	

Zone 30-S (Bremerton/Grays Harbor Areas)

0.41%	0.13%	0.19%	0.42%	0.61%	0.62%	0.59%	0.61%	0.59%	0.62%	0.57%	0.54%	0.53%	0.52%	0.51%	0.51%	0.48%	0.47%	0.46%	0.46%	0.44%	0.42%	0.55%	
24,447,207	24,566,951	24,692,129	24,896,875	25,175,752	25,459,388	25,753,113	26,015,282	26,291,212	26,662,620	26,836,084	27,094,375	27,353,304	27,609,662	27,896,330	28,122,783	28,368,630	28,613,691	28,854,259	29,095,991	29,331,255	29,560,084	29,848,267	30,136,893
13,162,398	13,177,453	13,188,375	13,211,951	13,237,390	13,261,012	13,280,928	13,299,526	13,320,112	13,342,120	13,348,102	13,348,102	13,354,104	13,355,080	13,354,555	13,352,299	13,347,704	13,341,515	13,333,642	13,324,565	13,313,679	13,301,048	13,287,193	13,271,931
574,518	524,388	454,380	442,590	409,388	379,057	352,137	327,208	304,352	284,424	265,719	248,876	233,726	219,973	206,221	193,240	181,599	170,585	160,289	150,326	140,100	134,147	126,537	118,530
2,343,495	2,300,088	2,297,003	2,274,147	2,251,519	2,229,116	2,206,938	2,184,977	2,163,238	2,141,711	2,120,401	2,099,302	2,078,414	2,057,733	2,037,269	2,016,988	1,996,918	1,977,049	1,957,371	1,937,900	1,918,618	1,899,627	1,880,927	1,862,410
40,527,528	40,578,877	40,655,066	40,825,563	41,074,051	41,328,553	41,573,573	41,828,992	42,074,330	42,321,888	42,562,330	42,790,655	43,019,548	43,242,468	43,464,364	43,685,311	43,894,851	44,102,840	44,305,566	44,509,082	44,705,631	44,894,806	45,126,244	45,348,786
36,616	36,863	36,732	36,896	37,110	37,340	37,562	37,791	38,014	38,238	38,465	38,681	38,898	39,099	39,270	39,429	39,599	39,847	40,030	40,214	40,391	40,562	40,738	40,919
425,700	425,200	427,040	428,811	431,441	434,144	436,898	439,590	441,948	444,549	447,074	449,472	451,976	454,218	456,544	458,969	461,070	463,255	465,364	467,522	469,587	471,574	473,477	475,300
745	740	740	739	739	738	738	737	737	736	735	734	733	732	731	730	729	728	727	726	725	724	723	722
3751	3754	3752	3761	3749	3748	3746	3745	3744	3742	3741	3739	3738	3737	3736	3735	3734	3732	3731	3729	3728	3726	3724	3724
33,408	33,715	33,961	34,207	34,453	34,699	34,945	35,191	35,437	35,683	35,929	36,175	36,421	36,667	36,913	37,159	37,405	37,651	37,897	38,143	38,389	38,242	38,095	37,948
3,505	3,511	3,515	3,522	3,531	3,538	3,545	3,551	3,557	3,562	3,566	3,570	3,573	3,574	3,576	3,576	3,576	3,576	3,576	3,575	3,574	3,573	3,571	3,568
19	19	18	18	17	16	16	16	16	16	15	15	14	13	13	13	13	13	13	13	13	12	12	12
4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
36,542	36,798	36,908	37,205	37,603	38,007	38,398	38,799	39,192	39,584	39,967	40,335	40,703	41,067	41,431	41,795	42,144	42,492	42,833	43,176	43,510	43,835	44,241	44,626

Zn ME-WA (Walla Walla)

1.03%	-0.14%	-0.04%	0.19%	0.21%	0.19%	0.17%	0.15%	0.13%	0.11%	0.10%	0.08%	0.06%	0.04%	0.04%	0.04%	0.02%	0.01%	0.00%	-0.02%	-0.03%	-0.05%	-0.06%	-0.07%
6,854,596	6,874,218	6,900,937	6,947,130	6,991,218	7,033,243	7,073,248	7,111,277	7,147,311	7,181,570	7,213,916	7,244,448	7,273,204	7,300,223	7,325,543	7,349,201	7,371,232	7,391,673	7,410,559	7,427,923	7,443,800	7,458,228	7,471,225	7,481,999
3,962,706	3,935,542	3,911,720	3,891,125	3,873,647	3,856,037	3,838,302	3,820,445	3,802,474	3,784,392	3,766,205	3,747,919	3,729,537	3,711,066	3,692,509	3,673,871	3,655,156	3,636,370	3,617,516	3,598,599	3,579,623	3,560,592	3,541,500	3,522,348
75,458	69,465	63,825	60,318	57,985	55,727	53,525	51,441	49,251	46,864	44,556	42,429	40,452	38,625	36,949	35,423	34,050	32,829	31,761	30,829	29,994	29,256	28,614	28,068
2,343,495	2,300,088	2,297,003	2,274,147	2,251,519	2,229,116	2,206,938	2,184,977	2,163,238	2,141,711	2,120,401	2,099,302	2,078,414	2,057,733	2,037,269	2,016,988	1,996,918	1,977,049	1,957,371	1,937,900	1,918,618	1,899,627	1,880,927	1,862,410
11,030,147	11,015,187	11,011,249	11,031,901	11,054,847	11,075,685	11,094,263	11,110,969	11,125,920	11,138,129	11,148,991	11,157,916	11,164,685	11,169,834	11,173,846	11,176,882	11,177,830	11,176,888	11,174,854	11,171,348	11,165,932	11,159,092	11,150,989	11,140,999
7,906	7,899	7,892	7,907	7,923	7,938	7,952	7,964	7,974	7,983	7,991	7,997	8,002	8,008	8,009	8,011	8,011	8,011	8,009	8,007	8,003	7,998		

TOTAL SYSTEM																							
Total Therms Pct. Growth	-0.59%	0.83%	0.82%	1.09%	1.14%	1.14%	1.09%	1.06%	1.09%	0.98%	0.95%	0.90%	0.89%	0.85%	0.80%	0.77%	0.74%	0.71%	0.68%	0.65%	0.61%	0.59%	
Residential Therms	154,468,936	156,605,476	158,970,796	161,523,231	164,179,754	166,836,858	169,410,692	171,937,497	174,392,305	176,785,649	179,142,173	181,418,029	183,638,586	185,799,379	187,906,254	189,959,950	191,940,193	193,867,791	195,736,059	197,569,706	199,330,896	200,983,154	
Commercial Therms	115,961,124	116,599,976	117,296,234	118,113,902	118,991,045	119,874,558	120,707,106	121,521,485	122,295,096	123,035,274	123,739,049	124,401,158	125,037,598	125,645,192	126,231,102	126,795,549	127,326,107	127,835,968	128,322,692	128,793,153	129,239,339	129,662,676	
Industrial Therms	15,551,981	15,214,494	14,895,356	14,780,715	14,696,798	14,639,142	14,597,428	14,567,066	14,485,275	14,478,987	14,471,463	14,462,006	14,519,201	14,566,868	14,558,663	14,538,966	14,548,899	14,546,016	14,538,100	14,525,785	14,572,250	14,621,586	
Ind., Inst., & Cmcl. Interrup. Therms	4,297,769	4,295,025	4,212,697	4,170,770	4,129,270	4,096,193	4,047,655	4,007,232	3,967,359	3,927,883	3,888,800	3,850,106	3,811,797	3,773,669	3,736,318	3,699,141	3,662,334	3,626,993	3,592,815	3,559,086	3,518,732	3,483,720	
Total Core Therms	290,279,830	292,674,974	295,375,073	298,588,618	301,996,868	305,438,741	308,762,731	312,033,280	315,140,036	318,227,793	321,241,505	324,131,298	327,007,492	329,785,308	332,432,338	334,993,646	337,477,334	339,875,668	342,186,706	344,442,740	346,660,717	348,771,136	350,820,328
Daily Baseload Therms	233,592	235,541	237,948	240,678	243,573	246,498	249,329	252,113	254,771	257,411	259,987	262,465	264,927	267,313	269,589	271,791	273,930	275,998	277,993	279,941	281,858	283,682	
Peak Day Therms	3,293,730	3,322,091	3,353,957	3,391,636	3,431,691	3,472,143	3,511,173	3,549,573	3,585,871	3,621,979	3,657,263	3,691,013	3,724,679	3,757,063	3,787,967	3,817,863	3,846,841	3,874,905	3,901,734	3,927,924	3,953,718	3,979,321	
Therms Per Residential Customer	699	697	696	694	693	692	690	689	688	686	685	684	683	682	681	679	678	677	676	675	674	673	
Therms Per Commercial Customer	3569	3564	3558	3551	3544	3538	3531	3524	3518	3511	3504	3498	3492	3485	3479	3473	3466	3460	3454	3448	3442	3436	
Residential Customers	221,032	224,582	228,477	232,652	236,942	241,259	245,459	249,593	253,627	257,573	261,467	265,247	268,948	272,569	276,107	279,572	282,933	286,219	289,421	292,578	295,625	298,513	
Commercial Customers	32,487	32,718	32,970	33,260	33,571	33,885	34,188	34,482	34,767	35,043	35,309	35,563	35,811	36,051	36,285	36,513	36,732	36,945	37,152	37,355	37,551	37,743	
Industrial Customers	495	490	485	487	490	492	496	499	503	507	511	516	521	526	531	537	542	548	555	561	568	575	
Ind., Inst., & Cmcl. Interrup. Cust.	16	16	16	15	15	15	15	15	15	14	14	14	14	14	14	13	13	13	13	13	13	13	
Total Core Customers	254,030	257,806	261,949	266,385	271,018	275,652	280,155	284,589	288,911	293,138	297,301	301,349	305,294	309,156	312,936	316,636	320,221	323,726	327,141	330,507	333,757	336,844	339,934

CASCADE NATURAL GAS CORPORATION
CORE DEMAND MEDIUM FORECAST SUMMARY TABLE

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
OTM (Send Area)																								
Total Thems Pct. Growth	1.04%	2.80%	3.19%	3.45%	3.73%	3.78%	3.64%	3.52%	3.41%	3.29%	3.19%	3.09%	2.99%	2.91%	2.84%	2.77%	2.69%	2.63%	2.56%	2.50%	2.43%	2.27%	2.23%	
Residential Thems	28,232,262	29,636,348	30,890,244	32,232,622	33,691,327	35,207,749	36,722,859	38,237,072	39,749,650	41,260,660	42,769,201	44,274,626	45,779,952	47,281,769	48,783,905	50,285,152	51,783,275	53,280,046	54,774,789	56,269,424	57,761,149	59,174,948	60,621,731	
Commercial Thems	17,966,710	18,353,206	18,827,307	19,358,958	19,973,199	20,683,749	21,480,805	22,369,558	23,352,702	24,441,850	25,637,071	26,938,429	28,346,057	29,861,904	31,487,027	32,220,272	32,962,348	33,713,006	34,481,792	35,268,742	36,075,119	36,902,343	37,750,000	
Industrial Thems	2,624,533	2,500,511	2,381,822	2,307,106	2,244,804	2,185,577	2,130,535	2,078,346	2,029,720	1,984,787	1,943,100	1,894,566	1,849,284	1,807,257	1,767,986	1,731,461	1,700,000	1,673,500	1,652,000	1,635,500	1,624,000	1,617,500	1,611,000	
Ind., Inst., & Cmnd. Interup. Thems	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Core Thems	49,113,749	50,490,065	52,099,377	53,898,326	55,899,404	58,023,096	60,134,276	62,252,977	64,379,069	66,492,277	68,613,992	70,732,503	72,850,907	74,969,423	77,101,383	79,238,037	81,370,142	83,506,517	85,643,788	87,780,968	89,921,769	91,965,954	94,010,884	
Daily BaseLoad Thems	41,994	43,191	44,589	46,132	47,897	49,733	51,568	53,412	55,261	57,107	58,950	60,811	62,664	64,520	66,379	68,240	70,103	72,017	73,899	75,790	77,677	79,578	81,250	
Peak Day Thems	591,000	575,000	562,000	550,000	539,000	529,000	520,000	512,000	505,000	499,000	494,000	489,000	484,000	479,000	474,000	469,000	464,000	459,000	454,000	449,000	444,000	439,000	434,000	
Thems Per Residential Customer	748	740	737	734	731	728	724	721	718	715	712	709	706	703	700	697	694	691	688	685	682	679	676	
Thems Per Commercial Customer	3076	3076	3077	3076	3075	3075	3074	3073	3073	3072	3071	3070	3069	3068	3068	3068	3068	3068	3068	3068	3068	3068	3068	
Residential Customers	38,137	39,921	41,716	43,511	45,305	47,099	48,893	50,687	52,481	54,275	56,069	57,863	59,657	61,451	63,245	65,039	66,833	68,627	70,421	72,215	74,009	75,803	77,597	
Commercial Customers	5,837	5,964	6,119	6,275	6,431	6,587	6,743	6,899	7,055	7,211	7,367	7,523	7,679	7,835	7,991	8,147	8,303	8,459	8,615	8,771	8,927	9,083	9,239	
Industrial Customers	65	64	63	62	61	61	60	60	60	59	59	59	58	58	58	58	58	58	58	58	58	58	58	
Ind., Inst., & Cmnd. Interup. Cust.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Core Customers	44,039	45,849	47,898	50,100	52,506	55,015	57,522	60,034	62,546	65,059	67,572	70,082	72,595	75,109	77,626	80,146	82,664	85,184	87,704	90,228	92,751	95,274	97,801	
Zone 11 (Yakima Area)																								
Total Thems Pct. Growth	1.58%	0.73%	0.65%	0.78%	0.76%	0.79%	0.73%	0.74%	0.71%	0.72%	0.69%	0.67%	0.65%	0.63%	0.63%	0.61%	0.59%	0.58%	0.56%	0.57%	0.56%	0.55%	0.55%	
Residential Thems	14,135,088	14,328,214	14,328,326	14,328,600	14,328,600	14,328,600	14,328,600	14,328,600	14,328,600	14,328,600	14,328,600	14,328,600	14,328,600	14,328,600	14,328,600	14,328,600	14,328,600	14,328,600	14,328,600	14,328,600	14,328,600	14,328,600	14,328,600	14,328,600
Commercial Thems	16,954,071	17,109,042	17,264,013	17,419,013	17,574,013	17,729,013	17,884,013	18,039,013	18,194,013	18,349,013	18,504,013	18,659,013	18,814,013	18,969,013	19,124,013	19,279,013	19,434,013	19,589,013	19,744,013	19,899,013	20,054,013	20,209,013	20,364,013	
Industrial Thems	3,508,102	3,512,051	3,493,350	3,474,650	3,455,950	3,437,250	3,418,550	3,400,000	3,381,500	3,363,000	3,344,500	3,326,000	3,307,500	3,289,000	3,270,500	3,252,000	3,233,500	3,215,000	3,196,500	3,178,000	3,159,500	3,141,000	3,122,500	
Ind., Inst., & Cmnd. Interup. Thems	431,050	431,050	431,050	431,050	431,050	431,050	431,050	431,050	431,050	431,050	431,050	431,050	431,050	431,050	431,050	431,050	431,050	431,050	431,050	431,050	431,050	431,050	431,050	
Total Core Thems	35,028,312	35,285,317	35,514,192	35,790,389	36,066,663	36,342,937	36,619,211	36,895,485	37,171,759	37,448,033	37,724,307	38,000,581	38,276,855	38,553,129	38,829,403	39,105,677	39,381,951	39,658,225	39,934,500	40,210,774	40,487,048	40,763,322	41,039,596	
Daily BaseLoad Thems	21,556	21,757	21,958	22,159	22,360	22,561	22,762	22,963	23,164	23,365	23,566	23,767	23,968	24,169	24,370	24,571	24,772	24,973	25,174	25,375	25,576	25,777	25,978	
Peak Day Thems	351,000	355,000	358,000	361,000	364,000	367,000	370,000	373,000	376,000	379,000	382,000	385,000	388,000	391,000	394,000	397,000	400,000	403,000	406,000	409,000	412,000	415,000	418,000	
Thems Per Residential Customer	688	687	686	685	684	683	682	681	680	679	678	677	676	675	674	673	672	671	670	669	668	667	666	
Thems Per Commercial Customer	4245	4237	4229	4221	4213	4205	4197	4189	4181	4173	4165	4157	4149	4141	4133	4125	4117	4109	4101	4093	4085	4077	4069	
Residential Customers	20,545	20,914	21,283	21,652	22,021	22,390	22,759	23,128	23,497	23,866	24,235	24,604	24,973	25,342	25,711	26,080	26,449	26,818	27,187	27,556	27,925	28,294	28,663	
Commercial Customers	3,994	4,038	4,082	4,126	4,170	4,214	4,258	4,302	4,346	4,390	4,434	4,478	4,522	4,566	4,610	4,654	4,698	4,742	4,786	4,830	4,874	4,918	4,962	
Industrial Customers	106	106	106	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	
Ind., Inst., & Cmnd. Interup. Cust.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Core Customers	24,649	24,879	25,109	25,339	25,569	25,799	26,029	26,259	26,489	26,719	26,949	27,179	27,409	27,639	27,869	28,099	28,329	28,559	28,789	29,019	29,249	29,479	29,709	
Zone 10 (Sunmayside Area)																								
Total Thems Pct. Growth	-2.00%	0.79%	0.82%	0.96%	0.96%	0.95%	0.90%	0.90%	0.86%	0.84%	0.81%	0.77%	0.76%	0.74%	0.74%	0.73%	0.69%	0.67%	0.66%	0.64%	0.62%	0.62%	0.62%	
Residential Thems	3,211,234	3,252,062	3,301,038	3,337,791	3,374,707	3,411,741	3,447,955	3,483,859	3,519,348	3,554,541	3,589,001	3,623,306	3,657,511	3,691,666	3,725,721	3,759,726	3,793,731	3,827,736	3,861,741	3,895,746	3,929,751	3,963,756	3,997,761	
Commercial Thems	4,904,938	4,948,229	4,992,143	5,036,057	5,080,013	5,124,019	5,168,025	5,212,031	5,256,037	5,299,993	5,343,999	5,387,955	5,431,911	5,475,867	5,519,823	5,563,779	5,607,735	5,651,691	5,695,647	5,739,603	5,783,559	5,827,515	5,871,471	
Industrial Thems	1,387,015	1,375,391	1,363,767	1,352,143	1,340,519	1,328,895	1,317,271	1,305,647	1,294,023	1,282,399	1,270,775	1,259,151	1,247,527	1,235,903	1,224,279	1,212,655	1,201,031	1,189,407	1,177,783	1,166,159	1,154,535	1,142,911	1,131,287	
Ind., Inst., & Cmnd. Interup. Thems	77,359	77,359	77,359	77,359	77,359	77,359	77,359	77,359	77,359	77,359	77,359	77,359	77,359	77,359	77,359	77,359	77,359	77,359	77,359	77,359	77,359	77,359	77,359	
Total Core Thems	9,586,546	9,652,041	9,717,536	9,783,031	9,848,526	9,914,021	9,979,516	10,045,011	10,110,506	10,176,001	10,241,496	10,306,991	10,372,486	10,437,981	10,503,476	10,568,971	10,634,466	10,700,000	10,765,500	10,831,000	10,896,500	10,962,000	11,027,500	
Daily BaseLoad Thems	6,797	6,800	6,803	6,806	6,809	6,812	6,815	6,818	6,821	6,824	6,827	6,830	6,833	6,836	6,839	6,842	6,845	6,848	6,851	6,854	6,857	6,860	6,863	
Peak Day Thems	97,000	98,000	99,000	100,000	101,000	102,000	103,000	104,000	105,000	106,000	107,000	108,000	109,000	110,000	11									

Zone 30-W (Bellingham/M Vernon Areas)

Total Thms Pct. Growth	-1.40%	2.18%	2.22%	2.32%	2.23%	2.19%	2.15%	2.11%	2.07%	2.05%	2.04%	2.00%	1.89%	1.96%	1.89%	1.83%	1.79%	1.75%	1.73%	1.72%	1.69%	1.65%	
Residential Thms	56,002.77	57,467.95	58,929.77	60,478.82	62,112.38	63,552.05	65,090.59	66,636.74	68,184.23	69,734.96	71,283.34	72,806.62	74,500.22	76,093.36	77,690.81	79,292.61	80,892.16	82,496.09	84,100.89	85,704.78	87,319.45	88,928.91	
Commercial Thms	29,219.29	29,794.60	30,375.84	30,976.06	31,577.76	32,178.47	32,779.58	33,380.12	33,980.59	34,581.21	35,182.05	35,782.88	36,383.74	36,984.62	37,585.51	38,186.42	38,787.34	39,388.29	39,989.27	40,590.28	41,191.34	41,792.45	
Industrial Thms	3,074.29	3,057.84	3,030.32	3,004.25	3,027.56	3,015.10	3,024.54	3,024.89	3,005.91	3,025.95	3,045.99	3,065.93	3,085.97	3,105.91	3,125.85	3,145.79	3,165.73	3,185.67	3,205.61	3,225.55	3,245.49	3,265.43	
Ind., Inst., & Cmnd. Intersp. Thms	633.92	633.92	633.92	633.92	633.92	633.92	633.92	633.92	633.92	633.92	633.92	633.92	633.92	633.92	633.92	633.92	633.92	633.92	633.92	633.92	633.92	633.92	
Total Core Thms	89,017.023	90,953.984	92,969.732	95,113.023	97,251.457	99,380.540	101,521.660	103,664.547	105,808.459	107,961.989	110,122.111	112,389.842	114,618.499	116,899.427	119,068.177	121,269.407	123,485.311	125,698.019	127,909.487	130,120.932	132,367.176	134,604.735	136,843.696
Daily Baseoad Thms	71,856	73,681	75,609	77,650	79,879	81,721	83,765	85,824	87,899	89,962	92,083	94,206	96,340	98,482	100,634	102,796	104,951	107,112	109,278	111,419	113,510	115,612	
Peak Day Thms	992,000	1,015,000	1,040,000	1,066,000	1,093,000	1,120,000	1,147,000	1,175,000	1,202,000	1,229,000	1,257,000	1,285,000	1,312,000	1,340,000	1,370,000	1,399,000	1,428,000	1,456,000	1,485,000	1,514,000	1,543,000	1,572,000	
Thms Per Residential Customer	743	742	741	740	739	738	737	736	735	734	733	732	731	730	729	728	727	726	725	724	723	722	
Thms Per Commercial Customer	3221	3214	3207	3199	3193	3187	3180	3173	3166	3159	3152	3146	3139	3132	3125	3118	3112	3105	3099	3092	3085	3078	
Residential Customers	75,492	77,445	79,516	81,711	83,890	86,033	88,200	90,492	92,712	94,942	97,220	99,519	101,820	104,131	106,443	108,766	111,123	113,471	115,826	118,180	120,567	122,947	
Commercial Customers	9,071	9,270	9,471	9,676	9,876	10,099	10,298	10,517	10,726	10,935	11,144	11,350	11,567	11,784	11,992	12,207	12,426	12,641	12,861	13,011	13,246	13,486	
Industrial Customers	157	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	
Ind., Inst., & Cmnd. Intersp. Cust.	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
Total Core Customers	84,725	86,877	89,150	91,556	93,940	96,356	98,766	101,194	103,620	106,073	108,547	111,076	113,593	116,119	118,687	121,206	123,750	126,323	128,931	131,481	134,073	136,617	

Zone 30-S (Bremerton/Grays Harbor Areas)

Total Thms Pct. Growth	1.35%	1.13%	1.20%	1.43%	1.62%	1.63%	1.61%	1.62%	1.60%	1.60%	1.58%	1.55%	1.55%	1.53%	1.52%	1.49%	1.48%	1.47%	1.47%	1.45%	1.43%	1.56%	
Residential Thms	24,943.64	25,307.37	25,702.41	26,176.00	26,735.22	27,300.13	27,879.59	28,468.11	29,059.20	29,658.74	30,260.64	30,858.94	31,466.96	32,081.03	32,704.73	33,337.42	33,966.83	34,604.67	35,246.22	35,890.79	36,552.64	37,208.07	
Commercial Thms	13,429.68	13,580.13	13,727.98	13,890.74	14,057.90	14,223.97	14,388.57	14,553.45	14,717.35	14,880.51	15,042.45	15,202.72	15,362.42	15,517.92	15,673.29	15,828.13	15,981.71	16,134.84	16,287.36	16,439.87	16,591.53	16,742.38	
Industrial Thms	580.32	535.00	492.12	460.67	430.40	402.51	377.69	354.78	333.04	314.53	296.61	280.21	265.17	251.04	237.97	225.73	215.20	204.28	193.89	183.94	175.31	167.16	
Ind., Inst., & Cmnd. Intersp. Thms	2,387.07	2,387.07	2,387.07	2,387.07	2,387.07	2,387.07	2,387.07	2,387.07	2,387.07	2,387.07	2,387.07	2,387.07	2,387.07	2,387.07	2,387.07	2,387.07	2,387.07	2,387.07	2,387.07	2,387.07	2,387.07	2,387.07	
Total Core Thms	41,320.629	41,769.584	42,289.610	42,894.833	43,590.662	44,301.698	45,012.923	45,743.138	46,473.166	47,220.667	47,966.812	48,709.374	49,462.462	50,219.173	50,984.709	51,759.424	52,530.885	53,310.738	54,092.511	54,889.638	55,688.754	56,484.994	57,367.782
Daily Baseoad Thms	36,986	37,420	37,891	38,437	39,075	39,727	40,380	41,050	41,724	42,408	43,094	43,777	44,471	45,168	45,874	46,588	47,301	48,021	48,745	49,481	50,218	50,957	
Peak Day Thms	400,000	434,000	459,000	485,000	511,000	539,000	566,000	594,000	622,000	650,000	679,000	708,000	737,000	767,000	797,000	827,000	857,000	887,000	917,000	947,000	977,000	1,007,000	
Thms Per Residential Customer	7793	7488	7428	7379	7329	7279	7229	7179	7129	7079	7029	6979	6929	6879	6829	6779	6729	6679	6629	6579	6529	6479	
Thms Per Commercial Customer	3347	3347	3347	3347	3347	3347	3347	3347	3347	3347	3347	3347	3347	3347	3347	3347	3347	3347	3347	3347	3347	3347	
Residential Customers	3,541	3,562	3,622	3,666	3,712	3,757	3,802	3,847	3,892	3,937	3,981	4,025	4,069	4,112	4,154	4,197	4,239	4,282	4,324	4,366	4,408	4,451	
Commercial Customers	20	19	19	18	18	17	17	17	17	17	17	17	16	16	16	16	16	16	16	16	15	15	
Industrial Customers	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
Ind., Inst., & Cmnd. Intersp. Cust.	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
Total Core Customers	36,911	37,452	38,034	38,725	39,533	40,399	41,194	42,033	42,885	43,749	44,617	45,480	46,347	47,211	48,109	49,058	49,956	50,875	51,799	52,738	53,681	54,625	

Zn ME-WA (Walla Walla)

Total Thms Pct. Growth	2.03%	0.87%	0.97%	1.19%	1.22%	1.20%	1.17%	1.16%	1.14%	1.12%	1.10%	1.09%	1.07%	1.05%	1.04%	1.03%	1.01%	1.00%	0.99%	0.97%	0.96%	0.94%
Residential Thms	6,993.71	7,084.28	7,183.29	7,304.05	7,424.27	7,543.97	7,663.13	7,781.76	7,899.86	8,017.46	8,134.46	8,251.01	8,367.01	8,482.50	8,597.47	8,711.91	8,826.85	8,939.28	9,052.18	9,164.58	9,276.40	9,387.85
Commercial Thms	4,043.15	4,055.85	4,071.77	4,091.09	4,113.59	4,136.04	4,158.41	4,180.64	4,202.86	4,224.69	4,246.81	4,268.66	4,290.42	4,312.07	4,333.63	4,355.05	4,376.47	4,397.72	4,418.89	4,439.96	4,460.94	4,481.81
Industrial Thms	76,220	70,811	65,375	60,957	56,116	51,176	46,116	40,866	35,436	29,866	24,166	18,366	12,466	6,566	6,566	6,566	6,566	6,566	6,566	6,566	6,566	6,566
Ind., Inst., & Cmnd. Intersp. Thms	138,776	138,776	138,776	138,776	138,776	138,776	138,776	138,776	138,776	138,776	138,776	138,776	138,776	138,776	138,776	138,776	138,776	138,776	138,776	138,776	138,776	138,776
Total Core Thms	11,251,932	11,349,715	11,459,713	11,596,550	11,737,605	11,877,970	12,017,502	12,156,599	12,295,333	12,432,579	12,569,814	12,706,345	12,841,875	12,976,730	13,112,121	13,247,171	13,381,352	13,515,209	13,648,879	13,781,464	13,913,233	14,044,482
Daily Baseoad Thms	7,969	8,056	8,139	8,237	8,340	8,444	8,547	8,650	8,754	8,857	8,961	9,065	9,169	9,271	9,376	9,480	9,585	9,690	9,795	9,900	10,005	
Peak Day Thms	158,000	169,000	180,000	191,000	202,000	213,000	224,000	235,000	246,000	257,000	268,000	279,000	290,000	301,000	312,000	323,000	334,000	345,000	356,000	367,000	378,000	389,000
Thms Per Residential Customer	683	682	680	678	677	676	674	673	672	671	670	669	668	667	666	665	664	663	662	661	660	659
Thms Per Commercial Customer	3400	3394	3387	3379	3371	3363	3356	3349	3342	3336	3329	3323	3317									

TOTAL SYSTEM																							
Total Thems Pct. Growth	0.34%	1.84%	1.94%	2.11%	2.16%	2.19%	2.11%	2.08%	2.01%	2.00%	1.96%	1.91%	1.89%	1.86%	1.82%	1.78%	1.75%	1.72%	1.69%	1.67%	1.65%	1.62%	1.60%
Residential Thems	157,605,281	161,391,072	165,475,175	169,821,800	174,349,614	178,951,910	183,538,888	188,148,528	192,752,708	197,361,611	202,002,571	206,624,800	211,255,920	215,889,614	220,532,232	225,183,166	229,817,267	234,458,151	239,096,680	243,761,950	248,405,974	252,982,867	257,644,820
Commercial Thems	118,315,604	120,163,070	122,095,475	124,182,232	126,361,761	128,579,387	130,773,611	132,979,070	135,170,591	137,355,405	139,529,434	141,688,833	143,842,309	145,993,583	148,148,484	150,306,510	152,452,373	154,601,156	156,749,470	158,905,284	161,058,346	163,235,050	165,365,590
Industrial Thems	15,709,072	15,522,629	15,349,760	15,384,702	15,451,097	15,545,158	15,656,649	15,781,109	15,892,213	16,002,581	16,155,012	16,306,687	16,535,711	16,756,730	16,915,605	17,062,493	17,245,512	17,415,619	17,581,076	17,742,727	17,978,371	18,220,535	18,443,187
Ind., Inst., & Cmcd. Interm. Thems	4,341,201	4,341,201	4,341,201	4,341,201	4,341,201	4,341,201	4,341,201	4,341,201	4,341,201	4,341,201	4,341,201	4,341,201	4,341,201	4,341,201	4,341,201	4,341,201	4,341,201	4,341,201	4,341,201	4,341,201	4,341,201	4,341,201	4,341,201
Total Core Thems	295,971,158	301,417,972	307,261,611	313,729,934	320,503,673	327,417,656	334,310,349	341,249,908	348,114,713	355,060,977	362,028,218	368,958,521	375,975,141	382,981,328	389,937,522	396,893,370	403,856,353	410,816,127	417,768,427	424,751,162	431,763,892	438,779,653	445,794,798
Daily BaseLoad Thems	235,951	240,828	246,074	251,817	257,871	264,059	270,225	276,465	282,660	288,914	295,221	301,502	307,799	314,108	320,389	326,684	332,989	339,302	345,615	351,964	358,363	364,791	371,197
Peak Day Thems	3,327,000	3,393,000	3,461,000	3,538,000	3,620,000	3,705,000	3,791,000	3,878,000	3,964,000	4,051,000	4,138,000	4,226,000	4,314,000	4,400,000	4,488,000	4,574,000	4,663,000	4,751,000	4,837,000	4,925,000	5,014,000	5,102,000	5,189,000
Thems Per Residential Customer	704	704	703	701	700	699	697	696	695	693	692	691	690	689	687	686	685	684	683	682	681	680	679
Thems Per Commercial Customer	3606	3600	3594	3587	3580	3573	3567	3560	3553	3546	3540	3533	3527	3520	3514	3508	3501	3495	3489	3483	3476	3471	3465
Residential Customers	223,265	229,131	235,447	242,136	248,103	254,190	260,270	270,395	277,526	284,677	291,885	299,080	306,301	313,541	320,806	328,099	335,379	342,684	349,999	357,373	364,724	371,989	379,383
Commercial Customers	32,815	33,381	33,976	34,619	35,294	35,983	36,687	37,395	38,043	38,730	39,417	40,100	40,788	41,470	42,159	42,851	43,541	44,234	44,929	45,628	46,328	47,033	47,730
Industrial Customers	500	500	499	507	515	523	532	541	550	560	570	582	593	605	617	630	643	657	671	685	701	717	733
Ind., Inst., & Cmcd. Interm. Cust.	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Total Core Customers	256,596	263,027	269,839	277,290	284,927	292,712	300,464	308,307	316,135	323,963	331,898	339,777	347,694	355,632	363,599	371,594	379,578	387,590	395,615	403,702	411,770	419,765	427,862

CASCADE NATURAL GAS CORPORATION
CORE DEMAND HIGH FORECAST SUMMARY TABLE

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
OTM (Send Area)																								
Total Thems Pct. Growth	1.99%	4.10%	4.49%	4.76%	5.04%	5.09%	4.94%	4.83%	4.71%	4.59%	4.49%	4.39%	4.29%	4.20%	4.14%	4.06%	3.98%	3.92%	3.85%	3.79%	3.72%	3.65%	3.52%	
Residential Thems	29,095,808	30,612,311	32,308,846	34,136,545	36,130,635	38,232,856	40,378,657	42,572,401	44,813,154	47,101,751	49,437,978	51,821,876	54,256,624	56,742,611	59,281,726	61,874,648	64,519,525	67,219,444	69,974,488	72,788,064	75,657,536	78,590,609	81,541,557	
Commercial Thems	18,327,841	18,957,500	19,691,932	20,502,687	21,419,292	22,430,336	23,549,334	24,784,844	26,142,938	27,624,372	29,214,788	30,919,719	32,737,811	34,664,761	36,706,311	38,859,289	41,124,411	43,499,389	45,984,811	48,580,289	51,287,411	54,004,811	56,733,411	
Industrial Thems	19,140,349	2,597,289	2,466,542	0	2,383,571	2,179,220	2,139,434	2,291,627	2,287,847	2,276,542	2,267,884	2,261,194	2,256,542	2,252,811	2,249,999	2,247,611	2,245,611	2,244,111	2,243,111	2,242,611	2,242,111	2,241,611	2,241,111	
Ind., Inst., & Cmnd. Interup. Thems	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Core Thems	50,074,428	52,127,190	54,487,321	57,058,450	59,933,502	62,983,245	66,097,426	69,288,325	72,582,799	75,882,909	79,279,676	82,767,904	86,351,729	90,036,996	93,828,390	97,729,110	101,742,095	105,873,688	108,388,243	111,365,104	114,817,448	118,761,448	123,214,517	
Daily BaseLoad Thems	42,414	44,153	46,139	48,329	50,765	53,540	56,669	60,154	64,004	68,234	72,854	77,874	83,304	89,154	95,434	102,154	109,334	116,974	125,094	133,714	142,834	152,454	162,674	
Peak Day Thems	566,610	589,838	616,317	646,637	678,169	712,678	747,916	784,022	820,961	859,842	900,784	943,804	988,924	1,036,154	1,086,594	1,140,254	1,197,134	1,257,254	1,320,634	1,387,274	1,457,194	1,530,414	1,606,834	
Thems Per Residential Customer	755	742	744	744	744	744	744	744	744	744	744	744	744	744	744	744	744	744	744	744	744	744	744	
Thems Per Commercial Customer	3,109	3,108	3,108	3,107	3,106	3,105	3,104	3,103	3,102	3,101	3,100	3,099	3,098	3,097	3,096	3,095	3,094	3,093	3,092	3,091	3,090	3,089	3,088	
Residential Customers	38,519	40,725	43,200	45,870	48,769	51,871	55,020	58,394	61,941	65,614	69,428	73,394	77,514	81,784	86,314	91,014	95,894	100,954	106,194	111,614	117,314	123,294		
Commercial Customers	5,895	6,099	6,337	6,599	6,886	7,213	7,597	8,028	8,505	8,929	9,397	9,911	10,471	11,079	11,737	12,457	13,241	14,091	14,999	15,969	16,999	18,099		
Industrial Customers	66	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65		
Ind., Inst., & Cmnd. Interup. Cust.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Total Core Customers	44,480	46,890	49,601	52,534	55,760	59,149	62,623	66,179	69,815	73,534	77,336	81,217	85,187	89,246	93,397	97,641	101,976	106,406	110,932	115,560	120,285	125,101		
Zone 11 (Yakima Area)																								
Total Thems Pct. Growth	2.49%	2.06%	1.92%	2.05%	2.03%	2.03%	2.00%	2.00%	1.98%	1.99%	1.99%	1.93%	1.94%	1.93%	1.90%	1.89%	1.87%	1.86%	1.85%	1.84%	1.83%	1.82%	1.81%	
Residential Thems	14,419,204	14,701,932	14,986,340	15,291,633	15,601,775	15,917,583	16,236,802	16,561,231	16,894,272	17,234,350	17,584,021	17,943,811	18,314,254	18,695,911	19,088,333	19,492,111	19,906,911	20,332,311	20,768,911	21,216,311	21,675,111	22,145,911	22,628,311	
Commercial Thems	17,294,848	17,672,465	18,054,171	18,438,234	18,829,704	19,228,332	19,634,704	20,049,534	20,474,332	20,908,632	21,352,932	21,807,732	22,272,532	22,747,932	23,233,532	23,729,932	24,237,732	24,747,532	25,268,932	25,792,532	26,328,932	26,877,532	27,438,932	
Industrial Thems	3,543,163	3,591,788	3,617,612	3,666,834	3,719,014	3,774,234	3,832,534	3,893,934	3,958,434	4,026,134	4,097,034	4,171,234	4,248,734	4,329,534	4,413,734	4,501,534	4,592,934	4,688,134	4,787,134	4,889,334	4,994,534	5,102,734	5,214,134	
Ind., Inst., & Cmnd. Interup. Thems	435,361	440,837	446,382	451,966	457,682	463,434	469,228	475,171	481,248	487,461	493,804	499,334	505,811	512,434	519,111	525,844	532,634	539,484	546,394	553,364	560,394	567,484	574,634	
Total Core Thems	35,692,995	36,407,923	37,104,804	37,863,698	38,680,898	39,541,044	40,202,236	41,017,728	41,886,789	42,809,728	43,784,354	44,811,149	45,890,731	46,923,811	47,914,911	48,868,999	49,790,911	50,676,911	51,524,911	52,342,911	53,132,911	53,906,911	54,666,911	
Daily BaseLoad Thems	21,772	22,207	22,653	23,096	23,564	24,042	24,522	25,014	25,509	26,016	26,526	27,039	27,563	28,089	28,626	29,174	29,734	30,306	30,890	31,486	32,094	32,714	33,346	
Peak Day Thems	354,510	361,606	368,534	376,074	383,694	391,474	399,304	407,302	415,361	423,611	431,924	440,274	448,611	457,044	465,466	473,888	482,311	490,734	499,156	507,578	516,000	524,422	532,844	
Thems Per Residential Customer	695	693	692	691	689	688	686	685	683	682	680	679	678	676	675	673	672	671	669	668	666	665	664	
Thems Per Commercial Customer	4287	4279	4271	4263	4255	4247	4239	4230	4220	4210	4200	4190	4180	4170	4160	4150	4140	4130	4120	4110	4100	4090	4080	
Residential Customers	20,751	21,209	21,667	22,124	22,581	23,037	23,494	23,951	24,407	24,864	25,321	25,778	26,234	26,691	27,148	27,605	28,062	28,519	28,976	29,433	29,890	30,347	30,804	
Commercial Customers	4,034	4,130	4,227	4,324	4,423	4,523	4,624	4,726	4,828	4,931	5,034	5,137	5,241	5,345	5,450	5,555	5,660	5,765	5,870	5,975	6,080	6,185	6,290	
Industrial Customers	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	
Ind., Inst., & Cmnd. Interup. Cust.	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
Total Core Customers	24,896	25,444	25,998	26,589	27,192	27,806	28,429	29,064	29,708	30,364	31,032	31,708	32,397	33,098	33,811	34,538	35,279	36,034	36,799	37,566	38,337	39,109		
Zone 10 (Sunmidside Area)																								
Total Thems Pct. Growth	-1.17%	2.06%	2.09%	2.23%	2.23%	2.22%	2.16%	2.17%	2.13%	2.11%	2.08%	2.04%	2.02%	2.01%	2.00%	1.99%	1.96%	1.95%	1.93%	1.93%	1.91%	1.89%	1.88%	
Residential Thems	3,275,780	3,359,157	3,452,633	3,534,988	3,619,041	3,704,778	3,790,802	3,878,890	3,969,660	4,057,741	4,148,815	4,239,781	4,332,467	4,426,347	4,521,831	4,618,824	4,716,373	4,815,388	4,915,522	5,016,238	5,120,128	5,223,977	5,329,566	
Commercial Thems	5,003,527	5,111,180	5,221,402	5,335,887	5,453,987	5,575,835	5,692,365	5,812,331	5,935,988	6,062,415	6,192,661	6,321,778	6,454,811	6,591,811	6,732,833	6,877,911	7,027,111	7,180,444	7,337,911	7,499,511	7,665,266	7,835,177	8,009,244	
Industrial Thems	1,400,885	1,400,885	1,413,160	1,422,988	1,432,988	1,443,634	1,454,934	1,466,834	1,479,334	1,492,434	1,505,134	1,517,434	1,529,334	1,540,834	1,552,934	1,564,634	1,576,034	1,587,134	1,597,934	1,608,434	1,618,634	1,628,534	1,638,134	
Ind., Inst., & Cmnd. Interup. Thems	78,133	79,115	80,111	81,118	82,139	83,172	84,218	85,277	86,350	87,436	88,534	89,644	90,777	91,919	93,078	94,246	95,434	96,634	97,844	99,066	100,300	101,546	102,804	
Total Core Thems	9,786,325	9,959,139	10,167,305	10,394,238	10,629,202	10,862,702	11,096,384	11,330,634	11,564,511	11,800,011	12,037,233	12,276,111	12,516,666	12,758,911	13,002,833	13,248,444	13,494,755	13,741,777	13,989,511	14,237,955	14,487,111	14,736,977	14,987,555	
Daily BaseLoad Thems	6,965	7,096	7,153	7,312	7,414	7,614	7,814	8,014	8,160	8,311	8,460	8,611	8,761	8,911	9,061	9,211	9,361	9,511	9,661	9,811	9,961	10,111	10,261	
Peak Day Thems	97,970	99,988	102,076	104,354	106,778	109,043	111,404	113,811	116,244	118,696	121,166	123,636	126,111	128,586	131,061	133,536	136,011	138,486	140,961	143,436	145,911	148,386	150,861	
Thems Per Residential Customer	695	694	692	691	689	688	686	685	683	682	680	679	678	676	675	673	672	671	669	668	666	665	664	
Thems Per Commercial Customer	3668	3661	3654	3647	3640	3633	3626	3619	3612	3605	3598	3591	3584	3577	3570	3563	3556	3549	3542	3535	3528	3521	3514	
Residential Customers	5,415	5,564	5,731	5,880	6,032	6,188	6,345	6,506	6,669	6,835	7,002	7,171	7,343	7,518	7,696	7,878	8,061	8,248	8,437	8,629	8,825	9,023	9,224	
Commercial Customers	1,384	1,396	1,429	1,46																				

Zone 30-W (Bellevue/Mt Vernon Areas)

Total Thems Pct. Growth	0.45%	3.48%	3.03%	3.01%	3.52%	3.48%	3.44%	3.40%	3.35%	3.34%	3.32%	3.29%	3.27%	3.24%	3.17%	3.13%	3.11%	3.07%	3.04%	3.01%	3.00%	2.97%	2.94%	
Residential Thems	57,217,682	59,360,451	61,636,059	64,051,947	66,502,107	68,010,802	71,570,244	74,102,057	76,689,897	79,007,016	82,444,413	85,338,121	88,296,709	91,318,549	94,409,719	97,567,615	100,788,145	104,070,033	107,438,164	110,871,044	114,374,052	117,947,304	121,568,116	
Commercial Thems	29,806,546	30,775,775	31,770,792	32,800,668	33,864,040	34,943,800	36,055,528	37,192,555	38,355,536	39,547,999	40,767,515	41,789,829	42,994,884	44,220,779	45,469,995	46,742,446	48,036,236	49,343,848	50,678,212	52,038,866	53,420,621	54,824,210	56,254,546	
Industrial Thems	3,105,039	3,127,024	3,138,108	3,190,068	3,241,616	3,291,690	3,352,490	3,424,418	3,503,047	3,586,308	3,672,327	3,761,000	3,852,249	3,946,099	4,042,579	4,142,788	4,246,744	4,353,468	4,462,952	4,575,228	4,700,123	4,836,776	5,025,050	
Ind., Inst., & Cmnd. Interup. Thems	540,169	545,212	555,386	561,447	572,822	584,522	597,488	611,747	626,333	641,287	656,652	672,451	688,700	705,049	721,708	738,683	756,000	773,683	791,748	810,187	829,000	848,173	867,700	
Total Core Customers	90,769,436	93,911,463	97,201,326	100,712,822	104,263,747	107,877,699	111,588,278	115,377,728	119,245,848	123,226,709	127,319,562	131,504,552	135,799,244	140,195,580	144,642,857	149,170,538	153,807,615	158,532,680	163,351,304	168,265,490	173,316,777	178,470,617	183,741,400	189,224,400
Daily Baseoad Thems	72,575	75,087	77,717	80,523	83,566	86,253	89,220	92,250	95,343	98,526	101,798	105,144	108,578	112,093	115,649	119,269	122,976	126,756	130,607	134,536	138,575	142,696	146,894	
Peak Day Thems	1,001,920	1,036,761	1,072,716	1,111,676	1,152,761	1,196,000	1,231,246	1,273,546	1,316,246	1,360,184	1,405,426	1,451,557	1,499,662	1,547,400	1,596,578	1,646,586	1,697,734	1,749,866	1,803,088	1,857,327	1,913,084	1,969,773	2,027,621	
Thems Per Residential Customer	744	749	748	744	744	744	745	744	744	742	741	742	740	739	738	737	736	734	733	732	731	730	730	
Thems Per Commercial Customer	3253	3246	3239	3232	3225	3211	3205	3198	3191	3184	3177	3170	3163	3156	3149	3143	3136	3130	3123	3116	3110	3103	3100	
Residential Customers	76,247	79,203	82,343	85,682	89,073	92,551	96,107	99,758	103,488	107,310	111,277	115,330	119,481	123,729	128,080	132,534	137,083	141,741	146,502	151,377	156,360	161,451	166,651	
Commercial Customers	9,162	9,481	9,810	10,149	10,490	10,837	11,221	11,594	11,973	12,360	12,754	13,153	13,562	13,978	14,404	14,839	15,281	15,733	16,193	16,664	17,143	17,631	18,130	
Industrial Customers	159	162	164	170	177	183	191	199	207	216	226	237	249	261	274	287	301	316	332	349	367	387	406	
Ind., Inst., & Cmnd. Interup. Cust.	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
Total Core Customers	85,972	88,846	92,321	96,006	99,763	103,596	107,523	111,582	115,672	119,890	124,261	128,725	133,296	137,914	142,763	147,864	152,617	157,794	163,033	168,398	173,976	179,813	185,203	

Zone 30-S (Bremerton/Grays Harbor Areas)

Total Thems Pct. Growth	2.20%	2.41%	2.47%	2.71%	2.90%	2.91%	2.89%	2.90%	2.89%	2.89%	2.89%	2.89%	2.89%	2.81%	2.80%	2.80%	2.77%	2.76%	2.75%	2.75%	2.73%	2.71%	2.84%
Residential Thems	25,444,950	26,140,774	26,882,778	27,732,480	28,670,899	29,653,647	30,654,991	31,695,841	32,769,911	33,875,379	34,973,030	36,139,034	37,294,231	38,500,370	39,742,473	41,020,887	42,341,079	43,688,004	45,026,849	46,437,241	47,877,914	49,349,432	50,964,440
Commercial Thems	13,699,584	14,027,344	14,358,428	14,711,407	15,078,136	15,445,684	15,820,946	16,203,540	16,592,157	16,987,084	17,387,957	17,794,252	18,207,346	18,623,015	19,046,033	19,476,135	19,912,462	20,356,127	20,807,405	21,266,023	21,732,163	22,205,920	22,687,225
Industrial Thems	586,124	587,152	593,633	602,486	612,992	624,781	637,179	650,781	665,173	679,773	695,301	711,773	729,205	747,399	766,288	785,949	806,349	827,452	848,754	871,329	895,088	919,159	944,567
Ind., Inst., & Cmnd. Interup. Thems	2,399,747	2,420,819	2,451,298	2,482,102	2,513,363	2,544,937	2,576,948	2,609,392	2,642,194	2,675,418	2,709,071	2,743,147	2,777,691	2,812,590	2,847,995	2,883,791	2,920,065	2,956,795	2,993,986	3,031,646	3,069,789	3,108,363	3,147,491
Total Core Customers	42,121,405	43,136,088	44,202,107	45,399,502	46,718,513	48,077,029	49,464,061	50,899,504	52,387,026	53,875,182	55,415,466	56,991,586	58,619,586	60,236,442	61,924,758	63,657,101	65,419,155	67,226,404	69,075,052	70,970,549	72,907,262	74,882,336	77,010,933
Daily Baseoad Thems	37,356	38,296	39,202	40,263	41,431	42,638	43,868	45,141	46,443	47,780	49,146	50,538	51,963	53,422	54,919	56,456	58,018	59,621	61,259	62,942	64,677	66,411	68,299
Peak Day Thems	434,300	444,762	455,753	468,095	481,677	495,708	510,008	524,808	539,939	555,498	571,327	587,522	604,119	621,000	638,486	656,347	674,615	693,146	712,190	731,754	751,722	772,004	794,034
Thems Per Residential Customer	755	755	755	755	755	754	754	754	753	753	753	752	752	751	751	750	750	750	750	750	750	749	749
Thems Per Commercial Customer	3831	3829	3828	3827	3825	3824	3822	3821	3819	3818	3816	3815	3813	3812	3811	3809	3808	3806	3805	3802	3800	3800	3799
Residential Customers	331,681	335,821	340,372	345,239	350,392	355,781	361,407	367,273	373,392	379,754	386,367	393,231	400,362	407,762	415,437	423,382	431,603	440,108	448,902	458,084	467,654	477,618	487,984
Commercial Customers	3,576	3,663	3,751	3,845	3,941	4,040	4,139	4,241	4,344	4,450	4,556	4,665	4,775	4,886	4,998	5,113	5,230	5,348	5,469	5,592	5,716	5,843	5,972
Industrial Customers	20	20	20	20	19	19	19	19	19	19	19	19	19	19	19	19	20	20	20	20	20	20	20
Ind., Inst., & Cmnd. Interup. Cust.	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Total Core Customers	37,280	38,306	39,386	40,507	41,674	43,392	44,838	46,335	47,869	49,446	51,063	52,705	54,389	56,122	57,919	59,767	61,627	63,549	65,518	67,545	69,616	71,732	74,004

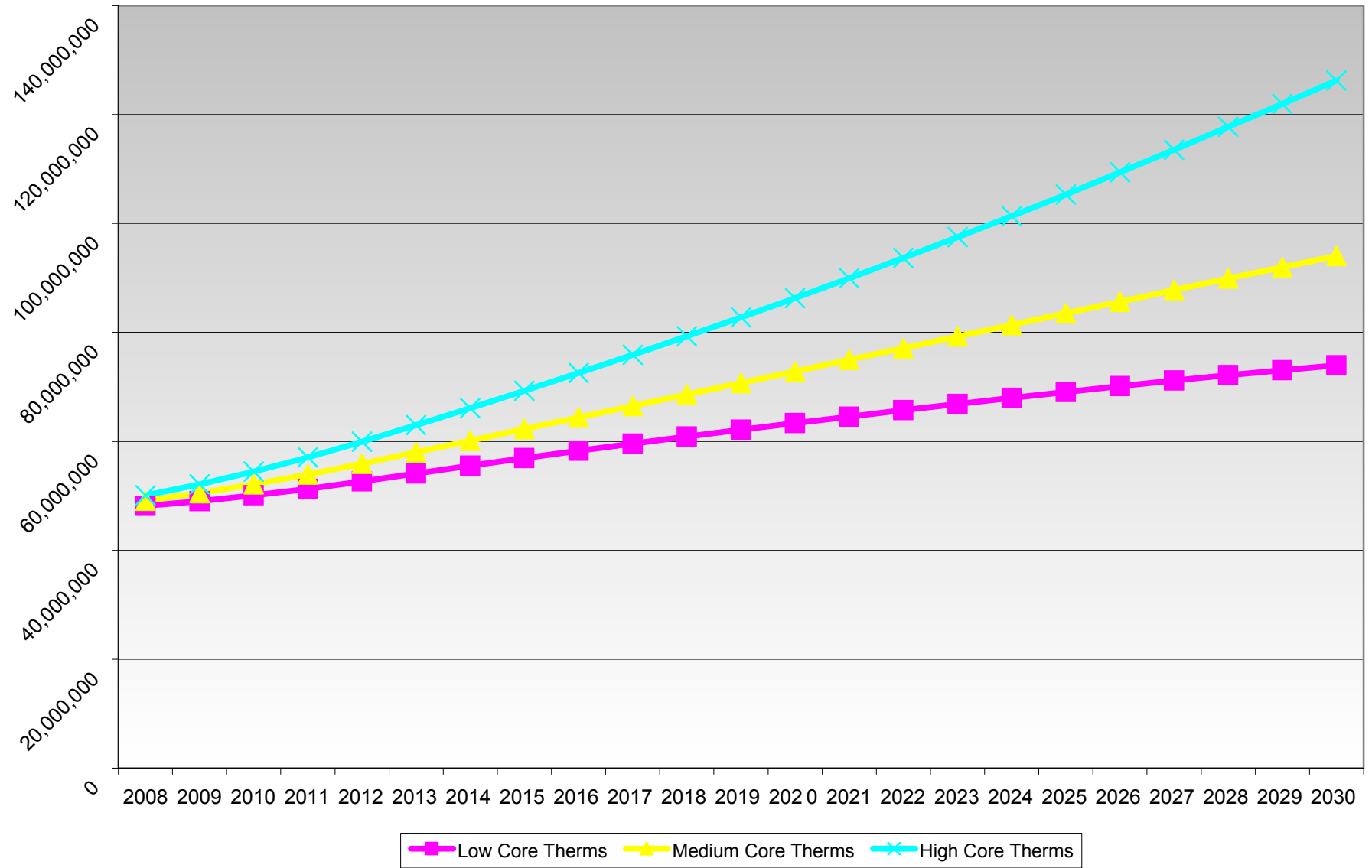
Zn ME-WA (Walla Walla)

Total Thems Pct. Growth	3.03%	2.14%	2.24%	2.47%	2.49%	2.47%	2.45%	2.43%	2.41%	2.39%	2.38%	2.36%	2.34%	2.32%	2.31%	2.30%	2.28%	2.27%	2.26%	2.24%	2.23%	2.21%	2.20%
Residential Thems	7,134,346	7,317,577	7,513,178	7,735,577	7,961,803	8,191,927	8,425,991	8,664,058	8,906,184	9,152,430	9,402,554	9,657,518	9,916,482	10,179,809	10,447,562	10,719,805	11,028,017	11,364,117	11,724,917	12,118,594	12,542,212	12,997,777	13,485,300
Commercial Thems	4,124,433	4,189,368	4,258,762	4,332,738	4,414,422	4,491,296	4,572,368	4,654,657	4,738,180	4,822,954	4,908,995	4,996,322	5,084,952	5,174,920	5,266,191	5,368,838	5,452,860	5,548,276	5,645,106	5,743,399	5,843,085	5,944,272	6,046,951
Industrial Thems	76,983	72,418	68,216	65,823	64,728	63,921	63,285	62,801	62,367	61,985	61,655	61,377	61,142	60,951	60,821	60,740	60,706	60,716	60,768	60,861	60,994	61,166	61,376
Ind., Inst., & Cmnd. Interup. Thems	140,164	141,927	143,712	145,520	147,350	149,204	151,080	152,981	154,905	156,853	158,826	160,824	162,847	164,895	166,970	169,070	171,196	173,350	175,532	177,743	179,978	182,238	184,530
Total Core Customers	11,475,924	11,721,291	11,983,869	12,279,668	12,585,306	12,896,502	13,211,706	13,532,777	13,859,424	14,190,454	14,527,601	14,870,163	15,217,860	15,571,144	15,931,544	16,298,124	16,670,380	17,048,900	17,433,738	17,824,906	18,221,748	18,621,491	19,035,101
Daily Baseoad Thems	8,065	8,238	8,422	8,630	8,845	9,063	9,285	9,511	9,740	9,973	10,210	10,451	10,695	10,943	11,197	11,454	11,716	11,982	12,252				

TOTAL SYSTEM																							
Total Thems Pct. Growth	1.28%	3.12%	3.22%	3.39%	3.45%	3.44%	3.39%	3.36%	3.20%	3.26%	3.25%	3.20%	3.18%	3.15%	3.10%	3.06%	3.03%	3.00%	2.97%	2.95%	2.93%	2.90%	2.89%
Residential Thems	160,773,147	166,705,856	173,074,449	179,854,881	186,972,813	194,322,232	201,810,115	209,480,856	217,306,483	225,301,456	233,499,798	241,846,950	250,377,793	259,088,271	267,988,632	277,082,354	286,341,502	295,798,291	305,444,670	315,321,514	325,370,872	335,533,710	346,015,174
Commercial Thems	120,693,748	124,120,194	127,702,582	131,518,925	135,510,560	139,623,174	143,752,075	148,056,271	152,389,277	156,800,207	161,285,525	165,838,235	170,480,051	175,206,159	180,028,596	184,948,474	189,948,485	195,048,700	200,246,570	205,554,044	210,959,750	216,500,281	222,084,820
Industrial Thems	15,866,163	16,879,059	16,895,725	16,132,308	16,406,724	16,713,212	17,044,814	17,396,411	17,692,367	18,087,102	18,489,088	18,897,425	19,403,873	19,910,562	20,352,157	20,787,108	21,274,353	21,754,438	22,237,353	22,724,099	23,315,532	23,926,910	24,523,831
Ind., Inst., & Cmod. Intersp. Thems	4,384,613	4,439,765	4,465,610	4,552,158	4,609,417	4,697,368	4,726,105	4,785,932	4,845,747	4,906,690	4,968,417	5,030,912	5,094,194	5,158,271	5,223,154	5,288,833	5,355,378	5,422,741	5,490,950	5,560,018	5,629,955	5,700,771	5,772,478
Total Core Thems	301,717,671	311,140,903	321,168,365	332,058,272	343,498,515	355,326,014	367,373,109	379,719,089	392,233,874	405,095,463	418,242,798	431,613,560	445,355,911	459,363,262	473,592,528	488,106,800	502,919,718	518,024,170	533,419,544	549,159,675	565,275,909	581,661,572	598,396,304
Daily Baseload Thems	238,311	245,881	253,948	262,711	271,928	281,459	291,174	301,131	311,235	321,620	332,234	343,036	354,136	365,458	376,959	388,691	400,668	412,881	425,332	438,063	451,101	464,354	477,899
Peak Day Thems	3,360,270	3,496,451	3,579,466	3,702,127	3,831,159	3,964,592	4,100,449	4,239,678	4,380,569	4,525,416	4,673,532	4,824,040	4,976,844	5,136,445	5,296,595	5,459,916	5,626,581	5,796,496	5,969,635	6,146,503	6,327,673	6,511,953	6,699,854
Thems Per Residential Customer	3642	3636	3629	3623	3616	3609	3602	3595	3589	3582	3575	3569	3562	3556	3549	3543	3536	3530	3524	3517	3511	3505	3499
Residential Customers	225,498	234,333	243,622	253,905	264,493	275,440	286,612	298,072	309,790	321,760	334,056	346,590	359,430	372,553	385,981	399,719	413,729	428,058	442,695	457,707	472,999	488,488	504,464
Commercial Customers	33,143	34,138	35,185	36,302	37,474	38,686	39,918	41,180	42,465	43,776	45,112	46,471	47,859	49,276	50,724	52,205	53,713	55,254	56,828	58,436	60,082	61,763	63,467
Industrial Customers	505	511	517	532	547	562	579	596	614	633	653	674	696	719	743	767	793	820	849	878	909	941	975
Ind., Inst., & Cmod. Intersp. Cust.	16	16	17	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20	21	21	21	21
Total Core Customers	259,162	268,999	279,540	290,755	302,531	314,768	327,126	339,865	352,977	366,186	379,639	393,746	408,004	422,967	437,467	452,710	468,255	484,152	500,392	517,044	534,010	551,213	568,907

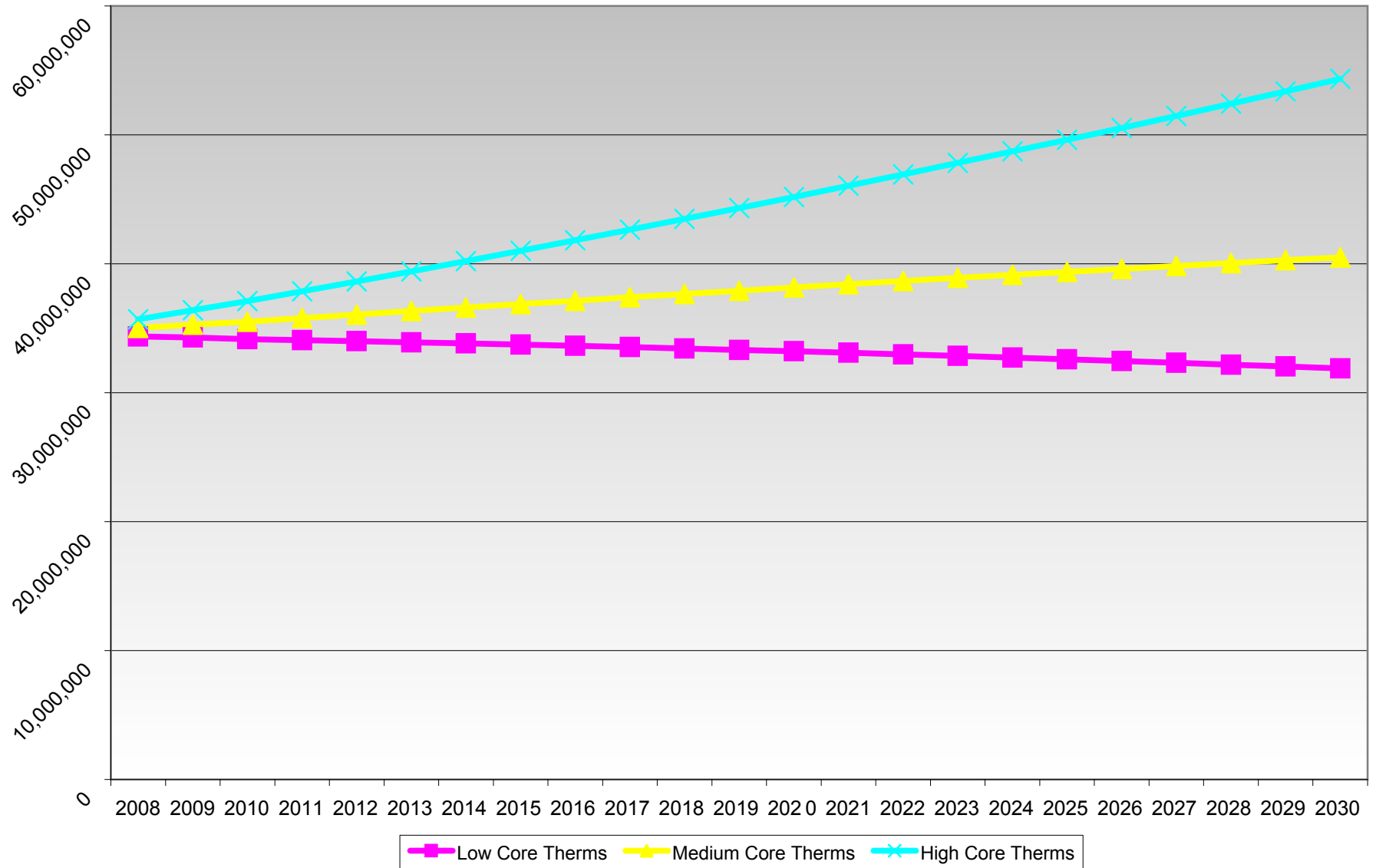
Therms

GTN (BEND AREA)



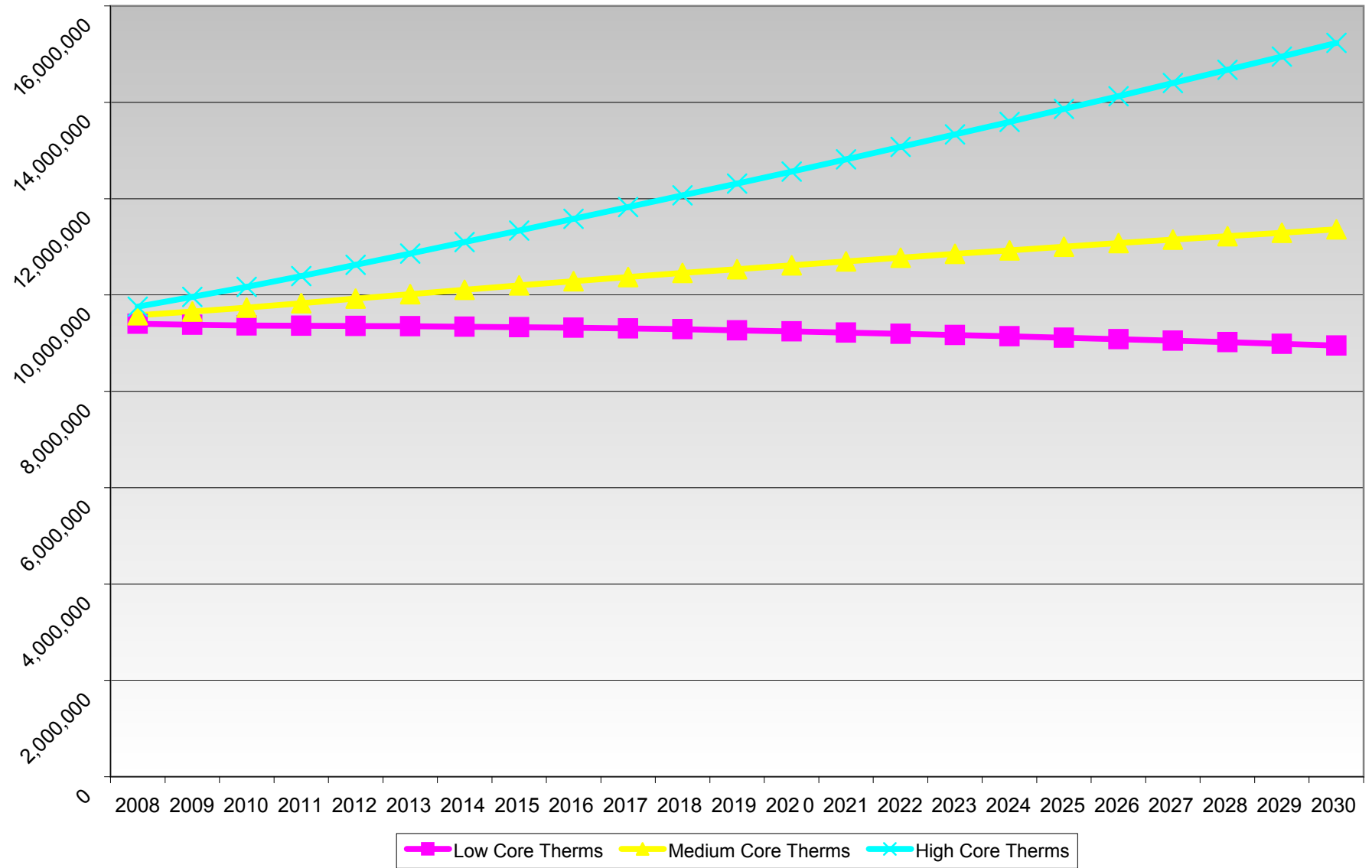
Therms

ZONE 11 (YAKIMA AREA)



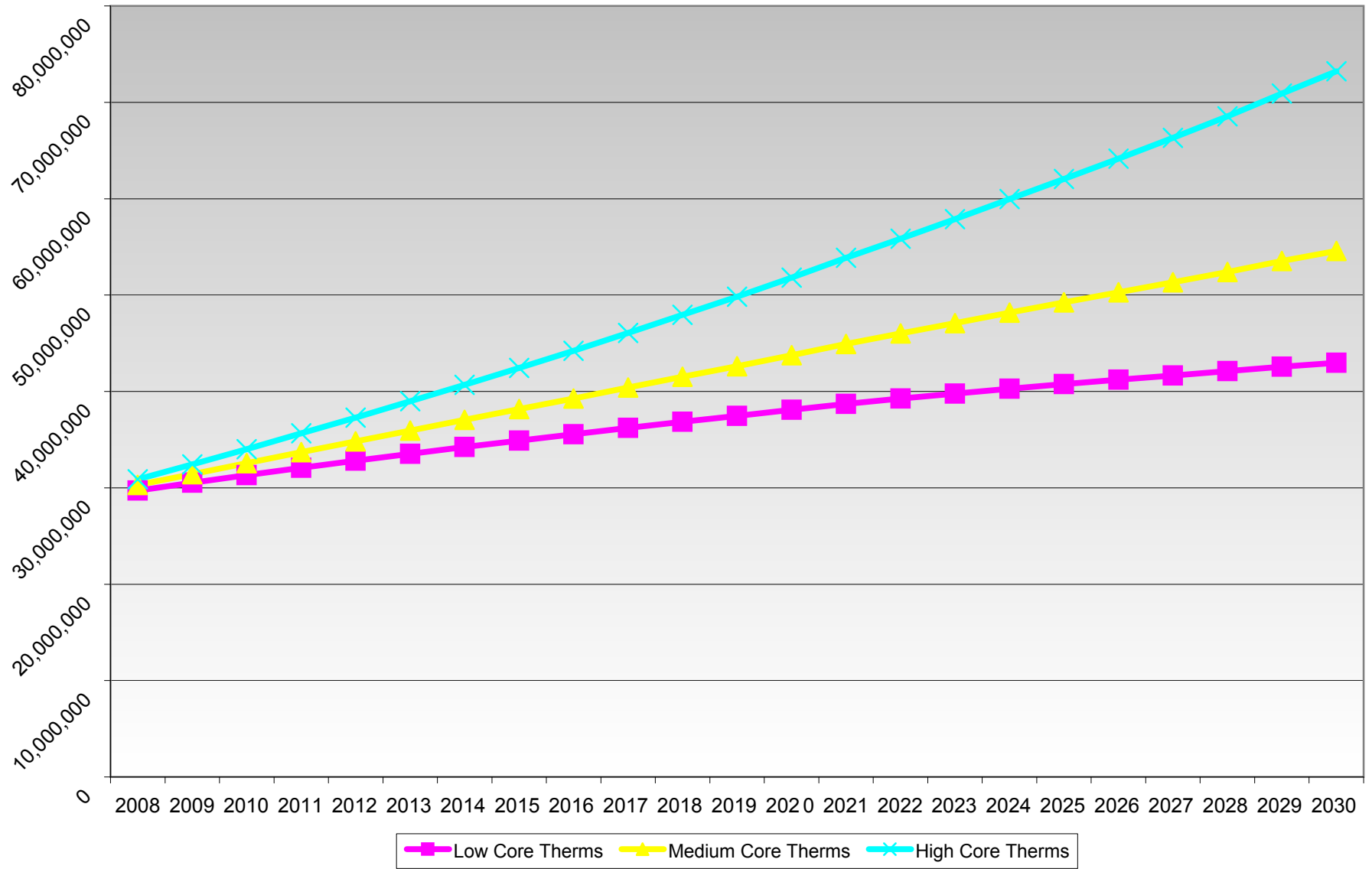
Therms

ZONE 10 (SUNNYSIDE AREA)



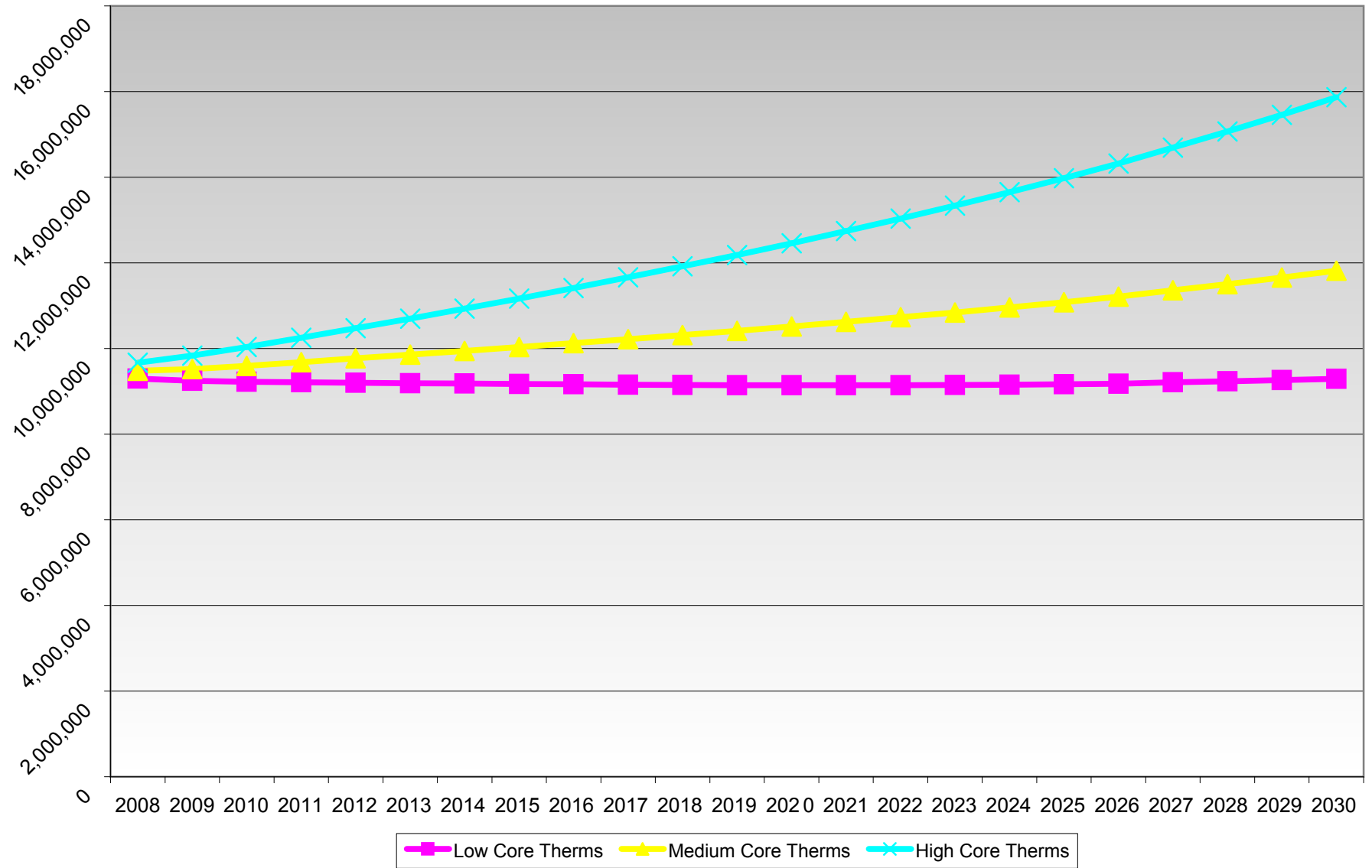
Therms

ZONE 20 (KENNEWICK AREA)



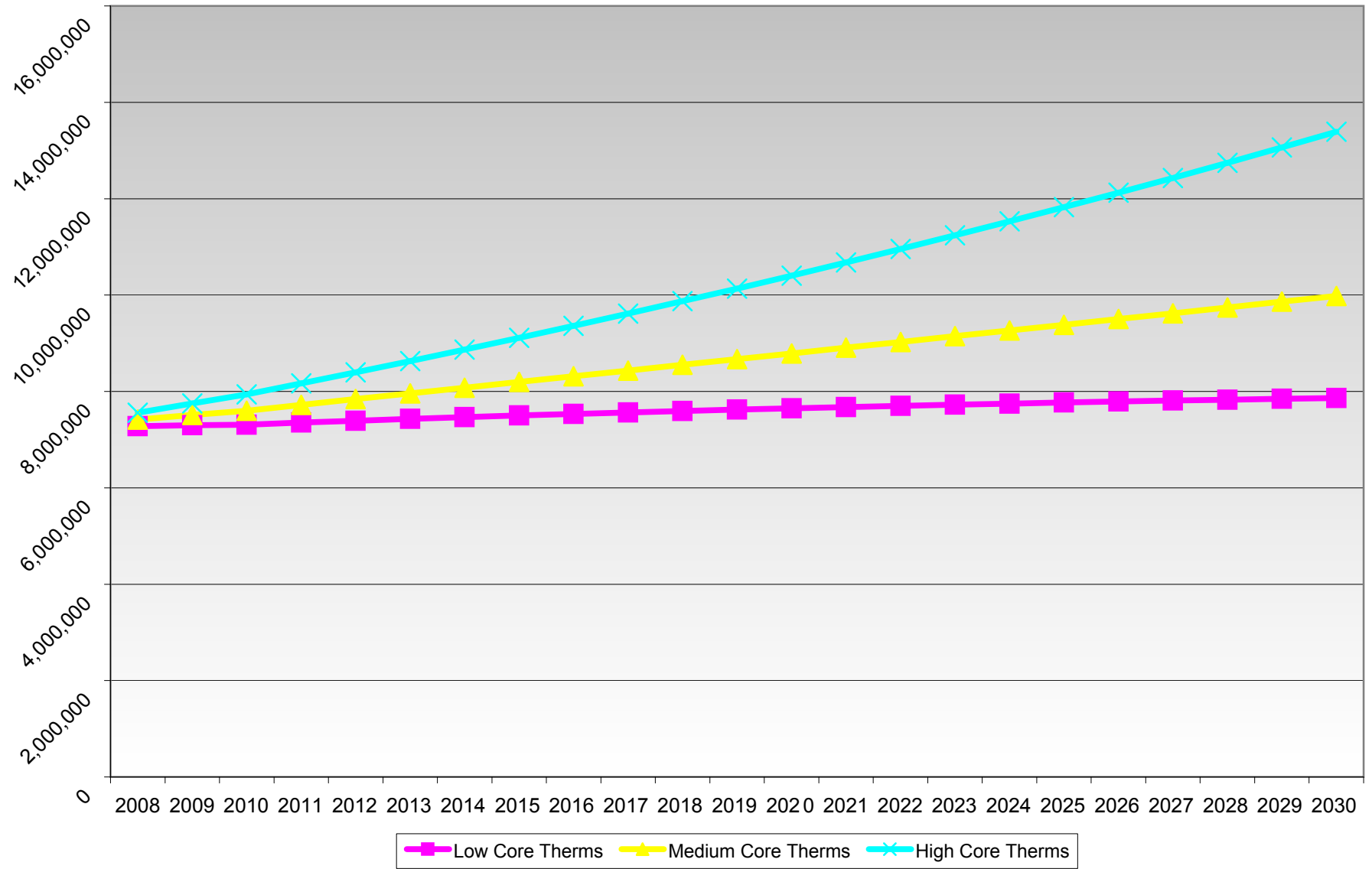
Therms

ZONE 24 (BAKERONT)



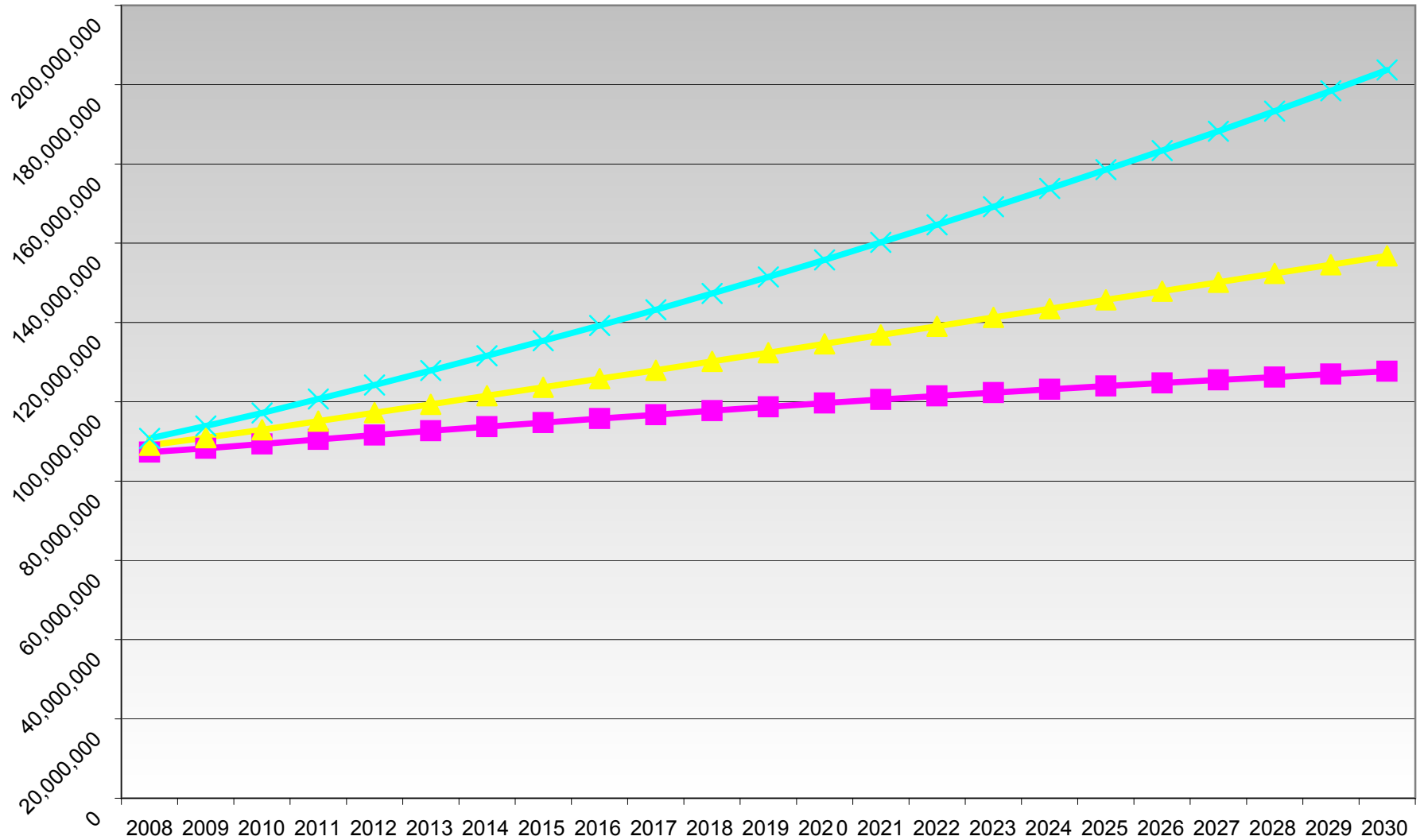
Therms

ZONE 26 (LONGVIEW AREA)



Therms

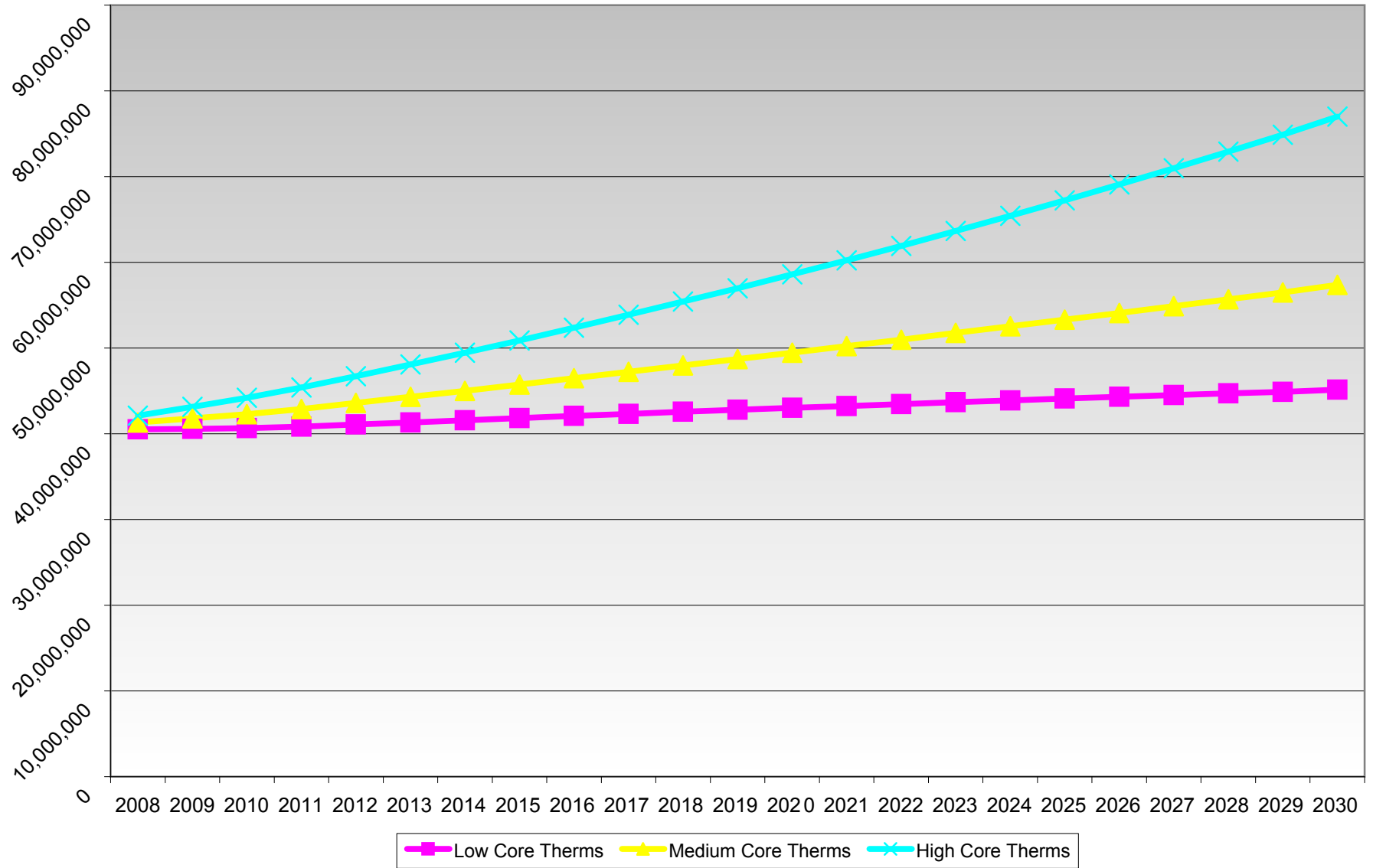
ZONE 30-W (BELLINGHAM/MT VERNON AREAS)



Low Core Therms Medium Core Therms High Core Therms

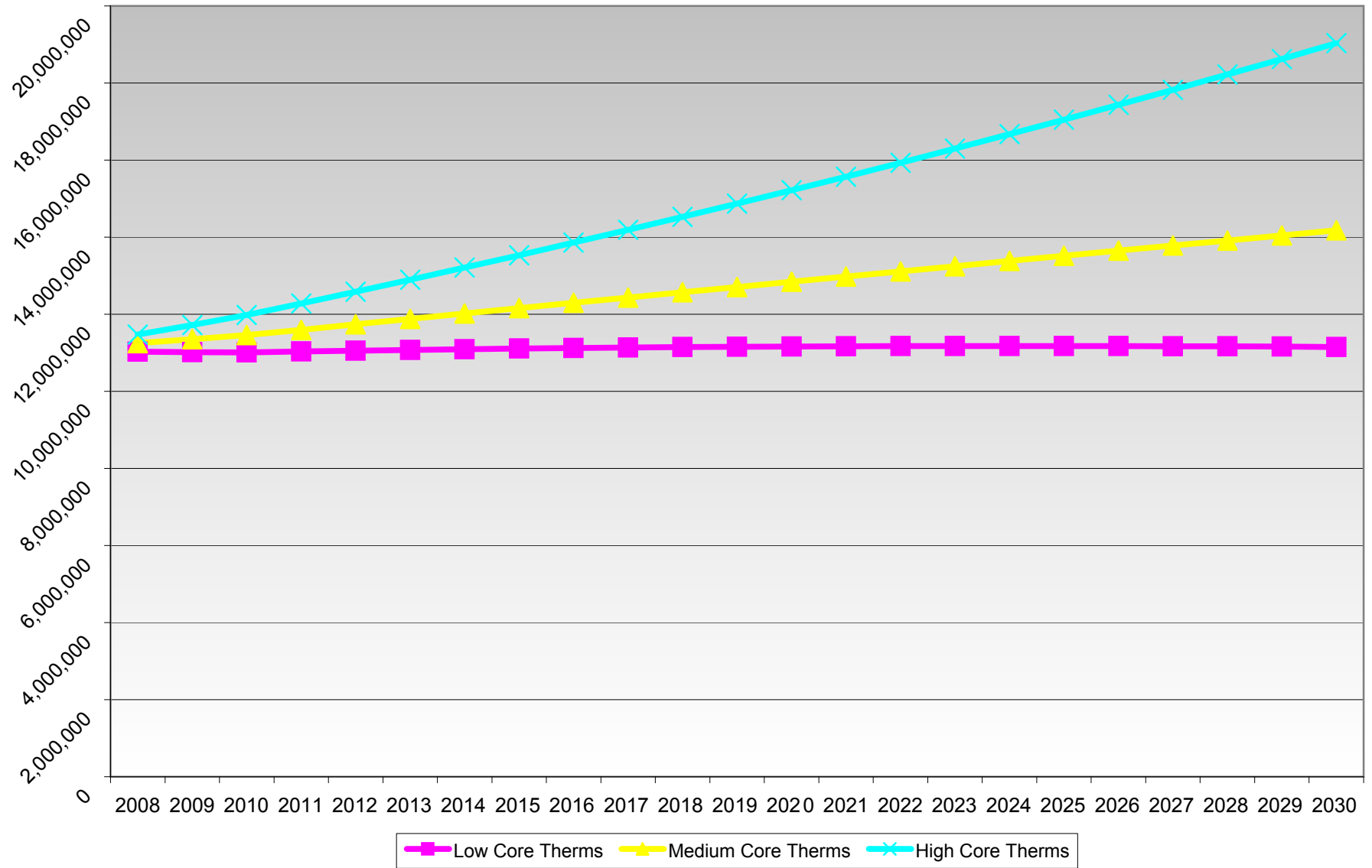
Therms

ZONE 30-S (BREMERTON/GRAYS HARBOR AREAS)



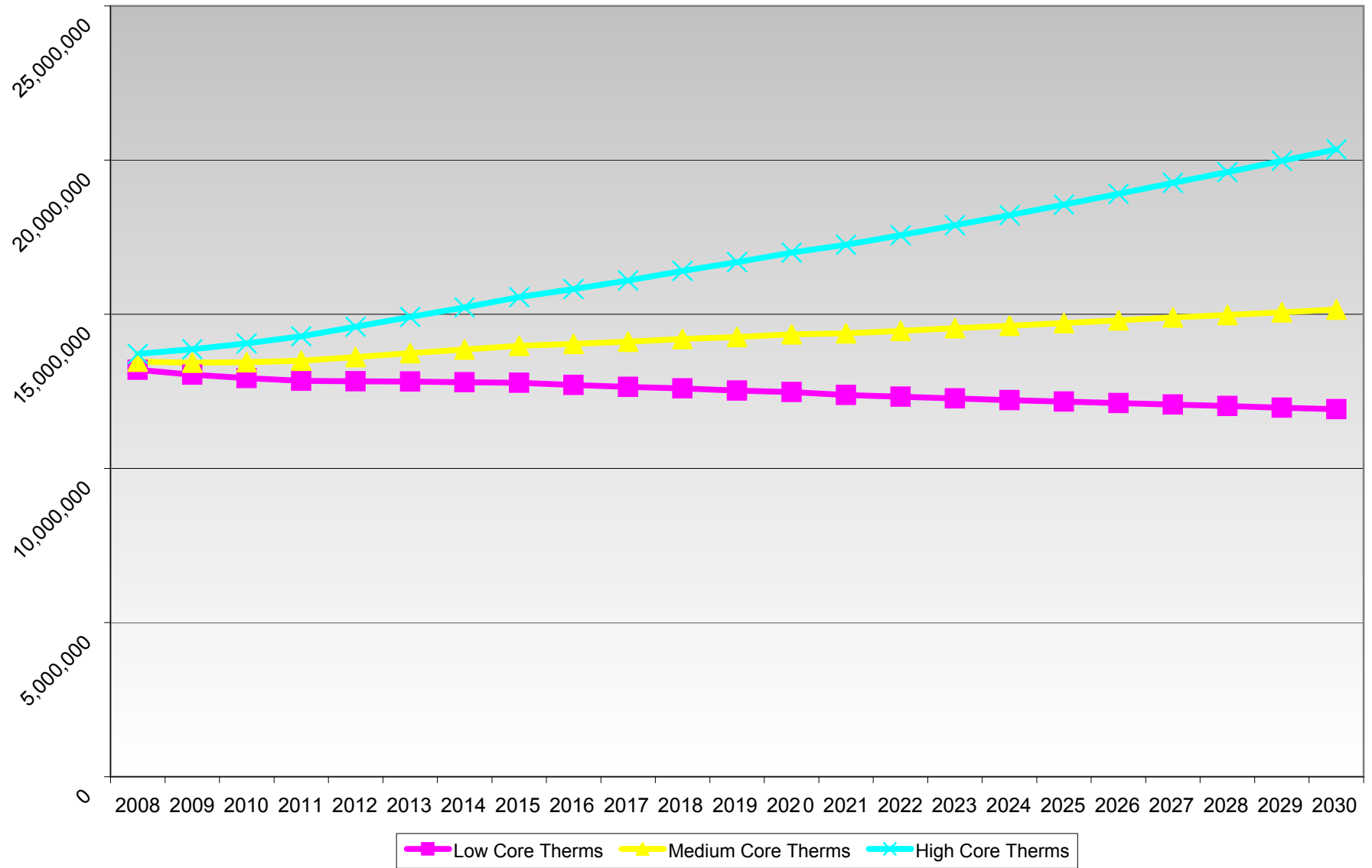
Therms

ZONE ME-WA (WALLA WALLA)



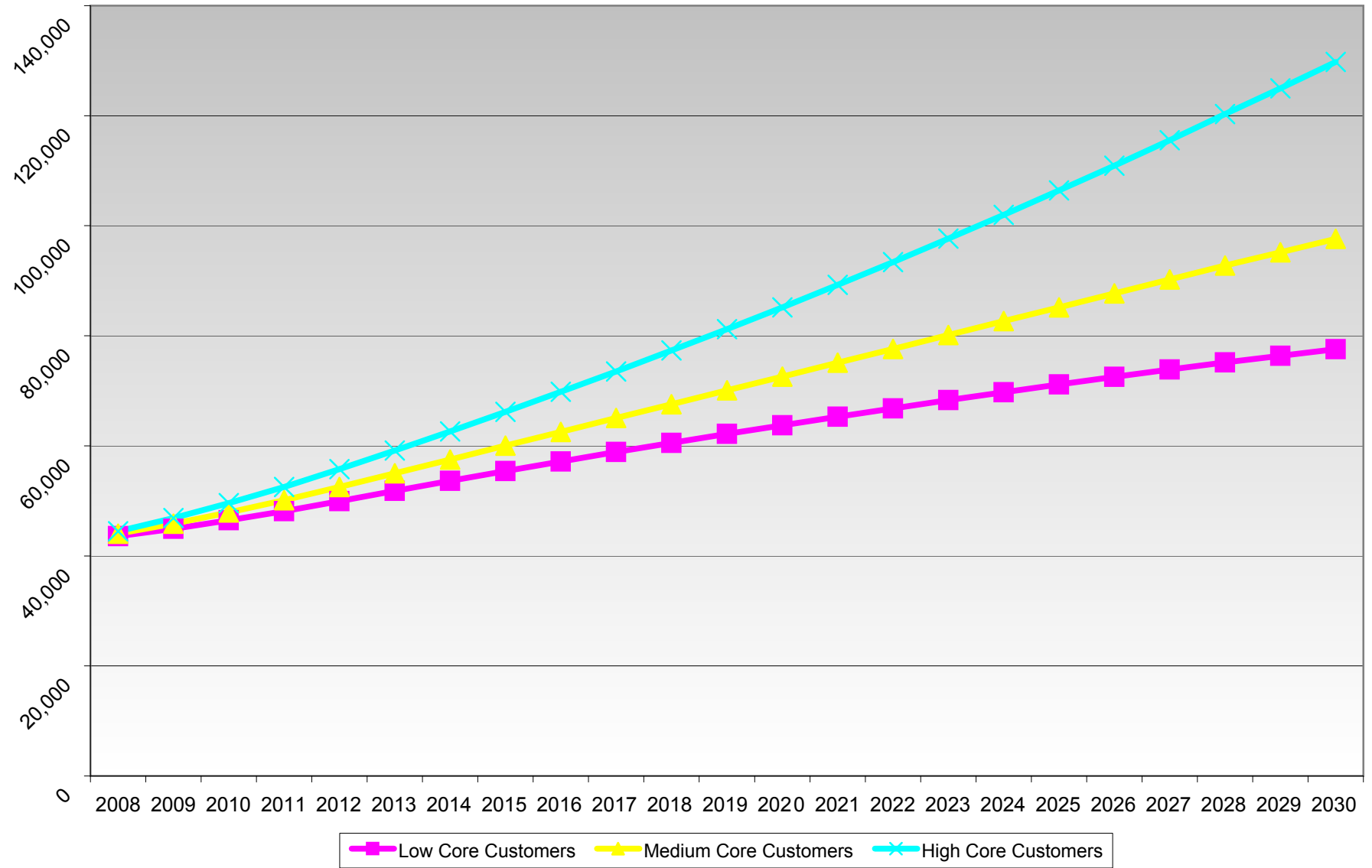
Therms

ZONE ME-OR (PENDLETON)



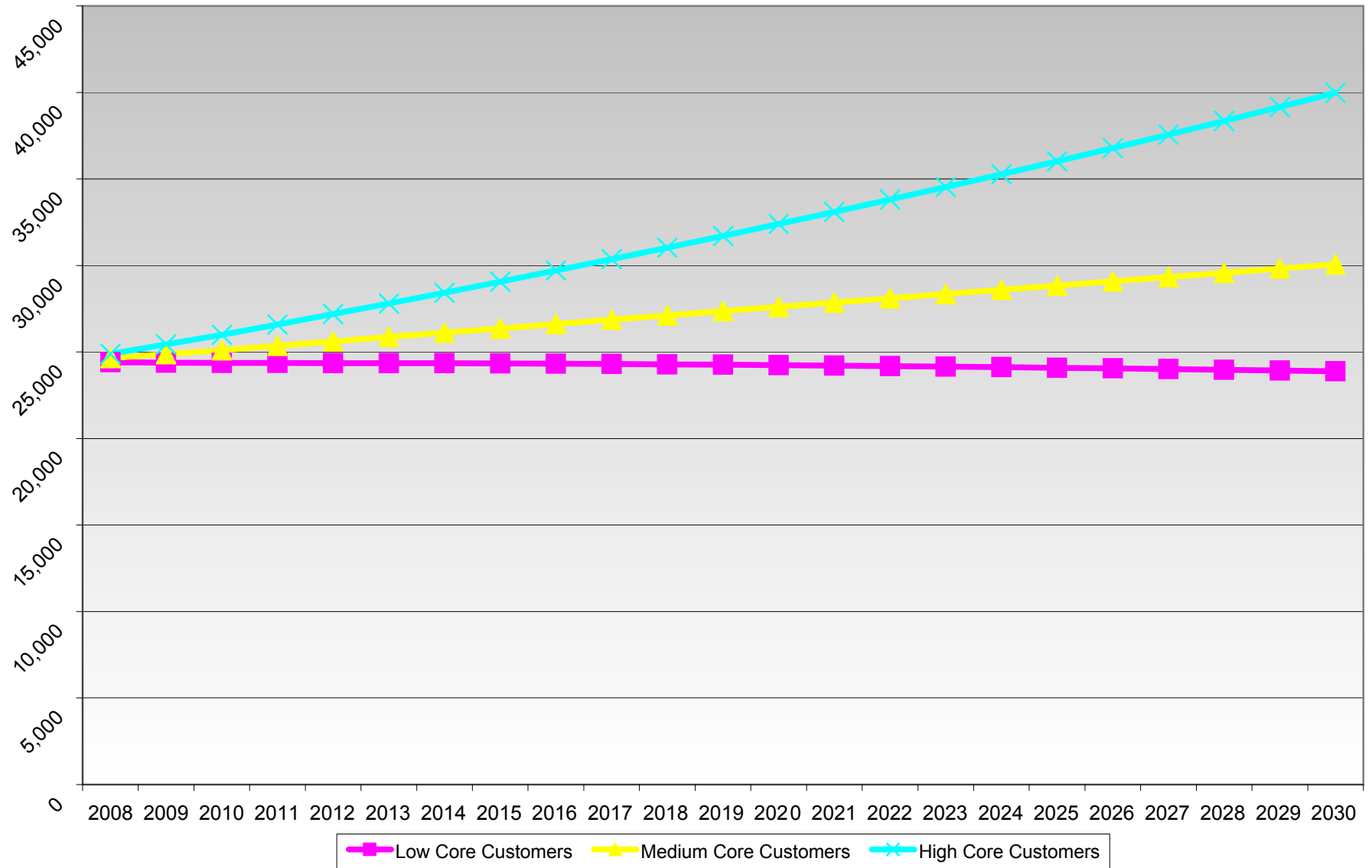
Customers

GTN (BEND AREA)



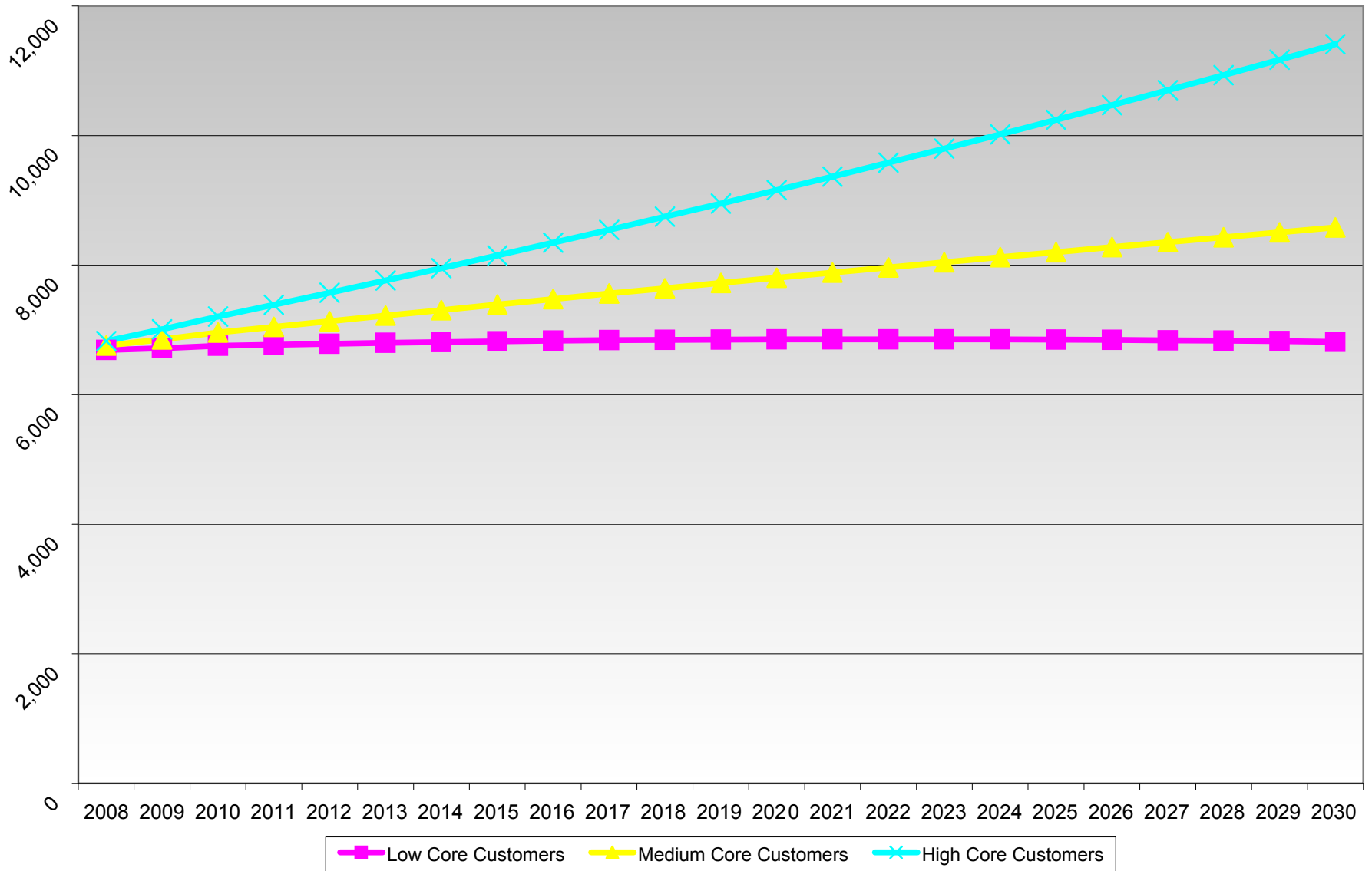
Customers

ZONE 11 (YAKIMA AREA)



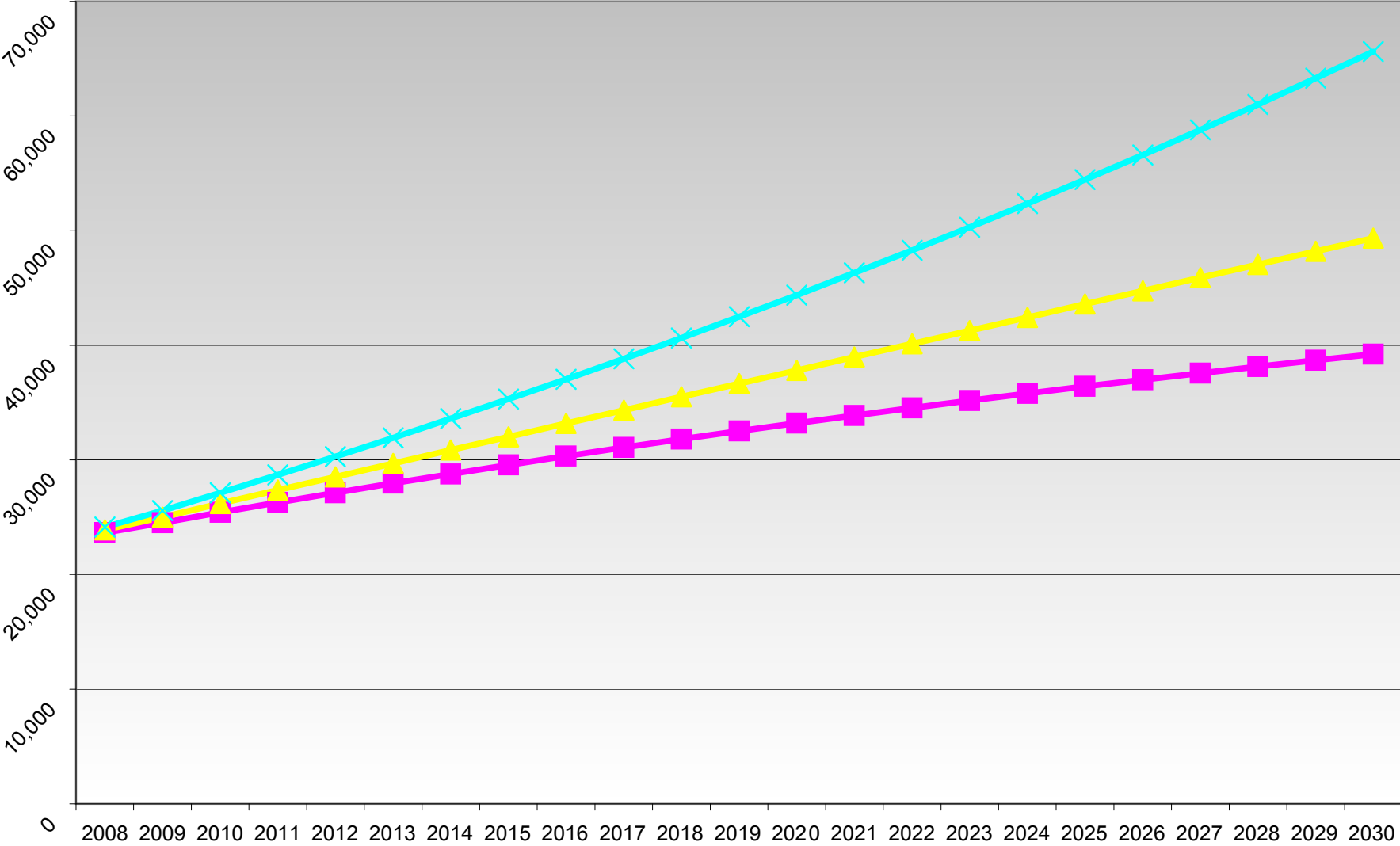
Customers

ZONE 10 (SUNNYSIDE AREA)



Customers

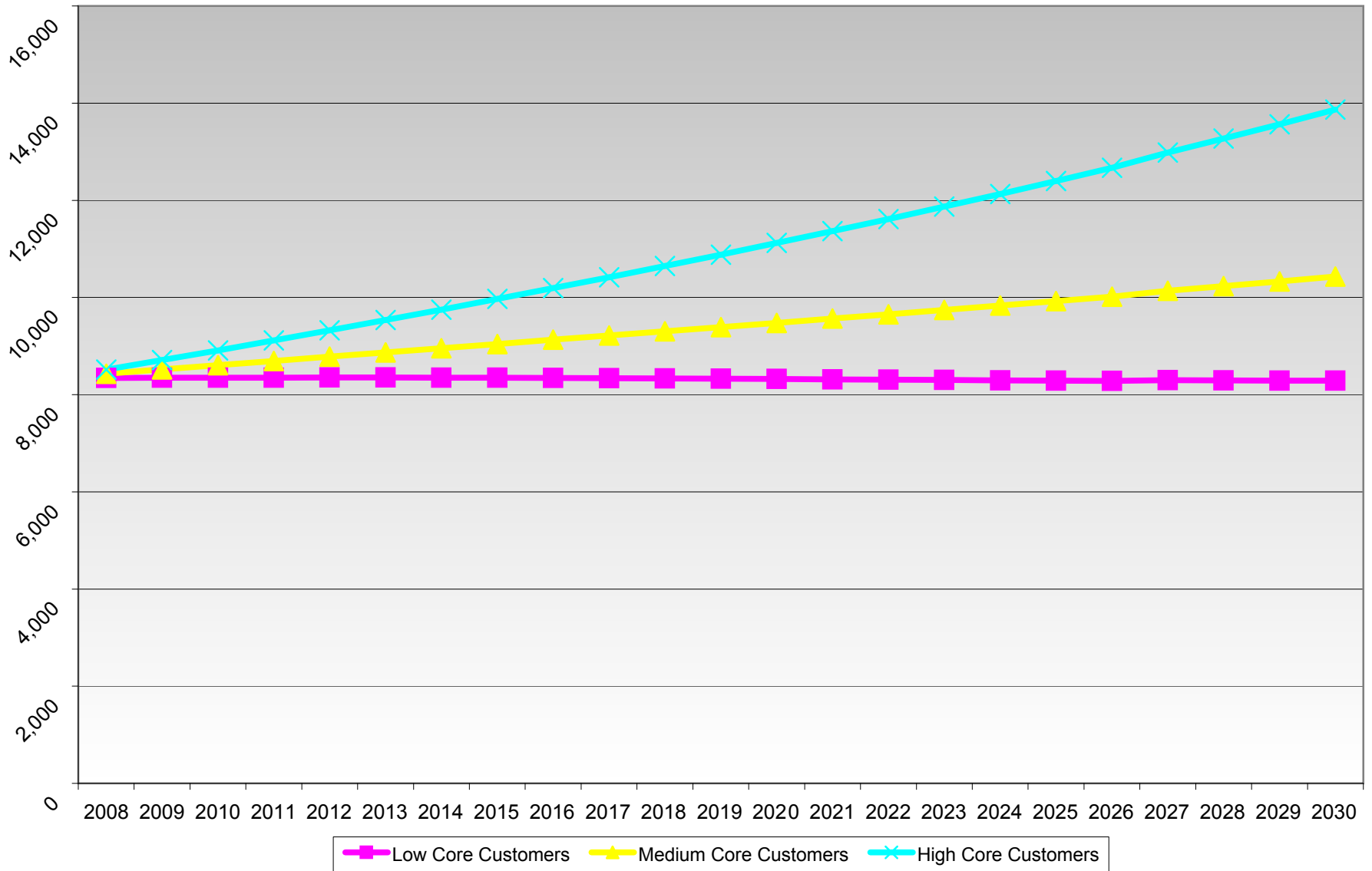
ZONE 20 (KENNEWICK AREA)



Low Core Customers Medium Core Customers High Core Customers

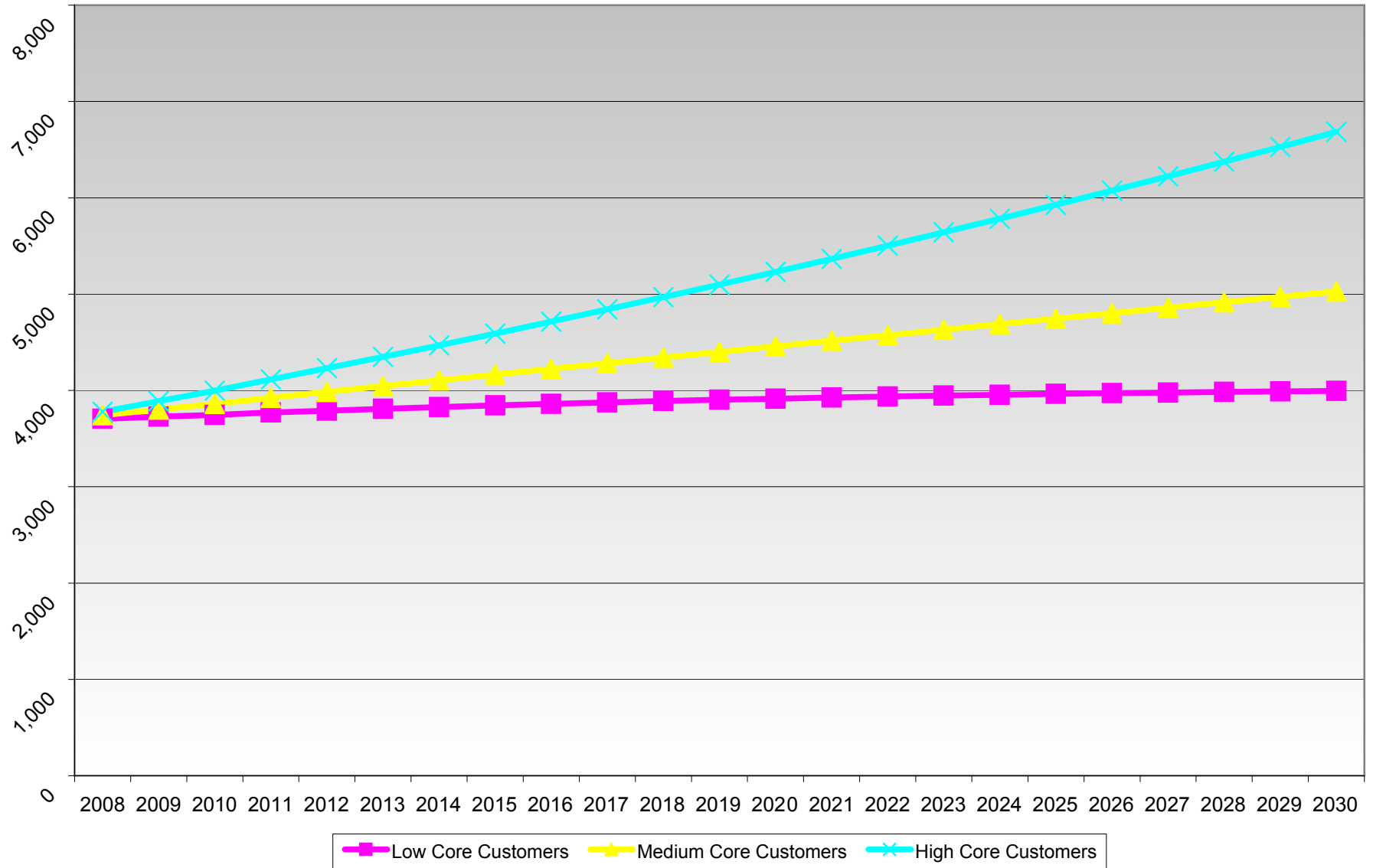
Customers

ZONE 24 (BAKERONT)



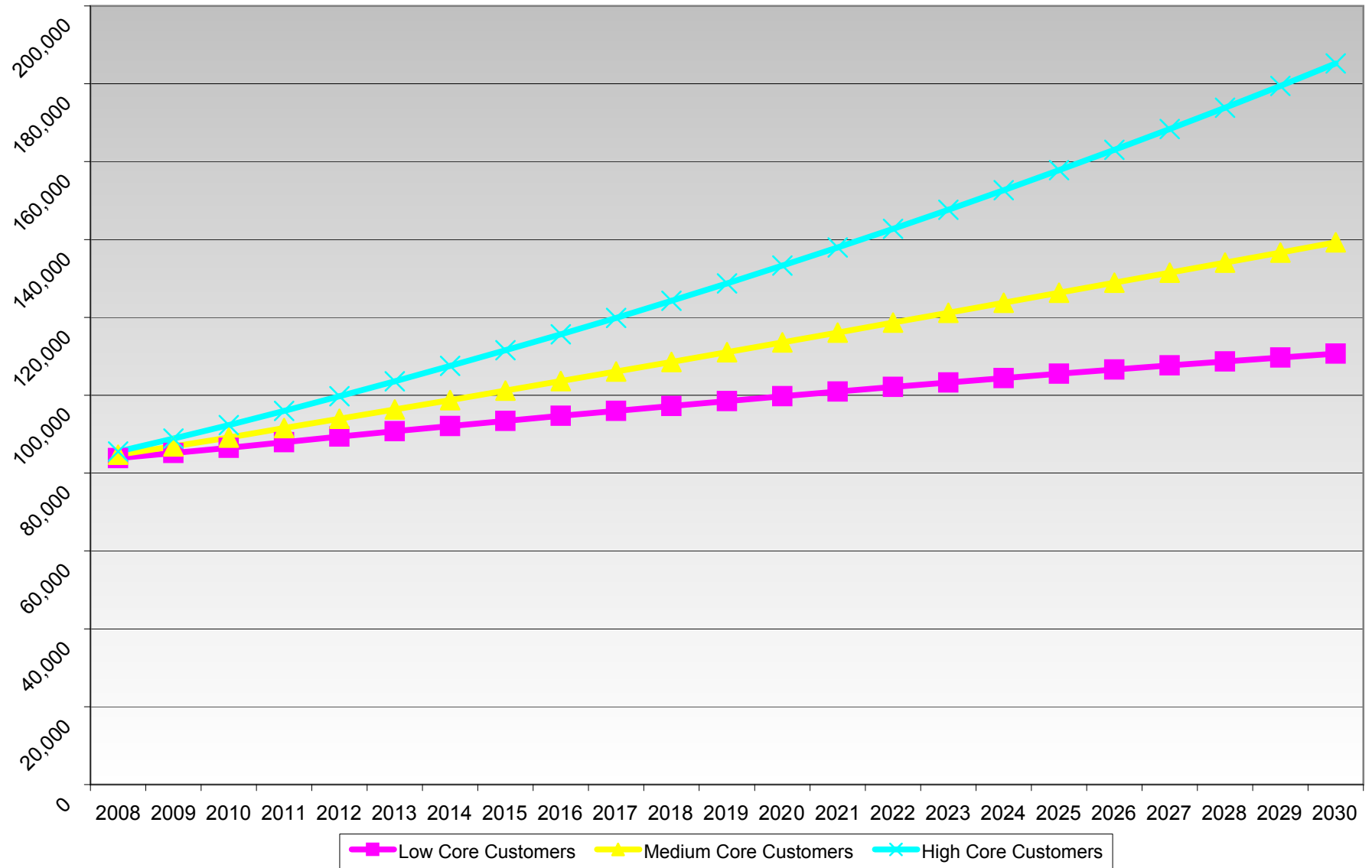
Customers

ZONE 26 (LONGVIEW AREA)



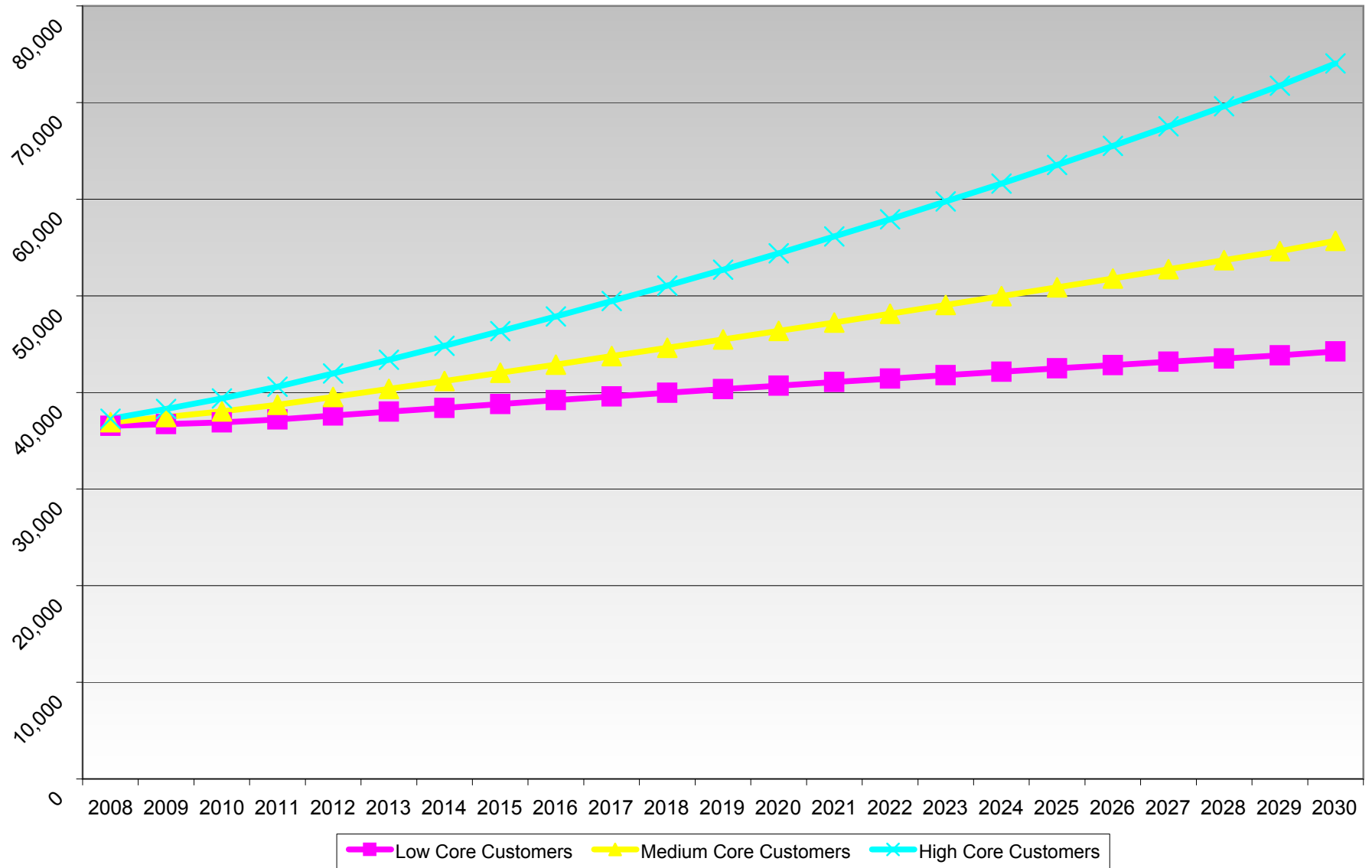
Customers

ZONE 30-W (BELLINGHAM/MT VERNON AREAS)



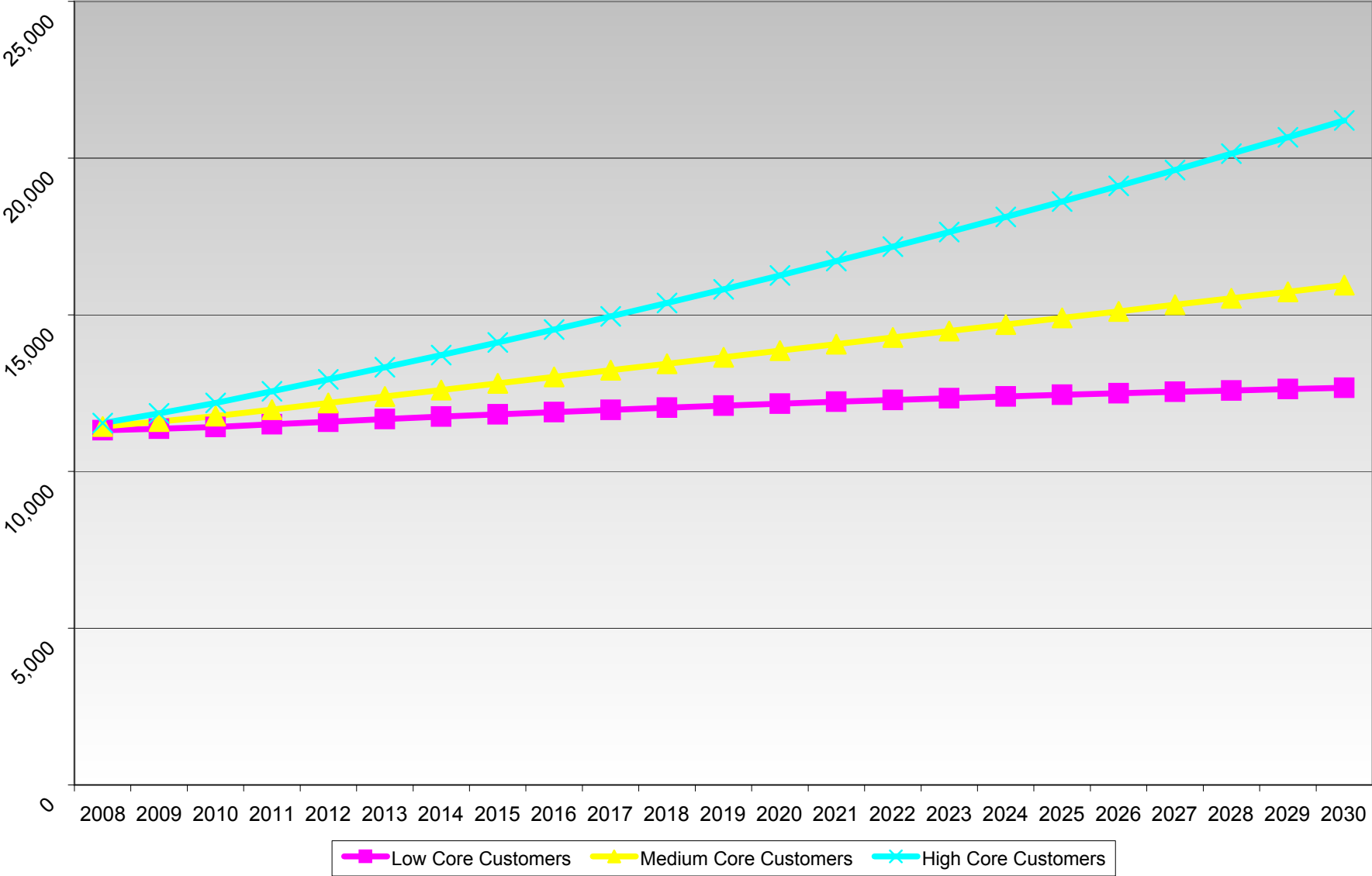
Customers

ZONE 30-S (BREMERTON/GRAYS HARBOR AREAS)



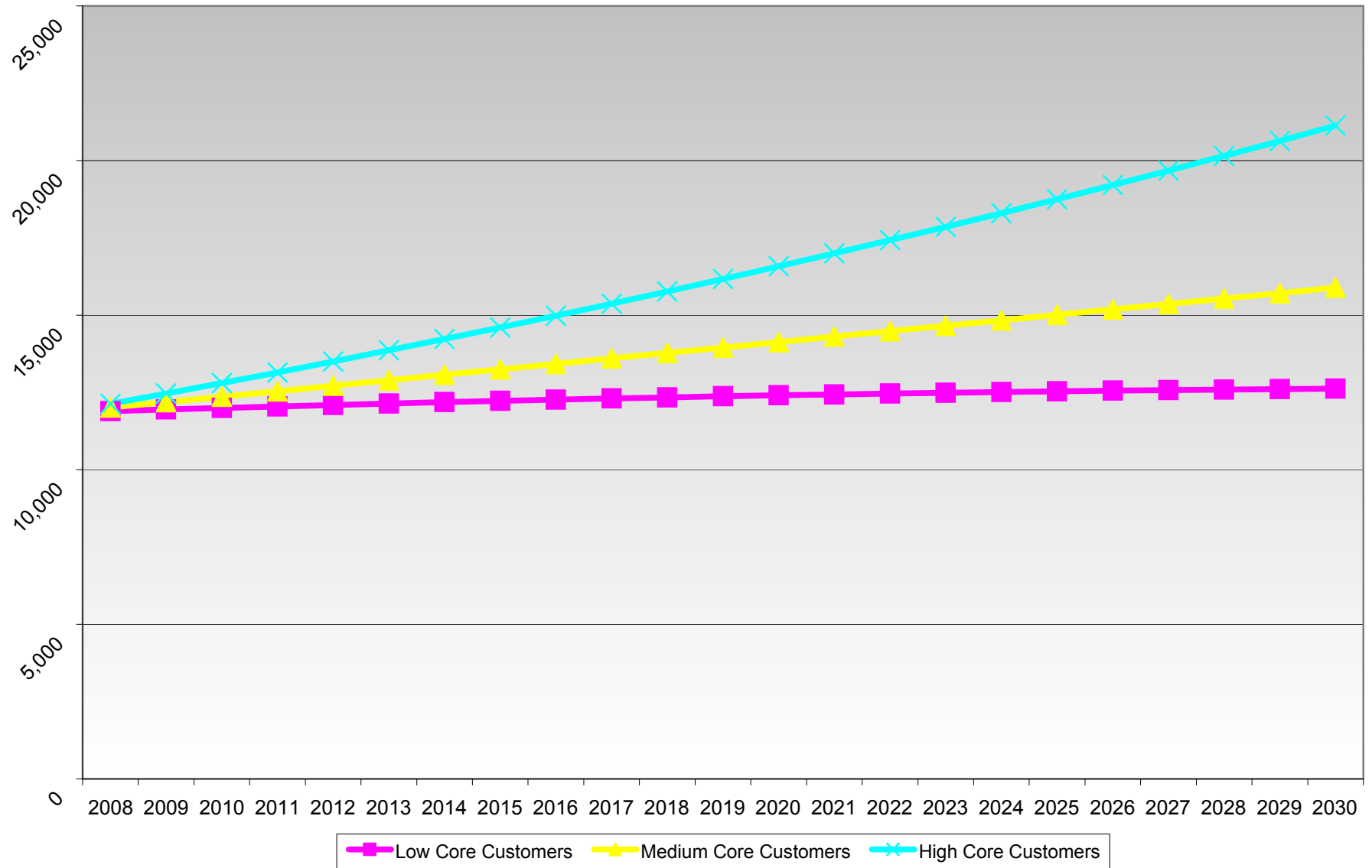
Customers

ZONE ME-WA (WALLA WALLA)



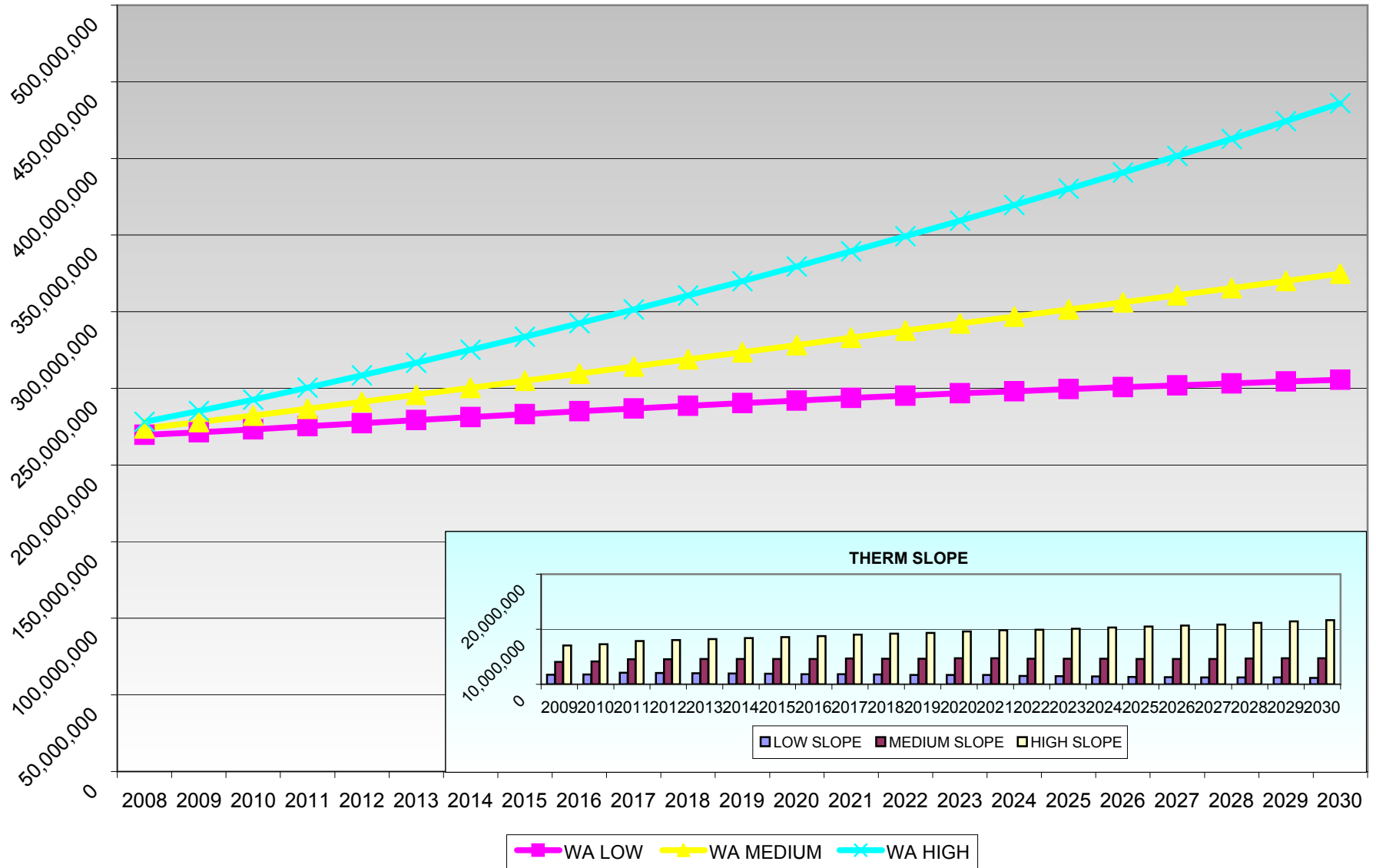
Customers

ZONE ME-OR (PENDLETON)



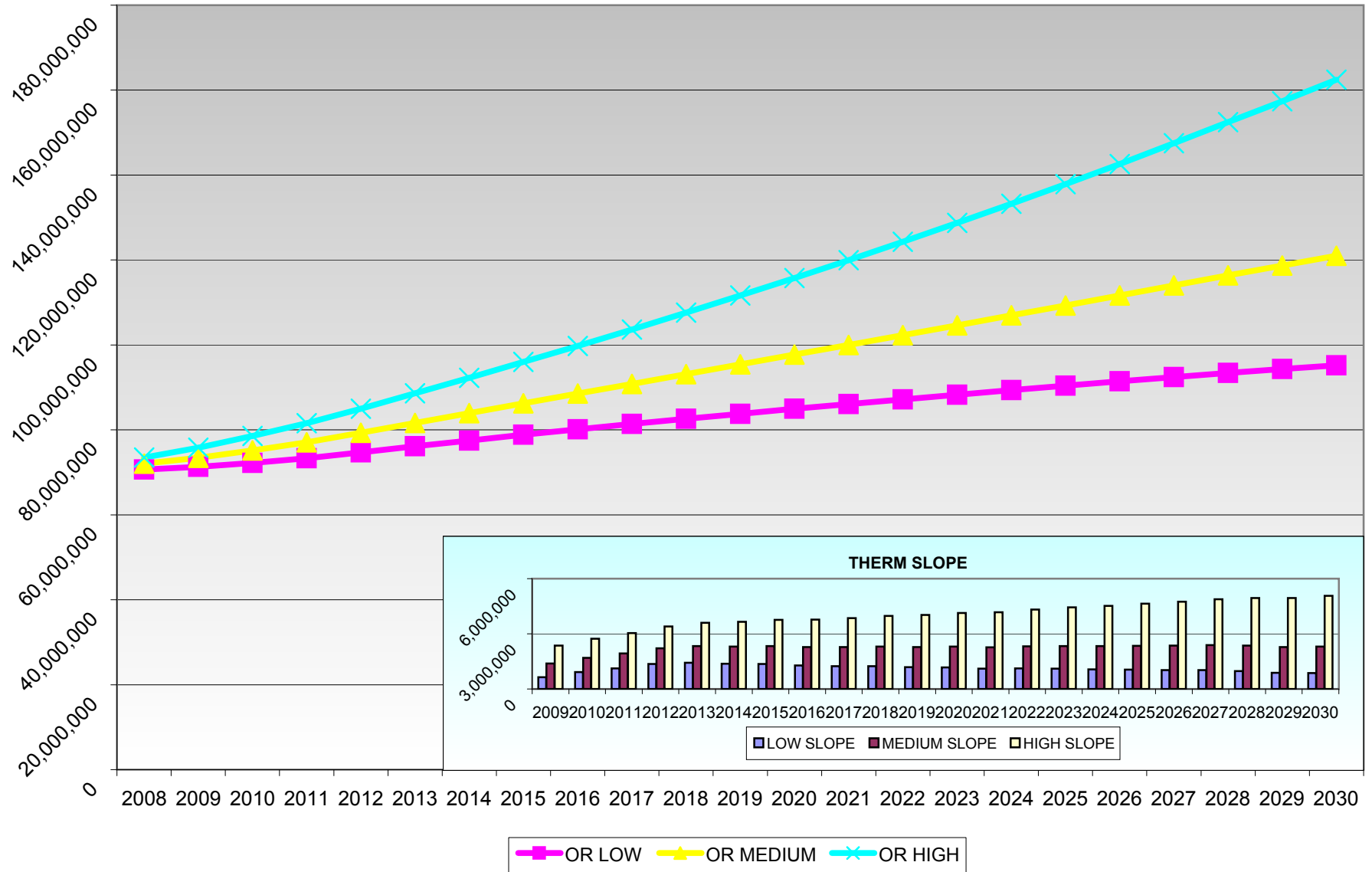
Therms

WA TOTAL THERM USAGE



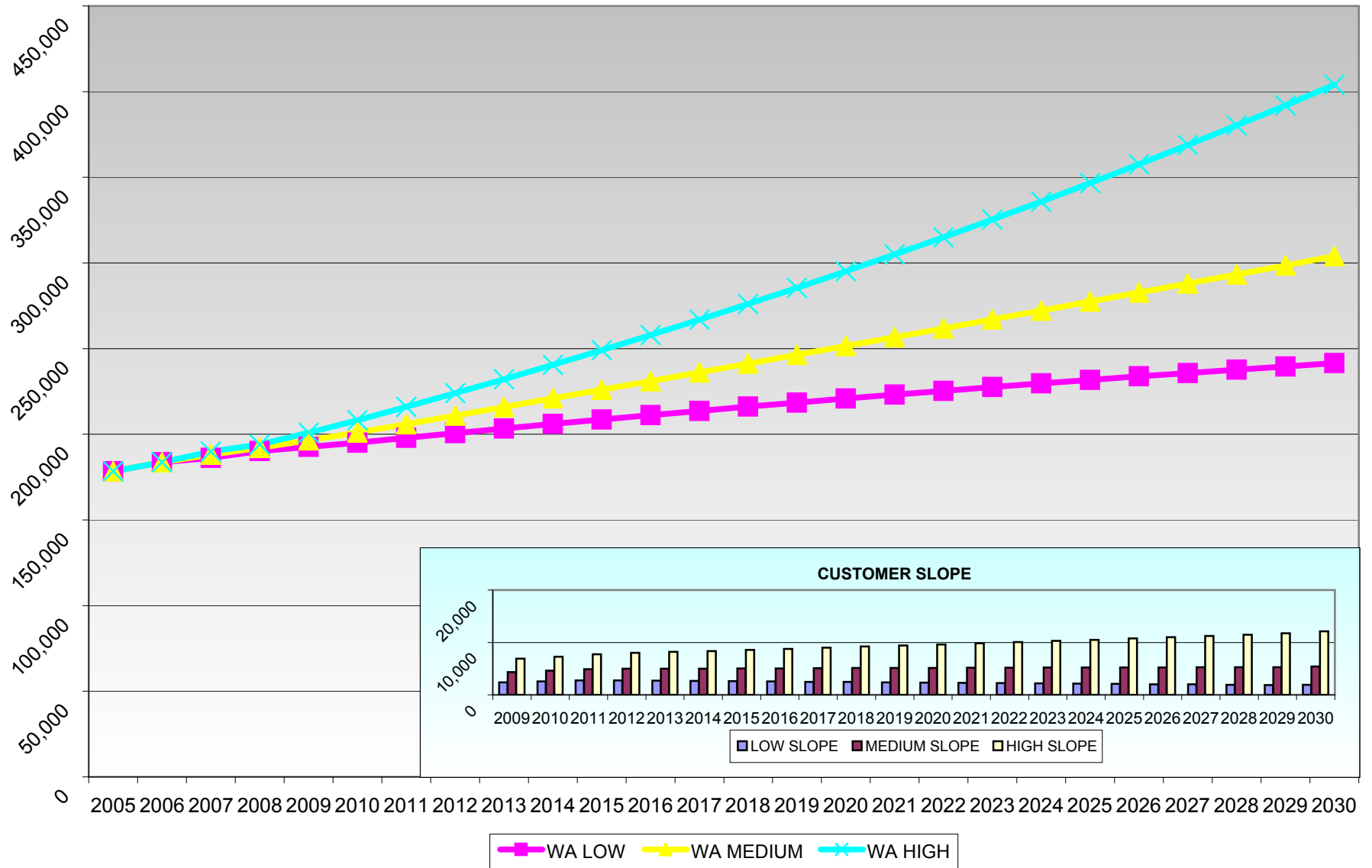
Therms

OR TOTAL THERM USAGE



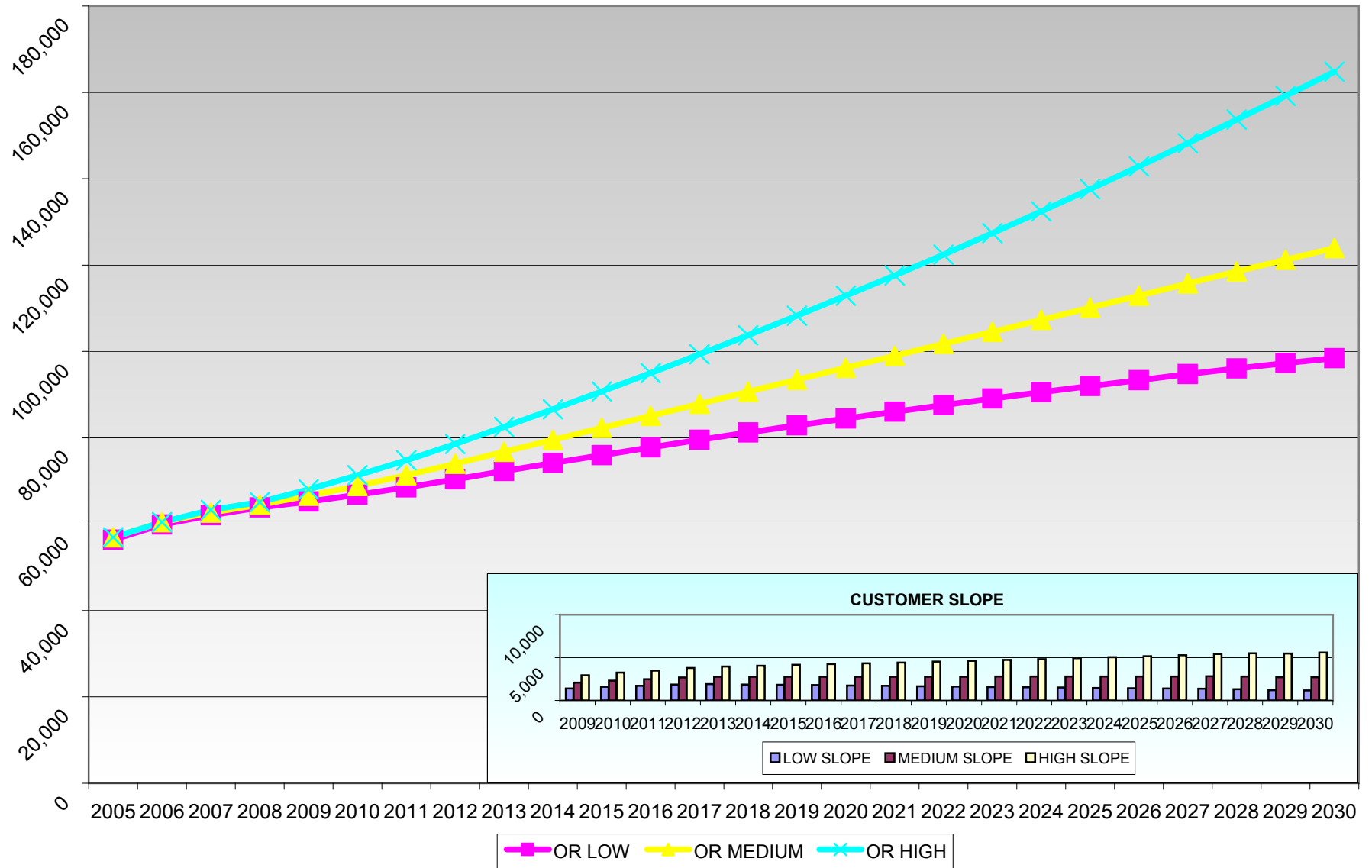
Customers

WA TOTAL CUSTOMER GROWTH



Customers

OR TOTAL CUSTOMER GROWTH



Appendix C

Distribution System Planning

2008 Cascade Natural Gas IRP Forecast

Estimated Reinforcement Projects

Gate Station	Town	20 year min pressure	Reinforcement Needed?	Reinforcement Needed				
				Length	Size	Type	Facilities	Year
Acme	ACME	36	no					
Arlington	ARLINGTON		yes	3740	6	HP		2008
				2120	6	PE		2011
				160	2	PE		2014
				1170	6	PE		2016
				1470	4	PE		2017
				2360	6	HP		2018
				3320	6	PE		2019
				1610	4	PE		2021
Bellingham 1	BELLINGHAM		yes				reg	2009
				6230	6	PE		2012
				1600	4	PE		2017
				2600	4	HP	reg	2020
Burbank Heights	BURBANK	29.0	no					
Castle Rock	CASTLE ROCK		no					
Deming	DEMING		no growth					
Finley	FINLEY		no					
Grandview	GRANDVIEW	0	yes	800	6	PE		2008
Kalama	KALAMA	7.0	no	1930	4	PE		2015
Kelso / South Longview	KELSO	29	no					
	LONGVIEW	18	no					
Kennewick	KENNEWICK	16	no					
	RICHLAND		yes	5910	8	HP		2010
				1600	4	PE		2011
				580	4	PE		2012
				1740	4	PE		2013
2080	4	PE		2014				
WEST RICHLAND		no						
Lawrence	LAWRENCE	35	no					
Lynden	EVERSON	22	no					
	NOOKSACK	22	no					

2008 Cascade Natural Gas IRP Forecast

Estimated Reinforcement Projects

Gate Station	Town	20 year min pressure	Reinforcement Needed?	Reinforcement Needed					
				Length	Size	Type	Facilities	Year	
McCleary	ABERDEEN	29	no						
	ELMA	8	no						
	HOQUIAM	24	no						
	MCCLEARY	3	no						
	MONTESANO		yes	170 2030 1660	2 6 4	PE PE PE		2011 2015 2020	
Moses Lake	MOSES LAKE	32	no						
	WHEELER		see Moses Lake						
Mount Vernon	MOUNT VERNON		yes	960 2590 1170	4 4 4	PE PE PE		2017 2022 2025	
		Moxee	MOXEE CITY		yes	410	2	PE	2010
		Othello	OTHELLO		yes	2640	4	PE	reg 2013
Pasco / North Pasco / Burbank Heights	PASCO		yes	2600 6660 1120 2030	6 6 6 6	PE PE PE PE		2008 2010 2017 2023	
		Patterson / Plymouth	PATTERSON - PLYMOUTH		NA				
		Prosser	PROSSER	35	no				
		Quincy	QUINCY		no				
Sedro Woolley	ANACORTES HP		no						
	BURLINGTON	-14.7	yes	3900	6	PE		2009	
				1650	4	PE		2011	
				3730	6	PE		2012	
				2510	6	PE		2015	
				520	6	PE		2018	
				560	4	PE		2020	
2100	4	PE		2021					
ANACORTES		yes	100 720 2070	2 4 6	PE PE PE		2015 2018 2022		
LA CONNER	40	no							
SEDRO WOOLLEY		yes	3740 600	4 2	PE PE		2010 2022		
	Selah	SELAH		yes	130	2	PE	2013	

2008 Cascade Natural Gas IRP Forecast

Estimated Reinforcement Projects

Gate Station	Town	20 year min pressure	Reinforcement Needed?	Reinforcement Needed				
				Length	Size	Type	Facilities	Year
Shelton	BELFAIR	24	no					
	BREMERTON		yes	400	4	PE	reg	2010
				2610	4	PE		2011
				5570	6	PE		2013
				580	2	PE		2018
				3850	6	PE		2022
	CHICO		see Silverdale					
	GORST		no growth					
	KEYPORT	35	no					
	KITSAP HP		yes	16900	12	HP		2008
				6200	12	HP		2012
				22300	12	HP		2018
	MANCHESTER		see Port Orchard					
	PORT ORCHARD		yes	890	2	PE		2008
				1150	4	PE		2011
			5960	6	HP	reg / uprate	2011	
						reg	2014	
			3660	6	PE	reg / uprate	2017	
						2020		
POULSBO		yes	2330	6	PE		2011	
			2800	4	PE		2021	
SHELTON	9.6	yes						
SILVERDALE		yes	2740	4	PE		2008	
			2750	4	PE		2013	
SUNNYSLOPE		no						
Stanwood	CAMANO ISLAND	21	no					
	OAK HARBOR		yes	1610	4	PE		2008
				2390	4	PE		2009
				3070	4	PE	reg	2013
				3120	6	PE		2017
					reg	2019		
STANWOOD	-14.7	yes				gate	2008	
				1480	6	PE	2008	
Sumas	LYNDEN	-14.7	yes	1030	4	PE		2009
				3890	4	HP		2010
				3650	4	PE		2011
				540	8	Steel		2016
				1930	4	PE		2017
				2780	4	PE		2018
				1910	4	PE		2020
				1500	4	PE		2022

2008 Cascade Natural Gas IRP Forecast

Estimated Reinforcement Projects

Gate Station	Town	20 year min pressure	Reinforcement Needed?	Reinforcement Needed					
				Length	Size	Type	Facilities	Year	
Sumas	BLAINE			3440	6	PE		2017	
				9470	6	HP		2019	
				4480	4	PE		2009	
				8500			5 regs / upra	2015	
				7080	4	PE		2021	
	FERNDAL			yes	7080	4	S		2008
					5280	4	PE		2010
					1600	4	PE		2010
					1840	4	S		2011
								3 regs / upra	2012
					5280	6	PE		2013
					15840	4	HP	new reg	2013
					6500	6	PE		2014
	5500	4	PE		2015				
SUMAS		18	no						
WHATCOM HP			no						
Sunnyside	SUNNYSIDE		yes	160	2	PE		2013	
Walla Walla	COLLEGE PLACE		yes	1500	4	HP		2010	
	WALLA WALLA		yes	330	4	PE		2008	
Wenatchee	EAST WENATCHEE		see Wenatchee						
	WENATCHEE		no						
Woodland	WOODLAND		yes	960	4	HP	reg / uprate	2009	
Yakima	UNION GAP		no						
	YAKIMA		yes	12100	8	S		2008	
				11600	8	HP	reg	2009	
8530	8	HP	reg	2010					
Zillah	GRANGER		no growth						
	TOPPENISH		42	no					
	WAPATO		no growth						
	ZILLAH		26	no					

2008 Cascade Natural Gas IRP Forecast

Estimated Reinforcement Projects

Gate Station	Town	20 year min pressure	Reinforcement Needed?	Reinforcement Needed				
				Length	Size	Type	Facilities	Year
Athena	ATHENA	29	no					
	WESTON		no growth					
Baker City	BAKER	17	no					
Bend / South Bend	BEND		yes	3680	8	S		2008
		6500	4	HP	reg / uprate	2008		
		1390	6	S		2008		
		17540	8	HP	reg	2009		
		6780	8	HP	reg	2011		
		3680	8	HP	reg / uprate	2011		
		6780	8	HP	reg	2012		
		2400	4	PE		2013		
		4120	8	HP	reg	2013		
		2300	6	PE		2015		
		1340	4	PE		2017		
		1200	6	PE		2019		
		1990	4	PE		2020		
2380	4	PE		2027				
Chemult	CHEMULT		no					
Gilchrist	CRESCENT	16	no					
	GILCHRIST	16	no					
Hermiston	HERMISTON	0	yes	4160	4	PE		2008
		2830	4	PE		2011		
		1400	4	PE		2013		
		620	2	PE		2020		
Huntington	HUNTINGTON	39.7	no					
La Pine	LA PINE		no growth					
Madras	MADRAS	32	no					
	METOLIUS	46	yes					
Milton-Freewater	MILTON-FREEWATER		no growth					
Mission	MISSION		no growth					
Ontario	NYSSA	26.0	no					
	ONTARIO		no					
	VALE	36	no					
	ONTARIO HP		no					

2008 Cascade Natural Gas IRP Forecast

Estimated Reinforcement Projects

Gate Station	Town	20 year min pressure	Reinforcement Needed?	Reinforcement Needed				
				Length	Size	Type	Facilities	Year
Pendleton	PENDLETON		yes	4220	4	PE		2008
	PILOT ROCK		yes	1310	4	PE		2008
Prineville	PRINEVILLE		yes	2100	6	PE		2008
				700	6	PE		2022
Redmond	REDMOND		yes	1350	6	PE		2008
				2130	4	PE		2009
				2240	4	HP	reg	2011
				1460	6	PE		2013
				2030	6	PE		2014
				640	6	PE		2021
				4000'	4	HP	reg	2022
Stanfield	STANFIELD		yes	1030	2	PE		2019
Sunriver	SUNRIVER		yes	5440	6	PE		2008
				130	2	PE		2008
				2010	4	PE		2011
Umatilla	BOARDMAN		no growth					
	IRRIGON		no					
Umatilla / Hermiston	UMATILLA		no					

Appendix D-1

Oregon Residential Conservation Measures

Detailed Measure Table - OR Residential Sector Technical Potential to 2030

2030 Potential Estimated with 07/02/2008 Stellar DRAFT Study

Measure Code	Measure Description	Program	Average Lifetime	Total Incremental Cost	Total O&M Impact (\$)	Gas Savings to 2030	Level Cost, \$/th	Therms Saved/Measure
N-A105	Hi-eff Washer	New	12	27,072	(94,634)	3,389	(\$2.15)	6
N-A102	MEF 2.0 Washer	New	12	48,128	(164,326)	7,686	(\$1.63)	5
R-A102	MEF 2.0 Washer	Replace	12	1,729,147	(2,085,681)	205,694	(\$0.19)	13
R-GD111	Tank upgrade (50 gal gas) Hi Eff Alternative	Replace Gas	15	208,451	0	1,163,065	\$0.02	3,221
R-GH115	AFUE 90 to hydrocoil combo, Z 3	Retro Gas	45	718,242	0	410,848	\$0.09	172
R-GH118	AFUE 90 to hydrocoil combo, Z 4	Retro Gas	45	718,242	0	403,607	\$0.09	169
N-GH130	Heating upgrade (AFUE 90) (Z 3)	New Gas	15	586,699	0	330,358	\$0.16	84
R-GW128	Wx insulation (add walls), Z 4	Retro Gas	45	4,549,818	0	1,270,641	\$0.18	342
R-GW123	Wx insulation (add walls), Z 3	Retro Gas	45	722,019	0	191,755	\$0.19	297
R-GH125	Duct Sealing and AFUE 90+ , Z 4	Replace Gas	20	5,176,857	888,290	2,304,549	\$0.20	695
N-GH135	Heating upgrade (AFUE 90) (Z 4)	New Gas	15	586,699	0	249,039	\$0.21	63
N-GH132	HRV, E* (Gas Z 3)	New Gas	15	7,846,358	0	3,273,213	\$0.22	125
N-GH133	Ducts Indoor, DHW, Lights (Gas Z 3)	New Gas	45	21,271,770	0	4,476,757	\$0.24	163
R-GW127	Wx insulation (ceiling, floor), Z 4	Retro Gas	45	6,524,191	0	1,371,592	\$0.24	423
R-GW122	Wx insulation (ceiling, floor), Z 3	Retro Gas	45	1,013,717	0	208,425	\$0.24	389
R-GH114	Duct Sealing, Z 3	Retro Gas	20	397,540	0	107,675	\$0.28	165
N-GH137	HRV, E* (Gas Z 4)	New Gas	15	7,846,358	0	2,467,499	\$0.29	94
R-GH117	Duct Sealing, Z 4	Retro Gas	20	397,540	0	97,723	\$0.30	149
N-GH138	Ducts Indoor, DHW, Lights (Gas Z 4)	New Gas	45	21,271,770	0	3,374,786	\$0.31	123
R-GD110	Tankless Gas heater replace	Replace Gas	20	1,304,058	0	305,719	\$0.32	184
R-GD112	Upgrade to Navien Tankless Gas heater	Replace Gas	20	230,436	0	44,656	\$0.39	27
N-GH129	E* Insulation, Ducts, DHW, Lights (Gas Z 3)	New Gas	45	28,836,014	0	3,551,401	\$0.40	172
N-GH131	Window U=.3 (Gas Z 3)	New Gas	45	5,035,654	0	534,554	\$0.47	19
R-GH116	Boiler to Polaris Combo radiant, Z 3	Retro Gas	45	10,534,218	0	954,228	\$0.55	399
N-GH134	E* Insulation, Ducts, DHW, Lights (Gas Z 4)	New Gas	45	28,722,548	0	2,537,865	\$0.56	124
R-GH119	Boiler to Polaris Combo radiant, Z 4	Retro Gas	45	10,534,218	0	913,018	\$0.57	381
N-GH136	Window U=.3 (Gas Z 4)	New Gas	45	5,035,654	0	402,971	\$0.62	15
N-GH139	Tank upgrade (50 gal gas)	New Gas	15	4,502,015	0	651,638	\$0.63	29
R-GW130	Window replace (U=.35), Z 4	Replace Gas	45	561,623	0	44,032	\$0.63	26
R-A103	Estar Dishwasher	Replace	12	693,815	(178,161)	87,456	\$0.63	5
R-GW125	Window replace (U=.35), Z 3	Replace Gas	45	89,437	0	6,764	\$0.66	23
N-A103	Estar Dishwasher	New	12	12,395	(3,183)	1,477	\$0.67	5
N-GD106	Tank upgrade (50 gal gas) Hi Eff Alternative	New Gas	15	2,823,928	0	371,756	\$0.69	76
N-GD109	Upgrade to Navien Tankless Gas heater	New Gas	20	3,300,829	0	303,548	\$0.81	14
N-GD108	Tankless Gas heater	New Gas	20	23,323,200	0	2,097,671	\$0.83	93
R-GD113	Solar hot water heater (50 gal) - With gas backup.	Replace Gas	20	2,228,225	0	179,409	\$0.93	518
R-GW129	Window, retro (U=.35), Z 4	Retro Gas	45	19,728,016	0	965,743	\$1.01	209
R-GW124	Window, retro (U=.35), Z 3	Retro Gas	45	3,498,078	0	165,563	\$1.05	185
R-GW131	HRV, Z 4	Retro Gas	18	6,196,735	2,088,467	277,542	\$2.39	86
R-GW126	HRV, Z 3	Retro Gas	18	962,955	345,165	42,401	\$2.47	80
N-GD107	Solar hot water heater (50 gal) - With gas backup.	New Gas	20	63,345,619	0	1,150,458	\$4.11	115
R-GH124	AFUE 90+ Furnace, Z 4	Replace Gas	18	4,767,880	2,413,451	115,904	\$4.96	7
R-GH122	AFUE 90+ Furnace, Z 3	Replace Gas	18	4,767,880	2,413,451	72,360	\$7.95	4
R-GH123	Duct Sealing and AFUE 90+ , Z 3	Replace Gas	20	5,176,857	888,290	45,431	\$9.97	14

At an \$1.00/therm leveled cost screen, cumulative therm savings equals 34,906,461.

New Measures in 2008:

Measure Code	Measure Description	Program	Average Lifetime	Total Incremental Cost	Total O&M Impact (\$)	Gas Savings to 2030
N-A102	MEF 2.0 Washer	New	12	48,128	(164,326)	7,686
N-A103	Estar Dishwasher	New	12	12,395	(3,183)	1,477
N-A105	Hi-eff Washer	New	12	27,072	(94,634)	3,389
N-GD109	Upgrade to Navien Tankless Gas heater	New Gas	20	3,300,829	0	303,548
N-GH129	E* Insulation, Ducts, DHW, Lights (Gas Z 3)	New Gas	45	28,836,014	0	3,551,401
N-GH133	Ducts Indoor, DHW, Lights (Gas Z 3)	New Gas	45	21,271,770	0	4,476,757
N-GH138	Ducts Indoor, DHW, Lights (Gas Z 4)	New Gas	45	21,271,770	0	3,374,786
R-A102	MEF 2.0 Washer	Replace	12	1,729,147	(2,085,681)	205,694
R-A103	Estar Dishwasher	Replace	12	693,815	(178,161)	87,456
R-GD112	Upgrade to Navien Tankless Gas heater	Replace Gas	20	230,436	0	44,656
R-GD113	Solar hot water heater (50 gal) - With gas backup.	Replace Gas	20	2,228,225	0	179,409
R-GH115	AFUE 90 to hydrocoil combo, Z 3	Retro Gas	45	718,242	0	410,848
R-GH116	Boiler to Polaris Combo radiant, Z 3	Retro Gas	45	10,534,218	0	954,228
R-GH118	AFUE 90 to hydrocoil combo, Z 4	Retro Gas	45	718,242	0	403,607
R-GH119	Boiler to Polaris Combo radiant, Z 4	Retro Gas	45	10,534,218	0	913,018

Appendix D-2

Oregon Commercial/Industrial Conservation Measures

Detailed Measure Table - OR Commercial Sector Technical Potential to 2030

2030 Potential Estimated with 06/17/2008 Stellar DRAFT Study

Measure Code	Measure Description	Measure Description	Construction Type	Measure End Use
Co116	Estar Steam Cooker	Install Energy Star Steam Cooker	New	Cooking
Co116rep	Estar Steam Cooker	Install Energy Star Steam Cooker	At Replacement	Cooking
Co112	Infrared Fryer		New	Cooking
Co107	Infrared Fryer		At Replacement	Cooking
E111	Roof Insulation - Attic R0-30	Roof Insulation - Attic R0-30. Application: Buildings with uninsulated attics	Retrofit	Heating
H105	HW Boiler Tune	Tune up in accordance with Minneapolis Energy Office protocol. Can include derating the burner, adjusting the secondary air, adding flue restrictors, cleaning the fire-side of the heat exchanger, cleaning the water side, or installing turbulators. Other modifications may include uprating the burner to reduce oxygen or derating the burner to reduce stack temperature. Note: In gas systems, excess air and stack temperatures are often within reasonable ranges, so the technical potential for this measure is limited. Combining this measure with the vent damper and power burner measures increases both applicability and cost effectiveness, and was assumed for this analysis.	Retrofit	Heating
W127r	Waste Water Heat Exchanger	Install HX on waste water	Retrofit	Water Heat
H119	HiEff Unit Heater (new)	Install power draft units (80% seas. Eff) in place of natural draft (64% seas. Eff)	New	Heating
E103	Roof Insulation - Rigid R0-11	Roof Insulation - Rigid R0-11-not including re-roofing costs but including deck preparation. Application: Old buildings with flat roofs and no attics	At Replacement	Heating
H104	Hot Water Temperature Reset	Controller automatically resets the delivery temperature in a hot water radiant system based on outside air temperature. The reset reduces the on-time of the heating equipment and the occurrence of simultaneous heating and cooling through instantaneous adjustments.	Retrofit	Heating
E101	Wall Insulation - Blown R11	Wall Insulation - Blown R11. Application: Old buildings	Retrofit	Heating
W124r	Computerized Water Heater Control	Install intelligent controls on the hot water circulation loops.	Retrofit	Water Heat
H114	Hi Eff Unit Heater (replace)	Install power draft units (80% seas. Eff) in place of natural draft (64% seas. Eff)	At Replacement	Heating
E104	Roof Insulation - Rigid R0-22	Roof Insulation - Rigid R0-22-- not including re-roofing costs but including deck preparation and ~4" rigid.. Application: Old buildings with flat roofs and no attics	At Replacement	Heating
W102	DHW Shower Heads	Install low flow shower heads (2.0 gallons per minute) to replace 3.4 GPM shower heads.	Retrofit	Water Heat
W101	DHW Wrap	Insulate the surface of the storage water heater or an unfired storage tank to R-5 to reduce standby losses.	Retrofit	Water Heat
E102	Wall Insulation - Spray On for Metal Buildings	Wall Insulation - Spray On for Metal Buildings (Cellulose) Unfinished. Application: Old buildings	Retrofit	Heating
H106	Steam Balance	Single-pipe steam systems are notorious for uneven heating, which wastes energy because the thermostat must be set to heat the coldest spaces and overheating other spaces. Steam balances corrects these problems by: 1) Adding air venting on the main line or at the radiators; 2) Adding boiler cycle controls; 3) Adding or subtracting radiators. Energy savings accrue from lowering the overall building temperature.	Retrofit	Heating
E107	Roof Insulation - Blanket R0-19	Roof Insulation - Blanket R0-19. Application: Buildings with open truss unfinished interior	Retrofit	Heating
E108	Roof Insulation - Blanket R0-30	Roof Insulation - Blanket R0-30. Application: Buildings with open truss unfinished interior	Retrofit	Heating
H117	SPC Hieff Boiler (new)	Install near condensing boiler. Assumed seasonal combustion efficiency of 82% over base of 75%	New	Heating
H107	Vent Damper	Install vent damper downstream of the draft relief to prevent airflow up the stack, while allowing warm air from the boiler to spill into the conditioned space as heat or into the boiler room to reduce jacket losses. This measure is most cost-effective when combined with the boiler tune up and power burner measures.	Retrofit	Heating
E105	Roof Insulation - Rigid R11-22	Roof Insulation - Rigid R11-22 2" rigid added to an existing foam roof insulation at re-roof, includes some surface prep. Application: Old buildings with flat roofs, no attics, and some insulation	At Replacement	Heating
E112	Roof Insulation - Attic 11-30	Roof Insulation - Attic 11-30. Application: Buildings with partially insulated attics	Retrofit	Heating
W103	DHW Faucets	Add aerators to existing faucets to reduce flow from 3.4 gallons per minute to 2.0 GPM.	Retrofit	Water Heat
H111	SPC Hieff Boiler Replace	Install near condensing boiler. Assumed seasonal combustion efficiency of 82% over base of 75%	At Replacement	Heating

H120a	Cond Unit Heater from Nat Draft(new)	Install condensing power draft units (90% seas. Eff) in place of natural draft (64% seas. Eff)	New	Heating
E123	Windows - Add Low E to Vinyl Tint	Windows - Add Low E to Vinyl Tint. Application: New Construction	New	Heating
E114	Windows - Add Low E to Vinyl Tint	Windows - Add Low E to Vinyl Tint. Application: Old buildings	At Replacement	Heating
W121	Combo Hieff Boiler (new)	Replace existing boiler with unit meeting OR Code requirements of 85% combustion efficiency.	New	Heating
Co102	Infared Fryer		0	Retrofit
Co115	Power Range Burner		0	New
Co110	Power Range Burner		0	At Replacement
H118	SPC Cond Boiler (new)	Install condensing boiler. Assumed seasonal combustion efficiency of 88% over base of 75%	New	Heating
R106	Heat Reclaim	Large Grocery - Heat recovery to space heating. Assumes floating head control exists and must be changed to allow HR.	New	Refrigeration
R106rep	Heat Reclaim	Large Grocery - Heat recovery to space heating. Assumes floating head control exists and must be changed to allow HR.	At Replacement	Refrigeration
W119	Combo Hieff Boiler (repl)	Replace existing boiler with unit meeting OR Code requirements of 85% combustion efficiency.	At Replacement	Heating
H115a	Cond Unit Heater from Nat draft(replace)	Install condensing power draft units (90% seas. Eff) in place of natural draft (64% seas. Eff)	At Replacement	Heating
E124	Windows - Add Low E and Argon to Vinyl Tint	Windows - Add Low E and Argon to Vinyl Tint. Application: New Construction	New	Heating
W115	DHW Hieff Boiler (new)	Replace existing boiler with unit meeting OR Code requirements of 85% combustion efficiency.	New	Water Heat
W113	DHW Hieff Boiler (repl)	Replace existing boiler with unit meeting OR Code requirements of 85% combustion efficiency.	At Replacement	Water Heat
E115	Windows - Add Low E and Argon to Vinyl Tint	Windows - Add Low E and Argon to Vinyl Tint. Application: Old buildings	At Replacement	Heating
H112	SPC Cond Boiler Replace	Install condensing boiler. Assumed seasonal combustion efficiency of 88% over base of 75%	At Replacement	Heating
E129	Windows - Tinted AL Code to Class 45	Windows - Tinted AL Code to Class 45. Application: New Construction	New	Heating
Co109	Infared Griddle		0	At Replacement
Co114	Infared Griddle		0	New
W127	Waste Water Heat Exchanger	Install HX on waste water	New	Water Heat
H103	Ducts	Duct retrofit of both insulation and air sealing	Retrofit	Heating
H108	Power burner	Replace standard burner with a power burner to optimize combustion and reduce standby losses in the stack. Note: Costs and savings assume that this measure will be performed in conjunction with a boiler tune up when appropriate.	Retrofit	Heating
E130	Windows - Tinted AL Code to Class 40	Windows - Tinted AL Code to Class 40. Application: New Construction	New	Heating
H120b	Cond Unit Heater From Power Draft (new)	Install condensing power draft units (90% seas. Eff) in place of power draft (80% seas. Eff)	New	Heating
E121	Windows - Tinted AL Code to Class 40	Windows - Tinted AL Code to Class 40. Application: Old buildings	At Replacement	Heating
W125r	Solar Hot Water	Install solar water heaters on large use facility such as multifamily or lodging	Retrofit	Water Heat
H101	Warm Up Control	This measure is designed to implement a shut down of outside air when the building is coming off night setback. Usualy the capability for this is available in a commercial t-stat but either the extra control wire is not attached or the unit itself has not been set up to receive the signal. Cost is based on labor cost to enable this ability in existing controllers	Retrofit	Heating
H123	HVAC controls	Control set up and algorithm. This assumes the development of an open source control package aimed at describing scheduling and control points throughout the HVAC system, properly training operators so that scheduling can be maintained and adjusted as needed, and providing operator back up so that temperature reset, pressure reset, and minimum damper settings are set at optimum levels for the current occupancy.	New	Heating
E135	Windows - Single to Class VEA	Windows - Single to Class VEA. Application: Old Single Glazed Buildings	Retrofit	Heating
W122	Combo Cond Boiler (new)	Replace with boiler using condensing or pulse technology to achieve steady-state combustion efficiencies of 89% to 94% (this analysis used 90% efficiency for savings calculations).	New	Heating
E132	Windows - Single to Class 45	Windows - Single to Class 45. Application: Old Single Glazed Buildings	Retrofit	Heating
E133	Windows - Single to Class 40	Windows - Single to Class 40. Application: Old Single Glazed Buildings	Retrofit	Heating
E134	Windows - Single to Class 36	Windows - Single to Class 36. Application: Old Single Glazed Buildings	Retrofit	Heating

W104	DHW Pipe Ins	Add 1" insulation to pipes used for steam or hydronic distribution; particularly effective when pipes run through unheated spaces.	Retrofit	Water Heat
W120	Combo Cond Boiler (repl)	Replace with boiler using condensing or pulse technology to achieve steady-state combustion efficiencies of 89% to 94% (this analysis used 90% efficiency for savings calculations).	At Replacement	Heating
W124	Computerized Water Heater Control	Install intelligent controls on the hot water circulation loops.	New	Water Heat
W116	DHW Cond Boiler (new)	Replace with boiler using condensing or pulse technology to achieve steady-state combustion efficiencies of 89% to 94% (this analysis used 90% efficiency for savings calculations).	New	Water Heat
W114	DHW Cond Boiler (repl)	Replace with boiler using condensing or pulse technology to achieve steady-state combustion efficiencies of 89% to 94% (this analysis used 90% efficiency for savings calculations).	At Replacement	Water Heat
H115b	Cond Unit Heater from power draft (replace)	Install condensing power draft units (90% seas. Eff) in place of power draft (80% seas. Eff)	At Replacement	Heating
W105	DHW Recirc Controls	Install electronic controller to hot water boiler system that turns off the boiler and circulation pump when the hot water demand is reduced (usually in residential type occupancies) or can be reset to meet the hot water load. (Steel boilers also require a mixing valve to prevent water temperatures from dropping below required levels).	Retrofit	Water Heat
E106	Roof Insulation - Rigid R11-33	Roof Insulation - Rigid R11-33: add 4' of insulation at reroof. Application: Old buildings with flat roofs, no attics, and some insulation	At Replacement	Heating
E116	Windows - Add Argon to Vinyl Lowe	Windows - Add Argon to Vinyl Lowe. Application: Old buildings	At Replacement	Heating
Co104	Infrared Griddle		Retrofit	Cooking
E139	Windows - Double to Class VEA	Windows - Double to Class VEA. Application: Double Glazed Buildings	Retrofit	Heating
H113	Hi Eff Unit Heater (retro)	Install power draft units (80% seas. Eff) in place of natural draft (64% seas. Eff)	Retrofit	Heating
W110	DHW Std. Boiler (retro)	Replace existing boiler with unit meeting OR Code requirements of 80% combustion efficiency.	Retrofit	Water Heat
E125	Windows - Add Argon to Vinyl Lowe	Windows - Add Argon to Vinyl Lowe. Application: New Construction	New	Heating
E137	Windows - Double to Class 40	Windows - Double to Class 40. Application: Double Glazed Buildings	Retrofit	Heating
E138	Windows - Double to Class 36	Windows - Double to Class 36. Application: Double Glazed Buildings	Retrofit	Heating
E136	Windows - Double to Class 45	Windows - Double to Class 45. Application: Double Glazed Buildings	Retrofit	Heating
H121	Cond Furnace (new)	Condensing / pulse package or residential-type furnace with a minimum AFUE of 92%.	New	Heating
H110	SPC Cond Boiler Retro	Install condensing boiler. Assumed seasonal combustion efficiency of 88% over base of 69.5%	Retrofit	Heating
H109	SPC Hieff Boiler Retro	Install near condensing boiler. Assumed seasonal combustion efficiency of 82% over base of 69.5%	Retrofit	Heating
E131	Windows - Tinted AL Code to Class 36	Windows - Tinted AL Code to Class 36. Application: New Construction	New	Heating
H122	HVAC System Commissioning	HVAC system commissioning. Includes testing and balancing, damper settings, economizer settings, and proper HVAC heating and compressor control installation. This measure includes the proper set-up of single zone package equipment in simple HVAC systems. The majority of the Commercial area is served by this technology. Work done in Eugene (Davis, et al, 2002) suggests higher savings than the other documented commissioning on more complex systems.	New	Heating
E122	Windows - Tinted AL Code to Class 36	Windows - Tinted AL Code to Class 36. Application: Old buildings	At Replacement	Heating
W108	DHW Condensing Tank (repl)	Costs and savings are incremental over a Code-rated tank (combustion efficiency of 80%) for a condensing tank with a minimum combustion efficiency of 94% and an R-16 tank wrap.	At Replacement	Water Heat
W109	DHW Condensing Tank (new)	Costs and savings are incremental over a Code-rated tank (combustion efficiency of 80%) for a condensing tank with a minimum combustion efficiency of 94% and an R-16 tank wrap.	New	Water Heat
H116	Cond Furnace (repl)	Condensing / pulse package or residential-type furnace with a minimum AFUE of 92%.	At Replacement	Heating
E110	Roof Insulation - Blanket R11-41	Roof Insulation - Blanket R11-41. Application: Buildings with open truss unfinished interior	Retrofit	Heating
E118	Windows - Non-Tinted AL Code to Class 40	Windows - Non-Tinted AL Code to Class 40. Application: Old buildings	At Replacement	Heating
E127	Windows - Non-Tinted AL Code to Class 40	Windows - Non-Tinted AL Code to Class 40. Application: New Construction	New	Heating

E109	Roof Insulation - Blanket R11-30	Roof Insulation - Blanket R11-30. Application: Buildings with open truss unfinished interior	Retrofit	Heating
W118	Combo Cond Boiler (retro)	Replace with boiler using condensing or pulse technology to achieve steady-state combustion efficiencies of 89% to 94% (this analysis used 90% efficiency for savings calculations).	Retrofit	Heating
H129	Steam Trap Maintenance	Set up a in-house steam trap maintenance program with equipment, training, and trap replacement. An alternative procedure is to just pay for an outside contractor to conduct a steam survey.	Retrofit	Heating
W112	DHW Cond Boiler (retro)	Replace with boiler using condensing or pulse technology to achieve steady-state combustion efficiencies of 89% to 94% (this analysis used 90% efficiency for savings calculations).	Retrofit	Water Heat
W117	Combo Hieff Boiler (retro)	Replace existing boiler with unit meeting OR Code requirements of 85% combustion efficiency.	Retrofit	Heating
H128	Rooftop Condensing Burner	Install condensing burner	Retrofit	Heating
W111	DHW Hieff Boiler (retro)	Replace existing boiler with unit meeting OR Code requirements of 85% combustion efficiency.	Retrofit	Water Heat
E119	Windows - Non-Tinted AL Code to Class 36	Windows - Non-Tinted AL Code to Class 36. Application: Old buildings	At Replacement	Heating
E117	Windows - Non-Tinted AL Code to Class 45	Windows - Non-Tinted AL Code to Class 45. Application: Old buildings	At Replacement	Heating
E128	Windows - Non-Tinted AL Code to Class 36	Windows - Non-Tinted AL Code to Class 36. Application: New Construction	New	Heating
E126	Windows - Non-Tinted AL Code to Class 45	Windows - Non-Tinted AL Code to Class 45. Application: New Construction	New	Heating
W125	Solar Hot Water	Install solar water heaters on large use facility such as multifamily or lodging	New	Water Heat

At an \$1.70/therm levelized cost screen, cumulative therm savings equals 5,393,882.

New Measures in 2008:

Measure Code	Measure Description	Measure Description	Construction Type	Measure End Use
Co102	Infrared Fryer	0	Retrofit	Cooking
E135	Windows - Single to Class VEA	Windows - Single to Class VEA. Application: Old Single Glazed Buildings	Retrofit	Heating
E132	Windows - Single to Class 45	Windows - Single to Class 45. Application: Old Single Glazed Buildings	Retrofit	Heating
E133	Windows - Single to Class 40	Windows - Single to Class 40. Application: Old Single Glazed Buildings	Retrofit	Heating
E134	Windows - Single to Class 36	Windows - Single to Class 36. Application: Old Single Glazed Buildings	Retrofit	Heating
Co104	Infrared Griddle	0	Retrofit	Cooking
E139	Windows - Double to Class VEA	Windows - Double to Class VEA. Application: Double Glazed Buildings	Retrofit	Heating
H113	Hi Eff Unit Heater (retro)	Install power draft units (80% seas. Eff) in place of natural draft (64% seas. Eff)	Retrofit	Heating
W110	DHW Std. Boiler (retro)	Replace existing boiler with unit meeting OR Code requirements of 80% combustion efficiency.	Retrofit	Water Heat
E137	Windows - Double to Class 40	Windows - Double to Class 40. Application: Double Glazed Buildings	Retrofit	Heating
E138	Windows - Double to Class 36	Windows - Double to Class 36. Application: Double Glazed Buildings	Retrofit	Heating
E136	Windows - Double to Class 45	Windows - Double to Class 45. Application: Double Glazed Buildings	Retrofit	Heating
H110	SPC Cond Boiler Retro	Install condensing boiler. Assumed seasonal combustion efficiency of 88% over base of 69.5%	Retrofit	Heating
H109	SPC Hieff Boiler Retro	Install near condensing boiler. Assumed seasonal combustion efficiency of 82% over base of 69.5%	Retrofit	Heating

Gas Savings to 2030 (000's)	Gas Savings to 2017 (000's)	Levelized Cost, \$/kWh	Levelized Cost, \$/th	Therms Saved/Measure (000's)
2	69	na	\$0.04	0.295
8	118	na	\$0.04	0.295
9	275	na	\$0.08	0.421
39	557	na	\$0.08	0.421
25	24	\$0.01	\$0.08	1.661
0	2	na	\$0.09	0.491
2	18	na	\$0.11	0.000
39	99	na	\$0.12	1.702
86	82	\$0.02	\$0.12	1.961
50	83	na	\$0.13	0.893
204	204	\$0.02	\$0.16	2.317
3	44	na	\$0.16	0.000
78	183	na	\$0.16	1.702
97	94	\$0.03	\$0.18	2.231
3	33	na	\$0.19	0.093
7	6	na	\$0.20	0.094
43	20	na	\$0.22	1.019
13	41	na	\$0.22	0.973
59	28	\$0.03	\$0.25	1.463
62	29	\$0.04	\$0.27	1.051
11	37	na	\$0.27	0.727
5	11	na	\$0.29	0.491
247	156	\$0.04	\$0.30	0.767
56	47	\$0.05	\$0.35	0.637
0	4	na	\$0.36	0.019
4	14	na	\$0.36	0.727

68	171	na	\$0.37	2.458
6	11	\$0.05	\$0.38	0.219
10	19	\$0.05	\$0.40	0.247
17	21	na	\$0.40	0.341
13	#N/A	na	\$0.41	0.421
2	50	na	\$0.43	0.121
5	71	na	\$0.43	0.121
20	70	na	\$0.44	1.257
149	534	na	\$0.45	6.466
296	1,057	na	\$0.45	6.466
30	35	na	\$0.46	0.341
135	318	na	\$0.51	2.458
8	15	\$0.07	\$0.53	0.297
9	29	na	\$0.54	0.223
16	32	na	\$0.54	0.223
16	27	\$0.07	\$0.55	0.334
7	25	na	\$0.57	1.257
0	1	\$0.08	\$0.58	0.028
4	50	na	\$0.62	0.211
1	34	na	\$0.62	0.211
2	53	na	\$0.65	0.000
33	43	\$0.09	\$0.70	0.982
50	110	na	\$0.71	0.724
1	4	\$0.10	\$0.72	0.123
17	44	na	\$0.75	0.944
2	6	\$0.10	\$0.77	0.135
6	88	na	\$0.77	0.000
149	128	na	\$0.79	0.239
407	563	\$0.09	\$0.81	1.021
341	6	\$0.11	\$0.81	1.683
33	42	na	\$0.85	0.667
275	6	\$0.11	\$0.86	1.367
298	6	\$0.11	\$0.86	1.477
317	6	\$0.12	\$0.87	1.572

1	5	na	\$0.89	0.032
58	68	na	\$0.95	0.667
0	15	na	\$0.97	0.000
17	56	na	\$0.98	0.436
30	62	na	\$0.98	0.436
34	81	na	\$1.02	0.944
1	33	na	\$1.03	0.064
83	56	\$0.14	\$1.04	0.406
73	72	na	\$1.16	0.084
2	#N/A	na	\$1.19	0.211
179	6	\$0.16	\$1.22	0.903
162	25	na	\$1.26	1.965
3	85	na	\$1.30	0.187
35	38	na	\$1.32	0.078
127	6	\$0.18	\$1.33	0.707
150	6	\$0.18	\$1.33	0.789
99	6	\$0.18	\$1.35	0.597
80	104	na	\$1.35	1.134
9	110	na	\$1.45	2.061
6	110	na	\$1.52	1.493
2	6	\$0.21	\$1.55	0.205
233	322	\$0.19	\$1.58	0.510
4	10	\$0.22	\$1.64	0.227
70	104	na	\$1.68	0.396
39	85	na	\$1.68	0.396
160	204	na	\$1.71	1.134
24	11	\$0.24	\$1.74	0.164
37	35	na	\$1.76	0.151
20	21	na	\$1.84	0.148

\$1.70/therm screen

20	9	\$0.25	\$1.85	0.230
28	56	na	\$1.99	0.998
15	47	na	\$2.03	1.375
10	85	na	\$2.03	0.623
18	56	na	\$2.11	0.657
69	563	\$0.25	\$2.18	0.493
7	85	na	\$2.34	0.410
56	53	na	\$2.87	0.237
14	13	na	\$3.01	0.050
30	31	na	\$3.01	0.227
7	8	na	\$3.19	0.053
1	29	na	\$4.64	0.000

Gas Savings to 2030 (000's)	Levelized Cost, \$/kWh	Levelized Cost, \$/th
13	na	\$0.41
341	\$0.11	\$0.81
275	\$0.11	\$0.86
298	\$0.11	\$0.86
317	\$0.12	\$0.87
2	na	\$1.19
179	\$0.16	\$1.22
162	na	\$1.26
3	na	\$1.30
127	\$0.18	\$1.33
150	\$0.18	\$1.33
99	\$0.18	\$1.35
9	na	\$1.45
6	na	\$1.52

Appendix D-3

Washington Residential Conservation Measures

Detailed Measure Table - WA Residential Sector Technical Potential to 2030

Measure Code	Measure Description	Program	Average Lifetime	Total Incremental Cost	Total O&M Impact (\$)	Gas Savings to 2030	Gas Savings to 2025	Level Cost, \$/th	Therms Saved/Measure	Implied No. of Units
N-A105	Hi-eff Washer	New	12	27,072	(94,634)	3,389	-	(\$2.15)	4	847
N-A102	MEF 2.0 Washer	New	12	48,128	(164,326)	26,566	-	(\$1.63)	3	8,855
R-A102	MEF 2.0 Washer	Replace	12	1,729,147	(2,085,681)	711,016	-	(\$0.19)	6	118,503
R-WG106	Wx insulation 1 added measure Zone 3	WxExist	45	1,209,659	0	500,847	467,920	\$0.12	367	1,363
R-WG104	Wx insulation 1 added measure Zone 1	WxExist	45	815,862	0	295,663	276,226	\$0.14	323	915
R-WG105	Wx insulation 1 added measure Zone 2	WxExist	45	1,645,785	0	577,721	539,741	\$0.14	314	1,842
R-GD112	Upgrade to Navien Tankless Gas heater	Replace Gas	20	230,436	0	154,360	-	\$0.39	14	11,026
N-H103	E* Insulation, Ducts, Zone 3	NewPkg	45	25,482,056	0	3,955,216	3,488,895	\$0.41	126	31,391
R-WG109	Window, replacement (U=.35) Zone 3	WxExist	45	11,141,516	0	1,291,204	1,206,318	\$0.43	544	2,375
R-H115	Duct Sealing and AFUE 90+, Zone 3	HVACExist	20	1,816,350	0	305,125	225,677	\$0.44	210	1,450
R-WG107	Window, replacement (U=.35) Zone 1	WxExist	45	7,514,462	0	759,124	709,217	\$0.49	475	1,598
N-H102	E* Insulation, Ducts, Zone 2	NewPkg	45	34,669,244	0	4,342,203	3,830,256	\$0.50	102	42,696
R-WG108	Window, replacement (U=.35) Zone 2	WxExist	45	15,158,429	0	1,472,717	1,375,897	\$0.51	457	3,220
R-WG103	Wx insulation 2 measures Zone 3	WxExist	45	8,467,615	0	820,810	766,849	\$0.51	258	3,178
N-H105	Heating upgrade (AFUE 90), Zone 2	NewPkg	18	9,261,207	0	1,811,898	1,598,275	\$0.52	81	22,369
R-H103	Duct Sealing, Zone 3	HVACExist	20	1,597,557	0	226,742	167,703	\$0.53	113	1,999
R-H113	Duct Sealing and AFUE 90+, Zone 1	HVACExist	20	1,225,048	0	168,839	124,877	\$0.54	173	977
N-H101	E* Insulation, Ducts, Zone 1	NewPkg	45	17,186,524	0	2,001,279	1,765,328	\$0.54	95	21,178
R-GH116	Boiler to Polaris Combo radiant, Z 3	Retro Gas	45	10,534,218	0	3,298,452	-	\$0.55	399	8,267
R-GH119	Boiler to Polaris Combo radiant, Z 4	Retro Gas	45	10,534,218	0	3,156,002	-	\$0.57	381	8,283
R-WG101	Wx insulation 2 measures Zone 1	WxExist	45	5,711,033	0	486,530	454,544	\$0.58	228	2,131
R-H114	Duct Sealing and AFUE 90+, Zone 2	HVACExist	20	2,471,209	0	316,149	233,830	\$0.58	160	1,971
R-WG102	Wx insulation 2 measures Zone 2	WxExist	45	11,520,492	0	951,120	888,592	\$0.60	222	4,287
R-A103	Estar Dishwasher	Replace	12	693,815	-178,161	302,308	-	\$0.63	2	151,154
N-H115	E* Plus (FTC) Insulation, Zone 3	NewPkg	45	41,873,733	0	4,143,104	3,654,631	\$0.64	296	13,992
N-H106	Heating upgrade (AFUE 90), Zone 3	NewPkg	18	6,807,030	0	1,079,008	951,793	\$0.64	65	16,651
R-H106	AFUE 90+ Furnace, Zone 3	HVACExist	18	15,206,583	0	1,859,161	1,375,074	\$0.66	99	18,853
N-A103	Estar Dishwasher	New	12	12,395	-3,183	5,105	-	\$0.67	3	1,702
R-H101	Duct Sealing, Zone 1	HVACExist	20	1,077,482	0	117,936	87,228	\$0.68	88	1,348
N-H104	Heating upgrade (AFUE 90), Zone 1	NewPkg	18	4,591,042	0	681,235	600,917	\$0.69	61	11,131
R-H112	Combo with Hot Water delivery, Zone 3	HVACExist	30	346,713	0	28,301	20,932	\$0.72	327	87
R-H102	Duct Sealing, Zone 2	HVACExist	20	2,173,533	0	209,331	154,826	\$0.78	77	2,719
R-H110	Combo with Hot Water delivery, Zone 1	HVACExist	30	233,842	0	17,378	12,853	\$0.79	297	58
R-H104	AFUE 90+ Furnace, Zone 1	HVACExist	18	10,256,171	0	1,031,683	763,055	\$0.80	81	12,704
N-H114	E* Plus (FTC) Insulation, Zone 2	NewPkg	45	56,970,705	0	4,469,564	3,942,601	\$0.81	235	19,028
N-H112	HRV, E*, Zone 3	NewPkg	45	11,343,160	0	889,527	784,651	\$0.81	94	9,503
N-GD109	Upgrade to Navien Tankless Gas heater	New Gas	20	3,300,829	0	1,049,264	-	\$0.81	14	74,947
R-H111	Combo with Hot Water delivery, Zone 2	HVACExist	30	471,715	0	33,944	25,105	\$0.82	288	118
N-H113	E* Plus (FTC) Insulation, Zone 1	NewPkg	45	28,241,989	0	2,080,009	1,834,776	\$0.86	221	9,433
R-H105	AFUE 90+ Furnace, Zone 2	HVACExist	18	20,689,098	0	1,925,599	1,424,214	\$0.86	75	25,617

\$0.85/therm screen

R-WG112	Window upgrade (U=.4 to U=.35) Zone 3	WxExist	45	866,562	0	48,408	45,226	\$0.89	20	2,412	
N-H111	HRV, E*, Zone 2	NewPkg	45	15,432,773	0	1,044,239	921,123	\$0.93	81	12,892	
N-H110	HRV, E*, Zone 1	NewPkg	45	7,650,462	0	489,198	431,521	\$0.99	77	6,395	
N-H109	Window U=.3, Zone 3	NewPkg	45	10,250,131	0	647,942	571,549	\$1.00	36	17,998	\$1.00/therm screen
R-WG110	Window upgrade (U=.4 to U=.35) Zone 1	WxExist	45	584,458	0	28,050	26,206	\$1.03	17	1,623	
R-WG111	Window upgrade (U=.4 to U=.35) Zone 2	WxExist	45	1,178,989	0	55,294	51,659	\$1.06	17	3,264	
N-H108	Window U=.3, Zone 2	NewPkg	45	13,945,668	0	769,574	678,841	\$1.15	32	24,431	
N-H107	Window U=.3, Zone 1	NewPkg	45	6,913,262	0	349,465	308,263	\$1.25	29	12,134	
N-DG104	Tankless Gas heater	NewDHW	20	6,464,131	0	429,473	378,838	\$1.43	43	10,054	
R-DG104	Tankless Gas heater	DHWExist	20	6,764,911	0	352,691	329,504	\$1.43	43	8,257	
R-H109	AFUE 85 DHW combo, Zone 3	HVACExist	18	3,451,075	0	184,920	136,771	\$1.49	115	1,605	
R-H107	AFUE 85 DHW combo, Zone 1	HVACExist	18	2,327,598	0	118,189	87,415	\$1.58	109	1,083	
R-H108	AFUE 85 DHW combo, Zone 2	HVACExist	18	4,695,310	0	221,571	163,878	\$1.70	101	2,184	
R-WG115	HRV Zone 3	WxExist	18	2,785,379	0	106,303	99,315	\$2.10	74	1,439	
R-WG113	HRV Zone 1	WxExist	18	1,878,615	0	62,527	58,417	\$2.41	65	959	
N-DG101	Tank upgrade (50 gal gas)	NewDHW	15	19,434,016	0	928,774	819,271	\$2.43	13	70,760	
R-DG101	Tank upgrade (50 gal gas)	DHWExist	15	20,338,292	0	762,726	712,583	\$2.43	13	58,109	
R-WG114	HRV Zone 2	WxExist	18	3,789,607	0	121,458	113,473	\$2.50	63	1,922	
N-DG103	Solar hot water heater (50 gal) - Solar Zone 2. With gas backup.	NewDHW	20	31,102,639	0	1,107,347	976,790	\$2.67	113	9,827	
R-DG103	Solar hot water heater (50 gal) - Solar Zone 2. With gas backup.	DHWExist	20	32,549,863	0	909,374	849,590	\$2.67	113	8,070	
R-DG102	Tank upgrade (50 gal gas) condensing	DHWExist	15	30,462,969	0	807,134	754,072	\$3.44	66	12,185	
N-DG102	Tank upgrade (50 gal gas) condensing	NewDHW	15	29,108,533	0	982,850	866,971	\$3.44	66	14,838	

At an \$0.85/therm levelized cost screen, cumulative therm savings equals 43,549,821.

At an \$1.00/therm levelized cost screen, cumulative therm savings equals 49,785,217.

New Measures in 2008:

Measure Code	Measure Description	Program	Average Lifetime	Total Incremental Cost	Total O&M Impact (\$)	Gas Savings to 2030	Level Cost, \$/th	Therms Saved/Measure
N-A102	MEF 2.0 Washer	New	12	48,128	(164,326)	26,566	(\$1.63)	3
N-A103	Estar Dishwasher	New	12	12,395	(3,183)	5,105	\$0.67	3
N-A105	Hi-eff Washer	New	12	27,072	(94,634)	3,389	(\$2.15)	4
N-GD109	Upgrade to Navien Tankless Gas heater	New Gas	20	3,300,829	0	1,049,264	\$0.81	14
R-A102	MEF 2.0 Washer	Replace	12	1,729,147	(2,085,681)	711,016	(\$0.19)	6
R-A103	Estar Dishwasher	Replace	12	693,815	(178,161)	302,308	\$0.63	2
R-GD112	Upgrade to Navien Tankless Gas heater	Replace Gas	20	230,436	0	154,360	\$0.39	14
R-GH116	Boiler to Polaris Combo radiant, Z 3	Retro Gas	45	10,534,218	0	3,298,452	\$0.55	399
R-GH119	Boiler to Polaris Combo radiant, Z 4	Retro Gas	45	10,534,218	0	3,156,002	\$0.57	381

Appendix D-4

Washington Commercial/Industrial Conservation Measures

Detailed Measure Table - WA Commercial Sector Technical Potential to 2030

Measure Code	Measure Description	Measure Description	Construction Type	Measure End Use	Gas Savings to 2030 (000's)	Gas Savings to 2025 (000's)	Levelized Cost, \$/kWh	Levelized Cost, \$/th	Therms Saved/Measure (000's)	Implied No. of Units
W123r	HiEff Clothes Washer	Install high performance commercial clothes washers - residential sized units	At Replacement	Water Heat	203	182	na	(\$0.30)	0.078	2,618
W123	HiEff Clothes Washer	Install high performance commercial clothes washers - residential sized units	New	Water Heat	73	51	(\$0.02)	(\$0.30)	0.078	947
E114	Windows - Add Low E to Vinyl Tint	Windows - Add Low E to Vinyl Tint. Application: Old buildings	At Replacement	Heating	1,217	528	\$0.00	\$0.03	3.352	363
R101	Heat Reclaim with Floating Head Control	Large Grocery - Heat recovery to space heating with floating head control	New	Refrigeration	7,937	5,471	\$0.00	\$0.03	25.409	312
R101rep	Heat Reclaim with Floating Head Control	Large Grocery - Heat recovery to space heating with floating head control	At Replacement	Refrigeration	13,443	11,926	\$0.00	\$0.03	25.409	529
E115	Windows - Add Low E and Argon to Vinyl Tint	Windows - Add Low E and Argon to Vinyl Tint. Application: Old buildings	At Replacement	Heating	1,806	879	\$0.00	\$0.04	4.559	396
C116rep	Estar Steam Cooker	Install Energy Star Steam Cooker	At Replacement	Cooking	472	424	na	\$0.04	0.295	1,599
C116	Estar Steam Cooker	Install Energy Star Steam Cooker	New	Cooking	179	125	na	\$0.04	0.295	605
E121	Windows - Tinted AL Code to Class 40	Windows - Tinted AL Code to Class 40. Application: Old buildings	At Replacement	Heating	572	295	\$0.00	\$0.06	1.854	308
E123	Windows - Add Low E to Vinyl Tint	Windows - Add Low E to Vinyl Tint. Application: New Construction	New	Heating	666	200	\$0.00	\$0.06	2.657	251
E101	Wall Insulation - Blown R11	Wall Insulation - Blown R11. Application: Old buildings	Retrofit	Heating	1,945	1,981	\$0.00	\$0.07	7.412	262
E111	Roof Insulation - Attic R0-30	Roof Insulation - Attic R0-30. Application: Buildings with uninsulated attics	Retrofit	Heating	138	121	\$0.00	\$0.07	3.769	37
E124	Windows - Add Low E and Argon to Vinyl Tint	Windows - Add Low E and Argon to Vinyl Tint. Application: New Construction	New	Heating	890	277	\$0.01	\$0.08	3.647	244
C112	Infrared Fryer		New	Cooking	705	494	na	\$0.09	0.421	1,672
C107	Infrared Fryer		At Replacement	Cooking	2,279	2,051	na	\$0.09	0.421	5,407
M105r	Solar Pool Heaters	Install solar pool heaters in public, educational and other swimming pool	Retrofit	Misc.	210	215	na	\$0.09	0.017	12,300
H105	HW Boiler Tune	Tune up in accordance with Minneapolis Energy Office protocol. Can include derating the burner, adjusting the secondary air, adding flue restrictors, cleaning the fire-side of the heat exchanger, cleaning the water side, or installing turbulators. Other modifications may include uprating the burner to reduce oxygen or derating the burner to reduce stack temperature. Note: In gas systems, excess air and stack temperatures are often within reasonable ranges, so the technical potential for this measure is limited. Combining this measure with the vent damper and power burner measures increases both applicability and cost effectiveness, and was assumed for this analysis.	Retrofit	Heating	9	9	na	\$0.09	0.388	22
H104	Hot Water Temperature Reset	Controller automatically resets the delivery temperature in a hot water radiant system based on outside air temperature. The reset reduces the on-time of the heating equipment and the occurrence of simultaneous heating and cooling through instantaneous adjustments.	Retrofit	Heating	424	284	na	\$0.11	0.705	602
E130	Windows - Tinted AL Code to Class 40	Windows - Tinted AL Code to Class 40. Application: New Construction	New	Heating	299	102	\$0.01	\$0.11	1.463	205
E122	Windows - Tinted AL Code to Class 36	Windows - Tinted AL Code to Class 36. Application: Old buildings	At Replacement	Heating	1,171	696	\$0.01	\$0.11	3.096	378
E103	Roof Insulation - Rigid R0-11	Roof Insulation - Rigid R0-11-not including re-roofing costs but including deck preparation. Application: Old buildings with flat roofs and no attics	At Replacement	Heating	491	418	\$0.01	\$0.13	4.576	107
E102	Wall Insulation - Spray On for Metal Buildings	Wall Insulation - Spray On for Metal Buildings (Cellulose) Unfinished. Application: Old buildings	Retrofit	Heating	318	324	\$0.00	\$0.15	3.287	97
E116	Windows - Add Argon to Vinyl Lowe	Windows - Add Argon to Vinyl Lowe. Application: Old buildings	At Replacement	Heating	2,218	1,645	\$0.00	\$0.16	1.206	1,840
H106	Steam Balance	Single-pipe steam systems are notorious for uneven heating, which wastes energy because the thermostat must be set to heat the coldest spaces and overheating other spaces. Steam balances corrects these problems by: 1) Adding air venting on the main line or at the radiators; 2) Adding boiler cycle controls; 3) Adding or subtracting radiators. Energy savings accrue from lowering the overall building temperature.	Retrofit	Heating	178	149	na	\$0.17	0.769	231
W127r	Waste Water Heat Exchanger	Install HX on waste water	Retrofit	Water Heat	74	76	na	\$0.17	0.000	0
E125	Windows - Add Argon to Vinyl Lowe	Windows - Add Argon to Vinyl Lowe. Application: New Construction	New	Heating	989	527	\$0.00	\$0.17	0.991	998
C111	Direct Fired Convection Oven		New	Cooking	200	140	na	\$0.18	0.522	384
C106	Direct Fired Convection Oven		At Replacement	Cooking	448	402	na	\$0.18	0.522	858

Detailed Measure Table - WA Commercial Sector Technical Potential to 2030

Measure Code	Measure Description	Measure Description	Construction Type	Measure End Use	Gas Savings to 2030 (000's)	Gas Savings to 2025 (000's)	Levelized Cost, \$/kWh	Levelized Cost, \$/th	Therms Saved/Measure (000's)	Implied No. of Units
E131	Windows - Tinted AL Code to Class 36	Windows - Tinted AL Code to Class 36. Application: New Construction	New	Heating	549	219	\$0.01	\$0.19	2.494	220
E104	Roof Insulation - Rigid R0-22	Roof Insulation - Rigid R0-22-- not including re-roofing costs but including deck preparation and ~4" rigid.. Application: Old buildings with flat roofs and no attics	At Replacement	Heating	560	477	\$0.01	\$0.20	5.205	108
W101	DHW Wrap	Insulate the surface of the storage water heater or an unfired storage tank to R-5 to reduce standby losses.	Retrofit	Water Heat	27	25	na	\$0.20	0.076	358
H119	HiEff Unit Heater (new)	Install power draft units (80% seas. Eff) inplace of natural draft (64% seas. Eff)	New	Heating	510	270	na	\$0.20	1.595	320
E118	Windows - Non-Tinted AL Code to Class 40	Windows - Non-Tinted AL Code to Class 40. Application: Old buildings	At Replacement	Heating	1,874	1,464	\$0.00	\$0.20	2.073	904
E127	Windows - Non-Tinted AL Code to Class 40	Windows - Non-Tinted AL Code to Class 40. Application: New Construction	New	Heating	1,114	673	\$0.00	\$0.21	1.913	582
E119	Windows - Non-Tinted AL Code to Class 36	Windows - Non-Tinted AL Code to Class 36. Application: Old buildings	At Replacement	Heating	1,397	921	\$0.02	\$0.22	3.227	433
W102	DHW Shower Heads	Install low flow shower heads (2.0 gallons per minute) to replace 3.4 GPM shower heads.	Retrofit	Water Heat	131	134	na	\$0.22	0.069	1,887
H114	Hi Eff Unit Heater (replace)	Install power draft units (80% seas. Eff) inplace of natural draft (64% seas. Eff)	At Replacement	Heating	897	607	na	\$0.24	1.595	563
M105	Solar Pool Heaters	Install solar pool heaters in public, educational and other swimming pool	New	Misc.	46	32	na	\$0.24	0.017	2,710
E107	Roof Insulation - Blanket R0-19	Roof Insulation - Blanket R0-19. Application: Buildings with open truss unfinished interior	Retrofit	Heating	297	303	\$0.02	\$0.27	3.275	91
E112	Roof Insulation - Attic 11-30	Roof Insulation - Attic 11-30. Application: Buildings with partially insulated attics	Retrofit	Heating	211	215	\$0.02	\$0.28	1.409	150
E108	Roof Insulation - Blanket R0-30	Roof Insulation - Blanket R0-30. Application: Buildings with open truss unfinished interior	Retrofit	Heating	312	318	\$0.02	\$0.29	2.303	135
W124r	Computerized Water Heater Control	Install intelligent controls on the hot water circulation loops.	Retrofit	Water Heat	160	163	na	\$0.31	0.000	0
E105	Roof Insulation - Rigid R11-22	Roof Insulation - Rigid R11-22 2" rigid added to an existing foam roof insulation at re-roof, includes some surface prep. Application: Old buildings with flat roofs, no attics, and some insulation	At Replacement	Heating	1,107	905	\$0.02	\$0.33	1.814	610
E117	Windows - Non-Tinted AL Code to Class 45	Windows - Non-Tinted AL Code to Class 45. Application: Old buildings	At Replacement	Heating	735	593	\$0.00	\$0.34	0.750	980
E128	Windows - Non-Tinted AL Code to Class 36	Windows - Non-Tinted AL Code to Class 36. Application: New Construction	New	Heating	1,688	1,016	\$0.00	\$0.35	2.921	578
H107	Vent Damper	Install vent damper downstream of the draft relief to prevent airflow up the stack, while allowing warm air from the boiler to spill into the conditioned space as heat or into the boiler room to reduce jacket losses. This measure is most cost-effective when combined with the boiler tune up and power burner measures.	Retrofit	Heating	47	40	na	\$0.36	0.388	121
W121	Combo Hieff Boiler (new)	Replace existing boiler with unit meeting OR Code requirements of 85% combustion efficiency.	New	Heating	87	60	na	\$0.36	0.379	231
E113	Roof Insulation - Roofcut 0-22	Roof Insulation - Roofcut 0-22. Application: Buildings with uninsulated flat roofs at reroofing time	At Replacement	Heating	2	2	\$0.02	\$0.37	1.883	1
E126	Windows - Non-Tinted AL Code to Class 45	Windows - Non-Tinted AL Code to Class 45. Application: New Construction	New	Heating	412	251	\$0.00	\$0.37	0.689	597
H101	Warm Up Control	This measure is designed to implement a shut down of outside air when the building is coming off night setback. Usualy the capability for this is available in a commercial t-stat but either the extra control wire is not attached or the unit itself has not been set up to receive the signal. Cost is based on labor cost to enable this ability in existing controllers	Retrofit	Heating	275	280	na	\$0.38	0.187	1,474
W119	Combo Hieff Boiler (repl)	Replace existing boiler with unit meeting OR Code requirements of 85% combustion efficiency.	At Replacement	Heating	136	120	na	\$0.39	0.379	359
C113	Convection Range/Oven	Install near condensing boiler. Assumed seasonal combustion efficiency of 82% over base of 75%	New	Cooking	43	30	na	\$0.39	0.149	290
H117	SPC Hieff Boiler (new)	Install near condensing boiler. Assumed seasonal combustion efficiency of 82% over base of 75%	New	Heating	245	117	na	\$0.39	0.681	360
C108	Convection Range/Oven	Install near condensing boiler. Assumed seasonal combustion efficiency of 82% over base of 75%	At Replacement	Cooking	95	86	na	\$0.40	0.149	638
W103	DHW Faucets	Add aerators to existing faucets to reduce flow from 3.4 gallons per minute to 2.0 GPM.	Retrofit	Water Heat	17	18	na	\$0.41	0.014	1,258
H111	SPC Hieff Boiler Replace	Install near condensing boiler. Assumed seasonal combustion efficiency of 82% over base of 75%	At Replacement	Heating	77	47	na	\$0.46	0.681	114
C115	Power Range Burner	Install near condensing boiler. Assumed seasonal combustion efficiency of 82% over base of 75%	New	Cooking	129	90	na	\$0.47	0.121	1,067
C110	Power Range Burner	Install near condensing boiler. Assumed seasonal combustion efficiency of 82% over base of 75%	At Replacement	Cooking	282	253	na	\$0.47	0.121	2,337

Detailed Measure Table - WA Commercial Sector Technical Potential to 2030

Measure Code	Measure Description	Measure Description	Construction Type	Measure End Use	Gas Savings to 2030 (000's)	Gas Savings to 2025 (000's)	Levelized Cost, \$/kWh	Levelized Cost, \$/th	Therms Saved/Measure (000's)	Implied No. of Units	
H102	DCV	Applicable to single zone packaged systems with large make-up air fractions either because of intermittent occupancy or because of code requirements. In most cases the outdoor air is reset to 5% or less with CO2 build-up modulating ventilation.	Retrofit	Heating	364	287	\$0.05	\$0.62	0.495	735	
H120a	Cond Unit Heater from Nat Draft(new)	Install condensing power draft units (90% seas. Eff) in place of natural draft (64% seas. Eff)	New	Heating	884	468	na	\$0.63	2.304	384	
H118	SPC Cond Boiler (new)	Install condensing boiler. Assumed seasonal combustion efficiency of 88% over base of 75%	New	Heating	457	219	na	\$0.65	1.178	388	
W109	DHW Condensing Tank (new)	Costs and savings are incremental over a Code-rated tank (combustion efficiency of 80%) for a condensing tank with a minimum combustion efficiency of 94% and an R-16 tank wrap.	New	Water Heat	280	176	na	\$0.67	0.357	784	
C114	Infrared Griddle		New	Cooking	93	65	na	\$0.67	0.211	439	
W108	DHW Condensing Tank (repl)	Costs and savings are incremental over a Code-rated tank (combustion efficiency of 80%) for a condensing tank with a minimum combustion efficiency of 94% and an R-16 tank wrap.	At Replacement	Water Heat	415	331	na	\$0.68	0.357	1,163	
W115	DHW Hieff Boiler (new)	Replace existing boiler with unit meeting OR Code requirements of 85% combustion efficiency.	New	Water Heat	93	59	na	\$0.68	0.160	583	
C109	Infrared Griddle		At Replacement	Cooking	205	184	na	\$0.68	0.211	971	
W113	DHW Hieff Boiler (repl)	Replace existing boiler with unit meeting OR Code requirements of 85% combustion efficiency.	At Replacement	Water Heat	132	106	na	\$0.69	0.160	826	
W127	Waste Water Heat Exchanger	Install HX on waste water	New	Water Heat	132	91	na	\$0.70	0.000	0	
W122	Combo Cond Boiler (new)	Replace with boiler using condensing or pulse technology to achieve steady-state combustion efficiencies of 89% to 94% (this analysis used 90% efficiency for savings calculations).	New	Heating	171	117	na	\$0.72	0.739	231	
H108	Power burner	Replace standard burner with a power burner to optimize combustion and reduce standby losses in the stack. Note: Costs and savings assume that this measure will be performed in conjunction with a boiler tune up when appropriate.	Retrofit	Heating	483	410	na	\$0.72	0.572	844	
H115a	Cond Unit Heater from Nat draft(replace)	Install condensing power draft units (90% seas. Eff) in place of natural draft (64% seas. Eff)	At Replacement	Heating	1,555	1,053	na	\$0.74	2.304	675	
H112	SPC Cond Boiler Replace	Install condensing boiler. Assumed seasonal combustion efficiency of 88% over base of 75%	At Replacement	Heating	145	88	na	\$0.76	1.178	123	
W104	DHW Pipe Ins	Add 1" insulation to pipes used for steam or hydronic distribution; particularly effective when pipes run through unheated spaces.	Retrofit	Water Heat	39	40	na	\$0.77	0.014	2,817	
W120	Combo Cond Boiler (repl)	Replace with boiler using condensing or pulse technology to achieve steady-state combustion efficiencies of 89% to 94% (this analysis used 90% efficiency for savings calculations).	At Replacement	Heating	266	235	na	\$0.78	0.739	359	\$0.85/therm screen
W105	DHW Recirc Controls	Install electronic controller to hot water boiler system that turns off the boiler and circulation pump when the hot water demand is reduced (usually in residential type occupancies) or can be reset to meet the hot water load. (Steel boilers also require a mixing valve to prevent water temperatures from dropping below required levels).	Retrofit	Water Heat	99	101	na	\$0.96	0.042	2,331	
H123	HVAC controls	Control set up and algorithm. This assumes the development of an open source control package aimed at describing scheduling and control points throughout the HVAC system, property training operators so that scheduling can be maintained and adjusted as needed, and providing operator back up so that temperature reset, pressure reset, and minimum damper settings are set at optimum levels for the current occupancy.	New	Heating	2,417	1,426	\$0.08	\$0.99	0.957	2,526	\$1.00/therm screen
H103	Ducts	Duct retrofit of both insulation and air sealing	Retrofit	Heating	146	126	\$0.09	\$1.04	0.776	188	
W124	Computerized Water Heater Control	Install intelligent controls on the hot water circulation loops.	New	Water Heat	35	24	na	\$1.04	0.000	0	
W116	DHW Cond Boiler (new)	Replace with boiler using condensing or pulse technology to achieve steady-state combustion efficiencies of 89% to 94% (this analysis used 90% efficiency for savings calculations).	New	Water Heat	182	116	na	\$1.08	0.311	583	
W114	DHW Cond Boiler (repl)	Replace with boiler using condensing or pulse technology to achieve steady-state combustion efficiencies of 89% to 94% (this analysis used 90% efficiency for savings calculations).	At Replacement	Water Heat	257	208	na	\$1.13	0.311	826	

Detailed Measure Table - WA Commercial Sector Technical Potential to 2030

Measure Code	Measure Description	Measure Description	Construction Type	Measure End Use	Gas Savings to 2030 (000's)	Gas Savings to 2025 (000's)	Levelized Cost, \$/kWh	Levelized Cost, \$/th	Therms Saved/Measure (000's)	Implied No. of Units
E106	Roof Insulation - Rigid R11-33	Roof Insulation - Rigid R11-33: add 4" of insulation at reroof. Application: Old buildings with flat roofs, no attics, and some insulation	At Replacement	Heating	415	331	\$0.07	\$1.13	0.917	453
H120b	Cond Unit Heater From Power Draft (new)	Install condensing power draft units (90% seas. Eff) in place of power draft (80% seas. Eff)	New	Heating	226	120	na	\$1.27	0.885	256
W125r	Solar Hot Water	Install solar water heaters on large use facility such as multifamily or lodging	Retrofit	Water Heat	686	701	na	\$1.45	1.318	521
H121	Cond Furnace (new)	Condensing / pulse package or residential-type furnace with a minimum AFUE of 92%.	New	Heating	400	237	na	\$1.45	1.063	376
H129	Steam Trap Maintenance	Set up a in-house steam trap maintenance program with equipment, training, and trap replacement. An alternative procedure is to just pay for an outside contractor to conduct a steam survey.	Retrofit	Heating	201	168	na	\$1.46	1.086	185
H115b	Cond Unit Heater from power draft (replace)	Install condensing power draft units (90% seas. Eff) in place of power draft (80% seas. Eff)	At Replacement	Heating	398	270	na	\$1.50	0.885	450
H116	Cond Furnace (repl)	Condensing / pulse package or residential-type furnace with a minimum AFUE of 92%.	At Replacement	Heating	693	525	na	\$1.78	1.063	652
E110	Roof Insulation - Blanket R11-41	Roof Insulation - Blanket R11-41. Application: Buildings with open truss unfinished interior	Retrofit	Heating	122	124	\$0.11	\$1.83	0.360	339
E109	Roof Insulation - Blanket R11-30	Roof Insulation - Blanket R11-30. Application: Buildings with open truss unfinished interior	Retrofit	Heating	102	104	\$0.12	\$1.95	0.518	196
H122	HVAC System Commissioning	HVAC system commissioning. Includes testing and balancing, damper settings, economizer settings, and proper HVAC heating and compressor control installation. This measure includes the proper set-up of single zone package equipment in simple HVAC systems. The majority of the Commercial area is served by this technology. Work done in Eugene (Davis, et al, 2002) suggests higher savings than the other documented commissioning on more complex systems.	New	Heating	1,381	815	\$0.18	\$2.10	0.478	2,886
W125	Solar Hot Water	Install solar water heaters on large use facility such as multifamily or lodging	New	Water Heat	322	222	na	\$2.26	1.318	244

At an \$0.85/therm levelized cost screen, cumulative therm savings equals 58,729.

At an \$1.00/therm levelized cost screen, cumulative therm savings equals 61,245.

New Measures in 2008:

Measure Code	Measure Description	Measure Description	Construction Type	Measure End Use	Gas Savings to 2030 (000's)	Levelized Cost, \$/kWh	Levelized Cost, \$/th
Co102	Infrared Fryer	0	Retrofit	Cooking	35	na	\$0.41
Co104	Infrared Griddle	0	Retrofit	Cooking	35	na	\$1.19

Appendix E

ENERGY STAR New Homes Incentives

APPENDIX E

ENERGY STAR New Homes Incentives

Whole House Incentives

ENERGY STAR Homes Packages	Gas Only	Full Territory
ENERGY STAR Qualified Home – Gas with A/C	\$350	\$550
ENERGY STAR Qualified Home – Gas without A/C	\$350	\$450
ENERGY STAR Qualified Home – Heat Pump 8.5 or 9.0 HSPF	n/a	\$550
NW ENERGY STAR <i>Plus</i> – Gas or Heat Pump	\$1,000	\$1,000
Zonal Electric Home		\$400

Upgrade Measures	Gas Only	Full Territory
2.0 MEF ENERGY STAR Qualified Clothes Washer	\$75	\$75
Lighting (15 additional CFL bulbs or 100% of all bulbs, whichever is less)	n/a	\$75
.81 EF Tankless Water Heater (gas model only)*	\$100	\$100
80% AFUE High Efficiency Gas Hearth*	\$70	\$70

*These measures not available in Avista's Oregon territory.

Stand Alone Incentives

Stand-alone Measures	Incentive Amount
90% AFUE Gas Furnace + PTCS Duct Sealing	\$300
90% AFUE Gas Furnace*	\$150
PTCS Ducts in homes with a heat pump.	\$150
Heat Pump Commissioning	\$150
Heat Pump – 9.5 HSPF / SEER 13 with commissioning	\$300
80% AFUE High Efficiency Gas Hearth*	\$70
.81 EF Tankless Water Heater (gas model only)*	\$200

*These measures not available in Avista's Oregon territory.

Verification and Certification Incentives

Verification Incentive	Incentive Amount
Builder Incentive for Homes Certified in 2007 (only in joint territory)	\$150
Builder Incentive for Homes Certified in 2007 (in gas territory)	\$100
ENERGY STAR Certification Fee	
Oregon Department of Energy Certification Fee (full certification fee is \$75, of which Energy Trust discounts \$35)	Discounted Fee
	\$40

Qualifications:

- All measures must be installed in Energy Trust of Oregon service territory and verified by an Energy Trust approved verifier.
- Homes must be built to ENERGY STAR Northwest Certification requirements and Energy Trust mechanical ventilation requirements.
- Incentives are provided for homes sited within the Oregon service territories of qualifying providers.
- Qualifying **electric** providers are PGE and Pacific Power. Qualifying **gas** providers are Cascade Natural Gas and NW Natural. Select incentives are available in Avista's service territory. Incentive amounts vary depending on the type of territory:
 - **Gas only:** Homes with a qualifying gas provider and non-qualifying electric provider

- **Full Territory:** Homes with a qualifying gas and electric provider.

Solar Thermal Incentive	Incentive Amount
Solar Water Heating* (Offered through Energy Trust's Solar Program. Ask your Builder Outreach Specialist for details.)	\$750

* Not available in Avista service territory.

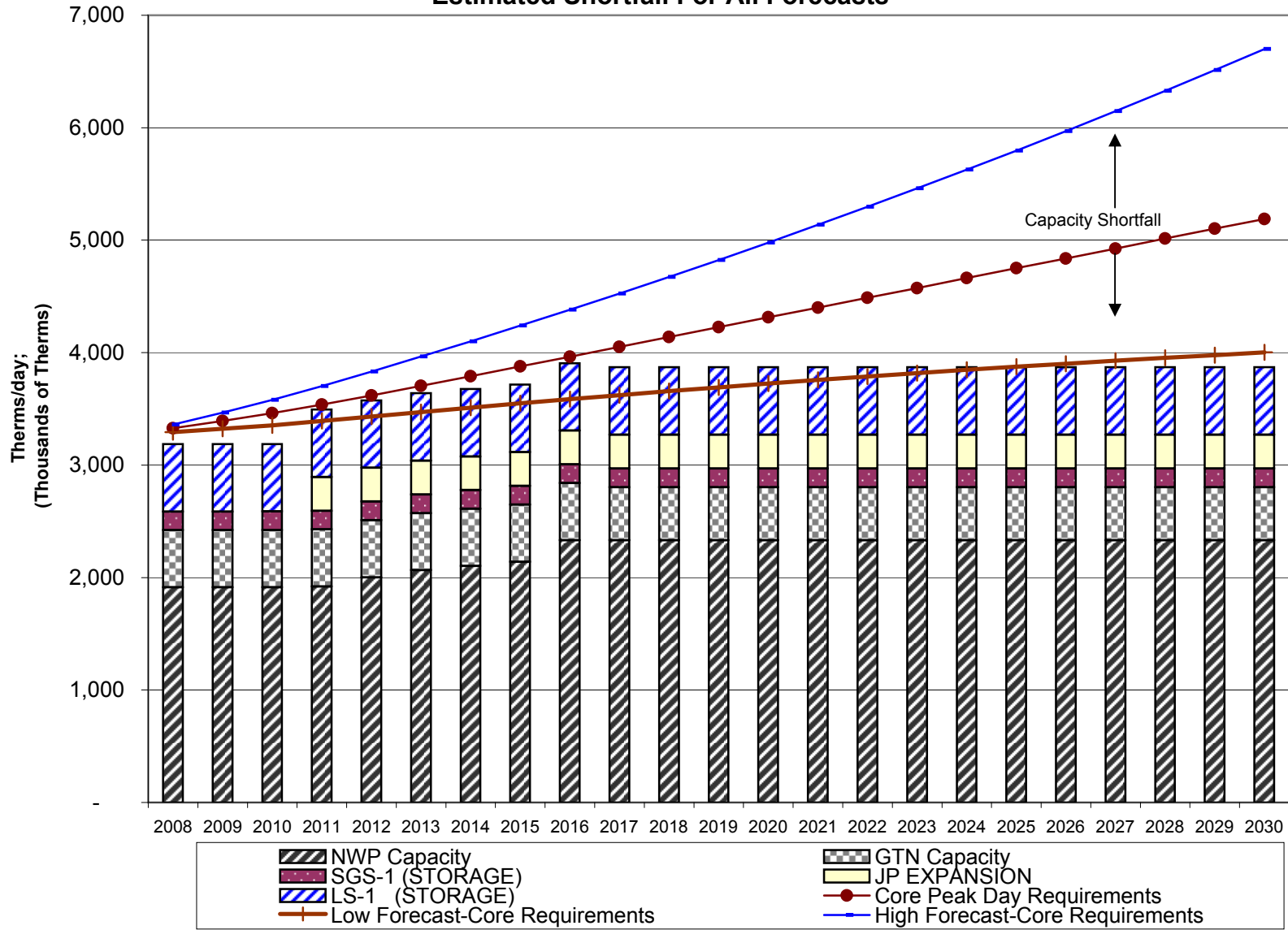
Performance Tester Training and Equipment Incentives

Performance Tester Training Incentives	Incentive
Full Duct Course (2 days)	TBD
Heat Pump & CAC Commissioning (1 day)	TBD

Equipment	Incentive
Performance Testing Equipment	Up to \$1,200

Appendix F
Capacity Requirements & Peak Day Planning

Peak Day Demand & Existing Capacity Resources Estimated Shortfall For All Forecasts



Note: WGPW Capacity is net of Non-Core primary term capacity requirements

Cascade Natural Gas Corporation
Transportation Capacity vs Peak Requirements
Medium Load Growth Forecast

(000's of Therms)

	Counter Party	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
CAPACITY REQUIREMENTS (@ 65 DD)																								
Non-Core Primary Term		419	419	418	412	330	267	229	191	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Core Capacity Requirement		3,328	3,392	3,461	3,537	3,619	3,705	3,791	3,878	3,964	4,052	4,139	4,227	4,314	4,402	4,489	4,576	4,663	4,750	4,837	4,925	5,013	5,102	5,189
Total Required Firm Capacity		3,747	3,811	3,879	3,949	3,949	3,972	4,020	4,069	3,964	4,052	4,139	4,227	4,314	4,402	4,489	4,576	4,663	4,750	4,837	4,925	5,013	5,102	5,189
CAPACITY RESOURCES																								
Current TF-1 *		Williams Gas Pipeline West	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061
Supplemental TF-1 (Kitsap)		Williams Gas Pipeline West	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210
Supplemental TF-1 (Weyerhaeuser)		Williams Gas Pipeline West	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
NWP Phase 1		Williams Gas Pipeline West	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
SGS-1 (STORAGE)		Williams Gas Pipeline West	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166
JP EXPANSION		Williams Gas Pipeline West	-	-	-	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300
LS-1 (STORAGE)		Williams Gas Pipeline West	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600
GTN FTS-1 **		Gas Transmission NW	313	313	313	313	313	313	313	313	313	313	313	313	313	313	313	313	313	313	313	313	313	313
GTN T-3 (Nov - Apr)		Gas Transmission NW	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74
GTN SUPPLEMENTAL (Nov - Apr) **		Gas Transmission NW	36	36	36	36	36	36	36	36	36	-	-	-	-	-	-	-	-	-	-	-	-	-
GTN 03 EXPANSION (Nov - Apr) **		Gas Transmission NW	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
Total Capacity Available			3,722	3,722	3,722	4,022	4,022	4,022	4,022	4,022	4,022	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	
CAPACITY BALANCE																								
Capacity For Release		(25)	(89)																					
Incremental Capacity Required		-	-	157	(73)	(73)	(50)	(1)	47	(57)	30	153	241	328	416	503	590	677	764	852	939	1,027	1,117	1,204

* 280/day is via Cascade's GTN FTS-1 contract. The TF-1 contract also includes 200 Upstream at Station 2 on Duke Energy Transmission (Formerly Westcoast) beginning Nov. 1, 2003.

** Includes Annual (12 Months) Upstream Capacity on TransCanada Pipeline (NOVA and ANG)

Cascade Natural Gas Corporation
Transportation Capacity vs Peak Requirements
Medium Load Growth Forecast

(000's of Therms)

	Counter Party	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
SUMMARY BY PIPELINE																									
Core Peak Load @ 65 dd system wide																									
NWP Load		2,766	2,818	2,869	2,926	2,986	3,047	3,107	3,169	3,230	3,291	3,353	3,415	3,478	3,539	3,601	3,662	3,725	3,787	3,848	3,910	3,973	4,036	4,098	
GTN Load		561	575	592	612	634	658	684	709	734	760	785	811	836	861	887	912	938	964	989	1,015	1,041	1,066	1,091	
Total System Core Requirements		3,327	3,393	3,461	3,538	3,620	3,705	3,791	3,878	3,964	4,051	4,138	4,226	4,314	4,400	4,488	4,574	4,663	4,751	4,837	4,925	5,014	5,102	5,189	
GTN		624	624	624	624	624	624	624	624	624	624	588	588	588	588	588	588	588	588	588	588	588	588	588	
NWP		3,098	3,098	3,098	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	
		3,722	3,722	3,722	4,022	4,022	4,022	4,022	4,022	4,022	4,022	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	
NWP Excess/(Shortfall)		(87)	(139)	(189)	60	82	84	62	38	168	107	45	(17)	(80)	(141)	(203)	(264)	(327)	(389)	(450)	(512)	(575)	(638)	(700)	
GTN Excess/(Shortfall)		63	49	32	12	(10)	(34)	(60)	(85)	(110)	(136)	(197)	(223)	(248)	(273)	(299)	(324)	(350)	(376)	(401)	(427)	(453)	(478)	(503)	
Total System Excess/(Shortfall)		(24)	(90)	(157)	72	72	50	2	(47)	58	(29)	(152)	(240)	(328)	(414)	(502)	(588)	(677)	(765)	(851)	(939)	(1,028)	(1,116)	(1,203)	

Cascade Natural Gas Corporation
Transportation Capacity vs Peak Requirements
Low Load Growth Forecast

(000's of Therms)

	Counter Party	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
SUMMARY BY PIPELINE																									
Core Peak Load @ 65 dd system wide																									
NWP Load		2,738	2,757	2,777	2,800	2,824	2,848	2,871	2,893	2,914	2,935	2,955	2,975	2,994	3,013	3,030	3,047	3,063	3,078	3,093	3,107	3,121	3,136	3,149	
GTN Load		555	565	577	591	607	624	640	656	672	687	702	716	730	744	758	771	784	796	809	821	832	843	853	
Total System Core Requirements		3,294	3,322	3,354	3,392	3,432	3,472	3,511	3,550	3,586	3,622	3,657	3,691	3,725	3,757	3,788	3,818	3,847	3,875	3,902	3,928	3,954	3,978	4,002	
GTN		624	624	624	624	624	624	624	624	624	624	588	588	588	588	588	588	588	588	588	588	588	588	588	
NWP		3,098	3,098	3,098	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	
		3,722	3,722	3,722	4,022	4,022	4,022	4,022	4,022	4,022	4,022	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	
NWP Excess/(Shortfall)		(59)	(78)	(97)	186	244	283	298	314	484	463	443	423	404	385	368	351	335	320	305	291	276	262	249	
GTN Excess/(Shortfall)		68	59	46	32	16	(0)	(16)	(32)	(48)	(63)	(114)	(129)	(143)	(156)	(170)	(183)	(196)	(209)	(221)	(233)	(244)	(255)	(265)	
Total System Excess/(Shortfall)		9	(19)	(50)	218	260	283	282	281	436	400	329	295	261	229	198	168	139	111	84	58	32	7	(16)	

Cascade Natural Gas Corporation
Transportation Capacity vs Peak Requirements
High Load Growth Forecast
(000's of Therms)

	Counter Party	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
CAPACITY REQUIREMENTS (@ 65 DD)																								
Non-Core Primary Term		419	419	418	412	330	267	229	191	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Core Capacity Requirement		3,360	3,466	3,579	3,702	3,831	3,965	4,100	4,240	4,381	4,525	4,674	4,824	4,979	5,136	5,297	5,460	5,627	5,796	5,970	6,147	6,328	6,512	6,700
Total Required Firm Capacity		3,779	3,885	3,997	4,114	4,161	4,232	4,329	4,431	4,381	4,525	4,674	4,824	4,979	5,136	5,297	5,460	5,627	5,796	5,970	6,147	6,328	6,512	6,700
CAPACITY RESOURCES																								
Current TF-1 *	Williams Gas Pipeline West	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061
Supplemental TF-1 (Kitsap)	Williams Gas Pipeline West	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210
Supplemental TF-1 (Weyerhaeuser)	Williams Gas Pipeline West	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
NWP Phase 1	Williams Gas Pipeline West	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
SGS-1 (STORAGE)	Williams Gas Pipeline West	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166
JP EXPANSION	Williams Gas Pipeline West	-	-	-	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300
LS-1 (STORAGE)	Williams Gas Pipeline West	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600
GTN FTS-1 **	Gas Transmission NW	313	313	313	313	313	313	313	313	313	313	313	313	313	313	313	313	313	313	313	313	313	313	313
GTN T-3 (Nov - Apr)	Gas Transmission NW	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74
GTN SUPPLEMENTAL (Nov - Apr) **	Gas Transmission NW	36	36	36	36	36	36	36	36	36	36	-	-	-	-	-	-	-	-	-	-	-	-	-
GTN 03 EXPANSION (Nov - Apr) **	Gas Transmission NW	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
Total Capacity Available		3,722	3,722	3,722	4,022	4,022	4,022	4,022	4,022	4,022	4,022	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986
CAPACITY BALANCE																								
Capacity For Release		(58)																						
Incremental Capacity Required		-	164	276	92	139	210	308	409	359	504	688	838	993	1,151	1,311	1,474	1,641	1,811	1,984	2,161	2,342	2,526	2,714

* 280/day is via Cascade's GTN FTS-1 contract. The TF-1 contract also includes 200 Upstream at Station 2 on Duke Energy Transmission (Formerly Westcoast) beginning Nov. 1, 2003.

** Includes Annual (12 Months) Upstream Capacity on TransCanada Pipeline (NOVA and ANG)

Cascade Natural Gas Corporation
Transportation Capacity vs Peak Requirements
High Load Growth Forecast

(000's of Therms)

	Counter Party	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
SUMMARY BY PIPELINE																									
Core Peak Load @ 65 dd system wide																									
NWP Load		2,794	2,877	2,963	3,056	3,153	3,252	3,353	3,456	3,560	3,667	3,776	3,887	4,002	4,119	4,237	4,357	4,480	4,605	4,732	4,862	4,995	5,132	5,271	
GTN Load		567	590	616	646	678	713	748	784	821	859	897	937	977	1,018	1,060	1,103	1,147	1,192	1,238	1,285	1,333	1,380	1,428	
Total System Core Requirements		3,360	3,466	3,579	3,702	3,831	3,965	4,100	4,240	4,381	4,525	4,674	4,824	4,979	5,136	5,297	5,460	5,627	5,796	5,970	6,147	6,328	6,512	6,700	
GTN		624	624	624	624	624	624	624	624	624	624	588	588	588	588	588	588	588	588	588	588	588	588	588	
NWP		3,098	3,098	3,098	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	3,398	
		3,722	3,722	3,722	4,022	4,022	4,022	4,022	4,022	4,022	4,022	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	
NWP Excess/(Shortfall)		(115)	(198)	(283)	(71)	(85)	(121)	(184)	(249)	(162)	(269)	(378)	(490)	(604)	(721)	(839)	(959)	(1,082)	(1,207)	(1,334)	(1,464)	(1,597)	(1,734)	(1,873)	
GTN Excess/(Shortfall)		57	34	7	(22)	(54)	(89)	(124)	(160)	(197)	(235)	(309)	(349)	(389)	(430)	(472)	(515)	(559)	(604)	(650)	(697)	(745)	(792)	(841)	
Total System Excess/(Shortfall)		(57)	(164)	(276)	(92)	(139)	(210)	(308)	(409)	(359)	(504)	(688)	(838)	(993)	(1,151)	(1,311)	(1,474)	(1,641)	(1,811)	(1,984)	(2,161)	(2,342)	(2,526)	(2,714)	

Cascade Natural Gas Corporation
Transportation Capacity vs Peak Requirements
Low Load Growth Forecast

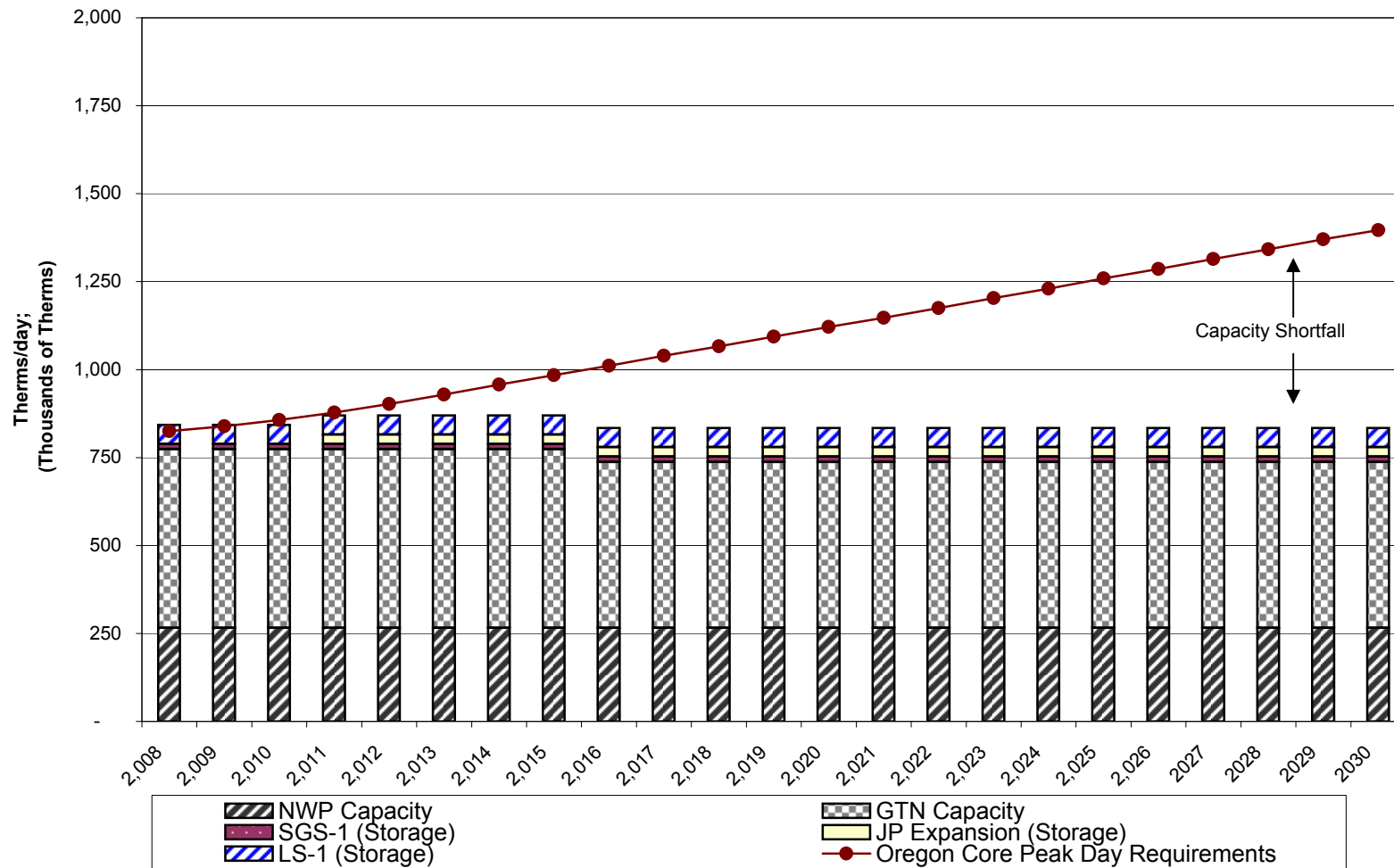
(000's of Therms)

	Counter Party	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
CAPACITY REQUIREMENTS (@ 65 DD)																									
Non-Core Primary Term		419	419	418	412	330	267	229	191	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Core Capacity Requirement		3,294	3,322	3,354	3,392	3,432	3,472	3,511	3,550	3,586	3,622	3,657	3,691	3,725	3,757	3,788	3,818	3,847	3,875	3,902	3,928	3,954	3,978	4,002	
Total Required Firm Capacity		3,713	3,741	3,772	3,804	3,762	3,739	3,740	3,741	3,586	3,622	3,657	3,691	3,725	3,757	3,788	3,818	3,847	3,875	3,902	3,928	3,954	3,978	4,002	
CAPACITY RESOURCES																									
Current TF-1 *		Williams Gas Pipeline West	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	2,061	
Supplemental TF-1 (Kitsap)		Williams Gas Pipeline West	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	
Supplemental TF-1 (Weyerhaeuser)		Williams Gas Pipeline West	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	
NWP Phase 1		Williams Gas Pipeline West	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	
SGS-1 (STORAGE)		Williams Gas Pipeline West	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	
JP EXPANSION		Williams Gas Pipeline West	-	-	-	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	
LS-1 (STORAGE)		Williams Gas Pipeline West	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	
GTN FTS-1 **		Gas Transmission NW	313	313	313	313	313	313	313	313	313	313	313	313	313	313	313	313	313	313	313	313	313	313	
GTN T-3 (Nov - Apr)		Gas Transmission NW	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	
GTN SUPPLEMENTAL (Nov - Apr) **		Gas Transmission NW	36	36	36	36	36	36	36	36	36	-	-	-	-	-	-	-	-	-	-	-	-	-	
GTN 03 EXPANSION (Nov - Apr) **		Gas Transmission NW	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	
Total Capacity Available			3,722	3,722	3,722	4,022	4,022	4,022	4,022	4,022	4,022	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	
CAPACITY BALANCE																									
Capacity For Release			9	(19)	(50)	218	260	283	282	281	436	400	329	295	261	229	198	168	139	111	84	58	32	7	(16)
Incremental Capacity Required			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

* 280/day is via Cascade's GTN FTS-1 contract. The TF-1 contract also includes 200 Upstream at Station 2 on Duke Energy Transmission (Formerly Westcoast) beginning Nov. 1, 2003.

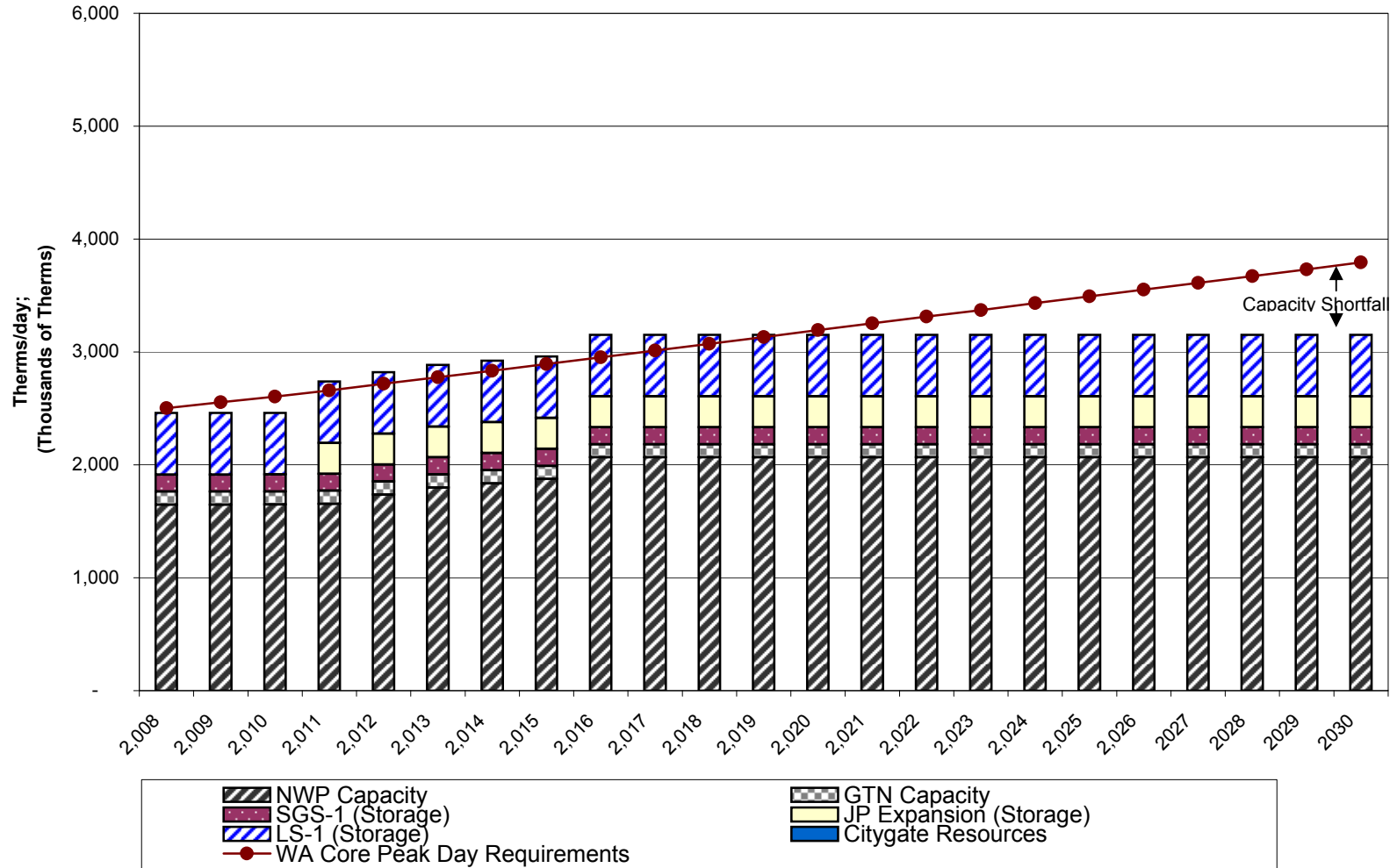
** Includes Annual (12 Months) Upstream Capacity on TransCanada Pipeline (NOVA and ANG)

OREGON Peak Day Demand & Existing Capacity Resources Medium Load Forecast



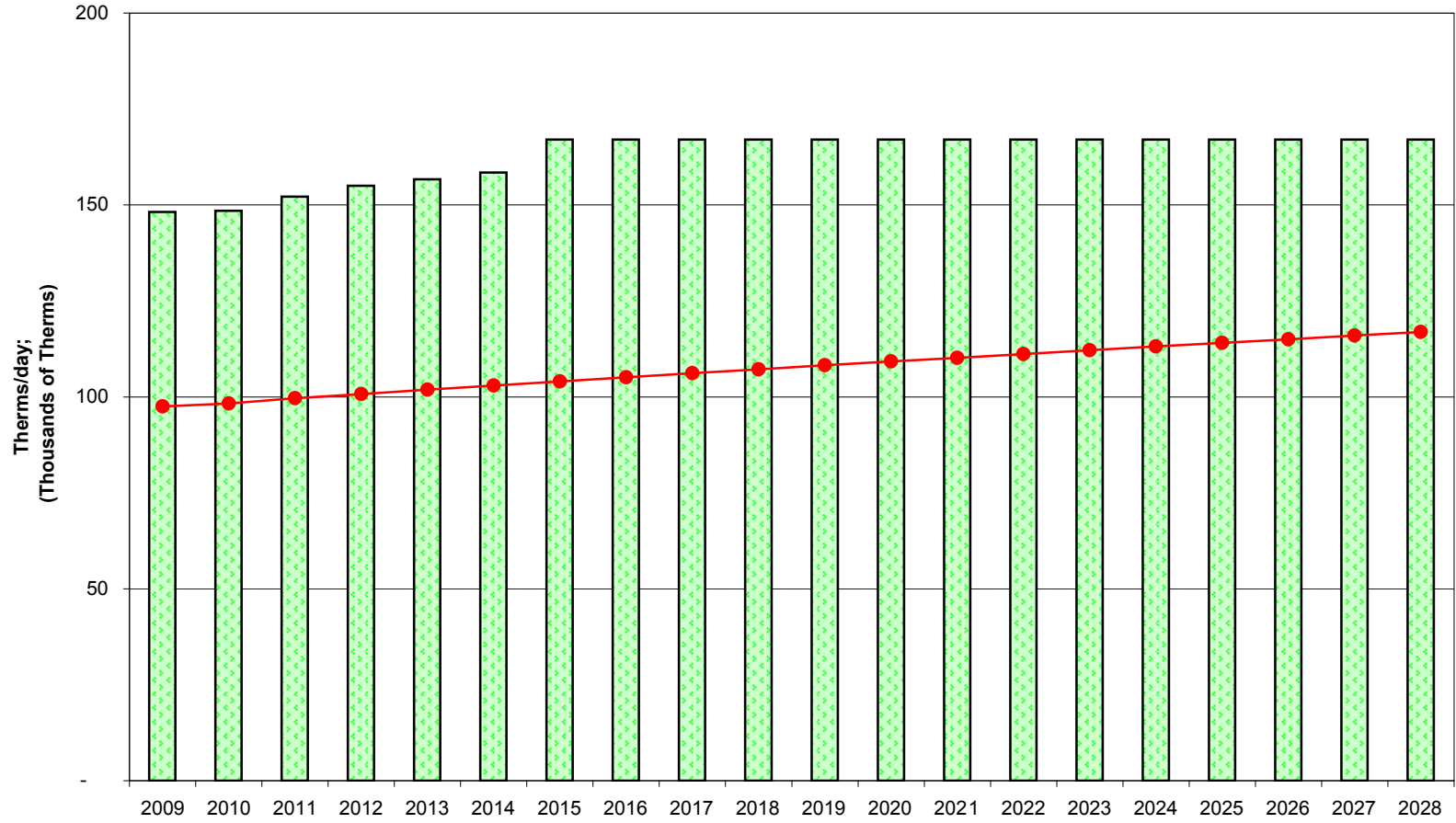
Note: WGPW Capacity is net of Non-Core primary term capacity requirements

WASHINGTON Peak Day Demand & Existing Capacity Resources Medium Load Forecast



Note: WGPW Capacity is net of Non-Core primary term capacity requirements

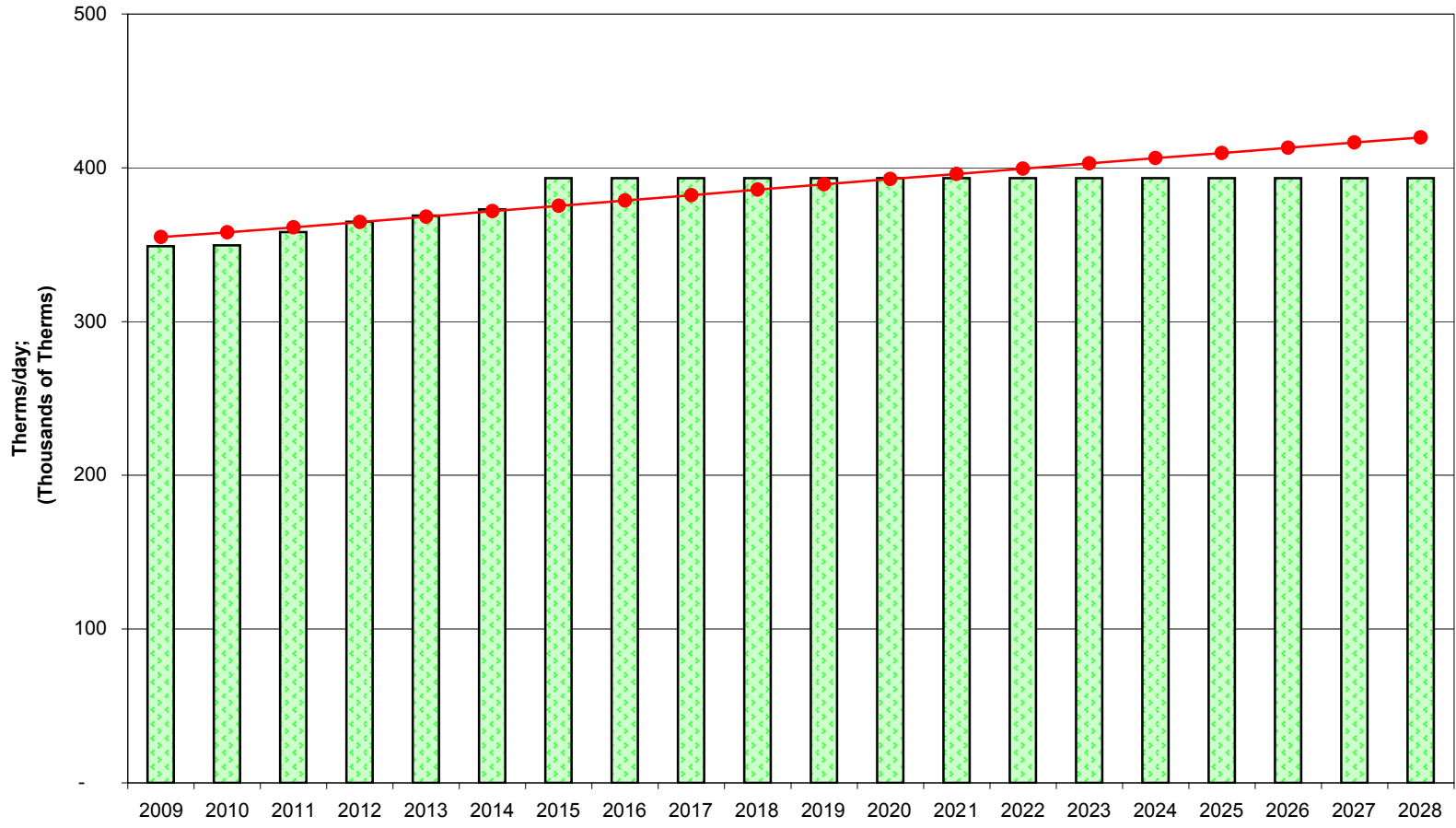
**ZONE 10 Peak Day Demand & Existing Capacity Resources
Medium Load Forecast**



Zone Capacity — Zone Core Requirement

Note: WGPW Capacity is net of Non-Core primary term capacity requirements

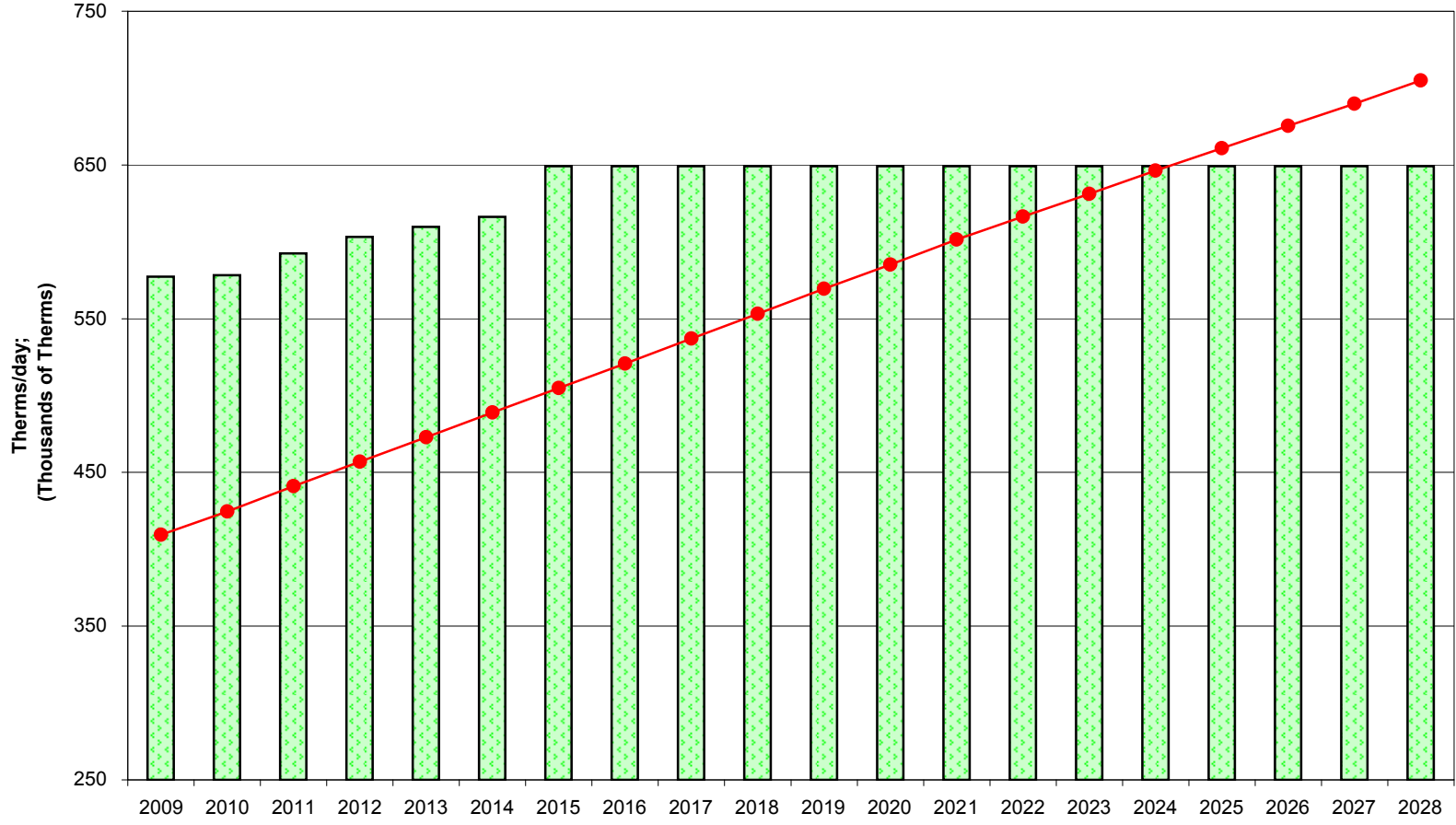
**ZONE 11 Peak Day Demand & Existing Capacity Resources
Medium Load Forecast**



Zone Capacity — Zone Core Requirement

Note: WGPW Capacity is net of Non-Core primary term capacity requirements

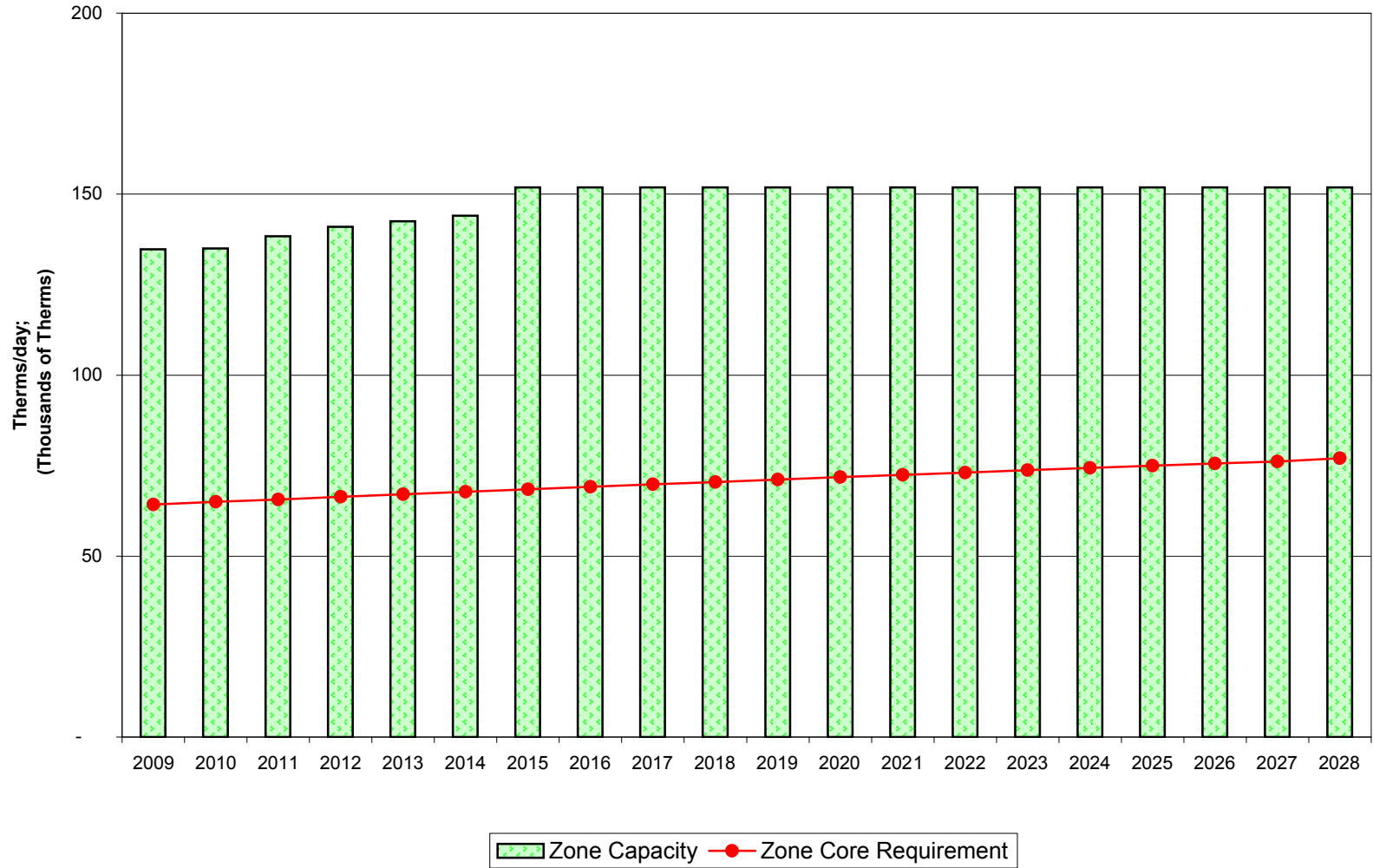
**ZONE 20 Peak Day Demand & Existing Capacity Resources
Medium Load Forecast**



Zone Capacity Zone Core Requirement

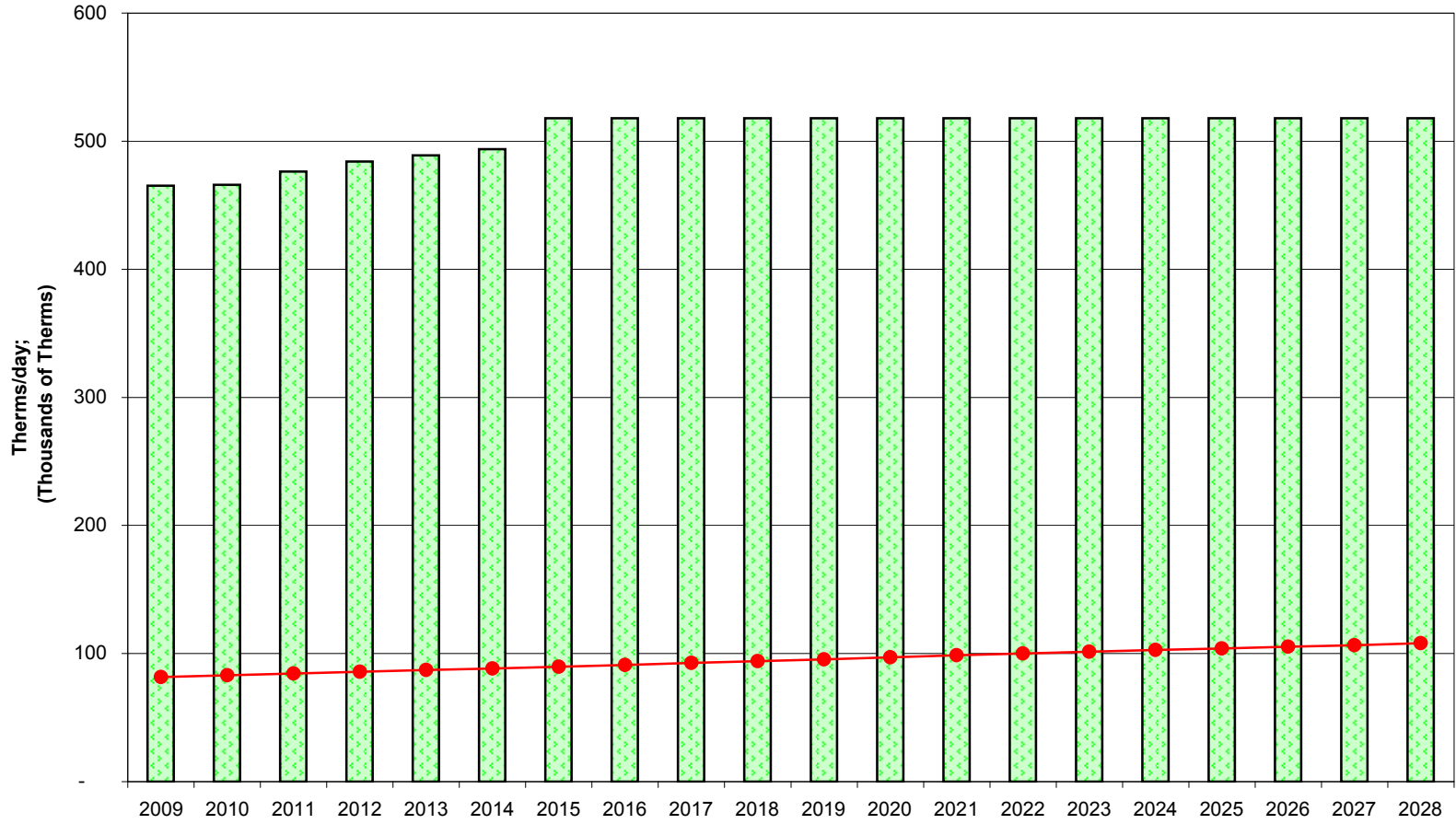
Note: WGPW Capacity is net of Non-Core primary term capacity requirements

ZONE 24 Peak Day Demand & Existing Capacity Resources
Medium Load Forecast



Note: WGPW Capacity is net of Non-Core primary term capacity requirements

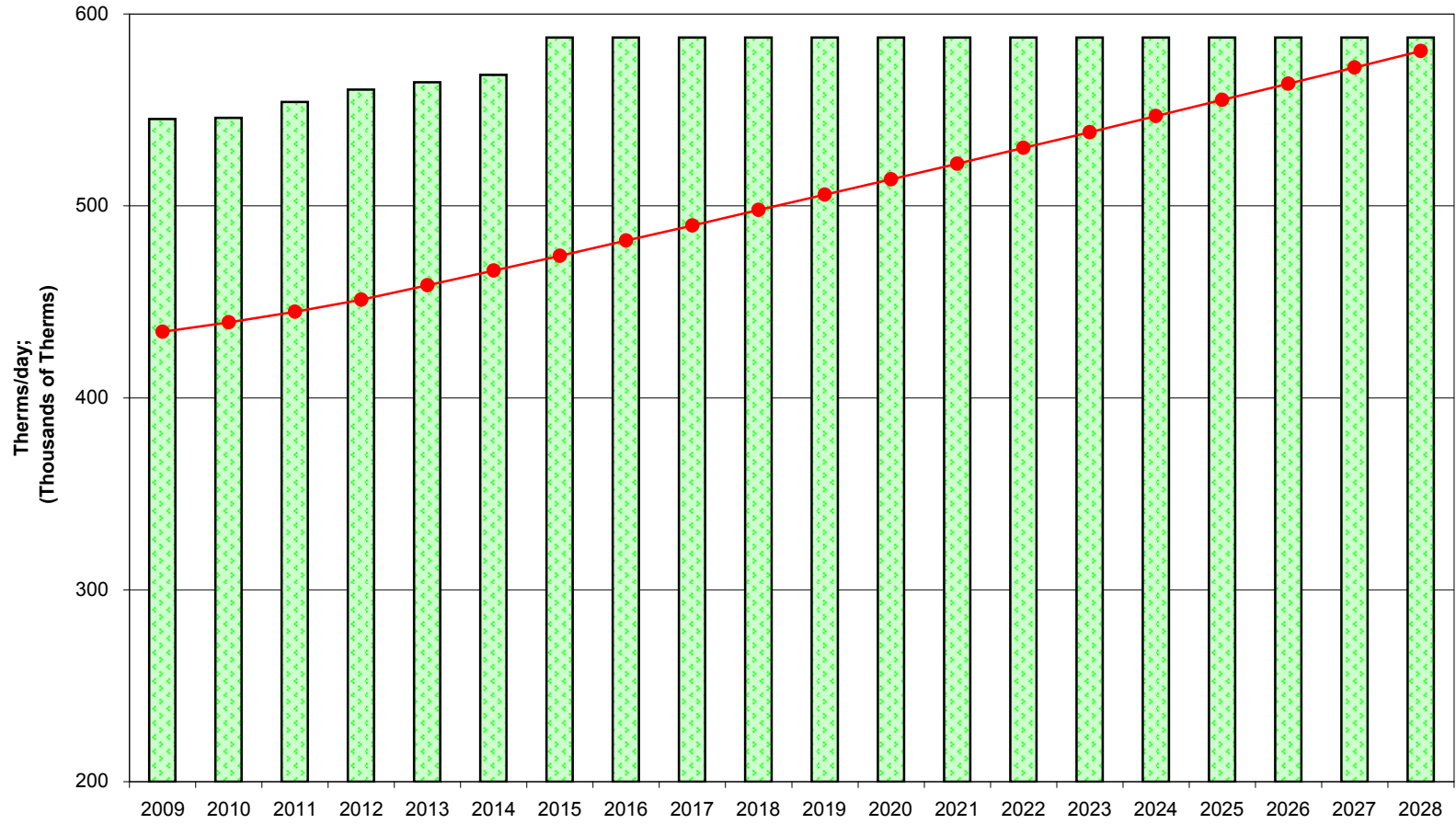
ZONE 26 Peak Day Demand & Existing Capacity Resources Medium Load Forecast



Zone Capacity Zone Core Requirement

Note: WGPW Capacity is net of Non-Core primary term capacity requirements

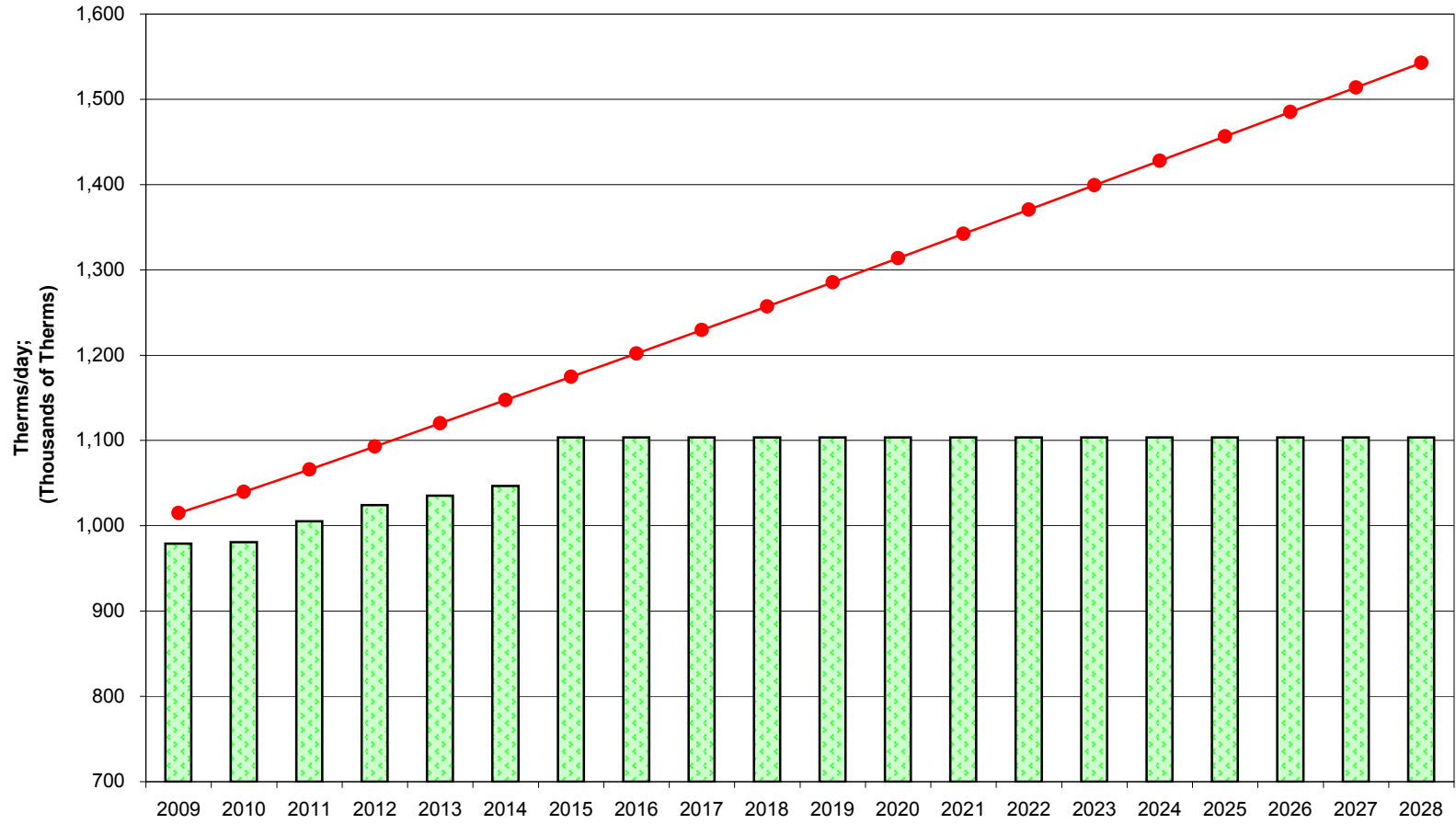
ZONE 30-S Peak Day Demand & Existing Capacity Resources
Medium Load Forecast



Zone Capacity — Zone Core Requirement

Note: WGPW Capacity is net of Non-Core primary term capacity requirements

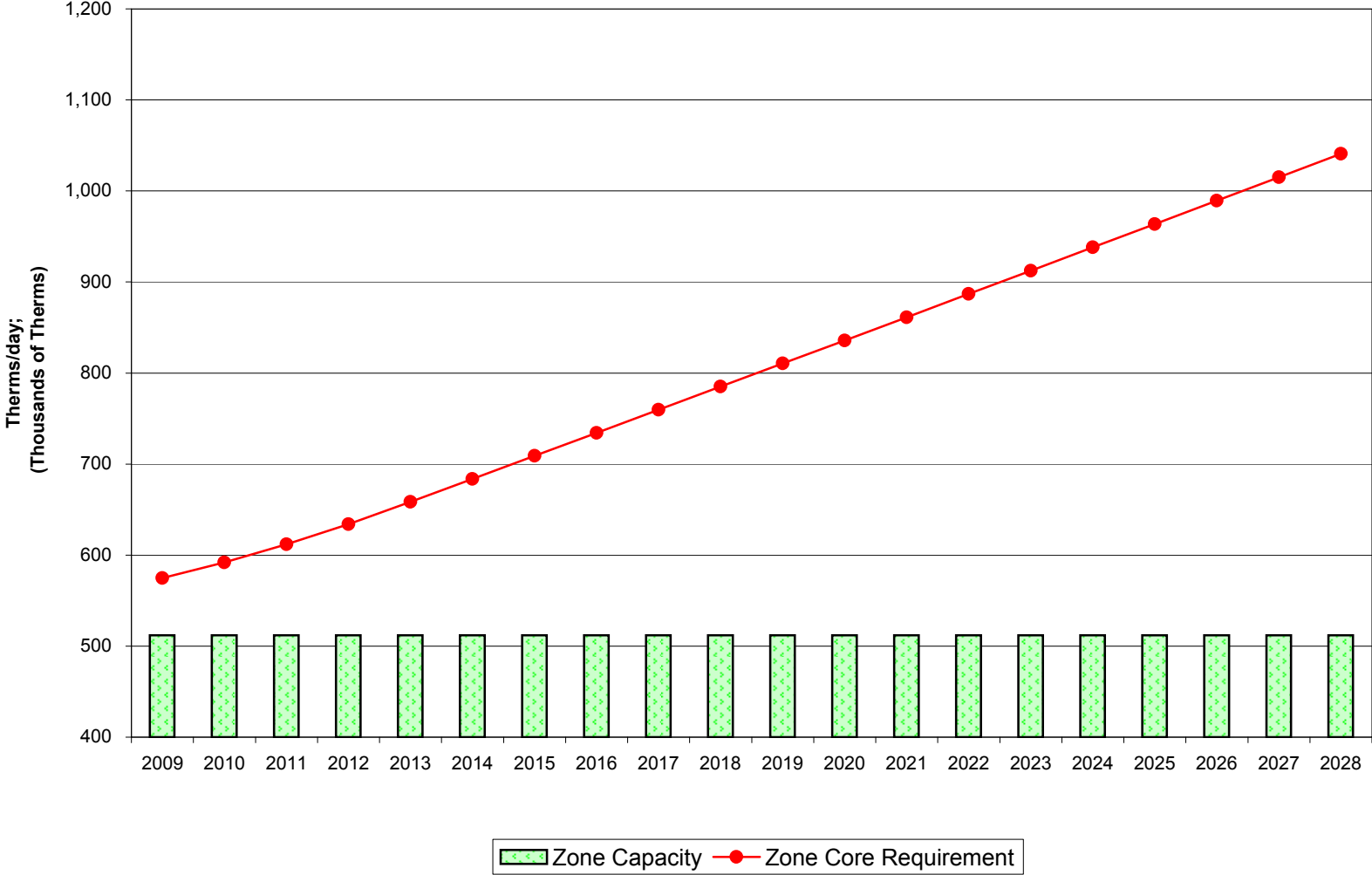
ZONE 30-W Peak Day Demand & Existing Capacity Resources Medium Load Forecast



Zone Capacity — Zone Core Requirement

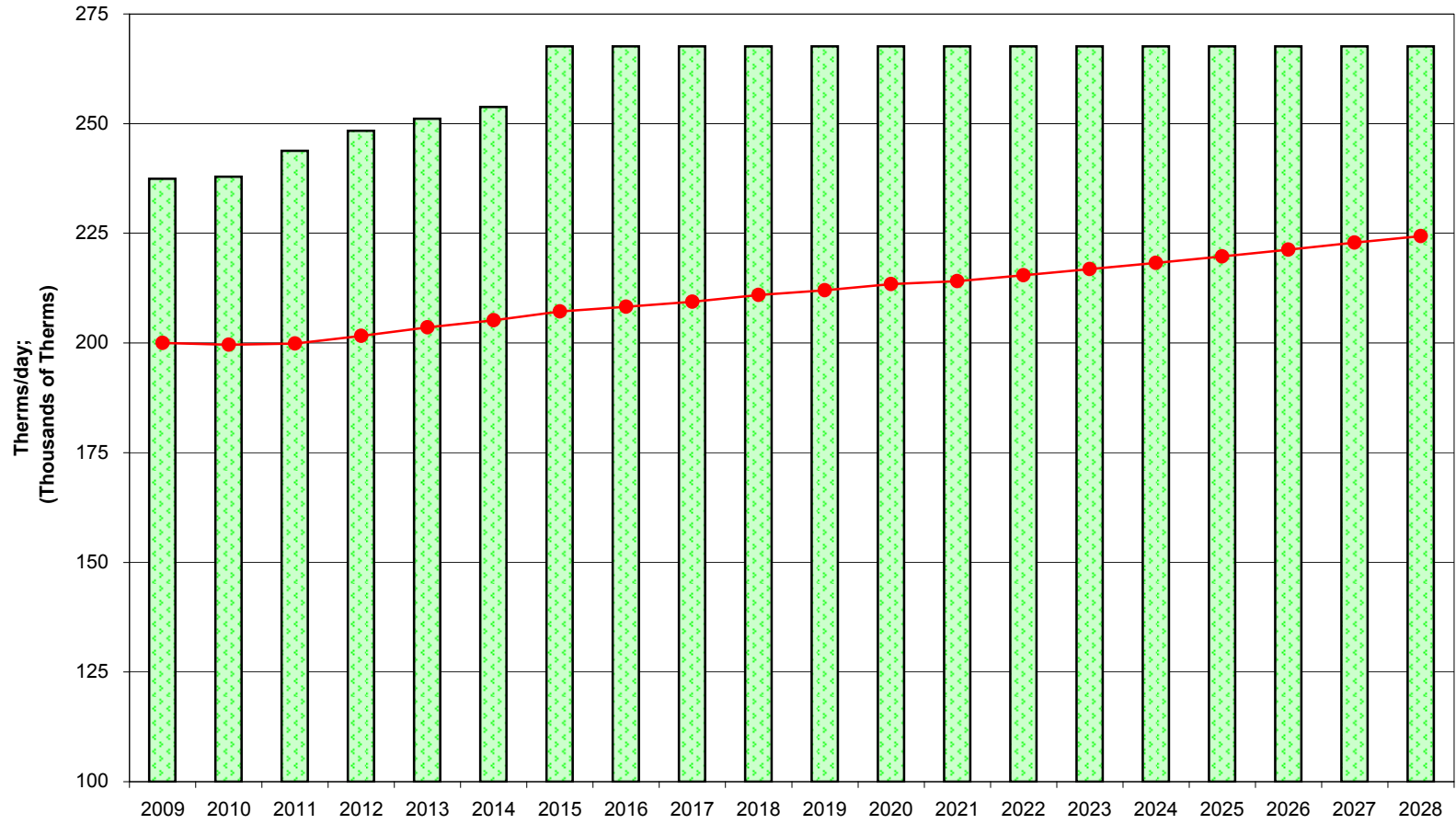
Note: WGPW Capacity is net of Non-Core primary term capacity requirements

ZONE GTN Peak Day Demand & Existing Capacity Resources
Medium Load Forecast



Note: WGPW Capacity is net of Non-Core primary term capacity requirements

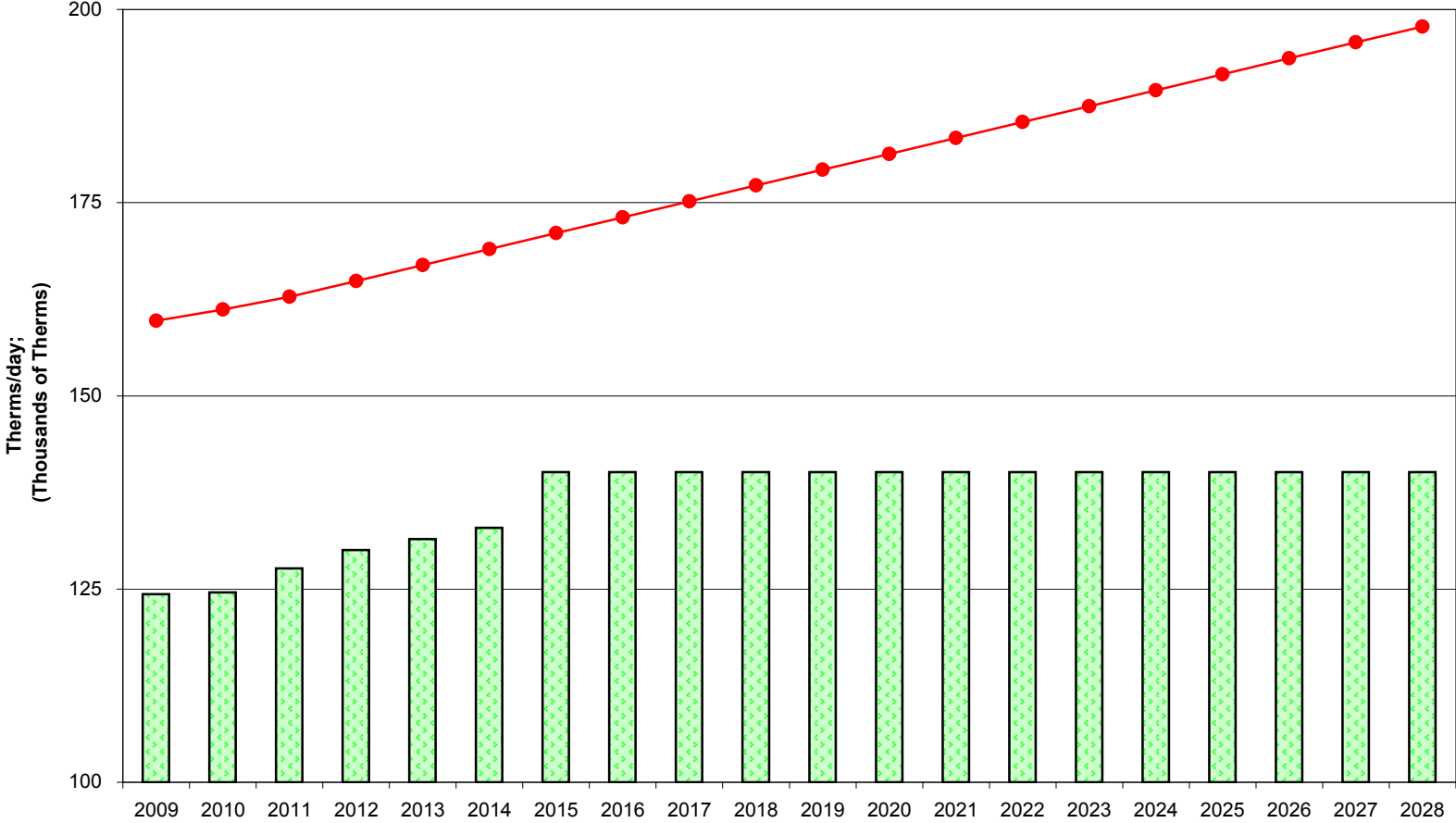
**ZONE ME-Oregon Peak Day Demand & Existing Capacity Resources
Medium Load Forecast**



Zone Capacity
 Zone Core Requirement

Note: WGPW Capacity is net of Non-Core primary term capacity requirements

ZONE ME-Washington Peak Day Demand & Existing Capacity Resources
Medium Load Forecast



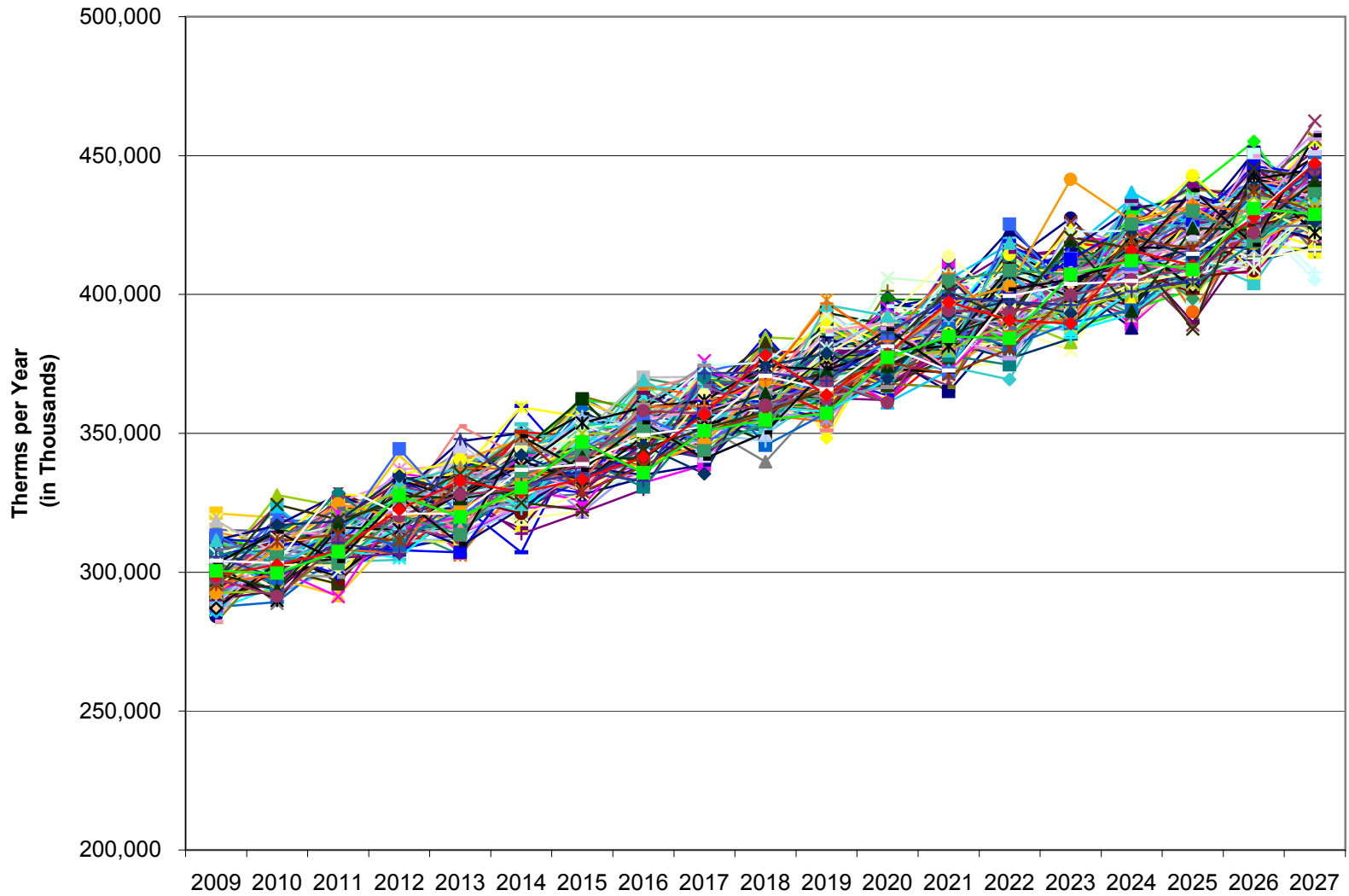
Zone Capacity Zone Core Requirement

Note: WGPW Capacity is net of Non-Core primary term capacity requirements

Appendix G-1

Weather Uncertainty Analysis & Impact on Annual Loads

Monte-Carlo Simulation Results - Total System Demand Medium Growth Forecast



**Annual Load in Therms
(000's)**

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
HighGrowth-Avg weather	300,721	312,416	324,890	338,225	351,452	365,226	379,346	394,088	408,520	423,645
Medium 95%-Max	314,117	320,161	328,635	336,352	343,201	351,092	359,202	365,840	373,166	381,856
Medium-Avg Weather	299,284	305,532	312,414	319,972	327,260	334,810	342,431	350,265	357,625	365,314
Medium expected high	306,887	312,696	320,902	328,526	335,094	342,664	350,516	357,441	364,973	373,438
Medium Load-Expected	299,658	305,230	313,170	320,700	326,988	334,236	341,829	349,043	356,780	365,020
Medium Expected Low	292,429	297,764	305,438	312,873	318,882	325,808	333,142	340,645	348,587	356,602
Medium 95%-Min	285,200	290,298	297,706	305,047	310,775	317,379	324,456	332,247	340,394	348,183
Low Growth-Average Weather	294,103	298,757	303,745	309,175	314,117	319,160	324,123	329,224	333,685	338,337

**Annual Load in Therms
(000's)**

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
HighGrowth-Avg weather	439,065	455,206	470,963	487,457	504,331	521,960	539,130	557,100	575,522	594,773
Medium 95%-Max	392,433	397,199	406,819	417,552	422,023	431,544	439,783	448,752	453,933	463,495
Medium-Avg Weather	372,985	380,955	388,344	395,999	403,672	411,685	419,062	426,760	434,510	442,672
Medium expected high	382,477	388,680	397,496	406,924	412,614	421,712	429,143	438,572	444,492	452,701
Medium Load-Expected	372,522	380,161	388,174	396,295	403,205	411,880	418,504	428,391	435,051	441,907
Medium Expected Low	362,566	371,641	378,851	385,666	393,796	402,048	407,865	418,211	425,610	431,113
Medium 95%-Min	352,611	363,122	369,528	375,038	384,387	392,216	397,226	408,030	416,169	420,319
Low Growth-Average Weather	342,846	347,540	351,568	355,784	359,908	364,198	367,807	371,609	375,355	379,278

Annual Load Forecast Monte-Carlo Results

Draw	2009	2010	2011	2012	2013	2014	2015
1	295,522	298,367	314,610	317,272	324,264	327,722	339,848
2	295,528	294,360	312,724	328,283	331,212	336,163	343,056
3	299,383	299,859	295,937	331,590	335,811	316,945	343,737
4	304,131	302,550	319,702	319,549	324,934	337,224	345,190
5	305,836	311,760	317,198	328,952	318,187	336,656	348,318
6	296,184	308,406	303,341	327,828	317,302	331,088	343,993
7	302,802	307,489	323,224	317,530	324,756	338,099	338,004
8	298,759	310,197	318,777	315,644	317,663	327,867	343,738
9	295,357	295,803	315,971	317,015	330,804	324,217	351,674
10	309,026	296,206	311,238	329,059	322,985	341,077	332,439
11	304,656	301,144	314,133	323,785	329,106	333,204	344,438
12	295,887	318,636	323,929	322,026	323,698	319,277	340,376
13	310,735	292,606	312,272	327,184	341,131	329,339	347,819
14	293,602	308,938	310,058	337,013	338,275	334,564	350,727
15	291,873	301,459	307,402	316,571	331,978	345,739	333,061
16	299,613	309,314	314,887	319,517	329,999	330,408	344,243
17	297,326	300,718	328,030	319,388	325,486	334,745	345,964
18	312,353	301,747	303,706	304,493	328,105	353,207	338,647
19	311,339	301,659	324,407	326,668	331,268	342,611	335,278
20	321,221	319,620	316,695	327,730	340,260	345,617	342,316
21	292,310	301,489	316,956	323,107	319,330	344,219	335,976
22	312,524	308,631	321,043	316,115	329,361	328,623	340,948
23	315,296	314,753	309,407	322,813	330,468	326,761	328,088
24	307,568	314,970	320,576	317,779	321,636	340,064	348,081
25	292,687	306,499	319,384	307,337	320,401	339,596	347,130
26	310,594	301,557	304,879	325,842	335,114	343,779	347,355
27	290,059	303,844	310,764	319,169	331,423	328,961	336,639
28	294,280	299,802	305,337	323,337	327,495	322,256	334,052
29	305,919	316,290	315,788	332,738	329,456	331,613	337,258
30	293,707	307,044	307,060	325,698	322,016	331,070	333,111
31	293,455	316,941	314,669	320,050	325,259	343,354	337,998
32	295,838	303,904	309,677	308,202	331,224	319,785	354,349
33	293,481	320,393	312,052	307,857	314,237	331,379	348,986
34	306,368	306,964	315,704	316,549	320,401	338,833	334,488
35	307,485	302,256	322,090	322,939	317,575	332,313	337,471
36	304,744	303,582	307,572	323,254	328,473	359,830	335,048
37	304,967	296,532	308,554	323,916	322,993	320,988	352,317
38	301,146	295,747	319,015	325,966	306,892	336,603	344,009
39	300,773	305,931	308,730	315,934	324,961	321,945	357,268
40	290,504	311,310	329,017	319,087	340,051	335,244	329,406
41	300,744	303,482	308,840	315,502	329,366	340,724	344,359
42	284,081	308,688	304,654	322,069	324,255	335,358	355,994
43	299,973	310,975	316,279	324,054	325,207	335,313	337,983
44	299,426	319,444	313,883	333,329	318,837	329,352	338,091
45	293,908	315,002	321,948	310,967	326,251	324,857	333,284
46	300,158	296,133	317,889	316,231	327,583	324,453	353,851
47	299,428	309,867	319,858	309,614	330,027	323,791	333,249
48	303,299	292,048	302,051	320,224	329,285	339,839	321,650
49	302,600	324,188	297,586	327,619	324,572	327,948	335,082
50	294,537	312,007	300,080	314,308	332,406	320,958	333,523
51	296,290	301,428	304,016	308,421	325,514	331,222	336,362
52	304,649	310,607	306,757	322,152	331,304	337,181	346,457
53	290,491	305,513	313,323	320,691	352,584	341,714	335,634

Annual Load Forecast Monte-Carlo Results

Draw	2009	2010	2011	2012	2013	2014	2015
54	287,524	289,248	306,443	308,395	333,524	329,578	338,677
55	299,104	302,515	302,743	307,198	330,930	332,664	362,460
56	305,877	298,209	317,138	319,241	322,449	333,436	346,319
57	304,363	297,651	314,206	335,677	332,266	330,172	325,653
58	294,564	306,751	297,692	328,087	321,793	328,524	344,656
59	286,431	295,129	317,490	319,348	324,228	330,842	338,199
60	307,941	304,506	319,322	316,922	325,474	329,081	340,240
61	309,738	302,669	318,827	320,728	326,838	331,372	343,888
62	296,494	313,968	308,821	306,655	338,652	344,331	332,885
63	304,896	297,321	317,179	320,872	324,491	307,108	350,385
64	285,824	303,457	319,760	313,780	341,926	337,478	335,755
65	298,601	306,917	325,445	322,736	335,320	332,933	336,533
66	305,179	305,440	308,289	312,061	322,401	336,930	329,404
67	300,573	310,371	312,696	319,998	320,139	319,307	321,900
68	306,704	297,347	305,860	317,475	333,616	330,359	344,633
69	302,617	303,258	322,010	326,735	318,662	323,596	351,114
70	306,263	311,428	323,519	318,944	330,510	344,907	345,579
71	292,987	308,611	310,784	322,727	327,421	328,070	337,172
72	286,211	320,911	313,722	321,025	332,234	336,424	363,315
73	295,798	309,781	310,459	319,459	326,341	337,631	352,414
74	304,440	308,594	323,555	320,458	332,103	326,272	333,289
75	292,119	297,672	291,570	315,201	325,606	337,531	361,870
76	314,559	309,645	304,020	326,265	317,339	329,515	334,969
77	298,693	303,827	309,791	333,896	306,176	332,527	345,946
78	302,974	310,275	311,936	323,599	332,106	339,206	332,267
79	294,552	310,231	323,907	329,189	343,927	329,976	348,526
80	301,687	306,303	310,926	308,441	312,744	338,925	353,996
81	303,334	311,519	309,115	315,983	306,229	336,738	353,289
82	294,386	302,527	303,384	315,777	328,580	346,563	334,972
83	302,328	301,360	295,760	327,065	328,702	324,214	336,974
84	295,856	294,470	315,976	323,915	326,729	341,342	331,455
85	302,930	296,224	305,261	309,494	328,082	340,330	337,876
86	302,407	302,820	311,485	310,253	332,483	322,631	333,146
87	304,236	295,131	308,976	318,604	314,016	335,990	341,187
88	297,406	298,397	325,557	317,180	325,120	346,745	356,412
89	305,899	298,681	320,228	307,620	323,146	350,517	348,864
90	298,621	294,796	322,048	317,098	323,081	343,172	362,062
91	301,637	313,341	316,677	307,945	314,254	331,616	328,578
92	299,928	297,904	308,393	311,333	310,857	343,106	332,776
93	296,928	300,351	311,801	315,687	338,843	326,111	338,050
94	309,262	294,831	317,964	325,261	328,649	321,068	339,361
95	306,184	310,694	325,466	321,659	326,894	329,797	340,222
96	311,299	311,451	320,484	328,322	321,752	327,289	346,692
97	294,067	306,486	311,893	319,230	330,878	327,885	334,910
98	282,065	306,171	308,309	326,619	331,000	339,257	363,352
99	293,072	301,464	308,890	318,553	325,784	340,858	345,381
100	298,246	314,266	316,755	313,403	334,055	335,440	360,454
101	302,802	310,706	311,106	313,516	327,054	332,613	349,679
102	300,784	306,954	309,665	325,384	326,625	339,187	340,074
103	306,662	307,201	316,218	315,033	327,552	333,750	338,251
104	304,983	307,170	305,919	325,232	333,905	347,009	331,326
105	293,419	305,251	318,802	312,689	328,990	337,361	334,854
106	288,747	318,849	319,560	330,378	327,527	331,023	354,420

Annual Load Forecast Monte-Carlo Results

Draw	2009	2010	2011	2012	2013	2014	2015
107	302,522	305,235	322,807	325,185	324,515	315,787	341,563
108	290,548	307,248	324,844	308,964	331,397	324,012	335,548
109	295,064	304,911	313,410	331,586	325,827	332,743	358,735
110	306,050	313,370	315,633	316,998	342,706	338,288	354,777
111	304,846	315,278	311,063	327,631	347,128	350,138	328,019
112	294,185	314,276	309,627	323,878	314,065	323,130	323,706
113	294,008	308,898	322,130	331,255	336,168	359,433	355,825
114	295,523	305,443	310,378	328,868	331,505	343,534	342,245
115	301,811	303,007	315,885	318,908	328,912	313,864	321,579
116	311,069	309,442	296,212	319,475	320,810	336,866	332,228
117	296,136	305,973	322,774	317,992	315,420	329,120	338,394
118	291,276	306,251	299,304	311,120	337,935	343,246	333,484
119	298,207	323,575	305,542	329,517	331,175	334,269	345,671
120	296,958	311,349	311,524	330,080	329,554	338,543	350,375
121	298,501	296,844	300,237	329,587	328,388	335,878	337,558
122	319,039	300,790	304,710	318,828	334,545	320,701	328,316
123	304,618	313,450	309,342	311,016	312,344	323,317	349,790
124	287,675	310,195	325,040	333,629	325,290	326,029	344,813
125	297,315	301,684	315,876	336,792	314,264	324,240	343,903
126	288,521	305,552	298,440	317,201	333,270	345,070	356,867
127	301,133	318,926	317,790	313,511	325,562	334,542	354,989
128	291,341	305,369	313,120	320,204	334,229	349,330	348,731
129	300,345	327,789	323,616	315,863	326,776	335,589	354,098
130	304,171	296,792	312,470	342,090	322,251	326,914	343,592
131	299,948	295,100	307,006	322,191	340,250	347,725	335,546
132	289,299	299,192	314,059	319,196	335,427	330,660	338,770
133	288,142	299,697	323,734	307,083	333,514	333,104	340,431
134	306,912	299,212	298,323	313,573	317,434	328,741	353,471
135	306,465	301,875	320,112	313,748	330,219	337,883	339,322
136	292,492	297,463	320,796	313,582	327,171	323,606	346,264
137	298,129	305,188	308,577	314,787	336,019	343,788	362,369
138	293,382	300,784	308,971	320,316	327,083	330,060	334,056
139	296,302	305,818	306,174	312,763	334,188	335,320	339,129
140	295,287	315,201	305,857	330,709	327,038	335,367	342,106
141	297,761	304,657	317,240	323,471	339,748	325,288	340,715
142	290,986	296,580	306,582	333,635	334,345	327,030	344,054
143	304,669	293,988	307,181	316,029	323,293	348,752	337,264
144	301,552	301,385	319,271	313,527	324,598	350,509	339,445
145	313,772	306,088	307,656	320,157	322,704	327,389	352,773
146	305,135	312,519	308,718	307,934	307,117	336,172	335,329
147	294,441	312,311	327,845	327,790	313,364	342,098	341,493
148	293,157	300,995	291,216	323,404	314,438	338,126	353,943
149	290,004	304,329	307,951	305,171	323,558	322,904	341,667
150	293,016	312,758	308,341	334,737	326,564	321,131	343,961
151	301,401	315,895	309,063	318,561	336,772	343,703	339,672
152	311,571	316,838	328,014	318,525	309,395	323,048	337,647
153	297,325	291,438	308,356	324,737	327,497	340,889	340,833
154	293,471	307,273	305,063	306,870	332,252	342,743	328,937
155	302,779	300,830	318,861	314,450	318,396	337,171	340,774
156	318,511	306,427	315,770	313,779	315,531	334,234	338,004
157	305,343	288,738	318,499	323,105	321,599	327,777	342,880
158	290,987	301,348	321,457	314,027	320,989	325,389	336,174
159	306,125	297,201	327,183	316,096	312,179	341,286	333,252

Annual Load Forecast Monte-Carlo Results

Draw	2009	2010	2011	2012	2013	2014	2015
160	304,902	293,521	324,841	322,614	322,464	327,507	335,739
161	304,061	299,028	311,966	319,140	323,068	337,989	345,473
162	290,198	293,349	312,400	318,642	333,294	334,428	337,893
163	299,000	309,469	322,973	328,477	314,698	345,119	341,950
164	307,277	295,308	314,775	309,603	326,898	330,653	334,131
165	303,521	310,100	314,399	317,608	346,284	329,541	344,902
166	292,626	308,827	316,619	329,771	321,227	339,832	345,242
167	304,318	301,928	321,328	315,605	319,968	342,350	341,218
168	296,591	310,812	313,251	334,951	340,499	335,825	345,795
169	297,663	305,709	305,738	315,861	336,895	322,912	348,573
170	296,023	294,615	318,963	332,362	326,059	339,883	333,258
171	287,577	301,041	311,863	318,395	328,204	331,741	341,361
172	306,436	308,016	328,693	311,611	322,414	343,175	342,064
173	312,100	310,529	309,051	333,193	324,716	337,431	341,974
174	296,851	304,573	315,097	330,318	324,801	342,948	353,885
175	295,735	307,608	303,667	319,839	324,941	336,822	353,165
176	306,772	311,879	316,973	315,203	327,875	332,830	351,865
177	297,004	302,845	302,319	326,062	329,147	344,699	348,422
178	288,112	309,353	306,132	334,115	323,833	337,889	356,083
179	282,230	314,234	313,783	325,084	335,526	336,495	329,781
180	303,660	304,059	310,653	323,989	333,253	337,486	340,093
181	286,951	303,219	304,700	333,205	326,412	340,138	332,491
182	313,319	302,323	313,215	344,382	320,243	334,915	344,574
183	311,570	303,785	311,029	332,017	337,666	324,471	344,044
184	292,643	293,166	319,357	329,254	319,733	329,024	350,007
185	302,583	289,822	316,128	315,389	328,482	338,063	353,725
186	292,473	308,837	324,595	319,643	322,802	333,798	343,157
187	296,129	299,071	308,131	306,919	337,395	337,263	332,682
188	307,928	312,051	322,820	314,639	331,329	334,550	344,312
189	300,938	303,418	319,075	324,931	330,415	346,356	338,298
190	297,259	317,000	318,334	334,553	328,549	342,121	333,204
191	297,182	305,447	303,057	320,530	313,557	336,194	341,992
192	299,605	293,620	317,026	327,735	326,522	329,839	341,474
193	297,025	324,348	318,969	325,134	335,500	325,026	322,361
194	295,644	311,066	313,597	311,420	333,014	349,044	329,031
195	297,652	291,357	310,458	320,122	327,924	329,915	339,666
196	305,611	297,994	310,640	306,651	347,973	331,612	335,791
197	303,196	314,541	304,035	327,188	310,166	348,906	336,801
198	304,095	303,303	331,233	321,141	321,123	336,822	338,906
199	298,860	302,636	307,612	322,597	332,911	328,726	333,496
200	300,498	299,683	307,390	327,573	319,906	330,356	346,827
Max	321,221	327,789	331,233	344,382	352,584	359,830	363,352
Min	282,065	288,738	291,216	304,493	306,176	307,108	321,579
Average	299,658	305,230	313,170	320,700	326,988	334,236	341,829

Annual Load Forecast Monte-Carlo Results

Draw	2016	2017	2018	2019	2020	2021	2022
1	349,078	355,544	359,824	381,671	375,372	386,117	390,543
2	344,677	349,356	380,511	371,836	378,633	410,427	384,192
3	351,920	354,288	363,363	370,378	362,263	383,544	391,704
4	357,304	352,183	368,562	364,210	377,510	403,401	397,301
5	360,869	364,041	361,747	363,043	384,214	385,542	399,246
6	346,538	362,558	381,101	367,704	393,703	378,088	390,187
7	353,335	361,800	372,997	360,562	382,198	387,491	400,335
8	355,989	344,343	374,867	370,470	363,700	383,114	402,140
9	338,156	371,371	365,052	387,350	392,245	387,129	389,599
10	347,933	358,731	350,688	379,814	382,305	394,509	387,776
11	345,986	355,680	356,811	383,885	374,082	384,575	406,477
12	349,091	357,816	372,326	352,456	378,583	373,628	375,656
13	358,142	347,625	371,983	363,186	379,578	400,285	396,722
14	346,271	344,975	375,734	375,938	387,811	399,204	390,046
15	349,297	368,105	356,240	373,865	387,418	392,363	384,646
16	348,523	354,040	368,638	362,961	388,448	368,944	405,953
17	349,526	372,108	377,079	367,475	380,142	381,080	389,011
18	355,954	349,215	356,889	383,235	386,433	371,509	408,887
19	349,534	358,049	364,418	355,911	386,107	383,663	382,422
20	355,205	355,402	359,947	355,274	385,651	396,981	394,463
21	351,377	356,297	355,836	357,932	380,924	385,483	410,871
22	348,872	343,459	379,286	358,794	371,932	390,108	415,265
23	351,079	356,929	364,854	366,895	386,757	406,290	387,472
24	351,255	354,839	368,453	353,973	387,817	386,278	382,260
25	354,573	359,125	360,163	369,891	369,930	385,697	390,740
26	369,873	365,944	368,832	361,861	372,801	388,414	389,744
27	344,706	359,373	355,290	377,854	372,210	393,032	392,146
28	345,251	355,525	370,794	360,154	368,407	392,658	391,014
29	344,674	348,179	360,533	375,313	373,800	399,793	390,515
30	346,785	341,503	360,446	366,791	375,967	367,086	398,581
31	345,204	341,177	366,262	382,092	380,078	378,907	388,344
32	353,251	368,320	368,884	378,836	385,854	382,711	416,096
33	357,677	352,619	364,870	375,092	381,003	391,334	396,961
34	334,320	364,588	374,676	370,103	361,511	379,522	399,207
35	352,338	361,847	368,846	386,269	385,681	386,824	389,345
36	365,841	356,492	357,583	373,820	371,932	382,773	385,702
37	346,363	350,002	382,505	348,317	386,767	379,181	397,613
38	332,216	338,645	366,047	356,320	390,073	392,293	394,213
39	342,299	355,582	380,513	372,498	381,780	390,421	396,454
40	349,842	349,680	356,676	375,959	390,596	381,865	390,151
41	350,525	352,556	382,704	370,091	379,019	396,026	402,085
42	335,735	351,752	374,563	383,609	371,253	393,936	411,338
43	361,475	360,838	364,628	366,353	401,350	377,664	405,330
44	358,340	347,336	362,518	362,725	361,963	388,354	414,354
45	339,717	353,666	372,923	372,794	368,741	386,078	399,345
46	338,549	348,011	371,759	359,274	383,008	388,434	402,613
47	355,149	358,353	362,558	382,871	391,638	381,834	397,952
48	339,436	361,832	359,877	382,794	367,367	379,501	405,034
49	340,617	365,627	357,487	379,085	382,682	388,807	408,346
50	349,211	366,003	371,479	376,504	392,311	376,231	397,495
51	335,231	363,918	362,143	383,639	371,580	400,170	404,379
52	349,670	353,236	361,958	384,523	380,539	387,739	383,405
53	365,493	371,360	358,933	377,284	374,598	394,661	405,122

Annual Load Forecast Monte-Carlo Results

Draw	2016	2017	2018	2019	2020	2021	2022
54	337,174	355,140	368,888	387,185	379,489	388,870	403,745
55	350,899	354,816	362,992	394,278	377,978	389,961	386,797
56	340,063	344,523	371,819	374,760	377,667	365,005	390,339
57	346,337	368,549	358,276	368,190	374,045	391,045	408,636
58	347,512	360,910	376,143	382,695	382,594	394,621	411,173
59	368,146	346,649	369,285	378,738	373,710	392,442	401,861
60	351,011	355,676	358,891	377,329	381,120	385,553	413,636
61	347,202	362,856	375,867	364,419	375,658	381,336	388,610
62	348,785	354,855	363,573	360,935	389,811	391,613	386,957
63	350,976	361,230	360,946	354,724	396,111	394,147	407,526
64	359,584	372,318	368,469	381,136	391,296	388,532	389,490
65	345,001	358,620	364,822	366,263	366,829	391,813	408,815
66	335,010	353,054	369,884	375,240	372,017	407,995	402,103
67	366,479	352,309	364,278	389,482	373,678	393,910	388,103
68	354,347	357,173	379,891	371,847	371,985	377,716	411,609
69	342,504	349,107	380,615	374,279	383,678	382,289	402,527
70	348,650	350,347	363,221	377,746	393,202	391,196	393,972
71	354,357	366,177	356,281	360,369	379,802	392,684	407,361
72	349,950	355,371	354,712	376,381	375,902	393,695	413,491
73	347,958	367,491	360,386	379,143	372,289	374,039	369,401
74	365,623	366,597	362,180	375,992	390,133	384,337	378,455
75	352,790	355,319	368,517	366,035	386,129	390,838	401,786
76	349,587	351,111	370,334	375,799	388,515	373,391	387,246
77	352,758	348,081	355,298	384,306	370,450	377,947	395,558
78	348,886	347,197	372,071	362,323	373,399	380,889	389,402
79	336,277	358,992	369,048	384,578	387,755	380,771	388,847
80	344,476	365,962	371,106	389,204	372,831	391,924	397,846
81	338,647	358,544	364,711	368,584	377,995	391,454	378,576
82	340,082	363,840	371,773	365,136	395,252	396,567	386,100
83	350,621	353,221	372,083	360,166	380,082	381,253	411,428
84	339,489	352,195	363,579	365,874	372,262	378,347	419,483
85	345,434	352,739	365,169	369,659	368,201	380,177	392,636
86	365,059	354,729	350,726	377,337	375,733	410,628	377,165
87	359,047	372,382	364,163	374,213	377,742	387,987	401,254
88	356,535	361,392	374,903	383,410	384,178	388,951	382,036
89	352,164	347,548	379,254	379,387	372,149	382,245	385,563
90	359,449	353,429	352,079	378,093	379,176	407,258	385,818
91	338,814	359,732	385,303	360,917	398,855	390,651	399,382
92	353,221	357,990	360,949	360,163	382,016	395,658	386,113
93	337,293	348,505	356,481	374,542	361,134	386,605	384,882
94	363,313	356,831	372,128	373,245	376,204	394,342	397,204
95	353,966	356,160	381,331	368,566	382,609	387,448	415,031
96	347,421	353,310	358,963	361,166	398,171	398,064	392,271
97	353,192	346,773	367,721	360,828	390,209	397,369	386,512
98	357,292	352,841	357,026	372,763	367,912	366,619	405,836
99	350,732	363,203	373,611	382,766	366,970	381,824	398,556
100	347,162	362,081	363,409	386,546	387,650	373,312	396,919
101	370,128	370,316	361,065	363,618	366,835	395,788	390,411
102	354,462	352,695	339,823	363,915	379,342	387,609	397,808
103	358,619	350,367	353,237	382,866	377,775	393,424	385,443
104	343,159	365,775	353,037	377,364	375,046	381,850	386,884
105	339,385	348,362	370,366	381,301	378,128	400,181	393,799
106	342,764	357,329	360,696	366,958	384,651	396,248	394,279

Annual Load Forecast Monte-Carlo Results

Draw	2016	2017	2018	2019	2020	2021	2022
107	352,972	351,012	353,462	358,519	379,676	406,323	384,436
108	352,888	357,981	381,693	351,029	386,699	371,319	402,116
109	342,435	367,501	369,542	363,763	384,984	379,013	396,734
110	354,397	349,485	379,387	369,763	370,519	390,235	374,572
111	333,982	365,160	372,320	376,988	395,300	399,197	423,186
112	348,110	376,153	357,031	371,208	375,656	383,719	399,395
113	337,463	354,339	357,787	376,617	376,926	379,117	390,384
114	367,013	365,520	368,884	366,457	381,222	376,832	392,029
115	329,802	363,134	377,096	363,693	367,724	378,709	394,667
116	353,498	349,504	363,184	363,379	372,169	387,798	394,196
117	358,250	347,661	352,504	380,607	365,150	401,295	412,283
118	355,238	352,798	362,045	366,916	394,277	381,350	405,363
119	342,167	354,286	352,577	370,564	382,821	405,435	417,993
120	355,715	373,830	362,515	365,902	384,939	384,255	377,302
121	352,325	360,353	356,749	367,921	405,909	404,086	402,411
122	342,792	345,460	367,589	377,809	391,593	378,883	383,782
123	342,389	358,399	371,042	372,598	380,180	391,678	406,558
124	352,112	360,454	365,133	379,436	391,773	391,332	392,828
125	349,331	350,065	360,868	385,467	370,294	389,137	385,365
126	351,250	356,432	363,006	363,193	380,669	393,416	379,415
127	345,893	373,596	361,244	380,900	391,014	396,764	399,511
128	337,312	352,753	349,627	365,081	373,981	396,455	396,779
129	345,803	351,982	384,555	383,425	389,152	384,717	391,847
130	354,927	369,983	367,246	376,150	366,773	395,457	404,246
131	356,228	347,378	368,875	397,958	380,129	384,260	396,153
132	367,073	363,165	356,561	354,269	383,973	388,875	398,177
133	336,872	350,772	356,306	366,716	389,321	398,530	387,453
134	346,322	352,390	365,671	383,039	375,732	394,529	385,299
135	353,849	364,791	358,013	380,443	385,056	382,843	376,950
136	342,281	348,236	363,189	362,188	379,206	397,374	404,427
137	339,769	355,873	347,182	393,449	388,916	390,068	407,401
138	341,168	365,600	382,571	366,231	367,260	377,017	406,340
139	359,524	357,374	360,130	357,917	384,105	384,304	395,995
140	350,907	365,490	372,444	374,104	376,884	389,749	402,859
141	357,416	351,096	355,056	382,228	388,272	391,084	387,472
142	344,723	357,154	360,028	384,832	373,267	371,856	402,807
143	345,042	352,401	373,082	363,155	383,954	384,070	409,181
144	357,153	359,554	366,697	357,559	375,836	384,963	391,726
145	351,479	356,192	371,771	368,856	392,777	394,286	382,669
146	349,595	358,840	362,019	376,952	377,743	389,392	417,419
147	350,063	371,696	355,401	388,506	376,695	397,375	400,542
148	341,279	372,108	367,711	376,785	395,115	382,844	396,951
149	341,175	367,495	361,462	377,169	383,001	381,005	400,252
150	347,719	353,218	370,551	374,480	387,240	386,240	394,792
151	349,585	356,623	367,473	372,964	376,145	381,883	391,050
152	335,061	338,656	361,908	384,828	372,782	382,915	391,757
153	347,931	360,548	367,084	362,566	383,934	391,525	395,924
154	346,921	341,975	363,638	380,693	377,695	391,134	402,414
155	330,595	355,579	378,154	371,724	385,688	378,057	374,653
156	359,725	356,702	364,334	370,734	380,611	391,032	397,842
157	354,445	368,405	355,709	367,560	391,626	383,896	383,412
158	338,486	349,219	357,870	354,926	377,330	391,800	407,822
159	344,257	359,934	367,968	362,156	378,386	384,116	390,199

Annual Load Forecast Monte-Carlo Results

Draw	2016	2017	2018	2019	2020	2021	2022
160	355,203	353,128	369,830	388,326	389,157	404,318	406,223
161	339,556	357,358	366,970	385,630	395,723	393,563	409,522
162	364,506	354,053	354,404	378,052	382,847	386,015	387,677
163	350,637	354,880	365,799	392,479	373,545	380,243	381,060
164	340,596	371,134	345,664	357,349	370,521	387,692	381,298
165	358,167	341,853	349,442	373,210	375,355	385,758	393,089
166	338,092	353,618	371,941	365,199	380,183	396,965	398,851
167	353,002	363,623	364,999	372,312	381,441	372,620	393,292
168	338,567	346,456	372,592	390,848	382,343	385,987	414,412
169	345,103	367,793	359,403	357,862	369,345	391,334	418,081
170	342,677	368,378	355,959	377,945	380,719	401,922	415,280
171	345,885	359,884	370,470	370,530	384,076	378,997	398,116
172	340,958	369,581	366,777	380,147	370,534	382,997	406,189
173	337,372	359,623	361,882	369,326	382,522	398,090	398,308
174	351,149	353,204	364,872	369,068	360,967	372,636	406,833
175	345,720	374,163	375,518	392,522	378,224	406,783	388,581
176	354,581	358,909	358,074	380,715	380,453	395,766	385,692
177	336,540	363,940	362,054	378,472	391,182	413,691	396,016
178	352,498	349,912	347,285	380,338	391,606	393,116	389,410
179	355,330	357,777	365,365	386,744	389,857	372,956	397,802
180	353,839	347,125	370,321	373,986	387,714	385,387	376,958
181	348,901	352,429	361,135	377,202	378,458	383,365	409,582
182	355,827	346,459	359,100	370,751	382,948	371,646	425,281
183	369,186	357,008	354,913	396,201	392,284	379,810	418,587
184	349,547	344,604	358,923	377,307	377,637	379,785	390,135
185	359,322	361,778	374,197	372,884	380,109	381,484	407,220
186	337,770	346,650	368,555	364,254	376,817	396,645	402,997
187	359,747	359,862	369,219	396,827	383,114	407,455	386,839
188	351,072	367,049	359,154	365,835	379,263	393,077	387,852
189	360,352	374,388	364,644	363,241	366,634	393,503	399,300
190	345,697	335,465	374,209	378,825	369,837	392,800	397,551
191	351,776	343,719	354,152	370,538	374,071	404,851	408,566
192	340,768	357,319	364,381	372,445	374,157	385,468	392,926
193	344,513	351,727	357,821	365,692	380,530	401,130	391,098
194	338,013	350,539	356,930	367,355	375,558	371,220	380,512
195	358,071	357,192	360,155	368,252	361,026	394,161	393,506
196	332,872	371,629	371,904	368,906	386,140	398,854	397,362
197	353,972	340,882	350,321	373,296	387,434	372,177	401,837
198	349,277	352,498	370,667	365,791	381,284	372,634	399,454
199	341,482	356,701	378,159	363,799	378,457	397,307	390,660
200	335,722	350,883	354,811	357,215	377,355	384,859	384,238
Max	370,128	376,153	385,303	397,958	405,909	413,691	425,281
Min	329,802	335,465	339,823	348,317	360,967	365,005	369,401
Average	349,043	356,780	365,020	372,522	380,161	388,174	396,295

Annual Load Forecast Monte-Carlo Results

Draw	2023	2024	2025	2026	2027	2028
1	409,515	424,139	405,001	438,288	438,865	432,169
2	407,230	389,078	408,940	407,636	429,207	444,781
3	400,639	416,788	422,602	419,839	439,204	442,307
4	407,777	403,400	424,195	445,828	434,522	455,424
5	395,130	409,682	420,197	435,121	451,695	429,227
6	400,045	399,146	412,238	442,797	444,648	449,256
7	409,573	416,589	442,119	420,676	423,343	445,274
8	393,277	409,915	408,855	452,285	433,492	432,276
9	416,238	434,510	420,024	427,874	442,615	444,638
10	390,814	406,765	429,937	427,372	405,276	446,426
11	416,434	404,132	408,864	425,872	448,381	453,467
12	411,127	412,134	419,165	425,609	440,252	431,169
13	398,164	396,389	430,933	430,287	446,498	440,065
14	407,957	425,523	429,822	431,246	433,551	427,854
15	404,877	395,561	416,122	429,218	439,395	441,684
16	404,321	390,437	408,241	417,354	424,432	444,323
17	391,262	433,054	414,134	433,419	432,547	425,461
18	388,199	410,839	431,030	436,193	435,272	451,434
19	417,271	422,843	400,733	437,106	415,934	441,443
20	403,891	410,226	429,557	433,110	435,563	447,480
21	393,944	429,939	417,638	416,559	428,082	428,390
22	399,906	424,113	421,476	427,780	456,217	440,165
23	401,199	413,777	410,896	430,825	427,437	429,644
24	412,355	414,945	431,878	436,199	439,165	456,084
25	397,777	412,682	409,357	433,671	437,841	448,873
26	403,442	392,919	413,259	437,462	437,626	444,182
27	415,423	412,701	409,206	437,582	429,959	435,017
28	406,037	417,550	417,536	432,452	436,436	441,403
29	407,335	397,838	411,680	432,005	418,380	440,835
30	399,288	406,899	432,028	433,841	438,876	434,474
31	410,417	422,423	405,377	412,289	432,036	459,691
32	403,256	407,475	427,500	440,005	426,005	446,296
33	396,665	424,693	411,259	412,571	435,089	441,671
34	403,759	423,098	420,318	436,935	432,381	419,975
35	387,470	394,628	401,725	414,022	429,151	431,969
36	409,144	422,189	415,489	422,236	451,162	430,894
37	417,066	412,682	413,964	424,152	417,288	436,448
38	392,146	416,610	409,649	442,388	432,398	434,156
39	409,013	404,582	421,203	434,710	437,711	443,310
40	406,333	413,424	428,645	428,193	425,715	434,161
41	410,320	414,347	410,816	437,559	455,542	435,586
42	427,470	405,136	412,414	427,473	440,161	453,427
43	401,990	415,827	437,580	436,714	428,106	431,490
44	414,892	404,019	428,207	407,990	430,605	464,392
45	395,897	404,965	426,238	435,675	439,306	444,300
46	401,741	411,221	426,884	417,741	416,332	435,277
47	405,381	424,660	419,230	445,041	438,134	469,752
48	387,846	412,018	429,921	424,582	434,653	436,888
49	405,485	407,095	403,972	427,034	437,874	443,121
50	407,253	407,741	427,383	438,425	437,457	441,258
51	409,683	414,110	413,266	430,450	444,545	441,310
52	402,478	423,497	404,640	422,288	436,838	441,983
53	408,972	413,571	423,054	425,093	433,016	446,594

Annual Load Forecast Monte-Carlo Results

Draw	2023	2024	2025	2026	2027	2028
54	388,449	433,756	404,359	440,199	428,240	443,003
55	418,614	416,858	421,504	421,582	425,587	441,927
56	397,902	400,465	424,145	451,111	430,359	433,075
57	396,322	425,369	417,498	414,176	443,486	433,752
58	406,718	419,004	396,750	432,468	455,095	449,450
59	404,270	415,432	422,843	423,976	428,116	435,710
60	416,307	412,241	404,223	432,930	438,568	445,290
61	400,909	395,979	425,214	424,099	420,205	448,962
62	417,383	407,182	432,136	433,214	435,811	460,396
63	405,624	415,427	427,629	415,008	430,138	437,006
64	400,964	406,128	421,351	416,941	430,507	429,143
65	396,002	417,312	396,331	450,396	438,543	446,075
66	400,783	416,841	429,835	436,834	435,010	431,723
67	379,884	412,284	424,746	407,343	442,313	439,344
68	413,446	426,461	402,976	414,739	431,679	427,310
69	410,139	402,884	422,628	407,422	442,187	440,584
70	406,830	432,694	427,889	423,054	425,540	440,740
71	408,072	396,586	415,372	437,566	419,505	444,203
72	402,723	404,216	431,456	440,377	437,355	435,880
73	408,494	430,945	418,908	430,019	422,882	437,092
74	405,532	406,795	420,486	416,851	425,252	441,825
75	410,660	411,470	423,943	431,104	422,238	448,947
76	412,132	411,635	414,770	419,711	435,129	447,135
77	400,962	417,301	420,879	438,999	448,867	440,131
78	410,424	411,679	422,732	417,944	443,859	451,078
79	398,752	399,277	411,010	413,229	440,239	452,064
80	398,858	410,639	404,086	411,544	417,734	438,554
81	405,724	402,513	429,684	438,030	443,773	471,087
82	407,816	396,493	412,648	437,122	424,039	439,088
83	400,631	414,663	417,237	439,491	438,472	440,051
84	406,746	411,531	408,578	441,107	427,864	430,080
85	395,737	410,580	388,981	430,431	462,449	441,313
86	399,798	416,802	404,491	445,089	440,561	436,426
87	406,214	427,777	425,489	435,358	449,612	440,181
88	387,799	416,747	418,654	424,047	431,750	453,847
89	395,120	419,546	429,723	436,461	442,687	447,796
90	399,614	412,201	420,556	434,041	428,792	426,347
91	393,596	410,038	419,897	410,754	445,360	427,273
92	415,584	424,586	434,983	419,031	415,124	440,238
93	420,274	419,284	423,827	439,147	432,100	454,547
94	400,130	403,159	406,490	428,217	436,030	434,939
95	410,365	408,222	423,161	424,860	440,150	435,258
96	412,254	407,616	411,455	418,618	436,968	445,500
97	405,247	398,276	426,643	429,315	424,046	438,908
98	391,239	426,535	423,504	434,968	424,778	433,531
99	393,201	414,267	412,280	417,740	430,497	441,465
100	389,901	406,959	409,368	438,316	444,067	457,627
101	402,521	409,069	427,759	425,515	449,304	447,387
102	403,217	420,172	414,644	421,533	445,661	420,066
103	424,887	416,586	400,305	420,989	432,668	433,397
104	393,185	422,282	421,115	430,751	437,088	447,574
105	405,795	416,144	432,420	432,516	430,656	430,537
106	402,337	410,109	415,859	429,597	407,963	443,918

Annual Load Forecast Monte-Carlo Results

Draw	2023	2024	2025	2026	2027	2028
107	405,147	414,474	389,973	420,881	431,788	431,527
108	393,398	423,365	435,632	421,185	437,990	444,978
109	409,024	407,348	425,274	418,170	424,147	468,424
110	411,473	396,290	426,136	411,216	449,449	450,037
111	404,061	387,914	436,429	428,085	425,974	457,502
112	400,967	413,041	407,191	410,548	442,795	442,073
113	415,484	420,463	418,209	435,466	426,489	428,603
114	386,529	392,997	410,116	418,452	434,433	442,556
115	395,267	410,195	437,177	421,220	435,313	443,037
116	399,900	402,615	424,824	421,388	432,844	445,274
117	396,834	404,078	425,955	431,225	431,398	450,197
118	416,135	407,256	431,248	424,134	433,854	456,771
119	402,875	400,207	417,406	420,902	436,857	454,466
120	406,144	413,612	420,469	430,739	444,430	444,482
121	397,090	418,055	424,868	427,123	435,837	451,967
122	394,385	401,924	422,338	427,699	435,451	453,728
123	400,421	395,108	435,791	423,912	433,703	434,644
124	404,196	404,804	420,929	445,296	425,314	438,931
125	388,177	427,089	411,924	437,979	458,202	421,047
126	406,296	396,784	417,929	441,517	437,376	445,263
127	414,679	410,190	431,521	431,458	431,463	454,426
128	397,262	408,476	413,549	403,827	434,534	428,911
129	382,709	412,210	415,963	430,565	438,288	431,319
130	388,345	414,977	424,690	440,255	438,981	476,291
131	409,571	399,553	430,628	423,670	427,756	458,173
132	411,022	425,618	393,786	426,660	447,180	403,472
133	396,529	410,295	421,801	438,414	415,468	443,835
134	410,262	420,996	410,389	422,299	428,001	440,032
135	384,084	401,509	404,666	440,652	425,868	454,016
136	399,149	412,904	398,507	430,452	422,084	431,335
137	389,634	403,964	415,916	414,497	443,712	451,224
138	401,252	404,183	419,753	420,294	442,047	438,549
139	426,055	410,310	423,245	422,744	446,937	439,950
140	399,046	392,555	408,070	436,465	420,609	418,280
141	400,446	407,751	415,406	435,875	441,013	441,984
142	405,873	407,609	426,921	431,144	447,233	431,329
143	392,133	410,028	421,625	414,596	444,976	445,789
144	418,501	416,451	407,085	424,387	432,905	437,801
145	397,914	429,119	437,647	455,115	423,101	441,568
146	408,418	404,414	406,123	440,571	436,099	433,574
147	423,242	397,432	429,560	407,914	433,832	462,818
148	405,844	421,411	431,893	424,713	442,806	424,022
149	386,783	401,061	410,867	435,393	441,857	423,288
150	396,673	403,563	406,409	408,482	441,541	444,228
151	418,831	406,086	414,634	425,766	429,928	442,319
152	416,080	430,995	434,291	425,373	420,139	435,446
153	389,725	411,033	418,480	422,106	432,763	438,774
154	406,340	425,216	439,203	433,019	430,222	442,244
155	400,849	417,837	428,684	420,688	436,039	474,346
156	399,414	402,409	409,639	416,181	436,383	428,278
157	399,742	415,511	415,192	439,526	441,812	447,204
158	390,935	406,876	416,052	420,806	444,716	453,964
159	407,466	403,511	417,668	426,515	443,475	438,536

Annual Load Forecast Monte-Carlo Results

Draw	2023	2024	2025	2026	2027	2028
160	408,435	408,508	420,609	412,990	416,177	446,053
161	397,083	406,438	407,056	412,445	431,898	444,163
162	395,700	433,679	421,833	445,510	432,193	452,857
163	397,046	409,834	410,260	438,930	443,347	445,763
164	389,814	394,318	412,048	430,956	447,525	457,316
165	408,543	410,517	420,649	432,798	436,562	451,283
166	405,102	410,041	416,941	416,825	442,712	441,010
167	403,528	406,500	424,278	428,746	435,319	446,687
168	396,729	422,227	442,752	423,267	434,496	433,378
169	384,299	415,247	428,438	417,598	433,834	426,717
170	400,513	413,994	426,156	424,882	441,330	445,562
171	407,523	409,258	400,508	424,789	429,316	439,152
172	412,860	412,028	403,137	419,049	434,139	435,846
173	412,585	424,978	425,652	446,226	443,182	426,452
174	390,377	436,751	424,776	441,000	432,054	434,686
175	422,662	422,976	431,137	434,474	430,834	447,511
176	407,387	411,508	412,124	409,476	431,392	451,600
177	393,466	403,904	407,980	432,357	421,678	427,474
178	398,413	407,871	434,621	426,955	441,213	430,287
179	407,626	414,373	416,249	449,785	432,860	448,876
180	406,872	408,189	423,664	427,166	456,004	464,375
181	402,729	418,851	402,593	441,606	444,830	447,032
182	399,412	410,702	413,670	437,385	428,257	463,451
183	395,229	426,127	424,264	428,718	433,431	441,245
184	394,316	400,515	403,793	435,201	432,054	441,347
185	399,207	417,086	416,478	442,477	422,243	435,541
186	441,394	426,597	431,862	418,327	429,997	449,236
187	391,494	416,741	432,452	429,429	439,043	457,532
188	400,141	416,128	427,340	424,412	424,940	445,672
189	408,450	413,672	418,657	432,192	429,364	440,684
190	393,252	421,751	413,140	438,464	426,258	433,429
191	407,327	425,311	429,974	418,930	437,307	436,869
192	419,530	394,069	423,908	423,171	441,108	446,356
193	420,609	416,528	387,538	445,239	441,794	446,350
194	399,936	419,617	416,539	437,443	429,780	438,066
195	399,678	405,259	409,460	422,111	444,944	432,553
196	396,199	401,117	405,316	429,391	445,031	431,849
197	405,356	412,842	437,464	417,814	457,263	450,376
198	403,738	404,894	414,622	428,390	447,928	455,882
199	389,552	415,739	410,490	427,870	447,178	440,707
200	407,156	412,107	408,866	430,927	428,873	419,384
Max	441,394	436,751	442,752	455,115	462,449	476,291
Min	379,884	387,914	387,538	403,827	405,276	403,472
Average	403,205	411,880	418,504	428,391	435,051	441,907

Annual Load Forecast Monte-Carlo Results

Draw	20 Year Demand
1	7,363,730
2	7,347,830
3	7,342,100
4	7,444,896
5	7,426,660
6	7,396,151
7	7,428,195
8	7,357,367
9	7,447,642
10	7,350,376
11	7,415,113
12	7,342,839
13	7,420,941
14	7,449,108
15	7,366,877
16	7,334,595
17	7,397,954
18	7,407,348
19	7,388,663
20	7,476,209
21	7,346,659
22	7,434,617
23	7,381,641
24	7,446,176
25	7,363,355
26	7,415,480
27	7,355,360
28	7,341,778
29	7,369,939
30	7,322,271
31	7,376,024
32	7,427,470
33	7,369,888
34	7,359,701
35	7,332,247
36	7,407,759
37	7,342,615
38	7,326,535
39	7,405,618
40	7,385,859
41	7,440,192
42	7,423,367
43	7,439,127
44	7,398,058
45	7,365,862
46	7,337,142
47	7,458,387
48	7,330,145
49	7,386,827
50	7,396,569
51	7,377,678
52	7,391,900
53	7,457,703

Annual Load Forecast Monte-Carlo Results

Draw	20 Year Demand
54	7,351,888
55	7,401,405
56	7,343,903
57	7,385,668
58	7,437,200
59	7,372,847
60	7,416,261
61	7,365,378
62	7,424,458
63	7,378,744
64	7,393,839
65	7,405,306
66	7,386,036
67	7,339,141
68	7,377,173
69	7,388,835
70	7,456,230
71	7,366,109
72	7,445,350
73	7,370,933
74	7,388,770
75	7,391,342
76	7,372,807
77	7,382,390
78	7,384,248
79	7,401,146
80	7,347,786
81	7,405,528
82	7,362,144
83	7,375,802
84	7,346,877
85	7,323,703
86	7,369,768
87	7,439,560
88	7,431,067
89	7,424,598
90	7,397,733
91	7,354,621
92	7,349,951
93	7,366,394
94	7,378,627
95	7,448,040
96	7,409,065
97	7,350,386
98	7,371,616
99	7,361,114
100	7,435,936
101	7,427,192
102	7,349,620
103	7,375,229
104	7,390,654
105	7,390,956
106	7,383,211

Annual Load Forecast Monte-Carlo Results

Draw	20 Year Demand
107	7,317,804
108	7,382,833
109	7,418,634
110	7,420,779
111	7,490,203
112	7,330,756
113	7,425,065
114	7,360,537
115	7,321,002
116	7,336,676
117	7,383,244
118	7,410,002
119	7,426,510
120	7,432,718
121	7,431,687
122	7,350,362
123	7,370,301
124	7,425,211
125	7,369,019
126	7,377,468
127	7,489,112
128	7,320,870
129	7,426,612
130	7,466,601
131	7,428,098
132	7,346,434
133	7,338,018
134	7,352,629
135	7,362,366
136	7,312,706
137	7,410,463
138	7,346,916
139	7,398,284
140	7,359,027
141	7,403,975
142	7,377,988
143	7,371,205
144	7,380,905
145	7,453,035
146	7,374,082
147	7,454,418
148	7,398,760
149	7,306,392
150	7,355,646
151	7,398,352
152	7,375,268
153	7,353,468
154	7,397,324
155	7,386,153
156	7,355,540
157	7,391,981
158	7,321,173
159	7,357,508

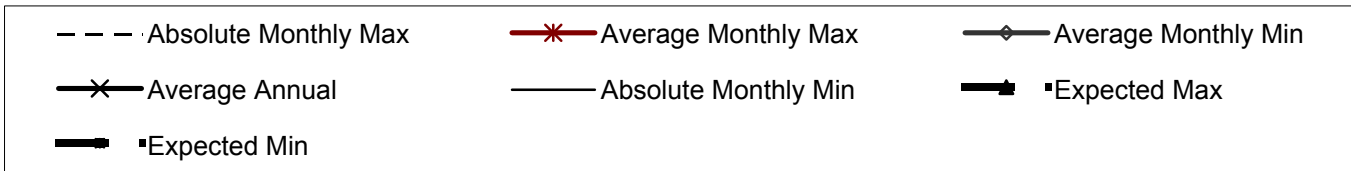
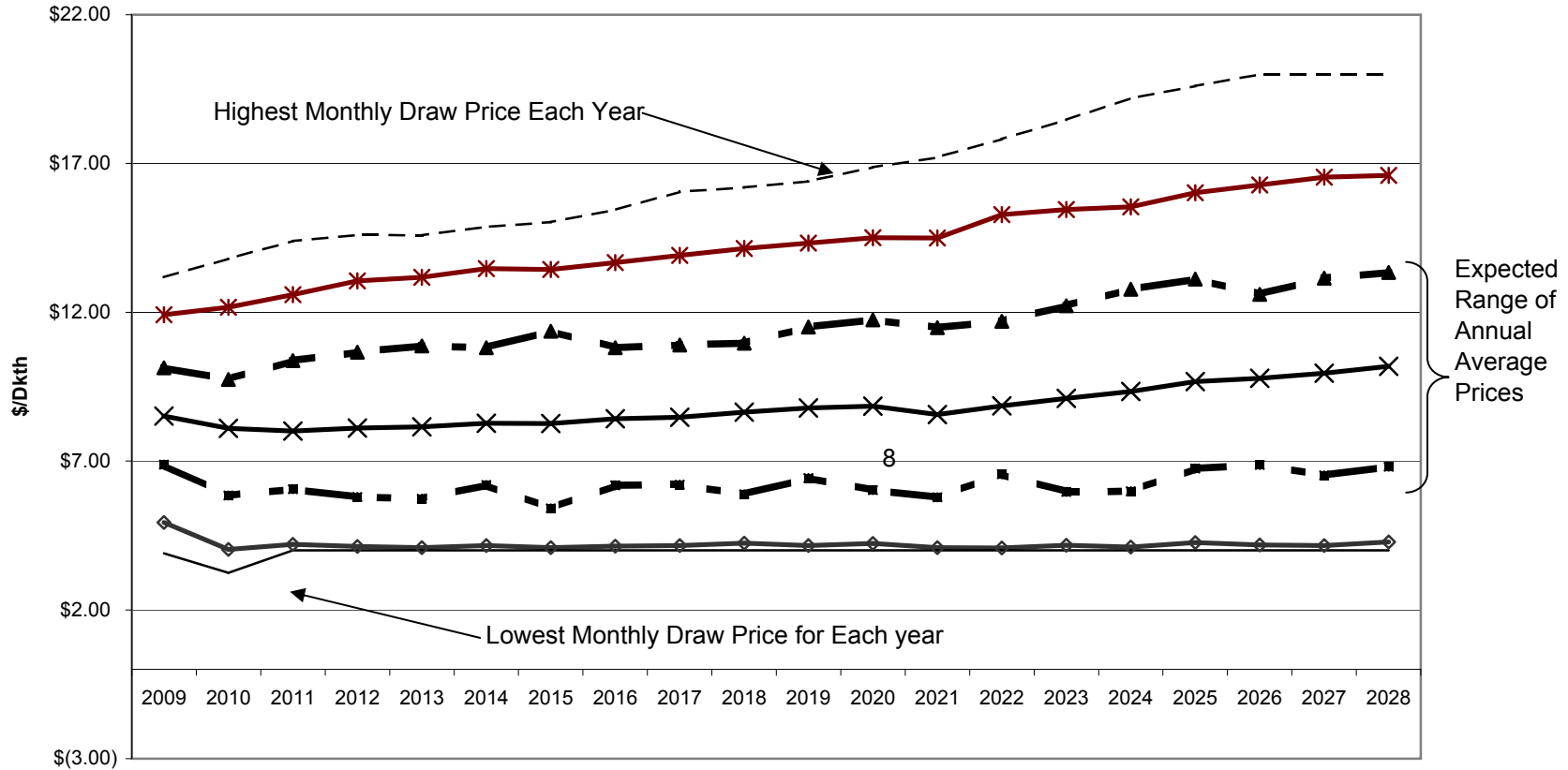
Annual Load Forecast Monte-Carlo Results

Draw	20 Year Demand
160	7,410,544
161	7,388,131
162	7,409,532
163	7,405,508
164	7,304,875
165	7,403,582
166	7,391,623
167	7,393,063
168	7,461,777
169	7,348,406
170	7,436,480
171	7,338,684
172	7,396,653
173	7,455,193
174	7,406,844
175	7,492,880
176	7,401,074
177	7,379,252
178	7,399,043
179	7,432,735
180	7,434,796
181	7,395,827
182	7,437,859
183	7,481,585
184	7,318,349
185	7,414,218
186	7,436,405
187	7,447,347
188	7,409,565
189	7,428,513
190	7,391,698
191	7,381,350
192	7,371,426
193	7,398,934
194	7,324,321
195	7,323,461
196	7,372,840
197	7,405,865
198	7,403,682
199	7,364,941
200	7,284,628

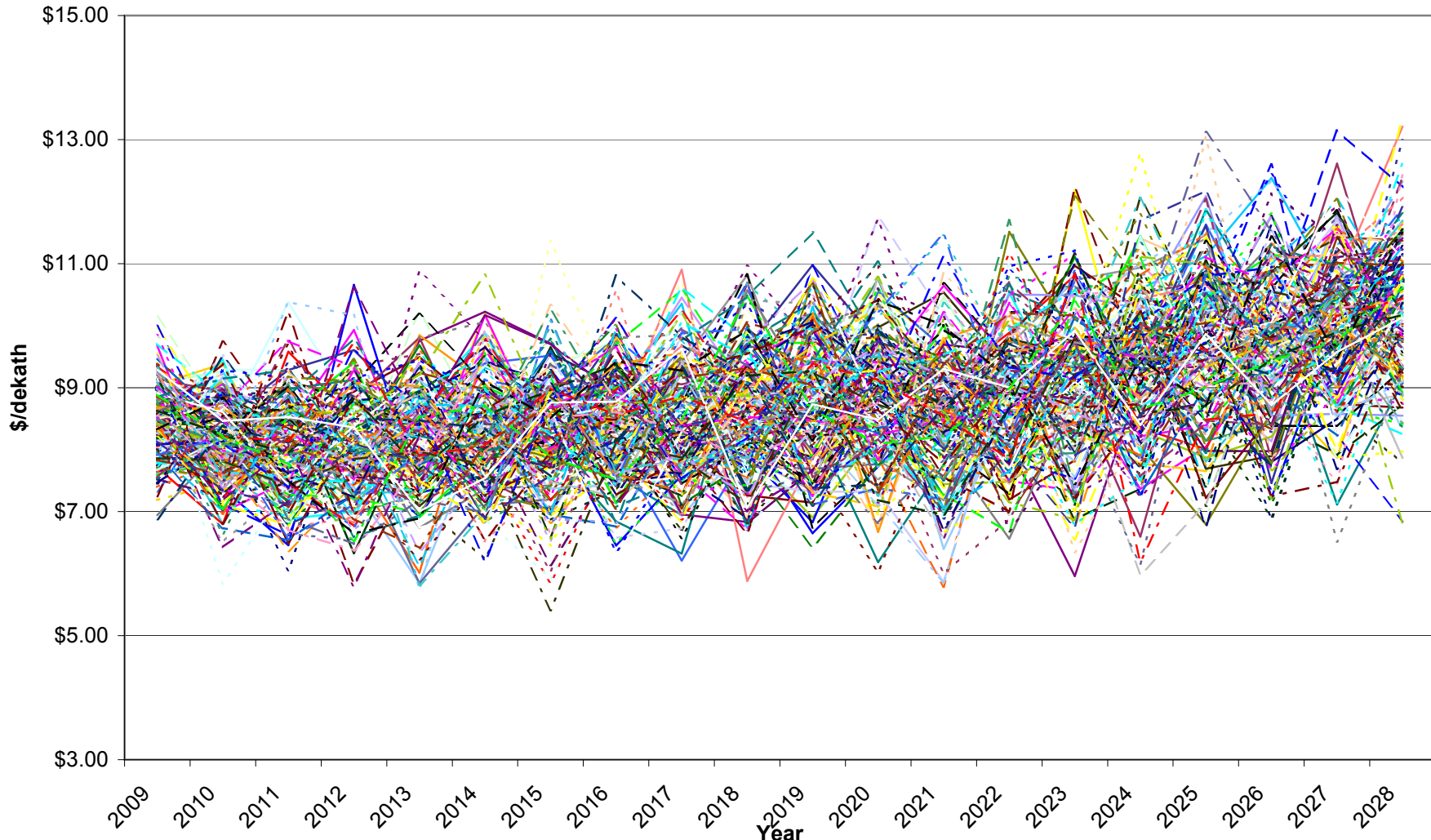
Max 7,492,880
 Min 7,284,628
 Average 7,388,744

Appendix G-2
Price Uncertainty Analysis

NYMEX Annual Price Forecast



NYMEX ANNUAL AVERAGE PRICE



Nymex Detail-Annual Ranges

Draw	2009			2010			2011		
	max	min	avg	max	min	avg	max	min	avg
1	\$12.33	\$4.31	\$8.52	\$13.80	\$4.73	\$9.06	\$14.00	\$4.00	\$8.39
2	\$10.99	\$4.12	\$7.85	\$11.81	\$3.47	\$8.17	\$9.14	\$4.00	\$6.90
3	\$11.52	\$4.89	\$8.42	\$11.73	\$3.95	\$7.93	\$11.05	\$4.57	\$7.73
4	\$12.80	\$5.95	\$8.77	\$13.40	\$4.05	\$8.97	\$12.08	\$4.00	\$7.43
5	\$12.57	\$5.14	\$8.58	\$13.39	\$4.68	\$8.75	\$12.43	\$4.00	\$8.45
6	\$13.18	\$6.04	\$8.93	\$11.58	\$4.39	\$7.74	\$13.52	\$4.00	\$7.18
7	\$11.22	\$4.03	\$8.02	\$13.24	\$3.38	\$7.37	\$12.03	\$4.00	\$6.46
8	\$11.87	\$5.93	\$8.58	\$13.18	\$4.00	\$8.51	\$13.66	\$4.00	\$8.61
9	\$12.34	\$4.18	\$7.79	\$11.88	\$3.79	\$8.35	\$12.43	\$7.15	\$10.38
10	\$11.77	\$5.39	\$9.06	\$11.16	\$5.54	\$9.27	\$11.90	\$4.31	\$7.67
11	\$10.09	\$5.73	\$8.17	\$13.40	\$3.32	\$8.41	\$11.40	\$4.00	\$8.41
12	\$12.66	\$4.16	\$7.96	\$13.06	\$5.34	\$9.17	\$10.83	\$4.13	\$7.34
13	\$11.69	\$4.03	\$7.92	\$12.48	\$3.32	\$7.92	\$13.66	\$4.00	\$7.37
14	\$11.73	\$4.89	\$8.19	\$13.43	\$3.43	\$7.32	\$13.54	\$4.00	\$7.80
15	\$11.63	\$4.29	\$7.67	\$11.81	\$4.20	\$7.54	\$11.20	\$4.00	\$7.51
16	\$11.60	\$6.95	\$9.09	\$13.20	\$3.59	\$7.92	\$12.43	\$5.41	\$8.87
17	\$12.80	\$4.23	\$8.69	\$10.73	\$3.24	\$6.80	\$12.31	\$4.00	\$8.50
18	\$11.75	\$4.78	\$8.76	\$13.80	\$4.34	\$8.53	\$14.06	\$4.00	\$8.43
19	\$12.80	\$4.87	\$9.05	\$12.92	\$5.92	\$9.39	\$12.43	\$4.00	\$7.45
20	\$12.45	\$4.07	\$8.34	\$13.06	\$3.24	\$7.73	\$12.74	\$4.00	\$7.91
21	\$11.13	\$6.75	\$9.02	\$11.21	\$3.58	\$7.56	\$12.43	\$4.00	\$7.68
22	\$12.80	\$5.41	\$8.83	\$12.51	\$3.38	\$7.69	\$11.04	\$4.00	\$7.46
23	\$11.13	\$5.12	\$8.26	\$10.47	\$3.77	\$7.47	\$10.79	\$4.03	\$8.19
24	\$11.60	\$4.51	\$8.21	\$12.06	\$3.38	\$8.93	\$14.00	\$4.00	\$8.54
25	\$12.49	\$5.08	\$8.55	\$11.63	\$4.68	\$7.90	\$14.01	\$4.77	\$9.05
26	\$12.80	\$4.07	\$9.21	\$12.46	\$4.27	\$8.12	\$12.48	\$4.00	\$8.81
27	\$11.83	\$5.18	\$8.56	\$13.21	\$5.03	\$8.88	\$14.06	\$4.00	\$8.34
28	\$11.37	\$5.32	\$7.92	\$13.40	\$3.62	\$8.04	\$11.04	\$4.26	\$7.07
29	\$12.02	\$6.62	\$9.13	\$12.48	\$5.78	\$8.94	\$10.92	\$5.30	\$8.00
30	\$12.73	\$4.26	\$8.40	\$13.40	\$5.04	\$8.47	\$13.89	\$5.48	\$9.29
31	\$11.47	\$7.15	\$8.92	\$11.76	\$4.43	\$8.20	\$12.32	\$4.00	\$8.50
32	\$12.39	\$6.64	\$8.98	\$13.39	\$3.38	\$7.20	\$12.35	\$4.00	\$7.88
33	\$10.71	\$4.03	\$7.71	\$11.89	\$3.65	\$6.80	\$12.55	\$5.86	\$9.58
34	\$11.92	\$6.10	\$8.68	\$13.06	\$3.38	\$8.35	\$11.56	\$4.00	\$6.78
35	\$13.18	\$5.28	\$9.23	\$13.73	\$4.73	\$8.44	\$11.80	\$4.25	\$8.24
36	\$11.68	\$3.96	\$8.20	\$13.40	\$3.43	\$8.51	\$10.29	\$4.00	\$7.70
37	\$12.68	\$5.90	\$9.67	\$11.88	\$3.89	\$6.99	\$13.09	\$4.00	\$7.49
38	\$11.96	\$6.03	\$8.43	\$13.80	\$5.62	\$9.45	\$10.10	\$4.00	\$6.88
39	\$12.80	\$4.12	\$8.72	\$11.94	\$4.60	\$8.83	\$9.07	\$4.00	\$6.48
40	\$13.18	\$6.63	\$9.14	\$10.46	\$3.38	\$7.03	\$14.40	\$4.00	\$8.70
41	\$13.18	\$4.75	\$8.56	\$13.40	\$3.38	\$8.85	\$12.48	\$4.27	\$7.38
42	\$12.80	\$6.58	\$9.29	\$11.88	\$3.68	\$8.23	\$13.87	\$5.93	\$9.09
43	\$12.17	\$4.89	\$8.42	\$13.19	\$3.32	\$7.64	\$13.92	\$4.00	\$8.18
44	\$11.87	\$4.88	\$9.13	\$11.89	\$3.76	\$8.08	\$13.00	\$5.01	\$8.98
45	\$12.81	\$3.89	\$7.62	\$12.69	\$4.91	\$8.20	\$11.17	\$4.00	\$7.72
46	\$11.08	\$4.45	\$6.94	\$13.11	\$3.43	\$8.07	\$11.63	\$4.00	\$7.63
47	\$12.80	\$4.33	\$9.09	\$12.20	\$5.41	\$8.78	\$13.66	\$4.00	\$8.20
48	\$11.07	\$3.89	\$8.57	\$11.88	\$3.24	\$7.63	\$14.00	\$4.00	\$9.11
49	\$11.87	\$4.32	\$8.39	\$12.26	\$3.38	\$7.04	\$11.86	\$6.09	\$8.55
50	\$11.28	\$4.03	\$8.21	\$13.43	\$3.47	\$9.29	\$12.84	\$4.00	\$9.28
51	\$12.80	\$4.12	\$8.29	\$10.66	\$5.57	\$8.33	\$13.66	\$4.03	\$8.40
52	\$12.80	\$5.40	\$8.35	\$11.59	\$4.05	\$7.87	\$11.20	\$4.00	\$7.23

Nymex Detail-Annual Ranges

53	\$12.81	\$5.29	\$9.46	\$13.26	\$3.56	\$8.46	\$10.41	\$4.00	\$7.45
54	\$12.82	\$5.23	\$8.98	\$11.48	\$4.50	\$8.53	\$12.50	\$4.00	\$8.26
55	\$10.58	\$5.16	\$7.74	\$13.34	\$4.08	\$8.11	\$13.15	\$4.00	\$7.67
56	\$12.45	\$5.31	\$9.01	\$11.89	\$6.22	\$8.49	\$12.50	\$4.00	\$7.45
57	\$11.32	\$8.50	\$9.96	\$11.81	\$3.24	\$8.36	\$12.23	\$4.00	\$7.43
58	\$12.82	\$6.41	\$9.71	\$12.48	\$3.32	\$8.86	\$13.78	\$4.00	\$8.28
59	\$10.09	\$5.44	\$7.65	\$12.54	\$3.56	\$7.84	\$11.76	\$4.00	\$7.65
60	\$12.80	\$4.68	\$8.78	\$11.21	\$3.43	\$6.81	\$13.06	\$4.00	\$8.78
61	\$12.81	\$5.64	\$8.78	\$13.43	\$4.80	\$8.79	\$14.06	\$4.83	\$8.86
62	\$12.80	\$7.03	\$9.99	\$11.94	\$3.93	\$7.83	\$12.55	\$4.00	\$8.24
63	\$12.07	\$4.71	\$8.18	\$11.93	\$3.38	\$8.07	\$13.99	\$4.00	\$8.61
64	\$11.47	\$4.24	\$8.26	\$11.81	\$3.38	\$7.63	\$13.09	\$4.00	\$9.10
65	\$12.81	\$6.50	\$10.14	\$12.50	\$3.38	\$8.54	\$13.66	\$4.02	\$6.90
66	\$11.32	\$4.69	\$9.13	\$11.00	\$3.55	\$7.68	\$14.40	\$4.03	\$8.21
67	\$10.91	\$6.22	\$8.89	\$12.48	\$4.68	\$8.24	\$12.30	\$4.00	\$7.98
68	\$10.78	\$6.76	\$8.63	\$11.49	\$4.88	\$8.27	\$12.50	\$4.03	\$9.02
69	\$12.80	\$5.07	\$8.78	\$12.01	\$4.27	\$9.22	\$12.10	\$4.86	\$7.38
70	\$11.75	\$5.60	\$8.38	\$12.24	\$3.93	\$8.40	\$13.53	\$4.00	\$7.46
71	\$12.15	\$4.03	\$7.33	\$10.57	\$5.71	\$8.90	\$11.64	\$4.00	\$8.72
72	\$11.78	\$5.31	\$9.05	\$10.30	\$3.38	\$7.57	\$14.01	\$4.00	\$7.94
73	\$11.27	\$3.96	\$8.29	\$13.43	\$3.24	\$9.12	\$11.68	\$4.00	\$6.87
74	\$12.33	\$5.25	\$8.57	\$11.03	\$3.38	\$7.91	\$13.37	\$4.75	\$8.73
75	\$11.89	\$4.03	\$7.96	\$11.72	\$3.43	\$7.88	\$9.81	\$4.00	\$6.37
76	\$11.31	\$5.64	\$8.41	\$13.25	\$3.72	\$7.54	\$12.48	\$4.00	\$8.09
77	\$12.81	\$4.03	\$8.67	\$11.74	\$3.32	\$8.61	\$10.52	\$4.00	\$7.11
78	\$10.73	\$6.47	\$8.99	\$11.74	\$4.05	\$8.43	\$13.21	\$4.00	\$7.93
79	\$10.54	\$4.03	\$7.70	\$12.78	\$4.35	\$9.50	\$11.38	\$4.65	\$8.10
80	\$12.81	\$4.68	\$8.60	\$12.30	\$3.68	\$8.63	\$12.55	\$4.00	\$8.54
81	\$12.13	\$4.88	\$9.14	\$11.94	\$3.56	\$7.29	\$14.01	\$4.00	\$8.17
82	\$11.27	\$5.91	\$9.25	\$12.29	\$4.05	\$7.65	\$11.25	\$4.75	\$7.97
83	\$12.82	\$4.84	\$9.28	\$12.50	\$4.41	\$8.16	\$14.11	\$4.00	\$8.71
84	\$10.79	\$4.89	\$8.29	\$11.98	\$3.48	\$7.66	\$12.55	\$4.00	\$9.78
85	\$11.38	\$3.89	\$8.09	\$13.45	\$3.38	\$8.16	\$8.76	\$4.00	\$6.79
86	\$11.87	\$5.25	\$8.18	\$11.88	\$4.61	\$8.54	\$14.06	\$4.00	\$8.66
87	\$12.82	\$6.63	\$9.23	\$12.71	\$3.43	\$7.99	\$12.61	\$4.00	\$8.10
88	\$12.09	\$5.39	\$9.35	\$11.88	\$4.05	\$8.57	\$14.40	\$4.00	\$7.47
89	\$12.45	\$4.03	\$7.60	\$11.94	\$3.24	\$7.81	\$12.50	\$4.00	\$7.27
90	\$12.45	\$5.53	\$8.95	\$12.73	\$3.38	\$7.13	\$11.19	\$4.00	\$6.62
91	\$12.82	\$5.13	\$9.55	\$12.48	\$3.38	\$7.15	\$12.07	\$4.00	\$7.92
92	\$11.96	\$4.59	\$8.73	\$11.71	\$5.05	\$8.69	\$12.43	\$4.00	\$9.75
93	\$12.14	\$4.03	\$7.73	\$13.34	\$4.67	\$9.24	\$9.85	\$4.00	\$7.76
94	\$9.88	\$4.52	\$7.25	\$13.18	\$5.98	\$9.74	\$12.27	\$4.89	\$8.22
95	\$12.41	\$4.29	\$8.19	\$13.39	\$5.40	\$8.70	\$12.09	\$4.00	\$7.13
96	\$11.57	\$4.03	\$8.64	\$13.40	\$3.59	\$8.31	\$11.50	\$4.00	\$7.70
97	\$11.32	\$4.69	\$7.71	\$9.40	\$4.05	\$7.51	\$13.78	\$4.00	\$9.17
98	\$11.56	\$5.32	\$8.76	\$9.80	\$3.32	\$6.42	\$12.55	\$4.00	\$7.18
99	\$12.82	\$5.16	\$8.49	\$10.87	\$3.38	\$7.50	\$13.38	\$4.00	\$8.63
100	\$12.45	\$5.13	\$8.42	\$10.91	\$3.47	\$7.85	\$13.88	\$4.46	\$8.26
101	\$11.22	\$4.03	\$8.37	\$13.40	\$3.38	\$7.39	\$13.09	\$4.00	\$8.51
102	\$11.64	\$5.60	\$8.99	\$11.89	\$3.38	\$8.10	\$14.00	\$4.00	\$7.45
103	\$12.50	\$4.20	\$8.50	\$12.01	\$3.81	\$8.53	\$11.85	\$4.46	\$8.23
104	\$12.04	\$4.07	\$8.50	\$11.89	\$3.38	\$8.72	\$11.64	\$4.00	\$7.80
105	\$12.80	\$3.89	\$7.89	\$12.85	\$4.63	\$9.28	\$11.85	\$4.00	\$8.51
106	\$11.66	\$4.12	\$7.52	\$11.14	\$3.43	\$7.24	\$12.02	\$6.50	\$8.44

Nymex Detail-Annual Ranges

107	\$11.83	\$6.12	\$9.20	\$12.21	\$3.68	\$7.61	\$11.98	\$4.00	\$7.53
108	\$10.96	\$3.89	\$7.92	\$9.19	\$3.56	\$6.74	\$10.94	\$4.00	\$6.54
109	\$11.01	\$4.03	\$7.45	\$12.84	\$3.43	\$8.26	\$14.40	\$4.10	\$8.65
110	\$11.87	\$4.27	\$8.78	\$11.25	\$5.28	\$8.31	\$9.89	\$4.00	\$6.05
111	\$12.45	\$4.03	\$9.85	\$10.05	\$3.47	\$7.36	\$13.09	\$4.00	\$7.14
112	\$11.93	\$5.26	\$8.79	\$13.19	\$3.56	\$8.01	\$11.61	\$4.11	\$8.43
113	\$11.27	\$5.77	\$8.79	\$11.88	\$3.56	\$8.01	\$14.01	\$4.00	\$7.57
114	\$11.32	\$4.97	\$8.37	\$11.74	\$4.05	\$7.49	\$12.94	\$4.25	\$9.33
115	\$12.82	\$4.41	\$8.24	\$11.74	\$3.67	\$7.70	\$14.40	\$4.00	\$9.69
116	\$11.27	\$4.88	\$8.09	\$12.67	\$4.05	\$8.34	\$14.06	\$4.00	\$8.44
117	\$11.62	\$4.03	\$8.73	\$11.31	\$4.52	\$8.88	\$11.64	\$4.00	\$7.60
118	\$10.77	\$5.96	\$7.84	\$11.81	\$3.51	\$8.19	\$12.84	\$4.00	\$7.20
119	\$11.74	\$5.32	\$8.49	\$12.48	\$3.68	\$9.00	\$13.21	\$4.00	\$7.64
120	\$12.80	\$4.20	\$9.81	\$13.39	\$5.73	\$8.66	\$12.19	\$4.00	\$6.79
121	\$12.80	\$4.64	\$8.66	\$12.48	\$3.24	\$8.04	\$12.50	\$4.03	\$7.58
122	\$12.10	\$5.06	\$9.12	\$11.72	\$4.53	\$7.67	\$13.38	\$7.21	\$10.38
123	\$11.02	\$3.91	\$8.02	\$11.88	\$6.42	\$8.71	\$12.78	\$4.00	\$7.95
124	\$12.80	\$4.82	\$8.34	\$12.10	\$4.03	\$8.66	\$13.36	\$4.00	\$9.16
125	\$11.03	\$6.55	\$8.91	\$11.72	\$6.91	\$9.21	\$12.81	\$4.34	\$8.20
126	\$12.81	\$5.68	\$8.60	\$11.08	\$5.15	\$8.34	\$12.48	\$4.00	\$7.35
127	\$11.87	\$4.07	\$8.55	\$11.08	\$5.32	\$7.73	\$14.00	\$4.00	\$8.89
128	\$11.87	\$4.20	\$8.80	\$11.74	\$4.02	\$7.69	\$11.27	\$4.28	\$8.18
129	\$10.37	\$4.82	\$7.19	\$13.40	\$4.05	\$7.47	\$12.38	\$5.54	\$8.15
130	\$12.45	\$5.26	\$9.38	\$13.42	\$3.27	\$7.93	\$13.65	\$4.00	\$7.72
131	\$11.26	\$4.49	\$7.66	\$13.30	\$3.38	\$8.79	\$13.78	\$4.40	\$9.31
132	\$13.18	\$6.47	\$9.03	\$12.94	\$4.15	\$8.64	\$9.95	\$4.00	\$6.64
133	\$11.27	\$4.07	\$8.38	\$8.74	\$3.47	\$6.51	\$13.09	\$4.00	\$7.39
134	\$12.35	\$3.96	\$7.52	\$12.04	\$3.24	\$8.88	\$12.55	\$4.00	\$8.94
135	\$11.27	\$5.84	\$8.77	\$13.06	\$3.24	\$6.63	\$14.40	\$4.00	\$8.86
136	\$11.06	\$5.29	\$8.01	\$10.62	\$5.11	\$7.27	\$12.55	\$4.00	\$7.46
137	\$11.87	\$5.59	\$9.32	\$9.74	\$3.32	\$7.09	\$10.95	\$4.00	\$7.31
138	\$12.54	\$4.31	\$9.38	\$12.98	\$5.35	\$8.87	\$13.66	\$4.00	\$8.12
139	\$10.71	\$4.03	\$7.86	\$11.95	\$4.27	\$8.01	\$12.50	\$4.00	\$7.24
140	\$11.32	\$5.77	\$9.34	\$12.32	\$3.68	\$7.63	\$13.77	\$4.03	\$9.40
141	\$13.18	\$4.54	\$8.63	\$11.39	\$5.26	\$8.23	\$13.66	\$5.99	\$9.12
142	\$12.80	\$5.24	\$8.90	\$13.43	\$3.47	\$8.61	\$11.14	\$4.45	\$7.42
143	\$11.27	\$4.20	\$8.34	\$11.88	\$3.56	\$7.23	\$14.00	\$4.00	\$8.42
144	\$11.59	\$5.12	\$8.73	\$13.43	\$4.38	\$8.13	\$12.55	\$4.00	\$7.70
145	\$13.03	\$3.89	\$8.61	\$13.40	\$3.68	\$9.28	\$14.06	\$4.26	\$9.16
146	\$12.82	\$5.58	\$8.89	\$13.80	\$3.24	\$8.14	\$13.50	\$4.00	\$8.74
147	\$12.80	\$4.03	\$8.52	\$13.43	\$4.90	\$7.98	\$14.06	\$4.00	\$7.92
148	\$12.82	\$4.65	\$8.60	\$11.89	\$3.38	\$7.12	\$11.34	\$4.11	\$6.93
149	\$12.73	\$3.96	\$8.06	\$12.83	\$3.80	\$8.23	\$12.86	\$4.00	\$7.38
150	\$11.22	\$3.89	\$7.83	\$11.67	\$3.47	\$8.39	\$12.20	\$4.00	\$6.84
151	\$12.11	\$4.54	\$7.45	\$11.94	\$4.90	\$8.90	\$12.74	\$4.00	\$7.53
152	\$11.09	\$4.88	\$8.35	\$11.21	\$3.78	\$7.80	\$14.01	\$4.00	\$7.58
153	\$11.27	\$4.03	\$7.83	\$13.03	\$3.24	\$8.97	\$13.29	\$4.00	\$8.77
154	\$9.12	\$5.78	\$7.53	\$12.02	\$3.32	\$8.15	\$12.25	\$4.00	\$7.80
155	\$12.68	\$5.32	\$8.60	\$11.37	\$3.43	\$7.69	\$14.01	\$4.00	\$8.73
156	\$12.82	\$5.15	\$8.80	\$13.80	\$6.05	\$8.75	\$13.03	\$4.00	\$8.12
157	\$12.13	\$5.92	\$9.22	\$10.99	\$5.07	\$7.43	\$12.19	\$4.06	\$7.97
158	\$12.80	\$5.73	\$9.12	\$12.08	\$3.64	\$7.92	\$13.40	\$4.00	\$8.63
159	\$11.32	\$4.12	\$8.35	\$13.43	\$3.47	\$8.41	\$13.72	\$4.00	\$7.60
160	\$12.82	\$4.20	\$9.14	\$7.85	\$3.24	\$5.84	\$11.52	\$4.00	\$7.46

Nymex Detail-Annual Ranges

161	\$11.35	\$6.14	\$8.63	\$13.39	\$3.43	\$6.99	\$11.43	\$4.00	\$8.66
162	\$11.45	\$5.00	\$8.58	\$12.48	\$3.24	\$7.81	\$9.47	\$4.00	\$6.73
163	\$11.32	\$4.03	\$7.40	\$13.06	\$3.32	\$7.82	\$13.09	\$4.00	\$7.98
164	\$10.54	\$5.36	\$8.55	\$12.80	\$4.83	\$9.52	\$12.48	\$4.00	\$7.68
165	\$11.32	\$4.03	\$7.46	\$12.18	\$3.38	\$8.16	\$13.98	\$4.00	\$7.61
166	\$12.37	\$4.32	\$9.00	\$11.74	\$3.64	\$7.88	\$12.43	\$4.26	\$8.32
167	\$12.80	\$3.96	\$8.20	\$10.11	\$3.47	\$7.12	\$9.63	\$4.00	\$6.78
168	\$12.45	\$4.03	\$7.79	\$11.90	\$3.38	\$7.64	\$14.06	\$4.00	\$7.55
169	\$11.85	\$4.99	\$8.44	\$9.22	\$3.38	\$7.18	\$13.65	\$4.00	\$8.06
170	\$11.59	\$4.03	\$7.96	\$10.98	\$3.24	\$7.35	\$14.06	\$5.10	\$10.21
171	\$11.40	\$6.59	\$8.85	\$13.39	\$5.85	\$9.14	\$12.49	\$4.00	\$9.28
172	\$12.08	\$4.20	\$8.09	\$13.43	\$5.05	\$8.11	\$12.35	\$4.00	\$7.39
173	\$11.27	\$4.68	\$7.95	\$10.68	\$3.32	\$7.00	\$12.35	\$4.00	\$8.66
174	\$10.53	\$3.89	\$7.67	\$11.30	\$4.56	\$8.18	\$13.09	\$4.00	\$6.85
175	\$11.27	\$5.49	\$8.74	\$12.42	\$3.47	\$8.18	\$14.40	\$4.62	\$8.01
176	\$11.42	\$4.96	\$8.57	\$12.86	\$3.43	\$9.38	\$12.33	\$4.00	\$6.98
177	\$11.20	\$4.03	\$8.27	\$11.67	\$4.68	\$8.36	\$14.01	\$4.00	\$8.33
178	\$12.01	\$5.43	\$8.67	\$11.57	\$3.43	\$7.58	\$12.35	\$4.00	\$6.70
179	\$13.18	\$5.12	\$9.52	\$10.92	\$3.38	\$7.38	\$12.48	\$5.30	\$8.91
180	\$12.39	\$4.67	\$8.64	\$12.48	\$3.96	\$8.08	\$13.78	\$4.03	\$9.26
181	\$12.80	\$4.76	\$7.91	\$12.92	\$3.38	\$8.20	\$9.96	\$4.00	\$6.57
182	\$10.75	\$6.48	\$9.32	\$12.29	\$3.38	\$7.57	\$11.42	\$4.00	\$7.02
183	\$12.81	\$5.62	\$8.43	\$12.48	\$5.17	\$8.06	\$13.66	\$4.00	\$8.64
184	\$12.00	\$4.03	\$8.34	\$11.00	\$3.38	\$7.34	\$11.31	\$4.00	\$7.99
185	\$11.13	\$5.25	\$8.67	\$10.84	\$4.89	\$8.66	\$14.06	\$4.00	\$8.12
186	\$11.40	\$3.96	\$8.37	\$10.82	\$3.32	\$6.97	\$12.50	\$4.00	\$8.97
187	\$11.32	\$4.03	\$8.61	\$13.06	\$4.68	\$9.05	\$14.40	\$4.00	\$6.88
188	\$12.82	\$6.16	\$9.24	\$13.40	\$3.43	\$7.96	\$14.40	\$4.00	\$7.81
189	\$9.55	\$4.07	\$6.88	\$10.87	\$6.02	\$8.38	\$12.89	\$4.00	\$8.11
190	\$11.69	\$4.03	\$8.48	\$12.87	\$4.22	\$8.10	\$13.78	\$4.21	\$7.93
191	\$11.50	\$4.03	\$8.63	\$12.84	\$4.85	\$8.23	\$11.73	\$4.00	\$7.95
192	\$12.35	\$4.07	\$7.86	\$13.39	\$3.68	\$7.82	\$11.77	\$4.00	\$7.42
193	\$11.36	\$4.20	\$7.83	\$11.74	\$3.32	\$7.61	\$12.50	\$5.05	\$8.20
194	\$12.80	\$4.03	\$7.55	\$11.94	\$3.47	\$8.49	\$12.35	\$5.02	\$8.08
195	\$11.84	\$4.03	\$8.14	\$11.88	\$3.68	\$7.34	\$11.72	\$4.00	\$7.12
196	\$12.80	\$4.03	\$8.32	\$11.89	\$5.23	\$8.83	\$11.85	\$4.00	\$7.51
197	\$12.82	\$6.73	\$9.29	\$11.81	\$4.96	\$8.46	\$12.65	\$4.00	\$8.52
198	\$12.53	\$4.96	\$8.87	\$13.39	\$4.45	\$8.22	\$14.00	\$4.00	\$8.14
199	\$11.54	\$6.33	\$8.89	\$11.64	\$3.32	\$8.21	\$12.90	\$4.00	\$7.76
200	\$10.73	\$4.88	\$7.66	\$13.20	\$4.72	\$8.91	\$14.01	\$4.00	\$8.19
average	\$11.92	\$4.93	\$8.51	\$12.17	\$4.03	\$8.10	\$12.59	\$4.20	\$8.01
Max	\$13.18			\$13.80			\$14.40		
Avg			\$8.51			\$8.10			\$8.01
Min	\$3.89			\$3.24			\$4.00		
Range	9.28			10.56			10.40		

Nymex Detail-Annual Ranges

2012			2013			2014			
max	min	avg	max	min	avg	max	min	avg	max
\$13.10	\$5.55	\$9.93	\$13.65	\$4.00	\$7.47	\$11.79	\$5.88	\$9.35	\$14.42
\$13.15	\$4.00	\$8.02	\$13.09	\$4.00	\$7.58	\$13.50	\$4.00	\$10.19	\$13.55
\$11.37	\$4.00	\$7.93	\$13.65	\$4.00	\$8.72	\$13.42	\$4.13	\$9.87	\$14.03
\$14.19	\$4.00	\$8.01	\$13.37	\$4.00	\$9.75	\$13.90	\$4.00	\$10.23	\$13.54
\$13.03	\$4.00	\$8.94	\$13.27	\$5.20	\$9.49	\$14.87	\$4.00	\$8.62	\$14.70
\$13.19	\$4.00	\$8.52	\$13.65	\$4.00	\$7.58	\$13.25	\$4.00	\$8.54	\$13.49
\$13.19	\$5.00	\$10.66	\$11.57	\$4.00	\$7.31	\$14.28	\$4.00	\$7.55	\$14.12
\$14.02	\$4.00	\$8.63	\$14.59	\$4.00	\$8.27	\$13.42	\$4.00	\$9.32	\$14.42
\$12.97	\$4.00	\$8.63	\$12.97	\$4.00	\$7.95	\$13.50	\$4.00	\$8.20	\$13.49
\$12.97	\$4.00	\$7.85	\$11.57	\$4.00	\$7.45	\$14.20	\$4.00	\$8.51	\$14.42
\$13.19	\$4.00	\$9.32	\$12.74	\$4.00	\$7.49	\$13.42	\$4.00	\$7.94	\$12.56
\$13.09	\$4.00	\$7.39	\$11.63	\$4.00	\$5.85	\$14.65	\$4.53	\$8.50	\$10.98
\$12.97	\$4.00	\$8.10	\$12.97	\$4.01	\$7.96	\$13.42	\$5.28	\$9.49	\$13.31
\$12.97	\$4.00	\$7.42	\$14.02	\$4.00	\$8.52	\$13.37	\$4.00	\$8.13	\$14.31
\$13.15	\$4.00	\$8.88	\$13.09	\$4.00	\$7.80	\$13.42	\$4.00	\$8.36	\$15.03
\$13.27	\$4.00	\$7.30	\$13.65	\$4.00	\$8.61	\$13.50	\$4.00	\$9.39	\$13.20
\$13.27	\$4.00	\$7.30	\$12.97	\$4.00	\$7.32	\$13.37	\$4.00	\$9.00	\$13.49
\$14.60	\$4.00	\$8.73	\$14.37	\$4.00	\$8.42	\$13.90	\$4.00	\$8.87	\$13.25
\$13.19	\$4.19	\$7.92	\$13.03	\$4.00	\$8.54	\$12.35	\$4.00	\$7.78	\$14.51
\$12.97	\$4.00	\$7.19	\$13.27	\$4.00	\$9.84	\$14.87	\$4.00	\$9.06	\$10.32
\$13.65	\$5.26	\$7.66	\$13.09	\$4.00	\$6.02	\$13.90	\$6.42	\$9.67	\$13.11
\$14.02	\$4.00	\$8.11	\$14.07	\$4.00	\$5.84	\$13.50	\$4.00	\$7.11	\$15.03
\$14.60	\$4.00	\$7.63	\$11.71	\$4.00	\$7.76	\$13.32	\$4.00	\$8.63	\$13.55
\$10.57	\$4.00	\$8.01	\$14.12	\$4.00	\$9.33	\$11.70	\$4.86	\$7.98	\$13.63
\$12.34	\$4.00	\$6.98	\$9.61	\$4.00	\$7.27	\$13.42	\$4.00	\$8.29	\$13.71
\$13.65	\$4.00	\$6.33	\$12.61	\$5.17	\$8.60	\$12.15	\$4.00	\$7.52	\$13.55
\$12.52	\$4.00	\$8.01	\$12.97	\$4.00	\$7.09	\$13.37	\$4.00	\$8.00	\$15.03
\$14.24	\$4.00	\$8.49	\$14.02	\$4.00	\$9.24	\$14.65	\$4.00	\$8.97	\$14.03
\$12.44	\$6.30	\$8.81	\$14.59	\$4.00	\$9.81	\$13.68	\$4.00	\$7.53	\$11.27
\$13.10	\$4.00	\$9.61	\$13.65	\$4.00	\$8.56	\$11.04	\$4.00	\$7.25	\$12.71
\$13.27	\$4.00	\$7.59	\$14.59	\$4.00	\$8.37	\$13.50	\$4.00	\$8.60	\$11.99
\$13.10	\$4.00	\$9.35	\$10.34	\$4.00	\$8.19	\$13.50	\$4.00	\$6.82	\$14.34
\$13.90	\$4.00	\$8.51	\$13.14	\$4.00	\$7.31	\$14.65	\$4.00	\$8.92	\$10.88
\$13.19	\$4.00	\$8.76	\$14.02	\$5.75	\$8.94	\$13.50	\$4.00	\$7.03	\$14.18
\$13.10	\$4.00	\$7.82	\$14.59	\$4.00	\$6.92	\$11.89	\$5.65	\$8.55	\$15.03
\$13.10	\$4.00	\$8.30	\$14.59	\$4.00	\$8.76	\$13.37	\$4.00	\$7.88	\$13.31
\$14.02	\$4.00	\$9.28	\$11.65	\$4.00	\$7.41	\$13.25	\$4.01	\$10.17	\$11.33
\$11.63	\$4.00	\$7.01	\$13.65	\$4.00	\$8.83	\$14.87	\$4.00	\$8.18	\$13.55
\$13.27	\$4.00	\$8.29	\$14.59	\$4.00	\$8.07	\$12.79	\$4.00	\$7.27	\$13.44
\$13.27	\$4.00	\$7.96	\$13.09	\$6.73	\$9.68	\$13.32	\$4.00	\$7.92	\$14.79
\$13.27	\$4.00	\$8.37	\$14.37	\$4.24	\$8.94	\$14.87	\$4.00	\$9.65	\$13.44
\$13.10	\$4.00	\$8.85	\$12.01	\$4.00	\$7.69	\$12.46	\$4.00	\$7.32	\$10.98
\$10.74	\$4.00	\$8.17	\$13.03	\$4.00	\$8.41	\$14.87	\$6.43	\$10.17	\$15.03
\$14.02	\$5.50	\$9.13	\$11.33	\$4.00	\$7.86	\$12.22	\$4.00	\$7.89	\$13.31
\$14.60	\$4.11	\$9.12	\$14.09	\$4.00	\$8.30	\$14.87	\$4.00	\$8.91	\$13.60
\$14.02	\$4.00	\$8.25	\$12.15	\$4.00	\$6.74	\$13.42	\$4.00	\$7.37	\$13.63
\$13.19	\$4.00	\$8.36	\$13.09	\$4.00	\$8.64	\$13.39	\$4.00	\$8.33	\$13.63
\$13.73	\$4.00	\$8.46	\$13.19	\$4.00	\$8.39	\$14.28	\$4.00	\$8.52	\$13.15
\$12.97	\$4.00	\$9.41	\$11.72	\$4.00	\$6.91	\$11.69	\$4.00	\$7.91	\$14.11
\$11.78	\$4.00	\$8.03	\$11.84	\$4.00	\$8.26	\$14.37	\$5.37	\$9.35	\$14.42
\$13.65	\$4.00	\$8.12	\$13.09	\$4.00	\$8.47	\$14.26	\$4.00	\$6.90	\$13.81
\$11.51	\$4.00	\$6.82	\$13.38	\$4.00	\$8.60	\$12.28	\$4.00	\$7.90	\$14.03

Nymex Detail-Annual Ranges

\$13.33	\$4.00	\$7.96	\$12.16	\$4.20	\$7.76	\$12.94	\$4.80	\$8.17	\$14.42
\$14.60	\$4.00	\$7.79	\$13.09	\$4.00	\$9.21	\$12.43	\$4.00	\$7.45	\$13.63
\$13.19	\$4.00	\$8.84	\$12.54	\$4.00	\$8.02	\$13.37	\$4.00	\$7.59	\$12.79
\$13.27	\$4.00	\$8.13	\$13.03	\$4.00	\$8.62	\$14.87	\$4.00	\$8.09	\$14.03
\$14.38	\$4.00	\$8.12	\$13.27	\$4.00	\$7.81	\$13.99	\$4.00	\$9.43	\$15.03
\$9.97	\$4.00	\$6.93	\$14.59	\$4.16	\$8.98	\$14.28	\$5.81	\$9.50	\$14.09
\$11.65	\$4.00	\$7.78	\$14.59	\$4.00	\$7.47	\$12.75	\$4.00	\$8.13	\$13.44
\$13.10	\$4.00	\$5.84	\$13.00	\$4.00	\$7.78	\$12.99	\$4.00	\$8.66	\$13.55
\$13.65	\$4.87	\$9.80	\$13.14	\$4.00	\$7.91	\$13.25	\$4.00	\$7.48	\$14.79
\$13.65	\$5.32	\$8.16	\$14.59	\$4.00	\$8.71	\$13.32	\$4.00	\$8.51	\$14.03
\$12.97	\$4.00	\$8.24	\$10.23	\$4.00	\$6.12	\$14.28	\$4.00	\$8.63	\$13.44
\$12.38	\$4.25	\$7.92	\$13.27	\$4.00	\$8.19	\$14.87	\$4.00	\$8.74	\$13.31
\$13.65	\$4.00	\$7.72	\$13.83	\$5.57	\$10.23	\$13.31	\$4.00	\$8.23	\$13.37
\$13.03	\$4.00	\$8.25	\$12.42	\$4.17	\$8.67	\$14.28	\$4.00	\$6.95	\$15.03
\$13.99	\$4.00	\$8.75	\$13.14	\$4.00	\$7.63	\$13.50	\$4.00	\$8.77	\$14.03
\$11.25	\$4.00	\$7.67	\$13.03	\$4.00	\$7.32	\$12.90	\$5.06	\$8.33	\$13.91
\$13.10	\$4.00	\$8.53	\$12.18	\$4.00	\$6.36	\$14.87	\$4.00	\$7.67	\$14.79
\$13.27	\$4.89	\$8.30	\$14.59	\$4.00	\$8.07	\$13.19	\$4.00	\$7.72	\$13.49
\$13.74	\$4.00	\$8.27	\$12.62	\$4.00	\$7.73	\$14.87	\$4.00	\$9.13	\$13.44
\$13.15	\$4.00	\$7.19	\$13.07	\$4.00	\$7.96	\$14.52	\$4.00	\$7.59	\$13.49
\$14.02	\$4.00	\$8.51	\$13.31	\$4.00	\$7.69	\$13.32	\$4.00	\$8.96	\$14.03
\$13.29	\$4.00	\$7.66	\$12.90	\$4.51	\$9.03	\$13.19	\$4.00	\$8.59	\$13.15
\$12.97	\$4.00	\$7.43	\$14.02	\$4.00	\$8.02	\$13.50	\$4.00	\$8.51	\$9.93
\$13.27	\$4.00	\$8.51	\$13.65	\$4.00	\$7.17	\$11.59	\$4.00	\$7.85	\$13.31
\$12.97	\$4.00	\$7.91	\$13.40	\$4.00	\$8.45	\$13.39	\$4.00	\$9.89	\$14.23
\$14.27	\$4.00	\$8.24	\$13.94	\$4.00	\$8.95	\$13.32	\$4.00	\$7.42	\$11.60
\$13.62	\$4.00	\$7.97	\$14.37	\$4.00	\$8.24	\$13.42	\$4.00	\$8.18	\$12.89
\$11.07	\$4.00	\$7.26	\$13.65	\$4.00	\$9.12	\$13.32	\$4.00	\$6.83	\$11.92
\$13.15	\$4.30	\$9.30	\$11.65	\$4.00	\$7.17	\$14.52	\$4.00	\$8.93	\$10.32
\$13.27	\$4.00	\$8.76	\$12.97	\$4.00	\$8.29	\$14.87	\$4.43	\$9.50	\$15.03
\$13.10	\$4.00	\$8.75	\$13.03	\$4.00	\$7.52	\$14.87	\$5.01	\$8.75	\$13.46
\$13.65	\$4.00	\$7.67	\$12.83	\$4.00	\$7.63	\$13.72	\$4.00	\$8.19	\$13.19
\$12.69	\$4.00	\$7.26	\$13.44	\$4.00	\$8.34	\$12.55	\$5.05	\$8.42	\$11.82
\$13.81	\$4.00	\$9.07	\$13.27	\$4.00	\$10.18	\$13.35	\$4.00	\$9.06	\$14.42
\$13.65	\$4.00	\$8.56	\$12.84	\$4.00	\$6.74	\$10.98	\$4.00	\$7.00	\$14.08
\$10.99	\$4.00	\$6.77	\$13.27	\$4.00	\$8.54	\$14.37	\$4.00	\$9.78	\$14.42
\$12.04	\$4.00	\$7.23	\$13.65	\$4.00	\$6.97	\$13.65	\$4.44	\$9.03	\$13.55
\$14.02	\$4.00	\$9.02	\$13.09	\$4.00	\$8.38	\$13.32	\$4.00	\$7.27	\$13.49
\$13.15	\$4.00	\$8.30	\$13.65	\$4.00	\$8.41	\$13.42	\$4.00	\$8.21	\$11.67
\$14.60	\$4.00	\$9.33	\$13.27	\$4.00	\$8.31	\$14.28	\$4.00	\$9.59	\$11.90
\$12.13	\$4.00	\$8.53	\$13.53	\$4.00	\$8.18	\$13.50	\$4.30	\$8.96	\$12.20
\$10.18	\$4.68	\$7.92	\$14.59	\$4.00	\$8.45	\$9.56	\$4.00	\$6.54	\$13.71
\$13.37	\$4.00	\$8.34	\$14.08	\$4.00	\$8.93	\$13.37	\$4.00	\$7.73	\$12.71
\$13.15	\$4.00	\$8.80	\$12.80	\$4.00	\$8.86	\$13.49	\$4.00	\$9.43	\$14.42
\$11.75	\$4.00	\$9.10	\$11.68	\$4.15	\$8.39	\$13.42	\$4.00	\$8.15	\$13.31
\$13.47	\$4.67	\$10.61	\$13.05	\$4.00	\$8.55	\$13.19	\$4.00	\$7.88	\$14.40
\$10.26	\$4.00	\$6.59	\$14.37	\$4.00	\$6.94	\$13.38	\$4.00	\$7.74	\$14.42
\$14.03	\$4.00	\$8.03	\$12.43	\$4.00	\$8.37	\$14.28	\$4.00	\$8.33	\$14.27
\$14.38	\$5.60	\$8.21	\$11.43	\$4.00	\$6.97	\$12.91	\$4.00	\$8.62	\$13.55
\$13.65	\$4.00	\$7.93	\$14.59	\$4.00	\$8.36	\$13.97	\$4.73	\$8.18	\$13.34
\$12.71	\$4.00	\$6.85	\$12.78	\$4.00	\$8.17	\$14.28	\$4.00	\$7.08	\$13.55
\$12.40	\$4.00	\$7.08	\$12.21	\$4.00	\$7.17	\$13.87	\$4.00	\$8.89	\$12.82
\$14.60	\$4.00	\$9.13	\$14.02	\$4.00	\$8.59	\$14.02	\$4.00	\$6.82	\$14.79
\$14.55	\$4.00	\$7.56	\$13.03	\$4.00	\$7.50	\$13.27	\$4.00	\$8.23	\$9.60

Nymex Detail-Annual Ranges

\$14.30	\$4.53	\$7.86	\$13.65	\$4.00	\$7.97	\$12.03	\$4.00	\$7.97	\$13.63
\$13.03	\$4.00	\$7.29	\$14.59	\$4.00	\$8.83	\$14.87	\$4.00	\$8.71	\$13.55
\$13.35	\$4.00	\$7.74	\$12.03	\$4.00	\$8.40	\$11.54	\$4.00	\$7.89	\$13.44
\$13.43	\$4.00	\$9.14	\$11.93	\$4.00	\$8.68	\$12.55	\$4.00	\$7.51	\$13.01
\$12.18	\$4.00	\$9.17	\$13.45	\$4.00	\$7.88	\$13.90	\$4.00	\$7.40	\$13.34
\$13.78	\$4.00	\$7.86	\$11.51	\$4.00	\$7.51	\$12.83	\$4.00	\$7.23	\$13.63
\$11.96	\$4.00	\$8.05	\$13.87	\$4.00	\$9.55	\$14.87	\$4.00	\$8.69	\$12.68
\$11.90	\$4.00	\$7.00	\$14.59	\$4.00	\$10.87	\$14.65	\$4.00	\$9.76	\$13.21
\$11.61	\$4.00	\$7.31	\$13.09	\$4.00	\$6.24	\$13.94	\$4.00	\$7.60	\$14.03
\$12.97	\$4.00	\$7.83	\$13.09	\$4.00	\$7.81	\$12.11	\$4.00	\$8.18	\$13.55
\$13.27	\$4.00	\$9.14	\$14.06	\$4.00	\$9.44	\$13.32	\$4.00	\$8.90	\$13.49
\$13.15	\$4.00	\$7.62	\$11.71	\$4.00	\$8.37	\$13.50	\$4.00	\$8.64	\$15.03
\$13.36	\$4.00	\$8.10	\$13.68	\$4.00	\$8.48	\$13.50	\$4.00	\$7.93	\$15.03
\$13.19	\$4.00	\$8.11	\$14.59	\$4.00	\$7.37	\$14.28	\$4.00	\$7.43	\$13.10
\$13.15	\$4.00	\$9.36	\$14.02	\$4.00	\$8.53	\$10.73	\$4.00	\$6.97	\$14.79
\$13.47	\$5.16	\$10.17	\$9.28	\$4.00	\$5.74	\$13.50	\$5.66	\$9.87	\$15.03
\$13.11	\$4.06	\$8.98	\$13.14	\$4.00	\$7.42	\$13.38	\$4.34	\$9.91	\$11.67
\$12.85	\$4.00	\$8.22	\$14.59	\$4.00	\$8.17	\$13.32	\$4.00	\$8.52	\$12.09
\$13.85	\$5.06	\$8.83	\$12.76	\$4.00	\$7.25	\$14.48	\$4.00	\$9.85	\$15.03
\$10.58	\$4.00	\$6.76	\$13.43	\$4.00	\$8.73	\$13.25	\$4.00	\$8.54	\$13.38
\$13.19	\$4.00	\$8.00	\$12.97	\$4.00	\$6.92	\$12.02	\$4.00	\$7.11	\$13.16
\$13.27	\$4.00	\$8.66	\$13.03	\$4.85	\$9.36	\$13.75	\$4.00	\$8.74	\$13.44
\$10.76	\$5.11	\$8.05	\$13.27	\$4.00	\$7.78	\$13.90	\$4.00	\$9.82	\$13.31
\$13.65	\$4.00	\$8.22	\$14.02	\$4.00	\$8.26	\$13.24	\$4.00	\$9.11	\$13.44
\$12.29	\$4.00	\$7.06	\$13.19	\$4.00	\$9.59	\$11.58	\$4.43	\$8.09	\$13.48
\$12.93	\$4.00	\$6.55	\$14.37	\$4.00	\$8.66	\$14.28	\$4.00	\$8.86	\$11.39
\$12.24	\$4.00	\$6.98	\$13.19	\$4.00	\$8.90	\$12.76	\$4.00	\$8.44	\$13.36
\$12.97	\$4.00	\$8.17	\$14.37	\$4.00	\$8.94	\$14.28	\$4.00	\$8.42	\$14.19
\$12.83	\$4.00	\$7.56	\$14.59	\$4.00	\$8.53	\$14.65	\$4.00	\$9.03	\$14.03
\$13.65	\$4.00	\$9.03	\$13.03	\$4.00	\$8.23	\$13.42	\$4.00	\$7.66	\$11.66
\$13.65	\$4.00	\$7.65	\$13.27	\$4.00	\$7.12	\$12.47	\$4.00	\$6.23	\$14.21
\$12.62	\$4.00	\$7.74	\$11.93	\$4.00	\$7.26	\$13.90	\$4.00	\$8.25	\$12.36
\$14.34	\$4.65	\$9.34	\$14.02	\$5.67	\$9.55	\$14.21	\$4.00	\$7.95	\$10.18
\$13.65	\$4.09	\$8.85	\$14.02	\$4.00	\$8.22	\$13.90	\$4.00	\$8.44	\$14.34
\$14.02	\$4.00	\$8.75	\$13.09	\$4.00	\$8.40	\$13.56	\$4.52	\$9.29	\$15.03
\$13.03	\$4.00	\$8.38	\$14.02	\$4.00	\$9.19	\$13.42	\$4.00	\$7.58	\$15.03
\$14.08	\$4.00	\$7.44	\$14.59	\$4.00	\$8.05	\$14.03	\$4.00	\$7.68	\$10.44
\$13.15	\$4.00	\$8.44	\$12.74	\$4.00	\$7.14	\$14.87	\$4.00	\$9.55	\$13.70
\$14.38	\$4.00	\$7.84	\$14.37	\$4.00	\$8.44	\$12.96	\$4.00	\$7.64	\$11.48
\$11.94	\$4.00	\$8.55	\$13.74	\$4.08	\$9.47	\$13.32	\$4.00	\$7.26	\$11.54
\$14.02	\$4.00	\$8.47	\$13.27	\$4.00	\$8.42	\$13.12	\$4.48	\$8.91	\$11.25
\$13.05	\$4.00	\$8.74	\$13.14	\$4.00	\$8.87	\$12.52	\$4.00	\$9.27	\$15.03
\$13.65	\$4.00	\$7.52	\$12.75	\$4.00	\$7.26	\$12.90	\$4.00	\$8.71	\$13.44
\$13.19	\$4.00	\$7.61	\$13.44	\$4.00	\$8.99	\$14.46	\$4.00	\$9.42	\$13.93
\$12.72	\$4.00	\$7.70	\$13.14	\$4.00	\$8.04	\$12.37	\$4.00	\$7.83	\$15.03
\$13.27	\$4.00	\$9.43	\$11.96	\$4.00	\$7.82	\$13.50	\$5.96	\$8.84	\$13.37
\$14.02	\$4.00	\$8.65	\$13.74	\$4.00	\$7.82	\$14.28	\$4.00	\$8.93	\$15.03
\$14.60	\$4.00	\$7.99	\$12.70	\$4.00	\$8.47	\$13.32	\$4.00	\$7.11	\$13.31
\$13.65	\$4.47	\$8.36	\$11.03	\$4.00	\$7.87	\$14.87	\$4.00	\$8.09	\$13.63
\$12.88	\$4.00	\$7.13	\$14.15	\$4.78	\$9.80	\$14.28	\$4.00	\$10.06	\$15.03
\$9.80	\$4.00	\$6.71	\$11.05	\$4.00	\$7.39	\$13.62	\$4.00	\$9.47	\$13.22
\$13.29	\$4.00	\$8.29	\$14.59	\$4.00	\$8.30	\$14.28	\$4.00	\$8.46	\$13.84
\$9.62	\$4.00	\$6.86	\$13.19	\$5.40	\$8.11	\$13.42	\$4.00	\$8.52	\$13.40
\$13.27	\$4.08	\$8.31	\$12.71	\$4.00	\$7.43	\$11.55	\$4.00	\$6.89	\$11.11

Nymex Detail-Annual Ranges

\$13.05	\$4.00	\$7.61	\$14.02	\$4.00	\$9.18	\$12.30	\$4.00	\$7.16	\$13.55
\$10.66	\$4.00	\$6.91	\$13.09	\$4.00	\$8.68	\$9.51	\$4.00	\$6.52	\$13.71
\$13.23	\$4.00	\$7.86	\$13.78	\$4.00	\$8.77	\$13.90	\$4.00	\$7.87	\$13.56
\$14.49	\$4.00	\$7.76	\$13.27	\$4.00	\$8.79	\$13.50	\$4.00	\$8.72	\$12.55
\$13.65	\$4.00	\$7.23	\$14.59	\$5.34	\$9.37	\$12.40	\$4.00	\$7.15	\$13.55
\$13.28	\$4.00	\$7.52	\$13.48	\$4.00	\$8.53	\$13.90	\$4.00	\$7.18	\$13.43
\$13.42	\$4.00	\$8.16	\$14.59	\$4.00	\$7.51	\$14.87	\$4.00	\$6.86	\$15.03
\$12.44	\$4.00	\$7.47	\$13.27	\$4.00	\$7.33	\$14.28	\$4.34	\$8.97	\$13.82
\$10.71	\$4.00	\$5.79	\$13.49	\$4.00	\$8.22	\$12.06	\$5.88	\$8.99	\$13.24
\$13.19	\$4.00	\$6.95	\$13.96	\$4.00	\$8.26	\$13.50	\$4.00	\$7.16	\$14.18
\$12.33	\$4.00	\$7.92	\$13.14	\$4.00	\$8.23	\$14.65	\$4.00	\$7.97	\$13.44
\$14.60	\$4.00	\$9.63	\$12.63	\$4.00	\$8.66	\$13.37	\$4.00	\$6.20	\$13.44
\$13.67	\$4.00	\$8.01	\$13.27	\$4.00	\$8.73	\$13.32	\$4.00	\$8.70	\$11.42
\$14.02	\$4.00	\$8.68	\$13.19	\$4.00	\$8.09	\$14.28	\$4.00	\$7.31	\$13.22
\$13.19	\$6.19	\$9.45	\$13.19	\$4.00	\$7.41	\$13.19	\$4.00	\$8.19	\$13.44
\$12.97	\$4.00	\$8.82	\$13.14	\$4.00	\$7.81	\$13.42	\$5.19	\$8.63	\$13.93
\$13.10	\$4.50	\$7.74	\$14.59	\$4.00	\$9.14	\$12.42	\$4.40	\$8.31	\$11.42
\$9.02	\$4.00	\$6.38	\$11.03	\$4.00	\$7.79	\$13.38	\$4.00	\$9.47	\$13.02
\$11.26	\$4.00	\$7.55	\$13.09	\$4.00	\$9.39	\$14.28	\$4.98	\$8.66	\$13.49
\$14.02	\$4.00	\$8.37	\$13.19	\$4.00	\$8.91	\$13.25	\$4.00	\$7.73	\$14.79
\$13.15	\$4.00	\$7.11	\$14.02	\$4.00	\$7.96	\$11.81	\$4.00	\$6.87	\$14.79
\$14.45	\$4.00	\$9.16	\$9.71	\$4.00	\$5.82	\$12.31	\$4.00	\$6.97	\$15.03
\$13.64	\$4.31	\$8.57	\$13.70	\$5.58	\$9.22	\$14.87	\$4.00	\$10.81	\$12.29
\$14.38	\$4.00	\$7.78	\$13.14	\$4.00	\$8.46	\$13.42	\$4.00	\$6.79	\$13.55
\$13.10	\$5.17	\$9.07	\$13.35	\$4.00	\$9.02	\$14.65	\$4.00	\$7.60	\$15.03
\$13.28	\$4.00	\$8.08	\$13.27	\$4.00	\$8.64	\$14.87	\$4.00	\$7.50	\$13.37
\$14.02	\$4.00	\$6.48	\$11.95	\$4.00	\$7.20	\$11.57	\$4.00	\$6.98	\$13.91
\$10.49	\$4.00	\$7.56	\$14.02	\$4.00	\$8.98	\$12.72	\$4.00	\$7.21	\$15.03
\$13.10	\$4.88	\$8.50	\$12.37	\$4.00	\$8.47	\$13.27	\$4.00	\$8.34	\$13.38
\$14.02	\$4.00	\$8.04	\$13.65	\$4.22	\$7.81	\$13.42	\$4.00	\$8.17	\$13.55
\$13.99	\$4.00	\$8.84	\$12.86	\$4.00	\$7.67	\$14.28	\$4.00	\$8.54	\$15.03
\$13.65	\$4.00	\$7.85	\$13.14	\$4.00	\$7.97	\$14.24	\$4.00	\$7.75	\$9.11
\$9.64	\$4.00	\$6.88	\$12.01	\$4.00	\$6.42	\$14.87	\$4.00	\$8.10	\$13.58
\$14.02	\$4.08	\$7.63	\$14.02	\$4.00	\$7.11	\$13.10	\$4.00	\$7.79	\$12.74
\$12.26	\$4.00	\$8.10	\$13.23	\$4.00	\$7.80	\$11.63	\$4.00	\$6.89	\$10.97
\$14.60	\$4.00	\$6.65	\$11.17	\$4.00	\$6.90	\$14.28	\$4.00	\$9.11	\$15.03
\$12.32	\$4.00	\$8.36	\$12.14	\$4.00	\$7.01	\$12.66	\$4.00	\$7.54	\$14.47
\$14.60	\$4.81	\$9.71	\$13.09	\$4.00	\$7.90	\$13.88	\$4.00	\$8.06	\$15.03
\$10.58	\$4.00	\$6.54	\$13.96	\$4.00	\$8.52	\$14.87	\$4.00	\$8.71	\$11.97
\$13.53	\$4.00	\$8.24	\$13.03	\$4.00	\$8.07	\$13.76	\$5.58	\$7.75	\$11.34

\$13.05	\$4.13	\$8.11	\$13.18	\$4.09	\$8.15	\$13.46	\$4.16	\$8.28	\$13.43
\$14.60			\$14.59			\$14.87			\$15.03
		\$8.11			\$8.15			\$8.28	
\$4.00			\$4.00			\$4.00			\$4.00
10.60			10.59			10.87			11.03

Nymex Detail-Annual Ranges

2015		2016			2017			2018	
min	avg	max	min	avg	max	min	avg	max	min
\$4.00	\$9.01	\$14.46	\$4.00	\$9.66	\$14.26	\$4.00	\$7.62	\$14.08	\$4.00
\$4.00	\$7.48	\$14.81	\$4.00	\$9.22	\$11.00	\$4.00	\$7.92	\$13.51	\$4.00
\$4.00	\$7.98	\$13.70	\$4.00	\$7.47	\$11.83	\$4.00	\$7.50	\$14.81	\$4.93
\$4.00	\$9.71	\$13.98	\$4.00	\$8.52	\$13.68	\$4.00	\$8.18	\$15.24	\$4.00
\$4.00	\$8.79	\$14.81	\$4.00	\$8.12	\$11.21	\$4.00	\$7.83	\$15.00	\$5.19
\$4.00	\$9.79	\$11.73	\$4.00	\$7.57	\$11.31	\$4.00	\$6.95	\$14.44	\$4.00
\$4.45	\$8.60	\$14.81	\$4.00	\$9.01	\$12.07	\$4.85	\$8.01	\$14.60	\$4.00
\$4.00	\$8.98	\$13.66	\$4.00	\$8.95	\$14.67	\$4.22	\$10.35	\$11.56	\$4.00
\$4.00	\$8.48	\$13.83	\$4.00	\$7.73	\$13.06	\$4.00	\$7.97	\$15.00	\$4.07
\$4.00	\$9.31	\$12.92	\$4.00	\$9.76	\$15.65	\$4.00	\$7.93	\$14.38	\$5.83
\$4.00	\$7.85	\$15.09	\$4.00	\$8.54	\$11.86	\$4.00	\$7.00	\$14.44	\$6.22
\$4.00	\$6.95	\$13.83	\$4.00	\$8.72	\$12.61	\$4.07	\$6.93	\$14.38	\$4.00
\$4.00	\$7.81	\$13.11	\$4.00	\$8.65	\$15.79	\$4.25	\$9.65	\$10.79	\$4.00
\$4.00	\$8.15	\$13.19	\$4.00	\$8.79	\$14.26	\$5.18	\$10.45	\$14.66	\$4.00
\$4.00	\$9.37	\$11.78	\$4.00	\$7.15	\$15.18	\$4.00	\$8.09	\$12.21	\$4.00
\$4.00	\$9.52	\$13.10	\$4.00	\$8.06	\$11.33	\$4.00	\$6.21	\$12.61	\$4.00
\$4.00	\$8.59	\$12.68	\$4.00	\$7.78	\$14.67	\$4.00	\$9.28	\$14.38	\$4.00
\$4.00	\$8.52	\$11.11	\$4.00	\$7.30	\$16.05	\$4.00	\$9.24	\$14.30	\$4.00
\$4.00	\$8.76	\$13.78	\$4.00	\$9.04	\$15.00	\$4.94	\$8.85	\$13.24	\$4.00
\$4.00	\$7.79	\$14.56	\$4.00	\$7.65	\$11.57	\$4.00	\$7.54	\$12.93	\$4.16
\$4.00	\$7.90	\$13.96	\$5.13	\$8.82	\$14.32	\$4.00	\$8.08	\$12.88	\$4.00
\$4.00	\$7.20	\$13.69	\$4.00	\$8.07	\$14.48	\$4.52	\$8.80	\$13.71	\$4.00
\$4.00	\$8.49	\$13.78	\$4.00	\$7.97	\$14.11	\$5.07	\$9.40	\$15.17	\$4.00
\$4.00	\$9.55	\$13.83	\$4.83	\$9.03	\$15.00	\$4.00	\$9.30	\$12.87	\$4.56
\$4.00	\$8.26	\$13.70	\$4.61	\$8.43	\$14.26	\$4.00	\$9.23	\$14.53	\$4.00
\$4.00	\$9.65	\$12.30	\$4.00	\$7.69	\$10.54	\$4.00	\$7.26	\$13.74	\$5.03
\$4.00	\$7.71	\$13.89	\$4.00	\$8.13	\$14.48	\$4.00	\$7.93	\$15.00	\$4.00
\$4.00	\$7.86	\$14.58	\$4.00	\$8.63	\$12.23	\$4.00	\$7.05	\$14.94	\$4.00
\$4.00	\$6.98	\$15.20	\$4.00	\$9.19	\$12.92	\$4.78	\$9.05	\$14.23	\$4.00
\$4.00	\$7.84	\$15.44	\$4.00	\$9.35	\$15.00	\$4.98	\$8.39	\$13.00	\$5.95
\$4.00	\$8.05	\$13.89	\$4.00	\$8.86	\$13.40	\$4.00	\$7.46	\$14.38	\$4.00
\$5.34	\$9.00	\$10.53	\$4.00	\$7.29	\$13.86	\$4.00	\$8.77	\$14.50	\$4.62
\$4.00	\$7.18	\$13.83	\$4.00	\$8.44	\$14.26	\$4.00	\$9.48	\$14.32	\$4.00
\$4.00	\$8.74	\$15.44	\$4.00	\$9.00	\$16.05	\$4.36	\$9.32	\$14.46	\$4.00
\$4.00	\$8.45	\$12.95	\$4.00	\$6.45	\$10.42	\$4.00	\$7.59	\$16.20	\$4.00
\$4.00	\$6.94	\$11.09	\$4.00	\$7.67	\$14.19	\$4.00	\$7.82	\$14.60	\$4.00
\$4.00	\$7.94	\$14.40	\$4.00	\$8.93	\$12.90	\$4.00	\$8.45	\$13.78	\$4.00
\$4.00	\$8.78	\$14.40	\$4.00	\$8.06	\$13.94	\$4.00	\$8.93	\$14.92	\$4.00
\$4.00	\$7.75	\$15.44	\$4.00	\$9.87	\$14.48	\$4.00	\$8.09	\$14.21	\$4.00
\$4.00	\$7.75	\$14.81	\$4.29	\$9.30	\$14.48	\$4.00	\$8.34	\$14.93	\$4.00
\$4.00	\$8.50	\$14.12	\$4.00	\$8.78	\$12.34	\$4.00	\$8.20	\$11.06	\$4.26
\$4.00	\$7.03	\$15.44	\$4.00	\$8.54	\$16.05	\$4.00	\$9.50	\$13.99	\$4.00
\$4.00	\$9.70	\$14.15	\$4.00	\$8.91	\$10.93	\$4.00	\$6.96	\$15.38	\$4.00
\$4.00	\$8.05	\$10.79	\$4.00	\$6.84	\$14.26	\$4.00	\$6.32	\$14.60	\$4.04
\$4.32	\$8.89	\$13.98	\$4.00	\$7.66	\$13.72	\$4.00	\$9.41	\$14.38	\$4.00
\$4.00	\$7.42	\$15.44	\$4.00	\$9.76	\$14.26	\$4.00	\$7.86	\$16.20	\$4.00
\$4.00	\$8.45	\$13.89	\$4.10	\$7.74	\$14.26	\$4.00	\$7.79	\$13.73	\$4.00
\$4.00	\$8.33	\$12.19	\$4.00	\$8.54	\$15.00	\$4.00	\$7.59	\$14.44	\$7.32
\$4.00	\$9.16	\$11.16	\$4.00	\$7.13	\$12.81	\$5.95	\$8.92	\$14.38	\$4.00
\$4.00	\$8.84	\$14.01	\$4.00	\$8.73	\$14.31	\$4.60	\$9.33	\$14.58	\$4.00
\$4.01	\$8.61	\$11.25	\$4.00	\$7.67	\$15.63	\$4.04	\$9.35	\$12.42	\$4.00
\$4.00	\$8.72	\$13.78	\$4.00	\$8.42	\$16.05	\$5.58	\$10.90	\$10.99	\$4.00

Nymex Detail-Annual Ranges

\$4.43	\$9.59	\$13.98	\$4.00	\$7.78	\$14.57	\$4.00	\$8.88	\$14.44	\$5.28
\$4.00	\$9.21	\$15.44	\$4.00	\$7.80	\$14.32	\$4.00	\$7.73	\$14.38	\$4.00
\$4.00	\$8.23	\$13.98	\$4.00	\$7.48	\$14.49	\$4.00	\$7.60	\$13.67	\$4.00
\$4.00	\$8.73	\$13.79	\$4.00	\$9.04	\$16.05	\$4.00	\$7.63	\$10.23	\$4.00
\$4.00	\$8.16	\$11.82	\$4.00	\$7.93	\$13.73	\$4.00	\$6.84	\$15.00	\$4.00
\$4.00	\$8.60	\$13.78	\$4.91	\$8.59	\$11.86	\$4.00	\$7.57	\$13.66	\$4.00
\$4.00	\$7.76	\$14.40	\$4.00	\$8.17	\$15.79	\$4.00	\$7.72	\$14.00	\$4.00
\$4.00	\$7.50	\$15.44	\$4.00	\$7.17	\$12.31	\$4.00	\$8.26	\$14.38	\$4.00
\$4.00	\$8.98	\$13.38	\$4.00	\$7.71	\$14.38	\$4.00	\$8.72	\$13.40	\$4.00
\$4.75	\$8.79	\$13.78	\$4.00	\$10.11	\$14.19	\$4.00	\$8.33	\$11.72	\$4.00
\$4.00	\$7.79	\$13.85	\$4.54	\$9.19	\$13.61	\$4.00	\$7.92	\$13.08	\$4.00
\$4.00	\$8.75	\$14.81	\$4.00	\$8.82	\$15.02	\$4.00	\$8.82	\$14.60	\$4.00
\$4.00	\$7.06	\$13.98	\$4.00	\$8.74	\$14.88	\$4.00	\$7.71	\$13.51	\$5.80
\$5.14	\$9.37	\$14.40	\$4.00	\$9.70	\$11.67	\$4.00	\$8.10	\$15.93	\$4.00
\$4.00	\$9.11	\$13.76	\$4.74	\$8.32	\$16.01	\$4.00	\$10.21	\$12.69	\$4.00
\$5.35	\$8.07	\$13.78	\$4.00	\$9.39	\$12.91	\$4.00	\$8.39	\$12.69	\$4.00
\$4.00	\$8.51	\$13.78	\$4.00	\$7.89	\$14.77	\$4.16	\$8.97	\$14.68	\$5.49
\$4.00	\$8.07	\$15.20	\$4.00	\$8.32	\$13.52	\$4.00	\$8.74	\$14.29	\$4.00
\$4.00	\$8.92	\$13.78	\$4.00	\$9.82	\$14.11	\$4.52	\$8.89	\$14.44	\$4.94
\$4.00	\$8.45	\$12.98	\$4.00	\$7.84	\$14.32	\$4.00	\$8.70	\$15.00	\$4.00
\$4.00	\$8.20	\$13.83	\$4.00	\$8.57	\$13.32	\$4.00	\$10.18	\$12.55	\$4.00
\$4.00	\$7.66	\$11.07	\$4.00	\$8.64	\$14.19	\$4.00	\$7.58	\$13.83	\$4.00
\$4.00	\$6.82	\$13.78	\$4.00	\$7.95	\$12.12	\$4.00	\$8.26	\$16.20	\$4.00
\$4.00	\$7.98	\$12.43	\$4.00	\$8.72	\$13.51	\$4.00	\$7.87	\$12.94	\$4.37
\$4.00	\$8.04	\$15.44	\$4.00	\$9.43	\$15.00	\$4.00	\$8.55	\$13.49	\$4.00
\$4.00	\$8.63	\$13.98	\$4.00	\$8.15	\$14.26	\$4.00	\$9.30	\$14.44	\$4.00
\$4.00	\$7.73	\$12.97	\$4.00	\$8.14	\$16.05	\$4.00	\$9.69	\$13.67	\$4.11
\$4.00	\$7.43	\$14.81	\$5.79	\$8.99	\$13.02	\$4.00	\$7.67	\$13.66	\$4.51
\$4.00	\$6.59	\$13.78	\$4.00	\$9.37	\$9.97	\$5.57	\$7.91	\$13.79	\$4.00
\$4.00	\$8.86	\$13.64	\$4.00	\$8.16	\$10.13	\$4.00	\$6.71	\$14.38	\$4.00
\$4.97	\$8.15	\$14.36	\$4.00	\$8.52	\$13.71	\$4.00	\$8.24	\$14.38	\$4.00
\$4.00	\$8.29	\$14.12	\$4.00	\$8.28	\$13.44	\$4.00	\$8.41	\$14.50	\$4.00
\$4.25	\$8.35	\$14.95	\$4.00	\$9.86	\$15.85	\$4.00	\$7.92	\$12.05	\$4.00
\$4.00	\$7.84	\$14.81	\$4.00	\$7.86	\$14.48	\$4.00	\$8.75	\$16.20	\$7.96
\$4.00	\$7.67	\$13.20	\$4.00	\$7.45	\$12.75	\$4.00	\$7.55	\$15.00	\$4.00
\$4.00	\$8.15	\$14.40	\$4.00	\$8.98	\$14.35	\$4.96	\$10.23	\$14.60	\$4.00
\$4.00	\$8.54	\$14.40	\$5.10	\$9.69	\$15.62	\$4.16	\$10.58	\$14.44	\$4.00
\$4.00	\$9.27	\$13.88	\$4.00	\$7.90	\$13.40	\$4.00	\$8.23	\$14.23	\$4.00
\$5.10	\$7.89	\$15.44	\$4.00	\$8.28	\$14.26	\$4.00	\$8.85	\$14.62	\$4.00
\$5.61	\$8.01	\$13.75	\$4.00	\$8.69	\$14.34	\$4.00	\$9.22	\$16.20	\$4.00
\$4.00	\$7.48	\$13.78	\$4.00	\$8.37	\$15.47	\$4.07	\$10.62	\$15.00	\$4.00
\$4.00	\$7.95	\$13.78	\$4.00	\$9.58	\$15.00	\$4.00	\$7.96	\$14.29	\$4.00
\$4.00	\$8.93	\$13.80	\$6.02	\$10.00	\$14.32	\$4.00	\$7.11	\$13.56	\$4.00
\$4.00	\$9.07	\$11.64	\$4.00	\$7.29	\$15.42	\$4.00	\$8.76	\$15.00	\$4.00
\$4.00	\$7.18	\$12.76	\$4.00	\$8.37	\$12.37	\$4.00	\$8.06	\$14.79	\$5.28
\$4.00	\$7.74	\$14.50	\$4.13	\$8.78	\$14.04	\$4.00	\$8.07	\$12.89	\$4.00
\$4.19	\$9.24	\$10.63	\$4.00	\$6.82	\$15.49	\$4.00	\$9.76	\$15.81	\$6.03
\$4.00	\$7.49	\$11.52	\$4.00	\$7.23	\$14.41	\$4.00	\$9.37	\$15.72	\$4.00
\$4.00	\$8.65	\$13.64	\$4.00	\$7.45	\$14.38	\$4.00	\$9.47	\$14.11	\$4.00
\$4.00	\$9.20	\$13.32	\$4.00	\$8.28	\$16.05	\$4.00	\$8.68	\$15.93	\$4.00
\$4.00	\$8.73	\$12.31	\$4.00	\$7.41	\$14.13	\$4.00	\$7.96	\$12.86	\$5.38
\$4.00	\$7.35	\$12.39	\$4.00	\$8.01	\$14.48	\$4.00	\$8.81	\$13.82	\$4.00
\$4.00	\$9.16	\$13.83	\$5.93	\$10.01	\$14.38	\$4.00	\$7.90	\$14.36	\$4.00
\$4.00	\$6.14	\$15.44	\$4.00	\$7.85	\$14.32	\$4.00	\$9.44	\$13.64	\$4.17

Nymex Detail-Annual Ranges

\$4.00	\$8.71	\$13.65	\$4.00	\$8.74	\$15.74	\$4.84	\$9.68	\$12.70	\$4.00
\$4.00	\$6.96	\$11.30	\$4.00	\$6.76	\$13.27	\$4.00	\$8.60	\$14.74	\$4.00
\$4.00	\$9.51	\$12.39	\$4.00	\$7.54	\$16.05	\$4.51	\$9.84	\$15.93	\$4.00
\$4.00	\$7.03	\$13.29	\$4.00	\$8.38	\$14.93	\$4.00	\$8.28	\$14.58	\$4.00
\$4.00	\$8.97	\$13.03	\$4.00	\$8.36	\$14.15	\$4.00	\$9.90	\$14.44	\$4.00
\$4.00	\$7.74	\$12.74	\$4.00	\$9.36	\$15.00	\$4.00	\$8.14	\$15.78	\$4.00
\$4.00	\$7.54	\$12.75	\$4.00	\$8.89	\$14.83	\$4.00	\$8.60	\$14.44	\$4.00
\$4.00	\$7.69	\$15.44	\$4.00	\$9.21	\$13.44	\$4.00	\$8.94	\$16.20	\$4.00
\$4.00	\$9.18	\$13.28	\$4.62	\$8.48	\$15.49	\$4.11	\$9.86	\$15.01	\$4.00
\$4.00	\$9.98	\$13.98	\$4.00	\$7.14	\$14.18	\$4.00	\$8.88	\$13.94	\$4.00
\$4.00	\$8.75	\$14.14	\$4.00	\$9.27	\$13.41	\$4.23	\$9.52	\$14.50	\$4.00
\$4.00	\$8.28	\$13.89	\$4.00	\$9.45	\$14.16	\$4.00	\$9.73	\$16.20	\$4.00
\$4.00	\$8.10	\$15.44	\$4.00	\$8.85	\$13.26	\$4.00	\$8.07	\$13.47	\$4.00
\$4.00	\$7.67	\$13.98	\$4.00	\$8.58	\$14.93	\$4.00	\$10.19	\$14.10	\$4.00
\$6.19	\$11.37	\$15.44	\$4.00	\$8.71	\$14.32	\$5.54	\$10.69	\$11.77	\$4.00
\$4.00	\$8.40	\$13.55	\$4.00	\$8.00	\$15.12	\$4.00	\$9.45	\$14.60	\$4.00
\$4.00	\$6.62	\$12.03	\$4.00	\$8.51	\$14.48	\$4.00	\$8.06	\$14.66	\$4.73
\$4.00	\$6.53	\$13.70	\$4.00	\$9.26	\$14.17	\$4.00	\$8.32	\$13.21	\$4.00
\$4.00	\$8.74	\$13.89	\$4.00	\$8.20	\$14.57	\$4.62	\$9.57	\$11.56	\$4.60
\$4.00	\$6.83	\$15.03	\$4.00	\$7.95	\$14.93	\$4.00	\$8.71	\$14.30	\$4.00
\$4.00	\$7.38	\$13.70	\$4.00	\$7.85	\$13.11	\$4.00	\$7.56	\$14.38	\$5.40
\$4.00	\$6.57	\$14.40	\$4.00	\$9.16	\$11.49	\$5.84	\$8.23	\$13.98	\$4.00
\$4.00	\$6.97	\$11.65	\$4.00	\$7.84	\$16.05	\$4.00	\$9.36	\$14.50	\$4.00
\$4.00	\$8.74	\$14.39	\$4.00	\$9.42	\$14.93	\$4.00	\$7.60	\$14.23	\$4.00
\$4.00	\$8.06	\$12.72	\$4.00	\$6.75	\$12.19	\$4.00	\$7.81	\$14.60	\$4.00
\$4.00	\$7.07	\$13.83	\$5.44	\$8.58	\$12.59	\$4.00	\$8.78	\$12.41	\$4.00
\$4.00	\$7.08	\$11.79	\$4.48	\$8.26	\$12.01	\$4.00	\$6.93	\$12.98	\$4.00
\$4.00	\$8.97	\$13.64	\$4.00	\$9.35	\$12.64	\$4.00	\$7.11	\$12.16	\$4.00
\$4.00	\$8.24	\$13.38	\$4.00	\$7.90	\$11.60	\$4.00	\$7.61	\$14.38	\$4.00
\$4.00	\$6.87	\$13.78	\$4.00	\$7.36	\$14.48	\$4.00	\$8.30	\$12.69	\$4.00
\$4.00	\$8.62	\$13.78	\$5.39	\$9.23	\$15.67	\$4.00	\$8.52	\$15.00	\$4.00
\$4.00	\$7.31	\$14.40	\$4.00	\$8.76	\$15.00	\$4.00	\$8.78	\$15.00	\$4.00
\$4.00	\$6.04	\$14.81	\$4.00	\$9.12	\$16.05	\$4.00	\$9.06	\$13.22	\$4.00
\$4.00	\$8.87	\$13.89	\$5.01	\$9.22	\$14.26	\$4.00	\$7.91	\$15.00	\$4.00
\$4.00	\$8.66	\$13.23	\$4.00	\$8.40	\$13.61	\$4.00	\$6.58	\$12.74	\$4.00
\$4.00	\$8.64	\$10.12	\$4.00	\$6.18	\$13.67	\$4.56	\$8.29	\$15.21	\$4.77
\$4.00	\$5.85	\$13.20	\$4.00	\$8.11	\$10.71	\$4.00	\$6.88	\$15.00	\$4.00
\$4.00	\$8.89	\$13.26	\$4.00	\$6.47	\$12.24	\$4.00	\$7.52	\$12.42	\$4.30
\$4.00	\$8.73	\$12.48	\$4.00	\$6.35	\$14.26	\$4.00	\$8.09	\$14.62	\$4.00
\$4.00	\$6.45	\$13.78	\$4.00	\$8.76	\$14.35	\$4.00	\$7.28	\$14.40	\$4.71
\$4.71	\$7.25	\$14.46	\$4.00	\$9.93	\$16.05	\$4.00	\$7.43	\$12.37	\$4.00
\$4.00	\$8.07	\$13.40	\$4.00	\$9.10	\$14.23	\$4.39	\$8.34	\$15.62	\$4.00
\$4.00	\$8.58	\$14.04	\$4.00	\$9.19	\$14.26	\$4.00	\$8.42	\$14.38	\$4.00
\$4.00	\$8.59	\$13.83	\$4.00	\$8.31	\$13.94	\$4.34	\$9.21	\$14.06	\$4.00
\$4.00	\$8.45	\$12.34	\$4.77	\$7.41	\$14.19	\$4.00	\$8.53	\$13.17	\$4.89
\$4.00	\$7.42	\$14.81	\$4.00	\$10.00	\$12.10	\$4.00	\$7.25	\$13.19	\$4.00
\$4.00	\$8.70	\$15.30	\$4.00	\$10.10	\$14.48	\$4.00	\$8.37	\$14.26	\$4.00
\$4.00	\$8.56	\$13.45	\$6.54	\$8.57	\$13.27	\$4.00	\$8.26	\$14.60	\$4.00
\$4.00	\$8.80	\$13.70	\$4.00	\$8.53	\$13.85	\$4.00	\$7.78	\$15.00	\$4.00
\$4.00	\$7.83	\$13.78	\$4.72	\$9.80	\$13.89	\$5.46	\$9.86	\$16.20	\$4.00
\$4.00	\$6.89	\$13.23	\$4.00	\$6.82	\$14.16	\$4.00	\$8.48	\$14.03	\$4.00
\$4.00	\$7.70	\$15.44	\$4.00	\$7.58	\$14.19	\$4.00	\$8.11	\$14.50	\$5.62
\$4.00	\$9.77	\$14.81	\$4.00	\$8.64	\$15.15	\$5.47	\$9.81	\$13.92	\$4.00
\$4.00	\$5.91	\$13.89	\$4.00	\$8.25	\$15.00	\$4.00	\$8.60	\$14.08	\$4.00

Nymex Detail-Annual Ranges

\$4.00	\$9.52	\$15.44	\$4.00	\$9.07	\$12.84	\$4.00	\$7.92	\$14.38	\$4.84
\$4.00	\$7.50	\$13.95	\$5.78	\$10.56	\$12.01	\$4.00	\$6.97	\$11.65	\$5.33
\$4.00	\$8.21	\$13.78	\$4.00	\$8.49	\$14.11	\$4.00	\$9.79	\$15.53	\$4.00
\$4.00	\$8.58	\$10.96	\$4.00	\$6.58	\$11.35	\$4.00	\$6.73	\$15.44	\$4.00
\$4.00	\$8.93	\$15.11	\$4.00	\$7.68	\$14.04	\$4.00	\$7.62	\$16.20	\$4.00
\$4.00	\$8.67	\$13.83	\$4.00	\$8.86	\$12.71	\$4.00	\$8.39	\$15.00	\$5.15
\$4.00	\$8.93	\$13.78	\$4.00	\$7.79	\$14.10	\$5.45	\$9.51	\$15.19	\$4.00
\$4.00	\$8.23	\$14.32	\$4.00	\$7.42	\$14.93	\$4.00	\$10.06	\$16.20	\$5.66
\$4.00	\$8.19	\$13.78	\$4.00	\$7.11	\$14.11	\$4.00	\$8.47	\$14.20	\$4.00
\$4.00	\$8.54	\$13.83	\$4.00	\$8.48	\$14.37	\$6.00	\$9.29	\$14.15	\$4.03
\$4.00	\$8.24	\$13.78	\$4.00	\$7.07	\$11.02	\$4.00	\$7.53	\$14.44	\$4.51
\$4.00	\$8.81	\$14.40	\$4.00	\$9.12	\$13.25	\$4.00	\$7.53	\$13.27	\$4.00
\$4.00	\$6.99	\$14.98	\$5.98	\$9.93	\$13.69	\$4.00	\$7.71	\$14.72	\$4.00
\$4.00	\$8.53	\$14.81	\$4.00	\$8.69	\$14.47	\$5.52	\$9.88	\$14.38	\$4.00
\$4.00	\$7.86	\$11.03	\$4.00	\$7.53	\$15.00	\$4.00	\$9.24	\$14.18	\$4.00
\$4.17	\$9.29	\$13.78	\$4.00	\$7.27	\$11.43	\$4.00	\$7.85	\$14.65	\$5.23
\$4.00	\$7.37	\$14.03	\$4.00	\$7.43	\$13.33	\$4.67	\$9.22	\$11.67	\$4.00
\$5.78	\$8.52	\$13.89	\$4.00	\$8.61	\$13.38	\$4.00	\$8.31	\$12.55	\$4.00
\$4.00	\$8.97	\$11.65	\$4.00	\$7.61	\$13.85	\$4.00	\$7.91	\$12.01	\$4.00
\$4.00	\$10.33	\$13.89	\$4.00	\$8.80	\$11.11	\$4.00	\$7.31	\$15.33	\$4.00
\$5.37	\$10.10	\$9.89	\$4.27	\$7.50	\$14.36	\$4.00	\$9.88	\$13.74	\$4.17
\$4.00	\$10.06	\$13.98	\$4.00	\$7.64	\$16.05	\$4.00	\$7.88	\$14.09	\$4.00
\$4.00	\$8.32	\$13.89	\$4.00	\$8.73	\$15.00	\$4.00	\$8.83	\$14.30	\$4.10
\$4.00	\$8.90	\$15.44	\$4.00	\$9.80	\$11.14	\$4.00	\$8.42	\$15.93	\$4.00
\$4.00	\$8.58	\$14.81	\$4.00	\$9.37	\$14.38	\$4.00	\$9.56	\$14.38	\$4.00
\$4.00	\$9.00	\$13.19	\$4.00	\$7.61	\$15.00	\$4.00	\$7.32	\$15.66	\$4.00
\$4.00	\$9.38	\$15.37	\$4.00	\$8.77	\$15.23	\$4.00	\$9.95	\$16.02	\$4.00
\$4.00	\$9.02	\$10.50	\$4.00	\$7.55	\$12.08	\$4.00	\$7.13	\$12.88	\$4.00
\$4.00	\$7.57	\$15.44	\$6.45	\$10.81	\$15.00	\$6.10	\$9.82	\$14.50	\$4.00
\$4.00	\$10.25	\$13.64	\$4.00	\$8.44	\$12.41	\$4.00	\$9.00	\$14.11	\$4.00
\$4.00	\$8.96	\$15.44	\$4.00	\$9.38	\$16.05	\$4.00	\$7.88	\$16.20	\$4.00
\$4.00	\$5.41	\$13.78	\$4.00	\$8.10	\$13.30	\$4.00	\$7.87	\$12.99	\$4.00
\$4.00	\$8.72	\$11.55	\$4.00	\$7.05	\$14.99	\$4.00	\$9.16	\$11.89	\$6.66
\$4.64	\$9.04	\$13.02	\$5.64	\$9.18	\$13.77	\$4.00	\$7.45	\$14.44	\$4.00
\$4.00	\$7.60	\$14.81	\$4.00	\$9.67	\$13.57	\$4.00	\$8.37	\$14.60	\$4.00
\$4.00	\$8.50	\$13.22	\$4.00	\$9.43	\$15.79	\$4.00	\$9.27	\$15.71	\$5.97
\$4.00	\$8.76	\$13.70	\$4.00	\$8.78	\$15.00	\$4.53	\$9.63	\$12.80	\$4.00
\$4.00	\$8.99	\$14.04	\$4.00	\$8.55	\$15.00	\$4.00	\$8.87	\$13.26	\$4.31
\$5.10	\$7.88	\$13.41	\$4.00	\$7.51	\$12.83	\$4.00	\$8.50	\$16.20	\$4.00
\$4.00	\$7.00	\$13.89	\$4.00	\$9.17	\$13.17	\$4.00	\$9.23	\$14.02	\$4.00
\$4.09	\$8.26	\$13.67	\$4.15	\$8.42	\$13.91	\$4.17	\$8.47	\$14.15	\$4.24

	\$15.44		\$16.05
\$8.26		\$8.42	\$8.47
	\$4.00		\$4.00
	11.44		12.05
			12.20

Nymex Detail-Annual Ranges

	2019			2020			2021		
avg	max	min	avg	max	min	avg	max	min	avg
\$8.90	\$11.69	\$4.00	\$7.25	\$16.24	\$4.00	\$9.79	\$15.00	\$4.00	\$8.08
\$7.92	\$15.00	\$4.00	\$9.39	\$14.92	\$5.39	\$10.51	\$15.03	\$4.00	\$9.65
\$8.39	\$14.54	\$4.00	\$9.16	\$11.48	\$4.16	\$8.24	\$15.00	\$4.00	\$7.02
\$8.65	\$15.99	\$4.00	\$9.76	\$15.00	\$4.00	\$9.09	\$15.01	\$4.00	\$8.98
\$9.95	\$16.40	\$4.70	\$9.14	\$13.90	\$4.00	\$8.91	\$15.03	\$4.51	\$9.29
\$9.76	\$14.89	\$4.00	\$10.37	\$12.58	\$4.00	\$8.93	\$13.30	\$4.00	\$7.25
\$8.26	\$14.62	\$4.00	\$6.65	\$11.30	\$4.00	\$7.73	\$14.88	\$4.00	\$8.87
\$6.70	\$14.77	\$4.77	\$10.30	\$15.00	\$4.00	\$7.36	\$15.76	\$4.00	\$8.17
\$9.93	\$13.94	\$4.00	\$7.70	\$13.90	\$4.00	\$8.90	\$15.19	\$4.00	\$8.36
\$10.51	\$15.00	\$4.00	\$8.48	\$12.02	\$4.00	\$8.36	\$15.03	\$4.00	\$10.47
\$9.63	\$14.39	\$4.00	\$8.73	\$15.00	\$4.00	\$9.97	\$15.03	\$4.00	\$8.49
\$8.09	\$14.77	\$4.00	\$9.93	\$16.78	\$4.00	\$9.94	\$9.90	\$4.00	\$6.40
\$7.24	\$14.54	\$4.00	\$8.25	\$15.00	\$4.00	\$8.32	\$16.60	\$4.00	\$9.15
\$8.92	\$15.00	\$4.00	\$7.98	\$15.00	\$5.59	\$9.44	\$15.03	\$4.00	\$8.20
\$6.90	\$14.43	\$4.00	\$9.71	\$14.76	\$4.00	\$6.68	\$15.00	\$4.00	\$9.52
\$7.99	\$14.16	\$4.00	\$7.84	\$15.00	\$4.00	\$10.55	\$15.00	\$4.00	\$9.63
\$7.07	\$15.00	\$4.00	\$8.71	\$14.92	\$4.00	\$7.84	\$11.88	\$4.00	\$7.53
\$7.99	\$10.90	\$4.00	\$6.90	\$13.44	\$4.00	\$8.29	\$12.77	\$4.00	\$7.44
\$7.66	\$13.37	\$4.00	\$8.30	\$13.52	\$4.47	\$7.88	\$13.60	\$4.00	\$9.11
\$8.56	\$16.40	\$4.00	\$10.20	\$13.52	\$4.00	\$6.67	\$15.74	\$4.00	\$9.79
\$7.54	\$16.13	\$4.00	\$10.14	\$14.76	\$4.00	\$8.44	\$15.03	\$4.00	\$9.75
\$8.36	\$14.46	\$4.00	\$8.50	\$14.39	\$4.00	\$9.60	\$15.00	\$4.00	\$9.15
\$10.81	\$13.88	\$4.00	\$8.02	\$12.67	\$4.00	\$7.83	\$15.19	\$4.00	\$7.18
\$8.24	\$14.30	\$4.00	\$7.32	\$14.21	\$4.00	\$8.85	\$13.11	\$4.00	\$8.74
\$9.57	\$15.73	\$4.00	\$9.01	\$15.00	\$4.00	\$10.76	\$13.39	\$4.00	\$8.06
\$9.76	\$14.96	\$4.00	\$8.32	\$15.00	\$6.04	\$9.51	\$14.58	\$4.00	\$8.26
\$9.36	\$14.54	\$4.00	\$7.44	\$15.46	\$4.00	\$9.97	\$15.00	\$4.00	\$10.54
\$9.10	\$14.49	\$4.00	\$10.70	\$12.26	\$4.00	\$7.35	\$15.00	\$4.00	\$8.96
\$9.29	\$14.56	\$4.00	\$7.90	\$13.59	\$4.00	\$8.27	\$15.43	\$4.00	\$7.57
\$9.63	\$14.67	\$7.44	\$10.98	\$15.00	\$4.00	\$9.73	\$17.21	\$4.00	\$9.40
\$8.08	\$14.54	\$4.00	\$7.46	\$13.84	\$4.00	\$8.81	\$15.00	\$4.00	\$8.05
\$9.81	\$14.77	\$4.00	\$8.42	\$14.06	\$5.20	\$9.12	\$12.98	\$4.00	\$8.57
\$8.41	\$14.54	\$4.00	\$9.06	\$15.00	\$4.00	\$7.94	\$13.11	\$4.00	\$9.10
\$8.86	\$14.54	\$4.00	\$8.81	\$14.99	\$4.00	\$8.31	\$15.00	\$5.30	\$10.01
\$7.92	\$11.07	\$4.00	\$6.83	\$13.45	\$4.00	\$9.32	\$15.19	\$4.00	\$7.99
\$8.31	\$15.33	\$4.00	\$7.88	\$14.92	\$4.00	\$8.40	\$11.62	\$4.00	\$7.22
\$9.41	\$12.69	\$4.00	\$7.95	\$12.57	\$5.85	\$9.26	\$14.72	\$6.35	\$10.64
\$9.63	\$14.46	\$4.00	\$7.38	\$15.70	\$4.00	\$8.05	\$15.03	\$4.00	\$7.99
\$7.26	\$13.32	\$4.00	\$7.15	\$14.92	\$4.00	\$9.34	\$15.00	\$4.00	\$8.70
\$9.85	\$15.00	\$4.00	\$8.41	\$16.87	\$4.00	\$9.86	\$15.00	\$4.17	\$9.48
\$8.22	\$15.00	\$4.00	\$7.87	\$14.99	\$4.00	\$9.82	\$12.66	\$4.00	\$8.02
\$7.31	\$13.11	\$6.55	\$10.76	\$12.42	\$4.00	\$8.42	\$15.00	\$4.00	\$7.00
\$6.83	\$13.11	\$4.00	\$9.94	\$15.00	\$4.00	\$8.01	\$13.91	\$4.00	\$9.69
\$9.98	\$14.31	\$4.00	\$8.46	\$13.79	\$4.00	\$6.18	\$15.00	\$4.00	\$7.76
\$7.89	\$12.50	\$4.00	\$7.34	\$14.04	\$5.15	\$10.79	\$15.07	\$4.00	\$7.99
\$10.57	\$15.00	\$4.00	\$8.87	\$13.79	\$4.00	\$9.57	\$12.74	\$4.00	\$8.07
\$8.15	\$14.54	\$5.22	\$8.73	\$13.58	\$4.00	\$8.84	\$15.00	\$4.00	\$8.18
\$10.69	\$14.52	\$4.00	\$7.56	\$14.34	\$4.65	\$8.17	\$14.52	\$4.00	\$6.98
\$9.74	\$14.20	\$4.00	\$9.72	\$11.59	\$4.00	\$7.74	\$14.08	\$4.00	\$8.53
\$7.72	\$11.19	\$4.00	\$7.20	\$13.13	\$4.00	\$8.46	\$15.00	\$4.00	\$9.19
\$6.82	\$14.32	\$4.00	\$7.67	\$15.00	\$4.00	\$9.01	\$11.82	\$4.26	\$8.93
\$5.88	\$13.95	\$4.00	\$7.88	\$15.00	\$4.00	\$9.01	\$15.00	\$4.00	\$9.56

Nymex Detail-Annual Ranges

\$9.09	\$15.00	\$4.00	\$8.65	\$11.75	\$4.00	\$8.26	\$15.00	\$4.00	\$9.18
\$7.45	\$14.54	\$4.00	\$7.33	\$13.80	\$4.00	\$7.32	\$12.75	\$4.00	\$5.87
\$6.89	\$14.67	\$4.00	\$8.82	\$12.86	\$4.00	\$8.50	\$13.98	\$4.00	\$8.28
\$6.71	\$16.13	\$4.00	\$9.41	\$15.00	\$4.56	\$9.41	\$17.21	\$4.00	\$9.54
\$9.91	\$14.67	\$4.00	\$7.92	\$15.00	\$4.00	\$9.67	\$13.45	\$4.00	\$8.83
\$8.25	\$14.54	\$4.00	\$8.61	\$14.99	\$4.00	\$7.73	\$15.00	\$4.00	\$8.41
\$9.25	\$11.82	\$4.00	\$7.63	\$14.76	\$6.06	\$9.78	\$12.10	\$4.00	\$6.57
\$8.16	\$14.68	\$4.00	\$8.48	\$15.69	\$6.06	\$9.22	\$15.00	\$4.00	\$7.57
\$6.81	\$16.40	\$4.00	\$9.48	\$15.00	\$4.36	\$9.09	\$14.57	\$4.00	\$6.99
\$7.70	\$15.33	\$4.00	\$10.96	\$14.99	\$4.00	\$8.75	\$15.03	\$4.84	\$9.81
\$7.66	\$14.83	\$4.00	\$8.60	\$16.59	\$4.00	\$9.54	\$11.80	\$4.00	\$7.06
\$9.69	\$15.04	\$4.00	\$8.43	\$13.90	\$4.46	\$8.54	\$15.03	\$4.00	\$7.02
\$8.65	\$14.54	\$4.00	\$7.11	\$13.71	\$4.00	\$8.46	\$13.60	\$4.00	\$8.73
\$10.27	\$14.77	\$4.00	\$8.77	\$15.00	\$4.00	\$10.59	\$13.88	\$4.00	\$7.93
\$8.88	\$15.00	\$4.00	\$8.23	\$14.40	\$4.93	\$9.16	\$13.65	\$4.00	\$9.48
\$8.35	\$14.46	\$4.00	\$7.44	\$15.00	\$4.00	\$9.03	\$15.76	\$4.46	\$9.93
\$9.72	\$16.12	\$4.00	\$10.73	\$13.08	\$4.00	\$9.06	\$15.03	\$4.00	\$10.19
\$8.66	\$15.00	\$4.00	\$8.38	\$15.00	\$4.73	\$8.64	\$15.56	\$4.00	\$8.14
\$10.67	\$12.11	\$4.00	\$7.11	\$13.29	\$4.00	\$7.38	\$12.72	\$4.00	\$7.19
\$8.90	\$16.40	\$4.00	\$9.22	\$14.76	\$4.00	\$7.26	\$17.21	\$4.00	\$10.36
\$8.47	\$14.56	\$4.00	\$9.23	\$15.00	\$4.00	\$10.78	\$15.91	\$4.00	\$8.42
\$8.29	\$14.18	\$4.00	\$7.31	\$16.87	\$4.00	\$7.08	\$17.21	\$4.00	\$9.80
\$8.39	\$12.39	\$4.00	\$8.47	\$12.98	\$4.20	\$8.36	\$15.03	\$4.00	\$7.52
\$9.28	\$13.44	\$4.59	\$9.17	\$12.63	\$4.00	\$7.85	\$14.11	\$4.00	\$5.79
\$7.73	\$12.99	\$4.00	\$7.69	\$13.07	\$4.00	\$7.77	\$15.26	\$4.00	\$9.51
\$7.36	\$15.30	\$4.00	\$8.58	\$14.99	\$4.00	\$9.90	\$13.59	\$4.00	\$8.68
\$9.03	\$14.39	\$4.00	\$10.20	\$15.00	\$4.00	\$9.17	\$15.00	\$4.00	\$8.75
\$9.68	\$14.46	\$4.00	\$10.22	\$13.19	\$4.00	\$8.74	\$13.16	\$4.00	\$7.89
\$8.10	\$14.67	\$4.00	\$8.15	\$15.00	\$4.00	\$9.10	\$14.77	\$4.00	\$8.74
\$8.68	\$14.67	\$4.00	\$8.51	\$15.00	\$6.48	\$10.35	\$15.00	\$4.00	\$9.08
\$10.05	\$15.04	\$4.00	\$9.77	\$16.59	\$4.40	\$9.80	\$15.00	\$4.00	\$8.57
\$8.62	\$16.13	\$4.00	\$9.00	\$15.00	\$4.00	\$8.43	\$14.84	\$4.00	\$6.94
\$8.57	\$15.00	\$4.00	\$7.10	\$15.39	\$4.00	\$8.71	\$15.10	\$4.00	\$6.72
\$10.82	\$11.25	\$4.00	\$6.74	\$15.64	\$4.00	\$7.76	\$15.00	\$4.00	\$10.68
\$8.81	\$13.56	\$4.00	\$9.07	\$14.79	\$4.00	\$8.46	\$10.29	\$4.00	\$6.17
\$8.71	\$11.46	\$4.00	\$8.66	\$14.76	\$4.00	\$9.30	\$16.40	\$4.04	\$9.57
\$8.91	\$14.46	\$4.26	\$8.70	\$16.87	\$4.00	\$8.38	\$11.74	\$4.00	\$7.29
\$7.90	\$11.39	\$4.00	\$7.37	\$14.41	\$4.00	\$8.16	\$13.05	\$4.00	\$9.35
\$8.76	\$14.58	\$4.00	\$10.75	\$16.87	\$4.00	\$9.44	\$15.19	\$4.00	\$9.47
\$9.44	\$16.13	\$4.35	\$9.98	\$14.92	\$4.00	\$7.84	\$13.97	\$4.26	\$10.21
\$9.78	\$16.40	\$4.00	\$9.96	\$14.81	\$4.29	\$9.08	\$13.29	\$4.00	\$8.14
\$6.65	\$15.00	\$4.00	\$9.88	\$13.76	\$5.24	\$10.42	\$15.00	\$4.00	\$8.67
\$7.80	\$14.67	\$4.00	\$6.43	\$14.13	\$4.00	\$7.74	\$15.00	\$4.00	\$8.62
\$9.66	\$15.88	\$4.88	\$10.07	\$13.34	\$5.96	\$9.42	\$14.43	\$4.16	\$9.11
\$9.79	\$15.08	\$4.00	\$9.37	\$14.99	\$4.00	\$10.02	\$15.00	\$4.00	\$9.06
\$8.23	\$13.49	\$4.58	\$8.55	\$14.99	\$4.00	\$8.75	\$15.00	\$4.00	\$7.86
\$10.47	\$16.13	\$5.49	\$11.50	\$14.99	\$6.65	\$9.69	\$16.91	\$4.00	\$9.27
\$8.74	\$13.83	\$4.00	\$9.22	\$13.05	\$4.00	\$8.39	\$11.18	\$4.00	\$6.58
\$7.03	\$16.13	\$4.24	\$9.91	\$14.92	\$4.00	\$10.31	\$15.00	\$4.00	\$8.79
\$9.20	\$14.77	\$4.00	\$9.39	\$14.35	\$5.70	\$9.56	\$15.00	\$4.00	\$8.98
\$8.35	\$13.23	\$4.00	\$8.20	\$15.11	\$4.00	\$8.78	\$15.00	\$4.00	\$9.54
\$7.13	\$12.42	\$4.00	\$8.32	\$14.92	\$4.00	\$8.04	\$12.57	\$4.00	\$8.72
\$9.75	\$12.88	\$4.14	\$8.54	\$15.29	\$5.15	\$10.60	\$15.03	\$4.00	\$9.29
\$9.01	\$11.44	\$4.00	\$7.40	\$14.50	\$4.00	\$8.97	\$13.09	\$4.00	\$8.54

Nymex Detail-Annual Ranges

\$9.25	\$14.46	\$4.67	\$7.35	\$14.08	\$4.47	\$8.90	\$15.01	\$4.00	\$8.63
\$9.69	\$11.70	\$4.00	\$8.32	\$15.00	\$4.00	\$8.34	\$13.87	\$4.00	\$8.63
\$8.74	\$12.17	\$4.50	\$8.59	\$16.87	\$6.56	\$11.75	\$15.19	\$4.00	\$10.15
\$7.58	\$15.00	\$4.00	\$9.08	\$13.42	\$4.00	\$8.41	\$14.20	\$4.00	\$8.53
\$7.98	\$15.12	\$4.00	\$9.59	\$13.92	\$4.00	\$8.42	\$15.30	\$4.00	\$8.46
\$8.83	\$14.39	\$6.32	\$10.38	\$15.00	\$4.00	\$9.72	\$12.02	\$4.00	\$6.66
\$8.37	\$14.39	\$4.00	\$8.31	\$14.99	\$4.00	\$9.63	\$17.21	\$4.00	\$9.05
\$10.96	\$14.71	\$4.00	\$9.62	\$13.39	\$4.00	\$7.14	\$15.00	\$4.00	\$9.58
\$8.76	\$12.76	\$4.00	\$7.69	\$13.78	\$4.00	\$6.03	\$14.94	\$4.00	\$8.64
\$9.67	\$14.74	\$4.00	\$9.48	\$12.61	\$4.00	\$7.71	\$15.03	\$4.00	\$9.14
\$10.35	\$14.39	\$4.00	\$8.05	\$14.92	\$4.00	\$7.88	\$16.15	\$4.00	\$8.77
\$8.55	\$14.58	\$4.71	\$10.62	\$13.99	\$4.78	\$9.30	\$17.21	\$4.00	\$8.84
\$6.72	\$14.67	\$4.00	\$8.09	\$14.84	\$4.00	\$8.34	\$15.00	\$4.00	\$8.18
\$8.55	\$12.01	\$4.00	\$7.42	\$15.00	\$4.00	\$9.11	\$15.00	\$4.10	\$9.08
\$6.88	\$14.77	\$4.00	\$9.10	\$15.96	\$4.00	\$7.51	\$13.76	\$5.26	\$9.33
\$9.06	\$12.46	\$4.00	\$7.56	\$15.00	\$4.00	\$9.97	\$15.00	\$4.00	\$8.16
\$8.26	\$14.60	\$5.50	\$10.47	\$16.59	\$4.00	\$9.29	\$15.00	\$4.09	\$10.54
\$8.87	\$13.74	\$4.55	\$8.97	\$12.40	\$4.00	\$8.02	\$15.03	\$4.00	\$8.70
\$7.86	\$12.68	\$4.00	\$7.59	\$15.47	\$4.00	\$10.39	\$15.00	\$4.00	\$8.51
\$8.82	\$13.06	\$4.00	\$8.89	\$14.84	\$5.64	\$10.28	\$16.24	\$4.11	\$9.07
\$10.68	\$15.00	\$5.35	\$9.79	\$13.22	\$4.00	\$10.14	\$15.41	\$6.88	\$11.45
\$8.57	\$13.40	\$4.00	\$9.03	\$12.84	\$4.00	\$7.01	\$15.00	\$4.00	\$10.09
\$9.26	\$12.28	\$4.89	\$9.23	\$15.37	\$4.00	\$9.41	\$15.00	\$4.08	\$8.50
\$8.80	\$14.71	\$4.00	\$9.14	\$16.31	\$4.00	\$9.86	\$12.96	\$4.71	\$8.77
\$7.24	\$14.31	\$4.00	\$8.51	\$14.68	\$4.00	\$9.44	\$13.31	\$4.00	\$7.68
\$7.30	\$11.52	\$4.00	\$7.60	\$14.92	\$4.00	\$7.98	\$15.00	\$4.00	\$8.40
\$10.41	\$14.60	\$4.18	\$10.35	\$12.96	\$4.00	\$8.57	\$15.00	\$4.00	\$9.13
\$7.67	\$16.40	\$4.83	\$10.62	\$14.92	\$4.00	\$8.95	\$16.98	\$4.00	\$8.52
\$9.21	\$14.54	\$4.00	\$8.73	\$16.59	\$4.00	\$9.03	\$14.96	\$4.00	\$7.50
\$9.01	\$16.40	\$4.00	\$8.49	\$16.61	\$4.00	\$9.34	\$14.42	\$4.00	\$10.07
\$6.82	\$14.54	\$4.00	\$8.08	\$14.76	\$4.00	\$9.05	\$15.00	\$4.00	\$7.98
\$10.01	\$12.89	\$4.00	\$8.09	\$14.92	\$4.91	\$9.60	\$14.41	\$4.00	\$7.04
\$7.85	\$13.47	\$4.00	\$10.47	\$14.40	\$4.00	\$7.96	\$13.06	\$4.00	\$8.67
\$10.41	\$14.01	\$4.00	\$9.77	\$15.00	\$4.29	\$9.88	\$17.21	\$4.00	\$6.89
\$8.67	\$14.39	\$4.00	\$8.22	\$10.59	\$4.00	\$8.32	\$13.71	\$4.00	\$7.40
\$9.52	\$16.40	\$4.00	\$10.91	\$16.28	\$4.00	\$8.60	\$12.60	\$4.47	\$9.05
\$8.49	\$15.00	\$4.00	\$8.88	\$16.25	\$4.00	\$8.32	\$12.88	\$4.00	\$8.42
\$7.42	\$15.00	\$4.00	\$7.92	\$15.00	\$4.72	\$10.62	\$14.01	\$4.00	\$7.74
\$9.80	\$12.93	\$4.00	\$8.60	\$15.00	\$4.00	\$8.61	\$14.17	\$4.00	\$7.52
\$9.15	\$14.60	\$4.00	\$7.76	\$12.48	\$4.00	\$6.95	\$15.00	\$4.00	\$7.94
\$7.29	\$14.67	\$4.00	\$8.86	\$14.99	\$4.00	\$9.30	\$15.00	\$4.00	\$8.30
\$8.04	\$12.85	\$4.00	\$9.29	\$13.51	\$4.00	\$8.28	\$12.81	\$4.00	\$6.95
\$9.54	\$14.59	\$4.26	\$10.09	\$16.11	\$5.02	\$10.95	\$15.00	\$4.00	\$9.20
\$8.62	\$12.16	\$4.00	\$7.12	\$14.27	\$4.00	\$8.91	\$16.91	\$4.00	\$9.52
\$8.76	\$15.00	\$4.00	\$8.28	\$14.99	\$4.00	\$9.99	\$15.00	\$4.00	\$8.75
\$8.07	\$13.92	\$4.80	\$8.64	\$15.85	\$4.00	\$7.36	\$13.44	\$4.00	\$8.39
\$8.49	\$14.39	\$4.00	\$9.12	\$15.02	\$4.00	\$11.71	\$15.19	\$4.00	\$8.62
\$8.30	\$16.34	\$4.00	\$9.97	\$12.03	\$4.00	\$7.74	\$15.00	\$4.00	\$8.82
\$9.81	\$16.13	\$4.00	\$9.76	\$14.59	\$4.00	\$9.70	\$17.21	\$4.00	\$10.15
\$7.84	\$16.40	\$4.69	\$10.00	\$13.23	\$4.00	\$10.35	\$15.00	\$4.00	\$8.34
\$8.20	\$16.40	\$4.23	\$10.40	\$14.84	\$4.00	\$7.72	\$17.07	\$4.00	\$8.58
\$9.69	\$14.47	\$4.00	\$9.33	\$15.00	\$4.00	\$8.59	\$11.30	\$4.00	\$6.00
\$8.16	\$15.98	\$4.00	\$9.40	\$15.66	\$4.00	\$9.12	\$14.89	\$4.00	\$7.71
\$8.12	\$14.54	\$4.00	\$8.86	\$13.85	\$4.77	\$8.62	\$15.00	\$4.00	\$6.91

Nymex Detail-Annual Ranges

\$8.77	\$14.42	\$4.00	\$9.30	\$15.77	\$4.63	\$10.59	\$15.03	\$4.00	\$10.15
\$9.01	\$15.00	\$4.00	\$9.32	\$14.83	\$4.00	\$8.38	\$13.45	\$4.00	\$7.54
\$8.70	\$16.40	\$4.00	\$9.46	\$15.00	\$4.46	\$8.45	\$15.00	\$5.10	\$8.95
\$8.75	\$13.76	\$5.54	\$9.76	\$13.89	\$4.00	\$8.46	\$15.00	\$4.00	\$8.17
\$9.33	\$14.46	\$6.41	\$10.04	\$14.92	\$4.00	\$9.26	\$11.46	\$4.00	\$6.72
\$8.53	\$13.69	\$4.00	\$8.48	\$15.00	\$4.00	\$8.23	\$12.79	\$4.00	\$8.49
\$9.12	\$14.54	\$4.00	\$9.16	\$14.27	\$4.16	\$9.28	\$10.64	\$4.00	\$7.39
\$9.48	\$14.77	\$4.00	\$8.96	\$14.76	\$4.00	\$9.25	\$17.21	\$4.00	\$9.53
\$7.01	\$15.00	\$4.00	\$7.67	\$14.20	\$4.00	\$9.73	\$15.00	\$4.00	\$8.23
\$9.54	\$14.60	\$5.40	\$9.98	\$13.05	\$4.00	\$7.42	\$14.82	\$4.00	\$9.22
\$8.16	\$16.13	\$4.00	\$9.44	\$14.41	\$6.50	\$11.03	\$14.28	\$4.00	\$8.54
\$8.20	\$14.40	\$4.00	\$9.87	\$14.35	\$4.00	\$8.68	\$17.21	\$4.00	\$11.11
\$8.15	\$16.02	\$4.00	\$9.50	\$14.99	\$4.00	\$9.19	\$14.05	\$4.00	\$7.05
\$7.64	\$14.46	\$4.00	\$8.79	\$15.83	\$4.90	\$10.42	\$15.00	\$4.00	\$9.44
\$7.48	\$14.77	\$4.00	\$9.98	\$13.86	\$4.00	\$8.47	\$15.00	\$4.00	\$9.61
\$9.35	\$13.51	\$4.00	\$8.21	\$14.81	\$4.00	\$8.65	\$15.00	\$4.00	\$7.78
\$7.49	\$12.35	\$4.00	\$8.28	\$15.39	\$4.00	\$7.11	\$12.46	\$4.00	\$5.86
\$7.84	\$14.77	\$4.00	\$8.35	\$15.00	\$4.00	\$8.75	\$14.06	\$4.00	\$8.69
\$7.26	\$14.89	\$4.00	\$9.07	\$15.19	\$4.00	\$9.68	\$13.69	\$4.00	\$9.17
\$8.93	\$12.69	\$4.00	\$8.51	\$13.85	\$4.00	\$6.75	\$15.00	\$4.44	\$10.85
\$9.95	\$16.03	\$4.00	\$8.93	\$16.87	\$4.00	\$10.23	\$15.51	\$7.19	\$11.48
\$7.87	\$14.39	\$4.06	\$9.26	\$14.76	\$4.00	\$9.51	\$11.75	\$4.00	\$6.99
\$8.87	\$12.76	\$4.00	\$7.50	\$15.14	\$5.97	\$9.20	\$12.52	\$4.00	\$8.60
\$8.95	\$15.00	\$4.00	\$9.67	\$13.34	\$4.42	\$10.29	\$15.00	\$4.00	\$9.29
\$8.04	\$10.85	\$4.00	\$7.73	\$15.00	\$4.00	\$8.98	\$15.00	\$4.00	\$8.29
\$9.20	\$15.00	\$5.38	\$9.54	\$13.68	\$4.00	\$7.33	\$15.00	\$4.00	\$8.67
\$9.35	\$11.99	\$4.00	\$7.99	\$15.00	\$4.00	\$6.82	\$15.00	\$4.00	\$7.84
\$8.42	\$16.40	\$4.00	\$8.68	\$11.84	\$4.00	\$7.53	\$15.00	\$4.00	\$8.84
\$9.23	\$12.28	\$4.00	\$7.38	\$11.70	\$4.23	\$7.44	\$14.02	\$4.00	\$8.68
\$7.79	\$14.87	\$4.00	\$8.74	\$14.20	\$4.00	\$8.90	\$11.27	\$4.00	\$7.53
\$9.19	\$14.77	\$4.00	\$9.27	\$13.17	\$4.00	\$7.18	\$11.32	\$4.00	\$6.95
\$7.12	\$14.94	\$4.00	\$9.25	\$14.15	\$4.00	\$8.73	\$11.86	\$4.00	\$8.40
\$9.32	\$14.64	\$4.00	\$9.04	\$13.04	\$4.00	\$7.31	\$15.00	\$4.00	\$9.37
\$8.35	\$14.46	\$4.00	\$7.30	\$16.20	\$4.00	\$8.19	\$15.00	\$4.00	\$9.46
\$8.61	\$14.54	\$4.00	\$8.57	\$16.59	\$4.00	\$9.04	\$14.40	\$4.00	\$8.00
\$9.93	\$11.35	\$4.00	\$8.15	\$16.29	\$4.00	\$10.40	\$15.00	\$5.02	\$10.00
\$7.07	\$14.18	\$4.00	\$8.73	\$14.48	\$4.00	\$8.49	\$14.92	\$4.00	\$9.30
\$8.44	\$14.60	\$4.00	\$9.39	\$15.00	\$4.00	\$9.12	\$15.00	\$4.00	\$8.54
\$10.45	\$15.00	\$4.00	\$8.65	\$15.02	\$4.00	\$8.09	\$15.00	\$4.00	\$8.22
\$8.01	\$14.60	\$4.00	\$8.67	\$13.17	\$4.00	\$9.04	\$15.00	\$4.00	\$9.56
\$8.64	\$14.32	\$4.16	\$8.78	\$14.50	\$4.23	\$8.84	\$14.50	\$4.09	\$8.56
	\$16.40			\$16.87			\$17.21		
\$8.64			\$8.78			\$8.84			\$8.56
	\$4.00			\$4.00			\$4.00		
	12.40			12.87			13.21		

Nymex Detail-Annual Ranges

2022			2023			2024			
max	min	avg	max	min	avg	max	min	avg	max
\$17.31	\$4.00	\$10.37	\$13.98	\$4.80	\$9.02	\$15.00	\$4.00	\$7.37	\$15.00
\$11.85	\$4.00	\$7.22	\$16.41	\$6.97	\$12.18	\$13.47	\$4.00	\$8.24	\$17.00
\$15.88	\$4.00	\$8.26	\$15.00	\$4.00	\$8.90	\$15.00	\$4.00	\$9.01	\$16.91
\$15.00	\$4.00	\$8.04	\$8.38	\$4.00	\$5.96	\$15.00	\$4.99	\$9.13	\$15.37
\$11.16	\$4.00	\$7.20	\$15.78	\$4.00	\$7.83	\$16.70	\$4.00	\$10.59	\$16.00
\$17.51	\$4.00	\$8.15	\$18.29	\$4.00	\$9.81	\$16.00	\$4.00	\$9.28	\$18.35
\$15.00	\$4.00	\$7.85	\$15.00	\$6.10	\$10.82	\$13.88	\$4.00	\$9.33	\$16.91
\$17.82	\$4.00	\$9.23	\$13.61	\$4.00	\$8.68	\$15.89	\$4.00	\$10.59	\$17.71
\$15.00	\$4.00	\$8.91	\$13.37	\$4.56	\$9.06	\$15.00	\$4.00	\$10.26	\$19.60
\$15.00	\$4.00	\$8.75	\$13.81	\$4.00	\$8.66	\$15.36	\$4.00	\$8.83	\$15.00
\$14.63	\$4.00	\$10.08	\$15.00	\$4.00	\$10.17	\$14.33	\$4.00	\$7.98	\$14.93
\$15.00	\$4.00	\$8.64	\$11.71	\$4.01	\$7.81	\$18.83	\$4.00	\$9.88	\$15.24
\$16.75	\$4.00	\$8.98	\$16.20	\$4.00	\$10.18	\$19.12	\$4.00	\$11.01	\$16.39
\$16.51	\$4.00	\$9.42	\$14.79	\$4.00	\$7.38	\$15.00	\$4.00	\$9.60	\$15.03
\$11.79	\$4.00	\$7.45	\$15.11	\$4.00	\$9.23	\$17.73	\$4.00	\$11.41	\$14.78
\$13.32	\$4.00	\$7.68	\$15.00	\$4.00	\$10.15	\$16.58	\$4.00	\$9.29	\$17.43
\$15.50	\$4.00	\$8.88	\$15.00	\$4.00	\$8.16	\$15.00	\$4.00	\$9.71	\$12.78
\$17.82	\$4.00	\$7.48	\$15.00	\$4.00	\$8.15	\$16.78	\$4.00	\$8.32	\$15.99
\$17.54	\$4.00	\$8.74	\$12.59	\$4.00	\$8.28	\$15.00	\$4.00	\$7.77	\$14.15
\$17.51	\$4.00	\$10.16	\$15.00	\$4.00	\$9.73	\$16.30	\$4.00	\$8.85	\$14.17
\$14.38	\$4.00	\$8.33	\$15.00	\$4.00	\$8.89	\$15.00	\$4.00	\$9.88	\$16.87
\$14.50	\$4.00	\$9.77	\$14.37	\$5.33	\$9.32	\$16.25	\$4.00	\$9.39	\$16.91
\$14.59	\$4.00	\$9.68	\$15.00	\$4.00	\$10.74	\$15.61	\$4.08	\$10.93	\$19.60
\$14.36	\$4.00	\$8.14	\$18.46	\$4.00	\$9.58	\$16.58	\$4.00	\$9.78	\$18.16
\$17.51	\$4.00	\$7.90	\$17.72	\$4.00	\$7.94	\$15.00	\$4.06	\$9.94	\$15.00
\$15.23	\$5.03	\$9.79	\$15.41	\$4.00	\$9.52	\$16.58	\$4.00	\$9.35	\$18.10
\$15.66	\$4.00	\$9.30	\$15.00	\$4.00	\$8.82	\$15.00	\$4.00	\$10.23	\$15.00
\$15.00	\$4.00	\$6.95	\$15.00	\$4.00	\$8.52	\$13.27	\$4.00	\$9.87	\$15.00
\$13.86	\$4.00	\$9.39	\$18.13	\$4.00	\$9.27	\$15.54	\$4.00	\$10.51	\$15.00
\$15.00	\$4.00	\$8.89	\$15.22	\$4.00	\$8.39	\$16.24	\$4.00	\$9.58	\$16.91
\$15.00	\$4.00	\$7.29	\$15.80	\$4.00	\$9.81	\$15.00	\$4.00	\$8.26	\$13.61
\$15.00	\$4.00	\$7.62	\$15.28	\$4.00	\$8.98	\$16.63	\$4.00	\$9.22	\$16.92
\$17.82	\$4.00	\$9.88	\$18.46	\$4.48	\$10.80	\$13.86	\$4.00	\$8.35	\$14.42
\$12.91	\$4.00	\$7.78	\$15.00	\$4.00	\$8.30	\$12.24	\$4.00	\$7.90	\$16.67
\$15.00	\$4.00	\$8.55	\$13.04	\$4.00	\$9.05	\$16.01	\$4.00	\$10.17	\$15.85
\$15.00	\$4.00	\$8.57	\$15.61	\$4.00	\$8.66	\$15.41	\$5.15	\$10.66	\$13.14
\$17.31	\$4.00	\$9.46	\$18.46	\$4.00	\$9.87	\$15.32	\$4.00	\$9.06	\$18.31
\$15.00	\$4.00	\$10.53	\$16.75	\$4.00	\$8.50	\$15.00	\$4.00	\$10.14	\$15.00
\$15.72	\$4.00	\$9.83	\$18.13	\$4.64	\$10.97	\$14.69	\$4.91	\$10.26	\$11.52
\$16.01	\$4.00	\$9.04	\$15.00	\$4.03	\$11.11	\$16.58	\$4.00	\$8.92	\$18.11
\$14.80	\$4.00	\$7.80	\$17.16	\$7.16	\$10.85	\$15.00	\$4.00	\$8.10	\$15.00
\$17.51	\$4.33	\$11.51	\$15.00	\$4.00	\$9.79	\$15.00	\$4.00	\$8.05	\$15.25
\$15.09	\$4.46	\$9.58	\$15.00	\$4.00	\$9.84	\$16.74	\$4.00	\$9.28	\$15.00
\$15.00	\$4.00	\$9.56	\$15.00	\$4.00	\$7.14	\$15.00	\$4.00	\$10.05	\$15.93
\$12.63	\$4.00	\$7.87	\$15.00	\$4.00	\$8.43	\$16.78	\$4.00	\$8.80	\$16.57
\$11.85	\$4.00	\$6.56	\$16.65	\$4.00	\$8.87	\$15.00	\$4.00	\$8.38	\$19.60
\$15.50	\$4.00	\$10.50	\$15.40	\$4.00	\$10.49	\$16.60	\$4.00	\$10.26	\$16.19
\$14.50	\$4.00	\$9.38	\$15.39	\$5.37	\$9.01	\$12.36	\$4.00	\$6.60	\$17.11
\$13.73	\$4.00	\$8.03	\$15.00	\$4.00	\$9.37	\$16.58	\$4.00	\$11.45	\$15.00
\$15.60	\$4.00	\$9.18	\$17.39	\$4.00	\$8.03	\$18.83	\$4.00	\$11.44	\$14.60
\$15.00	\$4.79	\$8.91	\$17.11	\$4.00	\$8.82	\$15.46	\$4.00	\$9.59	\$15.00
\$17.36	\$4.00	\$8.65	\$15.00	\$4.00	\$8.58	\$16.42	\$4.37	\$10.43	\$19.60

Nymex Detail-Annual Ranges

\$15.00	\$4.00	\$7.49	\$15.00	\$4.00	\$9.70	\$15.00	\$4.00	\$7.28	\$15.00
\$15.00	\$4.00	\$9.28	\$15.64	\$4.00	\$9.41	\$16.78	\$4.00	\$10.33	\$17.11
\$15.00	\$4.00	\$8.66	\$15.00	\$4.00	\$9.32	\$16.58	\$4.00	\$9.55	\$14.33
\$14.56	\$4.00	\$7.50	\$13.41	\$4.00	\$7.33	\$15.00	\$4.00	\$8.41	\$15.04
\$15.00	\$4.00	\$8.57	\$13.77	\$4.00	\$6.55	\$15.18	\$4.00	\$9.17	\$17.06
\$15.00	\$4.00	\$8.80	\$15.00	\$4.00	\$9.95	\$16.78	\$4.00	\$8.68	\$18.94
\$15.92	\$4.00	\$9.22	\$18.46	\$4.00	\$9.57	\$15.00	\$4.00	\$8.89	\$15.00
\$15.46	\$4.00	\$7.00	\$18.46	\$5.19	\$12.22	\$14.66	\$4.00	\$9.35	\$17.14
\$15.80	\$4.00	\$9.82	\$16.01	\$4.00	\$9.19	\$15.00	\$4.00	\$9.44	\$15.00
\$17.13	\$4.00	\$7.82	\$15.00	\$4.00	\$7.53	\$15.00	\$4.00	\$9.83	\$15.88
\$16.09	\$4.00	\$8.55	\$15.00	\$4.00	\$9.45	\$15.22	\$4.00	\$10.59	\$15.00
\$17.51	\$4.00	\$8.77	\$18.46	\$4.00	\$8.49	\$12.98	\$4.00	\$8.17	\$18.80
\$17.82	\$4.00	\$9.41	\$15.00	\$4.00	\$9.02	\$15.00	\$4.00	\$9.17	\$14.16
\$15.00	\$4.00	\$8.83	\$15.00	\$4.00	\$7.64	\$18.83	\$4.00	\$10.74	\$15.00
\$13.20	\$4.00	\$8.94	\$11.42	\$4.00	\$7.57	\$15.00	\$4.00	\$9.74	\$13.86
\$15.20	\$4.00	\$9.37	\$13.10	\$4.17	\$9.04	\$15.00	\$4.00	\$9.06	\$19.24
\$14.01	\$4.00	\$8.33	\$15.00	\$4.00	\$10.60	\$16.11	\$4.00	\$10.32	\$17.68
\$15.00	\$4.00	\$7.45	\$13.02	\$4.00	\$8.70	\$15.00	\$4.00	\$8.03	\$16.82
\$16.29	\$4.00	\$9.12	\$15.00	\$4.45	\$9.89	\$15.00	\$4.00	\$9.36	\$18.18
\$17.82	\$4.00	\$9.12	\$13.90	\$4.00	\$8.22	\$19.19	\$4.00	\$10.47	\$15.01
\$17.82	\$4.00	\$10.08	\$15.00	\$4.00	\$9.68	\$15.00	\$4.00	\$9.47	\$16.91
\$15.50	\$4.00	\$8.87	\$16.01	\$4.00	\$9.36	\$17.05	\$6.07	\$9.73	\$16.91
\$15.86	\$4.00	\$10.24	\$14.64	\$4.00	\$6.76	\$17.33	\$4.00	\$9.99	\$15.00
\$15.00	\$4.00	\$9.75	\$14.54	\$4.00	\$9.50	\$19.19	\$4.00	\$10.81	\$16.91
\$15.00	\$4.00	\$10.69	\$15.00	\$4.00	\$7.26	\$16.58	\$4.00	\$9.25	\$14.78
\$15.00	\$4.00	\$9.70	\$15.00	\$4.00	\$9.18	\$16.54	\$4.00	\$9.68	\$16.91
\$15.64	\$4.00	\$9.66	\$17.13	\$4.00	\$8.89	\$12.48	\$4.00	\$7.71	\$15.00
\$15.00	\$8.36	\$11.70	\$12.51	\$4.00	\$7.32	\$15.00	\$4.00	\$8.79	\$15.00
\$14.15	\$4.00	\$9.04	\$14.34	\$4.00	\$6.87	\$11.84	\$4.00	\$7.37	\$15.00
\$17.82	\$4.00	\$9.00	\$15.00	\$4.00	\$8.12	\$18.12	\$6.32	\$12.07	\$15.00
\$15.88	\$4.00	\$8.18	\$18.13	\$4.00	\$9.88	\$13.92	\$4.00	\$7.74	\$15.00
\$15.71	\$5.32	\$10.70	\$16.01	\$4.00	\$9.76	\$15.54	\$4.00	\$9.07	\$13.50
\$15.50	\$4.00	\$7.99	\$12.58	\$4.00	\$6.75	\$16.58	\$4.77	\$11.69	\$19.24
\$12.94	\$4.85	\$9.47	\$16.29	\$4.00	\$9.83	\$15.00	\$4.00	\$9.77	\$15.00
\$15.00	\$4.00	\$8.03	\$15.00	\$4.00	\$9.10	\$13.33	\$4.00	\$8.21	\$15.00
\$13.35	\$4.00	\$7.99	\$15.47	\$4.00	\$8.34	\$16.57	\$5.13	\$10.03	\$15.00
\$15.00	\$4.00	\$6.66	\$18.13	\$4.00	\$10.46	\$14.85	\$4.00	\$11.09	\$15.26
\$16.63	\$4.00	\$8.52	\$14.87	\$4.83	\$9.20	\$15.28	\$4.00	\$8.27	\$17.98
\$15.68	\$4.00	\$7.66	\$18.46	\$4.00	\$9.01	\$15.74	\$4.00	\$9.59	\$17.11
\$15.36	\$4.00	\$8.89	\$15.60	\$4.00	\$10.28	\$13.60	\$4.00	\$8.21	\$14.29
\$15.91	\$4.00	\$9.34	\$13.89	\$4.00	\$9.35	\$12.35	\$4.00	\$7.50	\$16.98
\$17.82	\$4.00	\$9.12	\$15.00	\$4.00	\$7.22	\$15.00	\$4.00	\$8.58	\$18.55
\$15.00	\$4.00	\$9.06	\$14.74	\$4.00	\$9.62	\$18.83	\$4.00	\$9.36	\$16.28
\$17.51	\$4.00	\$8.81	\$17.47	\$6.13	\$11.00	\$15.00	\$4.00	\$9.91	\$12.96
\$10.83	\$4.00	\$7.69	\$17.49	\$4.15	\$12.08	\$14.48	\$4.89	\$10.68	\$13.01
\$16.49	\$4.00	\$9.50	\$14.24	\$5.20	\$8.26	\$15.00	\$4.00	\$8.36	\$15.00
\$15.93	\$6.14	\$10.55	\$13.88	\$5.86	\$10.12	\$14.73	\$4.00	\$9.39	\$17.83
\$15.00	\$4.00	\$9.01	\$15.00	\$4.00	\$9.03	\$12.92	\$4.00	\$5.99	\$15.02
\$15.00	\$4.00	\$7.48	\$14.25	\$4.00	\$8.89	\$16.78	\$4.44	\$9.58	\$15.00
\$16.92	\$4.00	\$9.96	\$15.00	\$4.00	\$7.33	\$14.96	\$4.00	\$9.44	\$13.11
\$15.00	\$4.00	\$9.27	\$16.28	\$4.00	\$9.34	\$16.58	\$4.00	\$9.55	\$16.91
\$15.03	\$4.00	\$9.67	\$16.09	\$4.00	\$9.35	\$16.44	\$4.00	\$10.70	\$17.64
\$12.91	\$4.00	\$6.95	\$14.48	\$4.10	\$8.80	\$16.34	\$4.00	\$10.49	\$14.69
\$13.98	\$4.00	\$7.77	\$18.46	\$4.00	\$9.36	\$13.96	\$4.00	\$8.52	\$15.00

Nymex Detail-Annual Ranges

\$13.28	\$4.00	\$7.71	\$18.46	\$4.00	\$9.93	\$15.00	\$4.00	\$8.81	\$19.60
\$14.99	\$4.00	\$7.63	\$15.00	\$4.00	\$10.13	\$15.00	\$4.00	\$9.07	\$15.00
\$15.00	\$4.00	\$8.82	\$15.00	\$4.00	\$9.05	\$16.11	\$4.00	\$8.07	\$14.51
\$15.68	\$4.00	\$10.21	\$15.00	\$5.05	\$10.21	\$14.78	\$4.00	\$9.37	\$16.33
\$12.33	\$4.00	\$8.65	\$15.00	\$4.00	\$9.55	\$15.00	\$4.00	\$9.24	\$15.00
\$15.00	\$4.00	\$7.32	\$13.50	\$4.00	\$9.38	\$16.42	\$5.60	\$12.77	\$12.11
\$15.68	\$4.00	\$8.53	\$14.26	\$4.00	\$8.72	\$16.75	\$4.00	\$10.10	\$17.54
\$17.82	\$4.00	\$9.02	\$15.00	\$4.00	\$8.81	\$15.00	\$4.00	\$7.24	\$12.33
\$17.82	\$4.00	\$8.62	\$16.57	\$4.00	\$9.77	\$15.00	\$4.00	\$9.23	\$16.91
\$15.68	\$4.00	\$9.62	\$14.77	\$4.00	\$9.39	\$16.78	\$4.00	\$11.33	\$19.60
\$15.00	\$6.25	\$10.95	\$15.53	\$4.00	\$11.21	\$15.00	\$4.00	\$7.24	\$19.60
\$14.04	\$4.00	\$8.00	\$15.35	\$4.00	\$9.15	\$15.00	\$4.00	\$9.85	\$19.60
\$15.50	\$4.00	\$8.19	\$17.81	\$4.00	\$8.67	\$15.00	\$4.00	\$9.69	\$14.42
\$15.68	\$4.00	\$10.37	\$15.00	\$4.52	\$8.94	\$15.00	\$4.00	\$8.45	\$14.91
\$15.00	\$4.00	\$7.54	\$15.00	\$4.00	\$9.67	\$18.27	\$4.00	\$9.38	\$15.00
\$13.84	\$4.00	\$8.01	\$15.00	\$4.00	\$10.19	\$16.71	\$4.00	\$11.02	\$15.00
\$15.00	\$4.00	\$8.70	\$15.00	\$5.58	\$10.49	\$15.00	\$4.00	\$10.59	\$12.84
\$15.00	\$4.00	\$10.19	\$15.00	\$4.00	\$8.60	\$15.03	\$4.00	\$7.34	\$15.98
\$15.56	\$4.00	\$9.81	\$11.32	\$4.00	\$6.35	\$19.09	\$4.00	\$8.38	\$18.03
\$11.83	\$4.00	\$8.04	\$18.46	\$4.60	\$10.89	\$19.19	\$4.00	\$9.27	\$16.82
\$16.68	\$4.00	\$9.32	\$15.00	\$4.05	\$9.35	\$15.44	\$4.00	\$8.72	\$16.18
\$15.00	\$4.00	\$9.52	\$16.20	\$4.00	\$9.43	\$16.58	\$4.00	\$10.17	\$15.00
\$16.32	\$4.00	\$8.22	\$16.01	\$4.00	\$10.62	\$15.45	\$4.00	\$8.65	\$15.00
\$15.44	\$4.00	\$7.44	\$16.01	\$4.00	\$9.67	\$18.70	\$4.00	\$11.26	\$14.62
\$12.18	\$4.00	\$7.57	\$15.00	\$4.00	\$7.82	\$18.11	\$4.00	\$10.33	\$19.60
\$15.00	\$4.00	\$9.01	\$13.95	\$4.00	\$8.38	\$11.24	\$4.00	\$6.15	\$15.92
\$15.00	\$4.00	\$8.97	\$15.00	\$4.00	\$8.31	\$16.58	\$4.00	\$10.82	\$19.60
\$15.00	\$4.00	\$8.58	\$15.00	\$4.00	\$8.32	\$15.00	\$5.03	\$10.47	\$12.04
\$15.68	\$4.00	\$10.79	\$18.13	\$4.25	\$10.60	\$15.00	\$4.00	\$10.76	\$16.91
\$15.50	\$4.00	\$8.18	\$11.31	\$4.00	\$7.12	\$16.58	\$4.00	\$10.95	\$14.02
\$15.68	\$4.00	\$9.81	\$18.46	\$4.00	\$8.06	\$15.00	\$6.00	\$10.82	\$15.00
\$15.00	\$4.00	\$7.96	\$18.46	\$4.00	\$9.14	\$15.00	\$4.00	\$11.19	\$15.00
\$17.51	\$4.54	\$10.63	\$16.20	\$4.00	\$9.44	\$15.00	\$4.00	\$7.81	\$19.60
\$15.00	\$4.00	\$8.62	\$15.46	\$4.00	\$8.44	\$16.78	\$4.00	\$8.45	\$15.28
\$15.50	\$4.00	\$8.94	\$17.94	\$4.00	\$8.41	\$15.00	\$4.00	\$7.59	\$15.74
\$15.00	\$4.00	\$7.69	\$18.07	\$4.00	\$9.90	\$15.09	\$7.94	\$12.39	\$18.18
\$16.14	\$4.00	\$11.16	\$15.00	\$4.00	\$9.12	\$15.00	\$4.00	\$9.08	\$15.00
\$17.51	\$4.00	\$8.89	\$13.55	\$4.00	\$7.17	\$14.47	\$5.06	\$9.73	\$16.78
\$17.82	\$4.00	\$10.90	\$18.46	\$4.00	\$9.78	\$16.10	\$4.00	\$9.28	\$18.62
\$17.36	\$4.00	\$8.96	\$15.00	\$4.00	\$9.65	\$15.00	\$4.00	\$9.56	\$15.58
\$17.51	\$4.51	\$10.48	\$18.13	\$4.00	\$11.15	\$14.84	\$4.00	\$8.62	\$15.00
\$15.37	\$4.00	\$8.71	\$14.21	\$4.00	\$6.79	\$15.00	\$4.00	\$7.55	\$19.60
\$14.68	\$4.00	\$9.52	\$12.36	\$4.00	\$7.20	\$15.97	\$4.00	\$10.71	\$15.00
\$15.00	\$4.00	\$8.63	\$14.09	\$4.00	\$8.23	\$16.97	\$4.00	\$10.15	\$17.11
\$14.61	\$4.00	\$8.35	\$14.88	\$5.77	\$10.50	\$16.09	\$4.00	\$9.29	\$18.93
\$14.10	\$4.00	\$8.33	\$16.01	\$4.00	\$10.10	\$16.78	\$4.00	\$11.79	\$17.01
\$13.28	\$4.00	\$8.28	\$16.15	\$4.00	\$7.26	\$13.63	\$4.00	\$7.86	\$15.52
\$13.31	\$4.00	\$7.66	\$14.54	\$4.00	\$8.33	\$16.58	\$4.00	\$8.69	\$15.00
\$16.55	\$4.00	\$8.75	\$15.00	\$4.00	\$9.12	\$16.78	\$4.00	\$10.66	\$16.91
\$17.82	\$4.00	\$9.82	\$16.20	\$5.41	\$10.62	\$15.00	\$4.00	\$9.18	\$15.00
\$14.62	\$4.00	\$8.40	\$12.96	\$4.00	\$7.50	\$13.79	\$4.00	\$7.93	\$19.49
\$15.10	\$4.00	\$6.88	\$14.97	\$4.00	\$8.89	\$15.08	\$4.00	\$8.71	\$15.00
\$15.00	\$4.00	\$8.87	\$15.00	\$4.00	\$8.47	\$15.00	\$4.00	\$9.34	\$16.08
\$17.48	\$4.00	\$11.01	\$15.00	\$4.00	\$8.77	\$16.60	\$4.00	\$9.36	\$12.98

Nymex Detail-Annual Ranges

\$11.26	\$4.00	\$6.69	\$15.73	\$4.00	\$8.24	\$18.83	\$4.00	\$8.11	\$14.94
\$15.00	\$4.00	\$8.32	\$16.01	\$4.00	\$8.39	\$15.00	\$4.00	\$9.79	\$16.91
\$17.82	\$4.00	\$8.70	\$18.13	\$4.00	\$8.67	\$15.47	\$4.00	\$7.46	\$15.00
\$11.64	\$4.00	\$8.13	\$16.40	\$4.00	\$7.35	\$16.58	\$4.00	\$8.70	\$14.30
\$14.25	\$4.00	\$8.66	\$15.11	\$4.00	\$9.72	\$18.23	\$4.00	\$9.42	\$15.00
\$15.00	\$4.00	\$8.58	\$15.00	\$4.00	\$9.84	\$15.00	\$4.00	\$9.45	\$19.24
\$15.00	\$4.00	\$9.12	\$15.00	\$4.00	\$7.01	\$19.19	\$5.14	\$10.60	\$16.54
\$15.00	\$4.00	\$9.93	\$15.18	\$4.00	\$10.57	\$13.42	\$4.00	\$7.97	\$15.00
\$15.68	\$4.00	\$9.61	\$14.15	\$4.00	\$9.48	\$18.83	\$4.00	\$8.21	\$17.15
\$15.00	\$4.00	\$7.50	\$13.89	\$4.00	\$9.18	\$15.20	\$4.00	\$9.20	\$14.32
\$15.05	\$4.00	\$10.66	\$16.01	\$4.00	\$8.76	\$15.23	\$4.00	\$9.82	\$15.00
\$13.79	\$4.00	\$9.33	\$14.64	\$4.82	\$9.15	\$16.99	\$4.00	\$10.04	\$15.28
\$12.87	\$4.00	\$7.66	\$15.00	\$4.00	\$9.30	\$15.00	\$4.00	\$9.71	\$15.15
\$16.36	\$4.00	\$10.20	\$15.41	\$4.00	\$9.76	\$19.19	\$4.00	\$10.36	\$15.00
\$15.00	\$4.00	\$8.97	\$16.20	\$4.00	\$9.12	\$15.00	\$4.00	\$9.43	\$15.00
\$15.00	\$4.00	\$9.06	\$11.46	\$4.00	\$8.68	\$14.42	\$4.00	\$8.73	\$14.14
\$13.73	\$4.00	\$9.35	\$18.13	\$4.00	\$10.80	\$15.00	\$4.00	\$8.94	\$15.33
\$17.51	\$4.00	\$10.19	\$12.41	\$4.00	\$8.00	\$15.13	\$4.40	\$9.92	\$16.49
\$15.27	\$4.00	\$9.05	\$16.20	\$4.00	\$8.61	\$13.80	\$4.00	\$8.11	\$13.14
\$17.82	\$4.00	\$9.82	\$15.58	\$5.13	\$10.27	\$15.00	\$4.00	\$9.15	\$15.00
\$17.82	\$4.00	\$8.20	\$18.46	\$4.00	\$10.70	\$15.00	\$4.00	\$7.82	\$19.60
\$15.06	\$4.00	\$9.09	\$18.39	\$4.00	\$9.53	\$18.07	\$4.00	\$12.06	\$19.24
\$11.51	\$4.00	\$7.16	\$13.74	\$4.00	\$6.87	\$17.18	\$4.00	\$11.11	\$16.77
\$15.00	\$4.00	\$8.45	\$15.00	\$5.74	\$9.95	\$15.00	\$4.10	\$8.35	\$17.85
\$15.65	\$4.00	\$9.58	\$16.61	\$4.00	\$9.68	\$15.00	\$4.00	\$9.82	\$18.99
\$14.34	\$4.00	\$7.97	\$16.38	\$4.00	\$8.45	\$10.61	\$4.00	\$7.90	\$16.57
\$15.00	\$4.00	\$8.10	\$17.52	\$4.00	\$9.71	\$15.00	\$4.00	\$9.92	\$18.11
\$15.00	\$4.62	\$9.99	\$16.22	\$4.00	\$9.73	\$15.00	\$4.34	\$9.52	\$17.11
\$15.00	\$4.00	\$9.52	\$14.84	\$4.00	\$7.97	\$15.71	\$4.00	\$10.00	\$15.19
\$15.50	\$4.48	\$9.52	\$15.00	\$4.00	\$9.38	\$15.00	\$4.00	\$9.26	\$15.39
\$15.00	\$4.00	\$8.67	\$16.61	\$5.73	\$11.16	\$15.00	\$4.00	\$8.58	\$12.61
\$15.00	\$4.00	\$7.91	\$15.00	\$4.00	\$9.87	\$15.00	\$4.00	\$8.53	\$19.24
\$15.50	\$4.00	\$10.20	\$16.13	\$4.00	\$10.17	\$16.79	\$4.04	\$9.90	\$15.36
\$13.61	\$4.00	\$8.25	\$18.46	\$4.00	\$9.71	\$13.76	\$4.00	\$7.57	\$14.55
\$17.82	\$4.00	\$9.54	\$14.81	\$4.00	\$7.90	\$13.49	\$4.00	\$8.55	\$16.55
\$17.52	\$4.00	\$9.13	\$14.93	\$4.00	\$7.45	\$15.00	\$4.00	\$9.47	\$15.00
\$14.94	\$4.00	\$9.00	\$17.32	\$4.00	\$9.92	\$16.58	\$4.00	\$8.40	\$15.00
\$15.00	\$4.00	\$7.84	\$15.06	\$4.00	\$10.83	\$12.26	\$4.00	\$6.19	\$16.91
\$15.00	\$4.00	\$9.00	\$17.64	\$4.00	\$10.38	\$11.71	\$4.00	\$8.65	\$15.00
\$15.31	\$4.00	\$9.18	\$18.34	\$4.00	\$10.08	\$12.05	\$4.00	\$7.87	\$17.11

\$15.28	\$4.08	\$8.86	\$15.46	\$4.17	\$9.11	\$15.54	\$4.11	\$9.34	\$16.02
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\$17.82			\$18.46			\$19.19			\$19.60
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		\$8.86			\$9.11			\$9.34	
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\$4.00			\$4.00			\$4.00			\$4.00
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13.82			14.46			15.19			15.60
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Nymex Detail-Annual Ranges

2025		2026			2027			2028	
min	avg	max	min	avg	max	min	avg	max	min
\$4.00	\$8.04	\$16.60	\$4.00	\$9.63	\$18.17	\$4.00	\$11.49	\$15.00	\$4.00
\$4.00	\$10.15	\$15.00	\$4.00	\$10.89	\$15.05	\$4.05	\$10.87	\$16.02	\$4.00
\$5.16	\$10.28	\$20.00	\$4.00	\$9.95	\$16.43	\$4.00	\$9.11	\$15.00	\$4.00
\$4.54	\$10.17	\$17.30	\$4.00	\$8.98	\$15.29	\$4.00	\$8.89	\$16.46	\$4.00
\$4.00	\$9.61	\$17.52	\$4.00	\$9.73	\$15.00	\$4.00	\$8.74	\$15.55	\$4.00
\$4.00	\$11.87	\$20.00	\$5.85	\$10.14	\$17.59	\$4.00	\$7.11	\$15.00	\$4.00
\$4.00	\$9.58	\$15.00	\$4.00	\$8.99	\$15.00	\$6.73	\$10.80	\$19.73	\$4.00
\$6.73	\$11.12	\$17.59	\$4.00	\$12.38	\$17.27	\$4.00	\$10.46	\$17.30	\$4.00
\$6.44	\$10.21	\$16.37	\$4.00	\$11.04	\$18.28	\$4.00	\$8.62	\$16.74	\$4.00
\$4.00	\$9.50	\$17.30	\$4.00	\$10.38	\$17.90	\$4.14	\$8.49	\$17.05	\$4.00
\$6.34	\$10.85	\$15.25	\$4.00	\$9.39	\$15.00	\$4.00	\$10.16	\$18.37	\$4.00
\$4.00	\$10.47	\$15.92	\$4.00	\$9.13	\$17.30	\$4.00	\$11.74	\$19.07	\$4.00
\$4.00	\$9.90	\$18.04	\$4.74	\$10.81	\$15.40	\$4.00	\$10.27	\$17.05	\$4.12
\$4.00	\$9.00	\$15.00	\$4.00	\$8.13	\$17.52	\$4.00	\$11.82	\$16.85	\$4.00
\$4.00	\$10.95	\$15.00	\$4.00	\$7.88	\$17.30	\$4.00	\$9.34	\$17.24	\$4.96
\$5.14	\$11.63	\$15.05	\$4.00	\$9.58	\$16.89	\$4.00	\$9.24	\$18.90	\$4.00
\$4.00	\$7.81	\$17.27	\$4.00	\$9.01	\$15.00	\$4.00	\$10.37	\$17.24	\$4.11
\$4.00	\$7.87	\$14.38	\$4.00	\$8.21	\$15.00	\$6.94	\$9.56	\$15.00	\$4.00
\$4.00	\$7.66	\$19.73	\$4.00	\$8.99	\$12.77	\$4.00	\$7.87	\$15.07	\$4.00
\$4.00	\$9.37	\$15.00	\$4.00	\$9.98	\$15.00	\$4.00	\$9.01	\$14.99	\$6.23
\$4.00	\$9.40	\$16.84	\$4.00	\$11.20	\$15.00	\$4.00	\$9.80	\$16.65	\$4.00
\$4.00	\$10.35	\$15.00	\$7.62	\$10.90	\$20.00	\$5.02	\$10.57	\$19.73	\$4.00
\$4.00	\$11.40	\$15.61	\$4.00	\$8.67	\$19.73	\$4.00	\$10.76	\$15.11	\$5.44
\$4.00	\$9.90	\$16.10	\$5.81	\$11.77	\$15.70	\$5.42	\$9.58	\$16.41	\$4.00
\$4.00	\$8.14	\$13.42	\$4.00	\$8.42	\$16.35	\$4.00	\$9.10	\$19.73	\$4.00
\$4.00	\$9.71	\$16.11	\$5.79	\$10.86	\$16.29	\$4.00	\$11.82	\$16.06	\$4.00
\$4.00	\$7.69	\$13.44	\$4.00	\$7.90	\$17.88	\$4.00	\$11.24	\$15.95	\$4.67
\$4.00	\$8.83	\$14.00	\$4.00	\$8.33	\$20.00	\$4.00	\$11.43	\$16.87	\$4.00
\$5.21	\$10.73	\$15.27	\$4.00	\$9.34	\$20.00	\$4.00	\$12.61	\$16.39	\$4.00
\$4.15	\$11.62	\$19.61	\$4.00	\$7.46	\$20.00	\$4.00	\$10.78	\$15.00	\$4.00
\$5.86	\$9.99	\$15.00	\$4.00	\$8.38	\$14.10	\$4.00	\$8.38	\$15.00	\$4.00
\$4.00	\$10.72	\$18.45	\$4.00	\$11.07	\$17.64	\$4.00	\$10.11	\$15.92	\$4.00
\$4.00	\$8.01	\$15.00	\$4.00	\$10.11	\$17.52	\$4.00	\$9.21	\$19.73	\$4.00
\$4.00	\$10.46	\$18.42	\$5.71	\$11.14	\$15.00	\$4.00	\$11.02	\$15.35	\$4.00
\$4.94	\$10.88	\$12.15	\$4.00	\$7.22	\$20.00	\$4.00	\$10.05	\$20.00	\$4.00
\$4.00	\$10.16	\$15.00	\$4.00	\$9.06	\$15.00	\$4.00	\$11.63	\$14.89	\$4.00
\$4.00	\$10.39	\$15.67	\$4.00	\$9.32	\$15.65	\$4.00	\$8.73	\$17.19	\$5.30
\$4.00	\$10.54	\$15.02	\$4.00	\$10.54	\$15.00	\$4.00	\$8.69	\$17.05	\$4.00
\$4.00	\$7.22	\$16.01	\$4.00	\$8.56	\$17.30	\$4.00	\$10.80	\$17.52	\$4.00
\$4.00	\$10.87	\$13.88	\$4.00	\$8.84	\$15.00	\$6.18	\$9.67	\$17.52	\$4.67
\$4.00	\$9.34	\$13.80	\$4.00	\$7.80	\$19.05	\$4.00	\$8.50	\$15.00	\$4.50
\$4.00	\$6.79	\$17.52	\$4.00	\$8.60	\$16.20	\$4.00	\$9.99	\$18.05	\$4.00
\$4.00	\$9.34	\$15.00	\$4.00	\$8.81	\$19.73	\$4.00	\$10.28	\$17.30	\$4.00
\$4.00	\$9.40	\$19.16	\$4.00	\$8.58	\$15.00	\$4.00	\$10.54	\$15.00	\$4.36
\$4.00	\$10.34	\$15.00	\$4.00	\$10.01	\$16.53	\$4.00	\$10.22	\$11.17	\$4.00
\$4.00	\$10.22	\$19.41	\$4.00	\$11.32	\$15.00	\$5.62	\$10.22	\$15.00	\$6.51
\$7.08	\$12.09	\$17.61	\$4.00	\$8.55	\$15.00	\$4.00	\$8.58	\$17.30	\$4.00
\$4.00	\$10.39	\$15.00	\$4.00	\$9.75	\$20.00	\$4.00	\$10.58	\$17.30	\$4.00
\$4.00	\$9.12	\$15.00	\$4.00	\$9.89	\$15.00	\$4.00	\$10.52	\$19.42	\$4.00
\$4.00	\$9.05	\$19.73	\$4.00	\$9.42	\$13.57	\$4.79	\$10.72	\$15.57	\$4.22
\$4.00	\$7.98	\$15.00	\$4.00	\$7.97	\$17.52	\$5.56	\$11.10	\$18.34	\$4.00
\$4.00	\$10.66	\$17.30	\$4.00	\$9.51	\$18.70	\$4.00	\$10.71	\$20.00	\$4.00

Nymex Detail-Annual Ranges

\$4.00	\$9.05	\$15.00	\$4.63	\$9.27	\$20.00	\$4.57	\$10.77	\$14.38	\$4.00
\$4.00	\$9.94	\$15.90	\$4.00	\$10.33	\$15.32	\$5.99	\$11.70	\$17.02	\$4.00
\$4.00	\$8.48	\$15.68	\$7.38	\$11.62	\$20.00	\$4.00	\$9.22	\$17.52	\$4.00
\$4.00	\$9.99	\$16.64	\$4.00	\$10.12	\$19.51	\$4.00	\$10.30	\$15.00	\$5.55
\$4.00	\$9.88	\$13.84	\$4.00	\$9.16	\$15.00	\$4.00	\$9.41	\$18.74	\$4.63
\$4.00	\$9.36	\$14.71	\$4.65	\$9.72	\$14.81	\$4.00	\$8.71	\$14.12	\$4.00
\$4.59	\$10.05	\$16.05	\$4.00	\$8.41	\$16.96	\$4.06	\$11.62	\$15.00	\$4.00
\$4.00	\$10.03	\$20.00	\$4.00	\$10.89	\$17.52	\$4.00	\$10.50	\$15.00	\$4.00
\$4.00	\$7.95	\$16.85	\$4.00	\$11.28	\$16.42	\$4.10	\$10.96	\$17.30	\$4.00
\$5.95	\$10.09	\$17.30	\$4.00	\$12.60	\$14.71	\$4.00	\$8.21	\$14.82	\$4.00
\$4.00	\$7.36	\$17.30	\$4.00	\$10.98	\$18.57	\$7.10	\$12.03	\$15.00	\$4.00
\$4.00	\$10.22	\$19.73	\$4.00	\$10.54	\$15.74	\$4.00	\$8.57	\$15.00	\$4.00
\$4.00	\$8.31	\$15.00	\$4.00	\$9.61	\$16.18	\$4.00	\$10.25	\$16.60	\$4.00
\$4.00	\$8.76	\$15.00	\$4.00	\$8.79	\$17.87	\$4.00	\$9.87	\$15.64	\$4.00
\$4.00	\$10.34	\$17.30	\$4.00	\$10.54	\$17.52	\$4.00	\$10.53	\$15.00	\$4.00
\$4.00	\$11.36	\$19.73	\$4.00	\$10.01	\$15.00	\$4.00	\$10.46	\$17.75	\$4.00
\$4.00	\$9.92	\$17.52	\$4.29	\$11.76	\$16.20	\$4.00	\$9.82	\$15.63	\$4.01
\$4.00	\$9.30	\$16.48	\$4.00	\$9.47	\$17.88	\$4.00	\$9.62	\$15.00	\$4.00
\$4.00	\$10.00	\$15.00	\$4.00	\$10.03	\$15.00	\$4.00	\$9.47	\$15.69	\$4.00
\$4.00	\$9.48	\$14.32	\$4.00	\$9.36	\$17.30	\$4.00	\$10.17	\$17.30	\$4.00
\$4.30	\$10.32	\$15.00	\$4.00	\$7.67	\$13.99	\$4.00	\$8.81	\$16.02	\$4.00
\$6.83	\$10.93	\$14.11	\$4.00	\$9.50	\$15.12	\$4.00	\$9.42	\$17.85	\$4.00
\$4.00	\$9.32	\$15.00	\$4.00	\$10.46	\$19.73	\$4.00	\$9.73	\$19.73	\$4.00
\$4.07	\$11.48	\$20.00	\$4.00	\$10.37	\$17.52	\$4.00	\$11.56	\$15.00	\$4.00
\$4.00	\$10.22	\$13.18	\$5.10	\$9.96	\$15.00	\$4.00	\$8.69	\$16.81	\$4.00
\$4.00	\$8.73	\$13.15	\$4.00	\$7.73	\$19.03	\$4.00	\$11.17	\$20.00	\$5.18
\$4.24	\$8.74	\$16.08	\$4.00	\$9.87	\$16.48	\$4.00	\$10.78	\$16.99	\$4.00
\$4.00	\$8.16	\$15.00	\$4.00	\$9.47	\$20.00	\$4.00	\$9.72	\$15.29	\$4.00
\$5.52	\$11.05	\$16.92	\$4.00	\$8.47	\$14.79	\$4.00	\$7.91	\$15.00	\$4.00
\$6.22	\$9.99	\$17.30	\$4.00	\$10.88	\$15.75	\$4.00	\$11.41	\$15.00	\$4.11
\$4.00	\$9.42	\$15.00	\$4.00	\$9.66	\$16.30	\$4.00	\$9.06	\$17.52	\$4.00
\$4.04	\$8.47	\$15.59	\$4.00	\$8.40	\$17.48	\$4.00	\$10.50	\$17.18	\$4.00
\$4.77	\$12.17	\$14.93	\$4.00	\$9.74	\$20.00	\$4.00	\$9.26	\$17.52	\$4.00
\$4.00	\$7.41	\$20.00	\$4.00	\$10.61	\$17.49	\$4.00	\$11.85	\$15.91	\$4.00
\$4.86	\$9.32	\$17.42	\$4.00	\$12.13	\$15.00	\$4.00	\$8.21	\$15.00	\$4.67
\$4.00	\$9.60	\$15.00	\$4.00	\$10.67	\$16.18	\$4.00	\$10.56	\$16.76	\$4.00
\$4.43	\$8.42	\$17.13	\$4.00	\$9.51	\$15.00	\$4.00	\$10.56	\$15.00	\$4.00
\$4.58	\$10.94	\$20.00	\$4.00	\$10.08	\$20.00	\$4.00	\$13.15	\$19.73	\$8.46
\$4.00	\$10.07	\$15.00	\$4.00	\$10.29	\$17.30	\$4.00	\$8.00	\$17.51	\$4.00
\$4.00	\$8.39	\$18.60	\$4.00	\$10.44	\$15.00	\$4.00	\$8.79	\$16.13	\$4.00
\$4.00	\$10.48	\$16.80	\$4.00	\$10.78	\$17.30	\$4.00	\$10.39	\$19.73	\$4.13
\$4.00	\$9.17	\$16.04	\$4.00	\$10.07	\$20.00	\$4.00	\$10.79	\$15.00	\$4.00
\$4.00	\$8.79	\$20.00	\$4.00	\$9.76	\$15.00	\$4.00	\$8.63	\$17.52	\$4.00
\$4.00	\$6.75	\$17.52	\$4.00	\$10.66	\$13.68	\$4.00	\$7.69	\$17.48	\$4.00
\$4.00	\$8.06	\$15.14	\$4.00	\$10.78	\$18.06	\$4.00	\$12.03	\$17.52	\$4.00
\$4.00	\$9.83	\$15.00	\$4.00	\$11.13	\$16.09	\$4.00	\$10.65	\$15.76	\$4.00
\$4.00	\$10.81	\$13.96	\$4.00	\$9.65	\$15.00	\$4.00	\$10.67	\$19.73	\$4.00
\$4.00	\$7.12	\$15.00	\$4.00	\$10.03	\$15.92	\$4.00	\$8.68	\$15.00	\$4.00
\$4.64	\$11.27	\$15.00	\$4.00	\$8.54	\$14.83	\$5.35	\$10.54	\$17.30	\$4.00
\$4.00	\$8.34	\$14.98	\$4.00	\$9.12	\$17.52	\$4.00	\$10.56	\$15.10	\$8.08
\$4.00	\$12.04	\$14.56	\$4.00	\$7.83	\$15.00	\$4.00	\$9.46	\$20.00	\$4.00
\$4.00	\$9.97	\$16.36	\$4.00	\$9.63	\$17.30	\$4.00	\$10.09	\$14.93	\$4.00
\$4.00	\$9.17	\$15.00	\$4.00	\$10.12	\$15.45	\$4.00	\$10.46	\$15.83	\$4.00
\$4.00	\$8.77	\$19.16	\$4.00	\$11.30	\$20.00	\$4.00	\$10.69	\$16.12	\$4.00

Nymex Detail-Annual Ranges

\$4.00	\$9.42	\$17.52	\$5.52	\$11.09	\$15.00	\$4.00	\$11.14	\$17.52	\$4.00
\$4.00	\$8.29	\$15.00	\$4.00	\$8.99	\$17.52	\$4.00	\$8.23	\$19.58	\$4.00
\$4.00	\$8.74	\$15.19	\$4.00	\$11.54	\$15.00	\$4.00	\$9.02	\$16.31	\$4.00
\$4.00	\$10.01	\$15.00	\$4.00	\$6.87	\$15.00	\$4.00	\$9.96	\$15.29	\$4.00
\$4.00	\$9.41	\$17.30	\$4.00	\$9.10	\$15.00	\$4.00	\$10.24	\$18.95	\$5.41
\$4.00	\$8.62	\$17.46	\$4.00	\$11.05	\$15.00	\$4.00	\$7.87	\$15.00	\$4.00
\$4.00	\$11.80	\$15.75	\$4.00	\$10.54	\$15.09	\$4.00	\$9.78	\$18.61	\$4.00
\$5.18	\$8.50	\$17.52	\$4.00	\$11.11	\$17.30	\$4.00	\$11.94	\$16.38	\$4.00
\$5.76	\$11.18	\$19.76	\$4.00	\$9.20	\$15.00	\$4.00	\$9.18	\$16.50	\$4.00
\$4.00	\$9.86	\$20.00	\$4.00	\$10.90	\$13.88	\$4.00	\$9.18	\$15.00	\$4.00
\$4.00	\$10.64	\$18.67	\$4.00	\$12.44	\$15.00	\$4.00	\$10.69	\$17.30	\$4.00
\$4.00	\$8.83	\$15.00	\$5.62	\$10.38	\$20.00	\$4.00	\$11.31	\$16.68	\$4.00
\$4.00	\$9.40	\$15.00	\$6.15	\$11.23	\$20.00	\$4.04	\$10.32	\$19.36	\$4.00
\$4.00	\$6.86	\$15.00	\$4.00	\$10.98	\$17.52	\$4.00	\$10.33	\$15.00	\$4.00
\$4.00	\$7.44	\$19.73	\$5.89	\$10.95	\$17.52	\$4.00	\$10.32	\$15.00	\$4.00
\$4.00	\$11.48	\$20.00	\$7.12	\$12.34	\$16.20	\$4.00	\$10.68	\$15.00	\$4.00
\$4.00	\$9.34	\$15.00	\$4.00	\$9.00	\$13.77	\$4.00	\$7.46	\$20.00	\$4.00
\$5.91	\$11.01	\$19.91	\$4.00	\$8.81	\$15.00	\$4.00	\$11.23	\$15.00	\$4.00
\$5.98	\$13.04	\$13.46	\$4.00	\$7.86	\$15.00	\$4.00	\$9.43	\$19.73	\$4.00
\$4.00	\$9.79	\$17.23	\$4.00	\$10.55	\$17.52	\$4.00	\$9.55	\$17.54	\$6.06
\$4.00	\$9.89	\$15.05	\$4.00	\$8.85	\$16.35	\$4.00	\$9.91	\$17.43	\$4.67
\$4.00	\$8.71	\$15.01	\$5.21	\$10.37	\$15.55	\$4.00	\$10.41	\$19.39	\$4.00
\$4.00	\$9.02	\$15.00	\$4.00	\$9.75	\$15.00	\$4.00	\$9.33	\$15.00	\$4.00
\$4.00	\$9.01	\$17.69	\$4.00	\$11.35	\$15.94	\$4.00	\$9.45	\$20.00	\$5.27
\$4.00	\$8.60	\$15.00	\$4.00	\$8.79	\$15.00	\$4.00	\$10.20	\$15.00	\$4.00
\$4.71	\$10.70	\$18.97	\$4.00	\$10.82	\$17.52	\$4.00	\$11.75	\$17.52	\$4.00
\$4.46	\$10.85	\$17.30	\$4.00	\$8.33	\$20.00	\$4.00	\$10.65	\$12.11	\$4.00
\$4.00	\$7.70	\$15.00	\$4.00	\$10.04	\$15.00	\$4.00	\$9.18	\$17.28	\$4.00
\$4.00	\$10.37	\$15.00	\$4.00	\$10.04	\$18.41	\$4.00	\$9.92	\$15.00	\$4.00
\$4.00	\$8.60	\$13.90	\$4.00	\$6.90	\$19.73	\$4.00	\$9.97	\$18.46	\$4.00
\$4.00	\$7.09	\$15.02	\$4.00	\$9.05	\$15.00	\$4.00	\$8.62	\$15.00	\$4.00
\$4.00	\$9.86	\$15.74	\$4.00	\$10.95	\$16.66	\$4.64	\$10.99	\$15.94	\$8.33
\$4.00	\$9.65	\$16.68	\$4.00	\$10.56	\$16.38	\$4.00	\$9.48	\$20.00	\$4.00
\$4.00	\$8.64	\$15.00	\$4.00	\$8.28	\$13.12	\$6.47	\$9.12	\$17.30	\$6.62
\$4.00	\$11.05	\$15.00	\$4.00	\$10.04	\$15.00	\$4.00	\$9.67	\$17.52	\$4.00
\$4.64	\$9.78	\$17.43	\$4.00	\$10.05	\$16.34	\$4.00	\$12.22	\$15.39	\$4.00
\$4.00	\$9.67	\$16.29	\$4.47	\$10.36	\$15.00	\$4.00	\$8.62	\$15.35	\$4.00
\$4.00	\$10.40	\$18.19	\$6.51	\$11.80	\$14.17	\$4.00	\$8.67	\$14.50	\$4.00
\$4.00	\$9.73	\$15.00	\$4.00	\$7.35	\$15.00	\$4.00	\$9.33	\$16.14	\$4.00
\$4.00	\$10.77	\$17.94	\$4.00	\$10.25	\$18.52	\$4.00	\$11.65	\$15.87	\$4.00
\$4.00	\$9.40	\$13.91	\$4.00	\$7.69	\$17.52	\$4.00	\$8.90	\$15.00	\$4.00
\$5.95	\$11.87	\$17.26	\$4.00	\$9.18	\$11.62	\$4.00	\$7.15	\$17.30	\$4.00
\$4.00	\$9.11	\$17.30	\$4.00	\$9.37	\$15.00	\$4.00	\$9.26	\$17.30	\$4.00
\$4.00	\$9.83	\$14.25	\$4.00	\$7.13	\$16.97	\$4.00	\$9.80	\$15.00	\$4.00
\$4.00	\$10.66	\$17.30	\$4.00	\$10.71	\$16.03	\$4.09	\$10.08	\$17.52	\$4.00
\$4.00	\$9.43	\$15.00	\$4.00	\$9.04	\$19.16	\$4.00	\$10.13	\$14.87	\$4.00
\$4.00	\$9.49	\$17.07	\$4.00	\$10.23	\$17.30	\$4.04	\$9.75	\$15.76	\$5.80
\$4.00	\$8.99	\$20.00	\$4.00	\$11.30	\$15.85	\$4.00	\$10.25	\$15.00	\$4.10
\$4.00	\$8.73	\$14.17	\$4.00	\$9.41	\$19.47	\$4.00	\$10.18	\$15.00	\$4.00
\$4.00	\$10.39	\$18.45	\$4.00	\$10.83	\$13.66	\$4.00	\$6.52	\$14.89	\$4.00
\$4.00	\$10.19	\$18.11	\$4.00	\$10.61	\$14.50	\$4.00	\$8.85	\$16.11	\$4.00
\$4.00	\$9.62	\$15.54	\$4.00	\$9.56	\$15.00	\$4.00	\$9.02	\$15.25	\$4.00
\$4.00	\$9.38	\$16.80	\$4.00	\$9.20	\$15.03	\$4.00	\$9.98	\$16.81	\$4.00
\$4.19	\$8.88	\$16.14	\$4.00	\$8.50	\$19.73	\$4.00	\$11.01	\$16.75	\$6.29

Nymex Detail-Annual Ranges

\$4.00	\$9.15	\$19.68	\$4.00	\$12.13	\$15.51	\$4.72	\$11.43	\$18.55	\$4.00
\$4.00	\$8.25	\$15.37	\$4.00	\$10.24	\$15.30	\$4.00	\$10.42	\$17.63	\$4.14
\$4.00	\$9.01	\$17.30	\$4.00	\$8.64	\$15.00	\$4.00	\$9.96	\$15.83	\$4.00
\$4.00	\$9.43	\$15.34	\$4.00	\$10.44	\$15.00	\$4.00	\$8.49	\$17.30	\$4.00
\$4.00	\$10.71	\$15.11	\$4.00	\$9.77	\$15.53	\$4.00	\$9.23	\$16.43	\$4.00
\$4.96	\$11.10	\$15.00	\$5.33	\$10.69	\$17.52	\$6.45	\$11.58	\$15.00	\$4.00
\$4.21	\$11.43	\$15.00	\$4.00	\$9.50	\$15.00	\$4.00	\$8.84	\$15.94	\$4.00
\$6.22	\$10.45	\$19.41	\$4.00	\$9.07	\$18.79	\$4.00	\$9.56	\$20.00	\$7.20
\$5.71	\$10.51	\$14.51	\$4.00	\$9.06	\$15.00	\$4.00	\$9.82	\$16.12	\$4.00
\$4.00	\$9.46	\$15.00	\$4.00	\$9.82	\$15.85	\$4.00	\$10.61	\$19.30	\$4.00
\$4.00	\$10.53	\$17.30	\$4.00	\$9.87	\$17.52	\$4.00	\$10.44	\$16.06	\$4.75
\$4.82	\$10.80	\$17.30	\$4.00	\$10.94	\$17.52	\$4.00	\$8.93	\$17.87	\$4.77
\$4.00	\$8.68	\$17.89	\$4.00	\$10.06	\$16.97	\$4.87	\$9.89	\$16.61	\$4.00
\$4.00	\$10.12	\$16.48	\$4.00	\$9.75	\$15.00	\$4.00	\$7.88	\$15.00	\$4.00
\$4.00	\$9.55	\$12.06	\$4.00	\$7.79	\$15.00	\$4.00	\$10.76	\$17.30	\$4.00
\$4.00	\$9.88	\$13.16	\$4.00	\$7.25	\$17.39	\$4.00	\$7.48	\$15.00	\$4.00
\$4.00	\$9.57	\$15.00	\$5.30	\$11.15	\$15.75	\$4.00	\$8.55	\$13.21	\$4.00
\$4.00	\$9.05	\$15.00	\$4.00	\$9.08	\$15.00	\$4.00	\$10.28	\$15.00	\$4.00
\$4.90	\$9.48	\$14.61	\$4.00	\$9.47	\$19.73	\$4.00	\$10.94	\$17.03	\$5.54
\$4.29	\$9.57	\$15.00	\$4.00	\$10.02	\$17.25	\$4.00	\$11.47	\$16.84	\$7.34
\$4.00	\$10.79	\$15.00	\$4.00	\$9.65	\$16.39	\$4.93	\$10.56	\$17.52	\$4.00
\$4.00	\$9.74	\$15.00	\$4.00	\$9.19	\$18.27	\$4.00	\$10.52	\$15.00	\$4.00
\$4.00	\$10.99	\$11.93	\$4.00	\$7.22	\$19.64	\$4.00	\$10.46	\$13.33	\$4.00
\$4.00	\$9.34	\$15.23	\$4.00	\$9.71	\$16.17	\$4.00	\$10.04	\$16.89	\$4.90
\$4.00	\$7.76	\$15.88	\$4.91	\$10.77	\$15.00	\$5.03	\$10.06	\$15.00	\$4.00
\$4.00	\$10.97	\$15.00	\$4.00	\$9.99	\$15.00	\$4.00	\$9.88	\$17.35	\$4.00
\$7.67	\$13.12	\$20.00	\$4.00	\$11.53	\$15.57	\$4.00	\$9.53	\$17.30	\$4.00
\$4.00	\$9.35	\$18.90	\$4.00	\$10.03	\$16.35	\$4.00	\$9.77	\$17.72	\$4.00
\$4.00	\$9.54	\$13.87	\$4.00	\$9.20	\$15.00	\$4.00	\$9.32	\$16.27	\$4.28
\$4.00	\$10.98	\$17.87	\$4.00	\$9.44	\$15.00	\$4.00	\$9.93	\$15.00	\$4.00
\$4.00	\$8.71	\$20.00	\$4.00	\$9.47	\$19.27	\$4.00	\$9.90	\$17.52	\$4.00
\$4.20	\$11.04	\$20.00	\$4.21	\$10.55	\$15.00	\$4.00	\$10.34	\$20.00	\$4.00
\$4.41	\$10.04	\$16.74	\$4.00	\$9.78	\$18.28	\$4.00	\$11.01	\$17.30	\$4.00
\$4.00	\$8.44	\$15.00	\$4.00	\$9.75	\$17.52	\$4.00	\$11.09	\$17.59	\$4.00
\$4.00	\$9.43	\$15.00	\$4.00	\$10.38	\$16.45	\$4.00	\$9.46	\$18.87	\$6.69
\$4.00	\$8.72	\$17.52	\$4.00	\$11.43	\$15.00	\$4.60	\$9.49	\$18.50	\$4.00
\$4.00	\$9.87	\$16.94	\$4.00	\$8.72	\$19.73	\$4.00	\$9.57	\$15.00	\$4.00
\$4.00	\$8.48	\$15.58	\$4.00	\$8.58	\$19.21	\$4.00	\$10.15	\$15.01	\$5.82
\$4.00	\$9.01	\$15.00	\$4.00	\$9.43	\$15.00	\$4.00	\$9.75	\$16.24	\$4.00
\$4.00	\$10.20	\$17.52	\$4.45	\$12.29	\$19.42	\$4.00	\$11.37	\$16.64	\$4.00
\$4.26	\$9.67	\$16.28	\$4.18	\$9.78	\$16.54	\$4.16	\$9.96	\$16.60	\$4.28

		\$20.00			\$20.00			\$20.00	
	\$9.67			\$9.78			\$9.96		
		\$4.00			\$4.00			\$4.00	
		16.00			16.00			16.00	

Nymex Detail-Annual Ranges

avg
\$9.07
\$9.17
\$10.65
\$11.00
\$8.68
\$9.08
\$10.73
\$10.39
\$8.82
\$10.19
\$10.65
\$9.96
\$9.75
\$8.80
\$9.73
\$11.52
\$11.69
\$10.40
\$11.04
\$9.46
\$9.87
\$9.02
\$11.46
\$10.03
\$10.27
\$10.21
\$10.35
\$11.37
\$9.11
\$10.92
\$9.29
\$9.11
\$10.48
\$10.37
\$11.16
\$8.80
\$10.97
\$10.17
\$9.24
\$11.02
\$9.87
\$11.12
\$11.41
\$8.89
\$7.87
\$9.34
\$8.55
\$9.35
\$11.53
\$9.50
\$11.23
\$13.21

Nymex Detail-Annual Ranges

\$9.64
\$9.32
\$11.28
\$11.33
\$13.34
\$8.24
\$9.32
\$8.74
\$9.09
\$6.85
\$10.30
\$10.02
\$10.16
\$8.88
\$8.32
\$9.78
\$10.50
\$10.01
\$9.78
\$9.96
\$10.12
\$11.65
\$9.82
\$11.03
\$9.89
\$10.72
\$9.91
\$8.45
\$8.74
\$9.74
\$10.79
\$9.62
\$10.93
\$9.57
\$10.43
\$10.76
\$8.94
\$12.23
\$10.77
\$10.85
\$10.96
\$9.32
\$10.47
\$10.36
\$9.00
\$9.91
\$8.88
\$8.89
\$9.74
\$12.31
\$12.38
\$9.45
\$8.47
\$10.94

Nymex Detail-Annual Ranges

\$12.07
\$10.65
\$9.64
\$11.54
\$11.86
\$7.97
\$10.76
\$9.80
\$11.05
\$8.36
\$10.69
\$11.73
\$10.72
\$9.88
\$10.65
\$11.70
\$12.43
\$10.96
\$9.79
\$10.86
\$10.97
\$9.28
\$10.21
\$10.35
\$9.44
\$10.29
\$9.40
\$11.08
\$9.01
\$10.60
\$7.78
\$11.49
\$10.93
\$12.99
\$11.55
\$11.09
\$10.02
\$8.41
\$8.87
\$9.13
\$8.74
\$10.24
\$9.01
\$10.79
\$10.74
\$9.75
\$11.22
\$11.36
\$8.90
\$9.27
\$10.12
\$10.81
\$11.62
\$11.79

Nymex Detail-Annual Ranges

\$9.24
\$11.62
\$9.34
\$10.07
\$11.18
\$9.84
\$10.79
\$12.62
\$9.10
\$8.62
\$11.80
\$10.93
\$11.26
\$9.61
\$9.53
\$9.98
\$9.11
\$10.40
\$10.22
\$11.32
\$11.88
\$10.67
\$6.81
\$10.56
\$9.18
\$9.15
\$10.40
\$8.44
\$10.47
\$9.31
\$10.18
\$11.52
\$10.97
\$11.03
\$11.91
\$11.49
\$10.13
\$10.44
\$10.62
\$9.09
\$10.19

\$10.19

Appendix H
Avoided Cost Calculations

**CASCADE NATURAL GAS CORPORATION
INTEGRATED RESOURCE PLAN
BASECASE - MEDIUM FORECAST - AVERAGE WEATHER
45 YEAR RESOURCE SUMMARY COSTS - MELDED COST PER THERM**

YEAR	IRP ANNUAL PORTFOLIO COST PER THERM (PV)*	NOMINAL COST PER THERM	RESOURCE PORTFOLIO COST - % CHANGE	PV OF RESOURCE PORTFOLIO COST/THERM	PORTFOLIO COSTS WITH 10% CONSERVATION CREDIT	COST- EFFECTIVENESS LIMIT
2009	1	\$ 0.87	\$ 0.94	\$ 0.87	\$0.96	
2010	2	\$ 0.75	\$ 0.87	\$ -7.79%	\$1.78	
2011	3	\$ 0.73	\$ 0.91	\$ 5.05%	\$2.58	
2012	4	\$ 0.70	\$ 0.94	\$ 3.32%	\$3.35	
2013	5	\$ 0.66	\$ 0.95	\$ 1.42%	\$4.08	
2014	6	\$ 0.62	\$ 0.97	\$ 1.68%	\$4.76	
2015	7	\$ 0.57	\$ 0.95	\$ -2.14%	\$5.39	\$0.9031
2016	8	\$ 0.53	\$ 0.96	\$ 1.32%	\$5.97	
2017	9	\$ 0.50	\$ 0.97	\$ 0.65%	\$6.52	
2018	10	\$ 0.47	\$ 0.97	\$ 0.61%	\$7.03	\$0.8747
2019	11	\$ 0.44	\$ 0.98	\$ 0.93%	\$7.52	
2020	12	\$ 0.41	\$ 0.98	\$ 0.21%	\$7.96	
2021	13	\$ 0.37	\$ 0.96	\$ -2.35%	\$8.37	
2022	14	\$ 0.34	\$ 0.97	\$ 0.54%	\$8.75	
2023	15	\$ 0.33	\$ 0.99	\$ 2.51%	\$9.11	
2024	16	\$ 0.31	\$ 1.01	\$ 2.50%	\$9.45	
2025	17	\$ 0.30	\$ 1.05	\$ 3.94%	\$9.79	
2026	18	\$ 0.28	\$ 1.05	\$ -0.21%	\$10.09	
2027	19	\$ 0.27	\$ 1.10	\$ 4.77%	\$10.39	
2028	20	\$ 0.29	\$ 1.27	\$ 14.93%	\$10.71	\$0.8003
2029	21	\$ 0.27	\$ 1.30	\$ 2.60%	\$11.02	
2030	22	\$ 0.26	\$ 1.33	\$ 2.60%	\$11.31	
2031	23	\$ 0.25	\$ 1.37	\$ 2.60%	\$11.59	
2032	24	\$ 0.24	\$ 1.40	\$ 2.60%	\$11.85	
2033	25	\$ 0.23	\$ 1.44	\$ 2.60%	\$12.11	
2034	26	\$ 0.22	\$ 1.48	\$ 2.60%	\$12.35	
2035	27	\$ 0.21	\$ 1.52	\$ 2.60%	\$12.57	
2036	28	\$ 0.20	\$ 1.56	\$ 2.60%	\$12.79	
2037	29	\$ 0.19	\$ 1.60	\$ 2.60%	\$13.00	
2038	30	\$ 0.18	\$ 1.64	\$ 2.60%	\$13.20	\$0.7792
2039	31	\$ 0.17	\$ 1.68	\$ 2.60%	\$13.39	
2040	32	\$ 0.16	\$ 1.72	\$ 2.60%	\$13.57	
2041	33	\$ 0.16	\$ 1.77	\$ 2.60%	\$13.74	
2042	34	\$ 0.15	\$ 1.82	\$ 2.60%	\$13.90	
2043	35	\$ 0.14	\$ 1.86	\$ 2.60%	\$14.06	\$0.7708
2044	36	\$ 0.14	\$ 1.91	\$ 2.60%	\$14.21	
2045	37	\$ 0.13	\$ 1.96	\$ 2.60%	\$14.35	
2046	38	\$ 0.12	\$ 2.01	\$ 2.60%	\$14.49	
2047	39	\$ 0.12	\$ 2.06	\$ 2.60%	\$14.62	
2048	40	\$ 0.11	\$ 2.12	\$ 2.60%	\$14.74	\$0.7636
2049	41	\$ 0.11	\$ 2.17	\$ 2.60%	\$14.86	
2050	42	\$ 0.10	\$ 2.23	\$ 2.60%	\$14.97	
2051	43	\$ 0.10	\$ 2.29	\$ 2.60%	\$15.07	
2052	44	\$ 0.09	\$ 2.35	\$ 2.60%	\$15.18	
2053	45	\$ 0.09	\$ 2.41	\$ 2.60%	\$15.27	\$0.7573

Cascade's Long Term Real Discount Rate: 4.170%
 IRP Discount Rate = 7.631%
 Revised Discount Rate= 7.631%
 Years 21-45 Escalation = 2.60% (EIA Inflation Rate)

**CASCADE NATURAL GAS CORPORATION
INTEGRATED RESOURCE PLAN
BASECASE - MEDIUM FORECAST - ENVIRONMENTAL EXTERNALITY 1
45 YEAR RESOURCE SUMMARY COSTS - MELED COST PER THERM**

YEAR	IRP ANNUAL PORTFOLIO COST PER THERM (PV)*	NOMINAL COST PER THERM	RESOURCE PORTFOLIO COST - % CHANGE	PV OF RESOURCE PORTFOLIO COST/THERM	PORTFOLIO COSTS WITH 10% CONSERVATION CREDIT	COST- EFFECTIVENESS LIMIT
2009	1	\$ 0.87	\$ 0.94		\$ 0.87	\$0.96
2010	2	\$ 0.83	\$ 0.96	2.05%	\$ 1.70	\$1.87
2011	3	\$ 0.85	\$ 1.06	10.49%	\$ 2.55	\$2.80
2012	4	\$ 0.86	\$ 1.16	9.19%	\$ 3.41	\$3.75
2013	5	\$ 0.86	\$ 1.24	7.44%	\$ 4.27	\$4.69
2014	6	\$ 0.86	\$ 1.34	7.94%	\$ 5.13	\$5.64
2015	7	\$ 0.80	\$ 1.34	0.28%	\$ 5.93	\$6.53
2016	8	\$ 0.77	\$ 1.38	3.04%	\$ 6.70	\$7.37
2017	9	\$ 0.73	\$ 1.42	2.56%	\$ 7.43	\$8.18
2018	10	\$ 0.70	\$ 1.46	2.64%	\$ 8.13	\$8.95
2019	11	\$ 0.67	\$ 1.50	2.96%	\$ 8.80	\$9.68
2020	12	\$ 0.64	\$ 1.54	2.35%	\$ 9.44	\$10.38
2021	13	\$ 0.60	\$ 1.55	1.10%	\$ 10.03	\$11.04
2022	14	\$ 0.57	\$ 1.60	2.90%	\$ 10.60	\$11.67
2023	15	\$ 0.55	\$ 1.67	4.27%	\$ 11.16	\$12.27
2024	16	\$ 0.54	\$ 1.74	4.22%	\$ 11.69	\$12.86
2025	17	\$ 0.54	\$ 1.87	7.67%	\$ 12.23	\$13.45
2026	18	\$ 0.52	\$ 1.94	3.88%	\$ 12.75	\$14.02
2027	19	\$ 0.49	\$ 1.99	2.31%	\$ 13.24	\$14.56
2028	20	\$ 0.60	\$ 2.61	31.24%	\$ 13.84	\$15.22
2029	21	\$ 0.34	\$ 2.68	2.60%	\$ 14.41	\$15.85
2030	22	\$ 0.54	\$ 2.75	2.60%	\$ 14.95	\$16.45
2031	23	\$ 0.52	\$ 2.82	2.60%	\$ 15.47	\$17.02
2032	24	\$ 0.49	\$ 2.89	2.60%	\$ 15.97	\$17.56
2033	25	\$ 0.47	\$ 2.97	2.60%	\$ 16.44	\$18.08
2034	26	\$ 0.45	\$ 3.04	2.60%	\$ 16.89	\$18.58
2035	27	\$ 0.43	\$ 3.12	2.60%	\$ 17.32	\$19.05
2036	28	\$ 0.41	\$ 3.20	2.60%	\$ 17.72	\$19.50
2037	29	\$ 0.39	\$ 3.29	2.60%	\$ 18.11	\$19.92
2038	30	\$ 0.37	\$ 3.37	2.60%	\$ 18.48	\$20.33
2039	31	\$ 0.35	\$ 3.46	2.60%	\$ 18.84	\$20.72
2040	32	\$ 0.34	\$ 3.55	2.60%	\$ 19.18	\$21.09
2041	33	\$ 0.32	\$ 3.64	2.60%	\$ 19.50	\$21.45
2042	34	\$ 0.31	\$ 3.74	2.60%	\$ 19.80	\$21.78
2043	35	\$ 0.29	\$ 3.83	2.60%	\$ 20.10	\$22.11
2044	36	\$ 0.28	\$ 3.93	2.60%	\$ 20.37	\$22.41
2045	37	\$ 0.27	\$ 4.03	2.60%	\$ 20.64	\$22.70
2046	38	\$ 0.25	\$ 4.14	2.60%	\$ 20.89	\$22.98
2047	39	\$ 0.24	\$ 4.25	2.60%	\$ 21.13	\$23.25
2048	40	\$ 0.23	\$ 4.36	2.60%	\$ 21.36	\$23.50
2049	41	\$ 0.22	\$ 4.47	2.60%	\$ 21.58	\$23.74
2050	42	\$ 0.21	\$ 4.59	2.60%	\$ 21.79	\$23.97
2051	43	\$ 0.20	\$ 4.71	2.60%	\$ 21.99	\$24.19
2052	44	\$ 0.19	\$ 4.83	2.60%	\$ 22.18	\$24.40
2053	45	\$ 0.18	\$ 4.95	2.60%	\$ 22.36	\$24.60

Cascade's Long Term Real Discount Rate: 4.170%
 IRP Discount Rate = 7.631%
 Revised Discount Rate= 7.631%
 Years 21-45 Escalation = 2.60% (EIA Inflation Rate)

**CASCADE NATURAL GAS CORPORATION
INTEGRATED RESOURCE PLAN
BASECASE - MEDIUM FORECAST - ENVIRONMENTAL EXTERNALITY 3
45 YEAR RESOURCE SUMMARY COSTS - MELED COST PER THERM**

YEAR	IRP ANNUAL PORTFOLIO COST PER THERM (PV)*	NOMINAL COST PER THERM	RESOURCE PORTFOLIO COST - % CHANGE	PV OF RESOURCE PORTFOLIO COST/THERM	PORTFOLIO COSTS WITH 10% CONSERVATION CREDIT	COST- EFFECTIVENESS LIMIT
2009	1	\$ 0.83	\$ 0.90	\$ 0.83	\$0.92	
2010	2	\$ 0.84	\$ 0.97	8.41%	\$1.84	
2011	3	\$ 0.83	\$ 1.04	6.57%	\$2.76	
2012	4	\$ 0.87	\$ 1.16	11.99%	\$3.71	
2013	5	\$ 0.84	\$ 1.21	4.15%	\$4.63	
2014	6	\$ 0.81	\$ 1.27	4.58%	\$5.53	
2015	7	\$ 0.75	\$ 1.26	-0.62%	\$6.36	\$1.0946
2016	8	\$ 0.70	\$ 1.26	-0.01%	\$7.13	
2017	9	\$ 0.65	\$ 1.26	0.16%	\$7.84	
2018	10	\$ 0.61	\$ 1.26	0.27%	\$8.51	\$1.0964
2019	11	\$ 0.57	\$ 1.27	0.51%	\$9.13	
2020	12	\$ 0.53	\$ 1.27	0.13%	\$9.71	
2021	13	\$ 0.48	\$ 1.24	-2.26%	\$10.23	
2022	14	\$ 0.44	\$ 1.25	0.16%	\$10.72	
2023	15	\$ 0.42	\$ 1.27	1.77%	\$11.19	
2024	16	\$ 0.40	\$ 1.29	1.99%	\$11.62	
2025	17	\$ 0.38	\$ 1.33	3.23%	\$12.04	
2026	18	\$ 0.35	\$ 1.33	-0.43%	\$12.43	
2027	19	\$ 0.34	\$ 1.38	3.99%	\$12.81	
2028	20	\$ 0.36	\$ 1.55	12.24%	\$13.20	\$1.0503
2029	21	\$ 0.34	\$ 1.59	2.60%	\$13.57	
2030	22	\$ 0.32	\$ 1.63	2.60%	\$13.93	
2031	23	\$ 0.31	\$ 1.67	2.60%	\$14.27	
2032	24	\$ 0.29	\$ 1.72	2.60%	\$14.59	
2033	25	\$ 0.28	\$ 1.76	2.60%	\$14.90	
2034	26	\$ 0.27	\$ 1.81	2.60%	\$15.20	
2035	27	\$ 0.25	\$ 1.86	2.60%	\$15.48	
2036	28	\$ 0.24	\$ 1.90	2.60%	\$15.74	
2037	29	\$ 0.23	\$ 1.95	2.60%	\$16.00	
2038	30	\$ 0.22	\$ 2.00	2.60%	\$16.24	\$1.0445
2039	31	\$ 0.21	\$ 2.06	2.60%	\$16.47	
2040	32	\$ 0.20	\$ 2.11	2.60%	\$16.69	
2041	33	\$ 0.19	\$ 2.16	2.60%	\$16.90	
2042	34	\$ 0.18	\$ 2.22	2.60%	\$17.10	
2043	35	\$ 0.17	\$ 2.28	2.60%	\$17.29	\$1.0429
2044	36	\$ 0.17	\$ 2.34	2.60%	\$17.48	
2045	37	\$ 0.16	\$ 2.40	2.60%	\$17.65	
2046	38	\$ 0.15	\$ 2.46	2.60%	\$17.82	
2047	39	\$ 0.14	\$ 2.53	2.60%	\$17.97	
2048	40	\$ 0.14	\$ 2.59	2.60%	\$18.12	\$1.0418
2049	41	\$ 0.13	\$ 2.66	2.60%	\$18.27	
2050	42	\$ 0.12	\$ 2.73	2.60%	\$18.40	
2051	43	\$ 0.12	\$ 2.80	2.60%	\$18.53	
2052	44	\$ 0.11	\$ 2.87	2.60%	\$18.66	
2053	45	\$ 0.11	\$ 2.95	2.60%	\$18.78	\$1.0410

Cascade's Long Term Real Discount Rate: 4.170%
 IRP Discount Rate = 7.631%
 Revised Discount Rate= 7.631%
 Years 21-45 Escalation = 2.60% (EIA Inflation Rate)

**CASCADE NATURAL GAS CORPORATION
INTEGRATED RESOURCE PLAN
BASECASE - MEDIUM FORECAST - MONTE CARLO AVERAGE PRICE
45 YEAR RESOURCE SUMMARY COSTS - MELDED COST PER THERM**

YEAR	IRP ANNUAL PORTFOLIO COST PER THERM (PV)*	NOMINAL COST PER THERM	RESOURCE PORTFOLIO COST - % CHANGE	PV OF RESOURCE PORTFOLIO COST/THERM	PORTFOLIO COSTS WITH 10% CONSERVATION CREDIT	COST- EFFECTIVENESS LIMIT
2009	1	\$ 0.90	\$ 0.97	\$ 0.90	\$0.99	
2010	2	\$ 0.78	\$ 0.90	\$ 1.68	\$1.85	
2011	3	\$ 0.72	\$ 0.89	\$ 2.40	\$2.64	
2012	4	\$ 0.68	\$ 0.91	\$ 3.07	\$3.38	
2013	5	\$ 0.64	\$ 0.93	\$ 3.72	\$4.09	
2014	6	\$ 0.60	\$ 0.93	\$ 4.32	\$4.75	
2015	7	\$ 0.56	\$ 0.93	\$ 4.87	\$5.36	\$0.8987
2016	8	\$ 0.52	\$ 0.94	\$ 5.40	\$5.94	
2017	9	\$ 0.49	\$ 0.95	\$ 5.89	\$6.48	
2018	10	\$ 0.46	\$ 0.95	\$ 6.34	\$6.98	\$0.8677
2019	11	\$ 0.43	\$ 0.97	\$ 6.77	\$7.45	
2020	12	\$ 0.40	\$ 0.97	\$ 7.18	\$7.89	
2021	13	\$ 0.36	\$ 0.94	\$ 7.54	\$8.29	
2022	14	\$ 0.34	\$ 0.96	\$ 7.88	\$8.67	
2023	15	\$ 0.32	\$ 0.98	\$ 8.20	\$9.03	
2024	16	\$ 0.31	\$ 0.99	\$ 8.51	\$9.36	
2025	17	\$ 0.29	\$ 1.02	\$ 8.80	\$9.68	
2026	18	\$ 0.27	\$ 1.03	\$ 9.08	\$9.98	
2027	19	\$ 0.26	\$ 1.07	\$ 9.34	\$10.28	
2028	20	\$ 0.28	\$ 1.23	\$ 9.62	\$10.59	\$0.7908
2029	21	\$ 0.27	\$ 1.26	\$ 9.89	\$10.88	
2030	22	\$ 0.25	\$ 1.30	\$ 10.15	\$11.17	
2031	23	\$ 0.25	\$ 1.33	\$ 10.40	\$11.44	
2032	24	\$ 0.23	\$ 1.36	\$ 10.63	\$11.69	
2033	25	\$ 0.22	\$ 1.40	\$ 10.85	\$11.94	
2034	26	\$ 0.21	\$ 1.44	\$ 11.07	\$12.17	
2035	27	\$ 0.20	\$ 1.47	\$ 11.27	\$12.39	
2036	28	\$ 0.19	\$ 1.51	\$ 11.46	\$12.61	
2037	29	\$ 0.18	\$ 1.55	\$ 11.64	\$12.81	
2038	30	\$ 0.18	\$ 1.59	\$ 11.82	\$13.00	\$0.7675
2039	31	\$ 0.17	\$ 1.63	\$ 11.99	\$13.19	
2040	32	\$ 0.16	\$ 1.68	\$ 12.15	\$13.36	
2041	33	\$ 0.15	\$ 1.72	\$ 12.30	\$13.53	
2042	34	\$ 0.14	\$ 1.76	\$ 12.44	\$13.69	
2043	35	\$ 0.14	\$ 1.81	\$ 12.58	\$13.84	\$0.7587
2044	36	\$ 0.13	\$ 1.86	\$ 12.71	\$13.98	
2045	37	\$ 0.13	\$ 1.91	\$ 12.84	\$14.12	
2046	38	\$ 0.12	\$ 1.95	\$ 12.96	\$14.25	
2047	39	\$ 0.11	\$ 2.01	\$ 13.07	\$14.38	
2048	40	\$ 0.11	\$ 2.06	\$ 13.18	\$14.50	\$0.7511
2049	41	\$ 0.10	\$ 2.11	\$ 13.28	\$14.61	
2050	42	\$ 0.10	\$ 2.17	\$ 13.38	\$14.72	
2051	43	\$ 0.09	\$ 2.22	\$ 13.48	\$14.82	
2052	44	\$ 0.09	\$ 2.28	\$ 13.57	\$14.92	
2053	45	\$ 0.09	\$ 2.34	\$ 13.65	\$15.02	\$0.7446

Cascade's Long Term Real Discount Rate: 4.170%
 IRP Discount Rate = 7.631%
 Revised Discount Rate= 7.631%
 Years 21-45 Escalation = 2.60% (EIA Inflation Rate)

**CASCADE NATURAL GAS CORPORATION
INTEGRATED RESOURCE PLAN
BASECASE - MEDIUM FORECAST - MONTE CARLO LOW PRICE
45 YEAR RESOURCE SUMMARY COSTS - MELED COST PER THERM**

YEAR	IRP ANNUAL PORTFOLIO COST PER THERM (PV)*	NOMINAL COST PER THERM	RESOURCE PORTFOLIO COST - % CHANGE	PV OF RESOURCE PORTFOLIO COST/THERM	PORTFOLIO COSTS WITH 10% CONSERVATION CREDIT	COST- EFFECTIVENESS LIMIT
2009	1	\$ 0.83	\$ 0.90	\$ 0.83	\$0.92	
2010	2	\$ 0.71	\$ 0.83	-7.94%	\$ 1.55	\$1.70
2011	3	\$ 0.64	\$ 0.80	-3.13%	\$ 2.19	\$2.41
2012	4	\$ 0.61	\$ 0.82	2.33%	\$ 2.80	\$3.08
2013	5	\$ 0.57	\$ 0.82	0.45%	\$ 3.37	\$3.71
2014	6	\$ 0.53	\$ 0.83	0.97%	\$ 3.91	\$4.30
2015	7	\$ 0.50	\$ 0.83	0.37%	\$ 4.41	\$4.85
2016	8	\$ 0.47	\$ 0.84	0.77%	\$ 4.87	\$5.36
2017	9	\$ 0.44	\$ 0.85	0.70%	\$ 5.31	\$5.84
2018	10	\$ 0.40	\$ 0.84	-1.02%	\$ 5.71	\$6.28
2019	11	\$ 0.38	\$ 0.85	1.77%	\$ 6.09	\$6.70
2020	12	\$ 0.36	\$ 0.86	0.81%	\$ 6.45	\$7.09
2021	13	\$ 0.32	\$ 0.83	-3.88%	\$ 6.77	\$7.44
2022	14	\$ 0.30	\$ 0.84	1.92%	\$ 7.07	\$7.77
2023	15	\$ 0.28	\$ 0.86	1.61%	\$ 7.35	\$8.09
2024	16	\$ 0.27	\$ 0.87	1.03%	\$ 7.62	\$8.38
2025	17	\$ 0.26	\$ 0.89	3.06%	\$ 7.87	\$8.66
2026	18	\$ 0.24	\$ 0.90	1.04%	\$ 8.11	\$8.92
2027	19	\$ 0.24	\$ 0.95	5.93%	\$ 8.35	\$9.18
2028	20	\$ 0.25	\$ 1.11	15.89%	\$ 8.60	\$9.46
2029	21	\$ 0.24	\$ 1.13	2.60%	\$ 8.85	\$9.73
2030	22	\$ 0.23	\$ 1.16	2.60%	\$ 9.08	\$9.98
2031	23	\$ 0.22	\$ 1.19	2.60%	\$ 9.30	\$10.23
2032	24	\$ 0.21	\$ 1.23	2.60%	\$ 9.51	\$10.46
2033	25	\$ 0.20	\$ 1.26	2.60%	\$ 9.71	\$10.68
2034	26	\$ 0.19	\$ 1.29	2.60%	\$ 9.90	\$10.89
2035	27	\$ 0.18	\$ 1.32	2.60%	\$ 10.08	\$11.09
2036	28	\$ 0.17	\$ 1.36	2.60%	\$ 10.25	\$11.28
2037	29	\$ 0.17	\$ 1.39	2.60%	\$ 10.42	\$11.46
2038	30	\$ 0.16	\$ 1.43	2.60%	\$ 10.57	\$11.63
2039	31	\$ 0.15	\$ 1.47	2.60%	\$ 10.72	\$11.80
2040	32	\$ 0.14	\$ 1.50	2.60%	\$ 10.87	\$11.95
2041	33	\$ 0.14	\$ 1.54	2.60%	\$ 11.00	\$12.10
2042	34	\$ 0.13	\$ 1.58	2.60%	\$ 11.13	\$12.25
2043	35	\$ 0.12	\$ 1.63	2.60%	\$ 11.26	\$12.38
2044	36	\$ 0.12	\$ 1.67	2.60%	\$ 11.38	\$12.51
2045	37	\$ 0.11	\$ 1.71	2.60%	\$ 11.49	\$12.64
2046	38	\$ 0.11	\$ 1.76	2.60%	\$ 11.60	\$12.76
2047	39	\$ 0.10	\$ 1.80	2.60%	\$ 11.70	\$12.87
2048	40	\$ 0.10	\$ 1.85	2.60%	\$ 11.80	\$12.98
2049	41	\$ 0.09	\$ 1.90	2.60%	\$ 11.89	\$13.08
2050	42	\$ 0.09	\$ 1.95	2.60%	\$ 11.98	\$13.18
2051	43	\$ 0.08	\$ 2.00	2.60%	\$ 12.06	\$13.27
2052	44	\$ 0.08	\$ 2.05	2.60%	\$ 12.14	\$13.36
2053	45	\$ 0.08	\$ 2.10	2.60%	\$ 12.22	\$13.44

Cascade's Long Term Real Discount Rate: 4.170%
 IRP Discount Rate = 7.631%
 Revised Discount Rate= 7.631%
 Years 21-45 Escalation = 2.60% (EIA Inflation Rate)

**CASCADE NATURAL GAS CORPORATION
INTEGRATED RESOURCE PLAN
BASECASE - MEDIUM FORECAST - MONTE CARLO HIGH PRICE
45 YEAR RESOURCE SUMMARY COSTS - MELED COST PER THERM**

YEAR	IRP ANNUAL PORTFOLIO COST PER THERM (PV)*	NOMINAL COST PER THERM	RESOURCE PORTFOLIO COST - % CHANGE	PV OF RESOURCE PORTFOLIO COST/THERM	PORTFOLIO COSTS WITH 10% CONSERVATION CREDIT	COST- EFFECTIVENESS LIMIT
2009	1	\$ 0.96	\$ 1.04	\$ 0.96	\$1.06	
2010	2	\$ 0.85	\$ 0.98	\$ 1.81	\$1.99	
2011	3	\$ 0.79	\$ 0.99	\$ 2.60	\$2.86	
2012	4	\$ 0.75	\$ 1.00	\$ 3.35	\$3.68	
2013	5	\$ 0.71	\$ 1.03	\$ 4.06	\$4.46	
2014	6	\$ 0.66	\$ 1.03	\$ 4.72	\$5.20	
2015	7	\$ 0.62	\$ 1.03	\$ 5.34	\$5.87	\$0.9848
2016	8	\$ 0.58	\$ 1.04	\$ 5.92	\$6.51	
2017	9	\$ 0.54	\$ 1.05	\$ 6.46	\$7.11	
2018	10	\$ 0.51	\$ 1.07	\$ 6.98	\$7.67	\$0.9541
2019	11	\$ 0.48	\$ 1.08	\$ 7.46	\$8.20	
2020	12	\$ 0.45	\$ 1.08	\$ 7.90	\$8.70	
2021	13	\$ 0.41	\$ 1.05	\$ 8.31	\$9.14	
2022	14	\$ 0.38	\$ 1.07	\$ 8.69	\$9.56	
2023	15	\$ 0.36	\$ 1.10	\$ 9.06	\$9.96	
2024	16	\$ 0.34	\$ 1.12	\$ 9.40	\$10.34	
2025	17	\$ 0.33	\$ 1.15	\$ 9.73	\$10.70	
2026	18	\$ 0.31	\$ 1.16	\$ 10.04	\$11.04	
2027	19	\$ 0.29	\$ 1.19	\$ 10.33	\$11.37	
2028	20	\$ 0.31	\$ 1.36	\$ 10.65	\$11.71	\$0.8747
2029	21	\$ 0.30	\$ 1.39	\$ 10.94	\$12.04	
2030	22	\$ 0.28	\$ 1.43	\$ 11.23	\$12.35	
2031	23	\$ 0.27	\$ 1.47	\$ 11.50	\$12.65	
2032	24	\$ 0.26	\$ 1.50	\$ 11.75	\$12.93	
2033	25	\$ 0.25	\$ 1.54	\$ 12.00	\$13.20	
2034	26	\$ 0.23	\$ 1.58	\$ 12.23	\$13.46	
2035	27	\$ 0.22	\$ 1.62	\$ 12.46	\$13.70	
2036	28	\$ 0.21	\$ 1.67	\$ 12.67	\$13.94	
2037	29	\$ 0.20	\$ 1.71	\$ 12.87	\$14.16	
2038	30	\$ 0.19	\$ 1.75	\$ 13.07	\$14.37	\$0.8484
2039	31	\$ 0.18	\$ 1.80	\$ 13.25	\$14.57	
2040	32	\$ 0.18	\$ 1.85	\$ 13.42	\$14.77	
2041	33	\$ 0.17	\$ 1.89	\$ 13.59	\$14.95	
2042	34	\$ 0.16	\$ 1.94	\$ 13.75	\$15.13	
2043	35	\$ 0.15	\$ 1.99	\$ 13.90	\$15.29	\$0.8384
2044	36	\$ 0.15	\$ 2.05	\$ 14.05	\$15.45	
2045	37	\$ 0.14	\$ 2.10	\$ 14.19	\$15.61	
2046	38	\$ 0.13	\$ 2.15	\$ 14.32	\$15.75	
2047	39	\$ 0.13	\$ 2.21	\$ 14.44	\$15.89	
2048	40	\$ 0.12	\$ 2.27	\$ 14.56	\$16.02	\$0.8300
2049	41	\$ 0.11	\$ 2.33	\$ 14.68	\$16.15	
2050	42	\$ 0.11	\$ 2.39	\$ 14.79	\$16.27	
2051	43	\$ 0.10	\$ 2.45	\$ 14.89	\$16.38	
2052	44	\$ 0.10	\$ 2.51	\$ 14.99	\$16.49	
2053	45	\$ 0.09	\$ 2.58	\$ 15.08	\$16.59	\$0.8228

Cascade's Long Term Real Discount Rate: 4.170%
 IRP Discount Rate = 7.631%
 Revised Discount Rate= 7.631%
 Years 21-45 Escalation = 2.60% (EIA Inflation Rate)