2011 IRP Advisory Group Meeting

July 22, 2010

PUGET SOUND ENERGY

The Energy To Do Great Things

Presentation Road Map

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- Kick off, Introductions, and Agenda Review: 10 a.m. or earlier based on when we arrive.
- GHG/Multi-Pollutant Regulation Issues: 10:15 - 10:45 a.m.
- Scenarios/Sensitivities and Assumptions: 10:45 a.m. to noon

Lunch Break--Lunch Provided noon to 12:30 p.m.

- Flexibility Needs and Wind Integration Analysis: 12:30 - 1:15 p.m.
- Tour: 1:15 – 3:00 p.m.

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An Overview of Kerry Lieberman

July 2010

Overview

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Federal Greenhouse Gas Regulation/Legislation on the horizon

- Recent Developments
- Kerry-Lieberman (Released 5/12/2010)
- EPA Regulatory Work

Kerry-Lieberman

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- The Kerry Lieberman energy and climate change bill has four main titles:
  - Domestic Clean Energy Development
  - Greenhouse Gas Pollution Reduction
  - Consumer Protection
  - Job Protection and Growth
- For Utilities:
  - Cap-and-trade program
  - Free emission allowances granted (decline to 2030)
  - Full auction after 2030
  - Carbon price cap - $25 per ton with escalators
- EPA analysis completed mid-June

Title I: Domestic Clean Energy Development

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- Nuclear Power
  - Increases funding for loan guarantee program
- Offshore Oil and Gas
  - Authorizes revenue sharing from leases for certain states
- Carbon Capture and Sequestration
  - Provides allowances to create a special funding program for development and deployment
- Renewable Energy and Energy Efficiency
  - Dedicates 2.5% of allowances from 2013 – 2016 to fund clean energy technology deployment and energy efficiency

Title II: Greenhouse Gas Pollution Reduction

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- Economy Wide Reduction Cap:
  - 4.5% below 2005 levels by 2013
  - 17% below 2005 levels by 2020
  - 42% below 2005 levels by 2030
  - 83% below 2005 levels by 2050
- First Year: Includes free allocation & auction
- Federal preemption of state and regional cap and trade programs

Title III: Consumer Protection

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EMISSION PERMIT POOL

- 87.7% Free allowance, 12.3% Auction

ELECTRIC SECTOR

- Allowance Allocation
  - 2013 - 2015: 51% of the free allowance
  - 2016 – 2025: 35% of the free allowance
  - 2030 and beyond: 0%
- Allowance Distribution Formula
  - Generation related emissions: 75%
  - Retail load: 25%

NATURAL GAS

- Allowance Allocation
  - 2016 – 2025: 9%
  - 20% Set-aside for energy efficiency (all years)

Allowance Distribution by Sector

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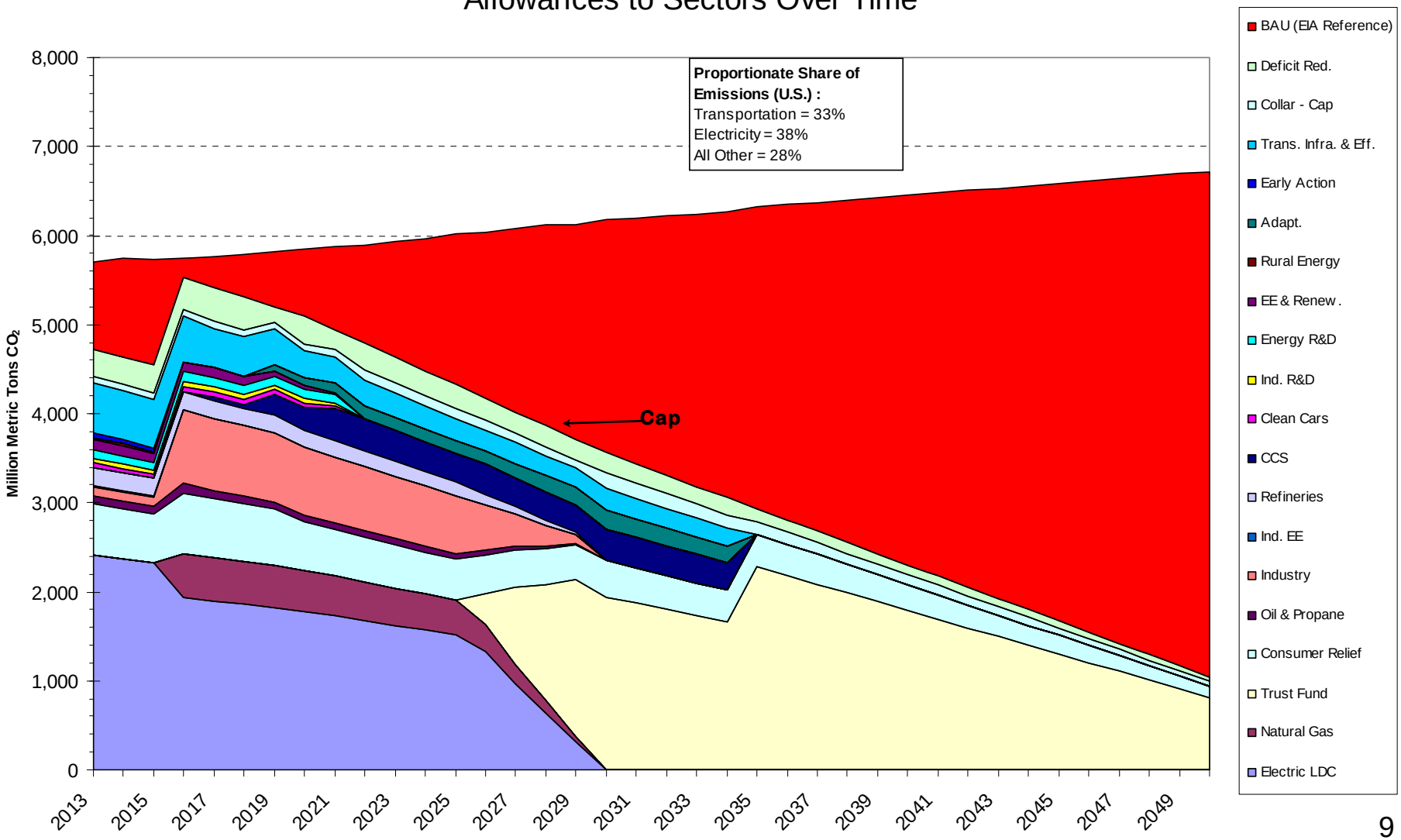
Allowances to Sectors Over Time



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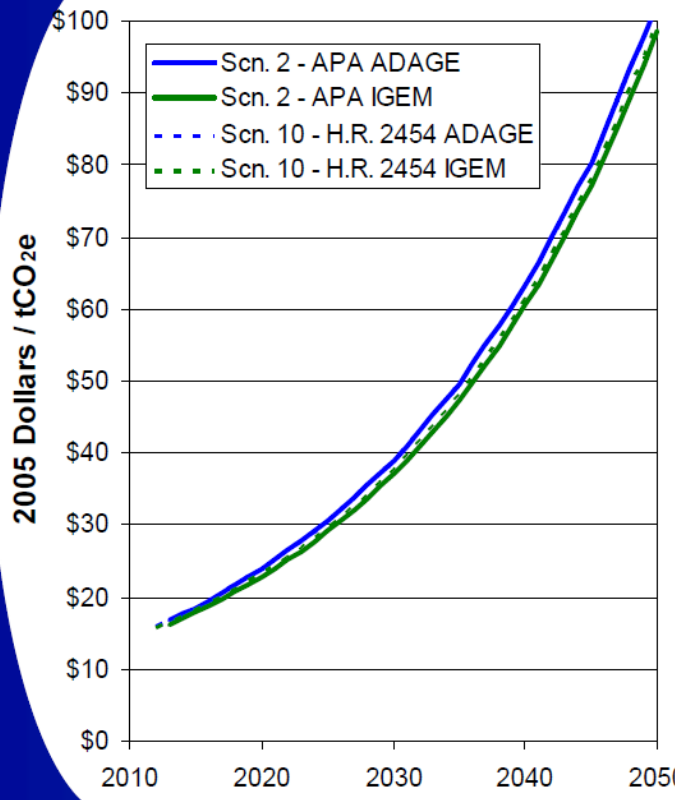
GHG Allowance Prices

Scenario 2 – APA & Scenario 10 - H.R. 2454



Scn. 2 - APA

	2013	2020	2030	2050
ADAGE	$17	$24	$39	$102
IGEM	$16	$23	$37	$99

Scn. 10 - H.R. 2454

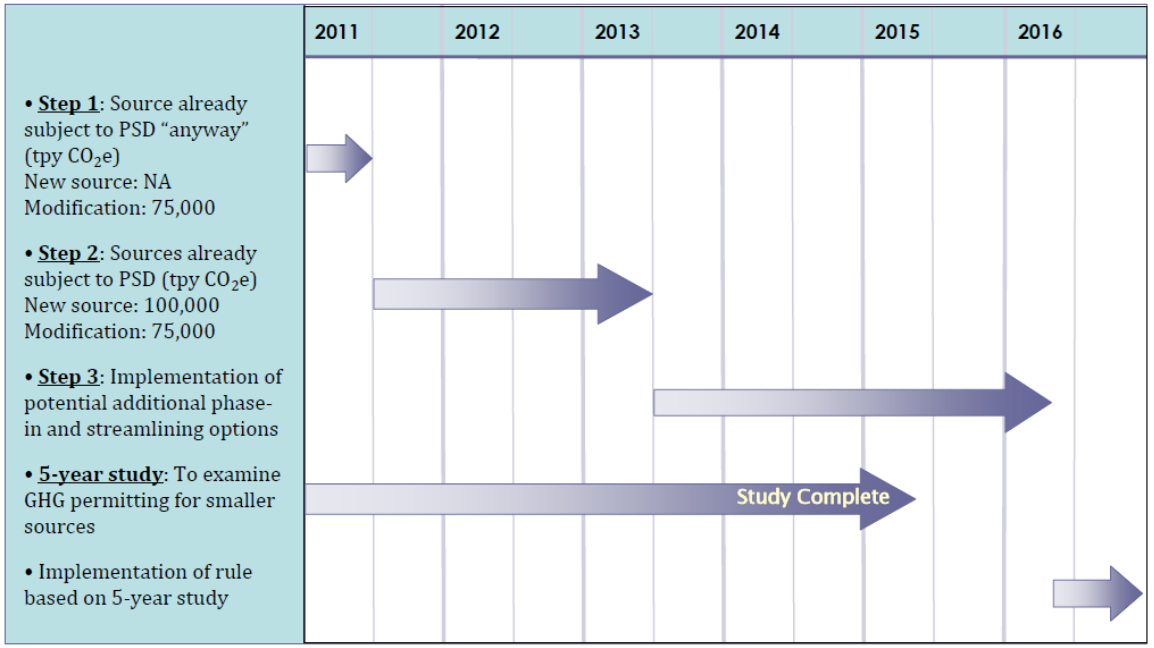
	2013	2020	2030	2050
ADAGE	$17	$24	$39	$102
IGEM	$16	$23	$38	$100

- The marginal cost of GHG abatement is equal to the allowance price.
- Range of 2030 allowance price in *"scenario 2 – APA"* across models is $37 - $39. This range only reflects differences in the models and does not reflect other scenarios or additional uncertainties discussed elsewhere.
- The limit on international offsets usage is non-binding in both models, and thus the domestic allowance price is equal to the international offset price (after discounting) and the international offset price acts as a floor on the allowance price.
- When the international offsets limit is non-binding, the differences in allowance prices between the models arises from differing demands for international offsets.
  - The differences between the models in terms of cost and availability of domestic abatement show up in the differing amount of international offsets used instead of differing allowance prices.
  - In scenario 2, ADAGE projects an average of 929 $MtCO_2e$ of international offsets will be used annually, and IGEM projects average annual international offsets usage to be 522 $MtCO_2e$.
  - See the 'Offsets Usage & Limits' section for further discussion of international offsets.
- Allowance prices under the American Power Act in scenario 2 are almost identical to allowance prices estimated for H.R. 2454 in scenario 10.

Overview

- EPA Regulatory Work
  - PSE makes first EPA greenhouse gas emissions report in Quarter 2011
  - Beginning greenhouse regulation for stationary sources under Clean Air Act
    - Tailoring Rule, MACT, Transport Rule, Regional Ozone & PM, etc.

Permitting Steps under the Tailoring Rule



Possible Timeline for Environmental Regulatory Requirements for the Utility Industry

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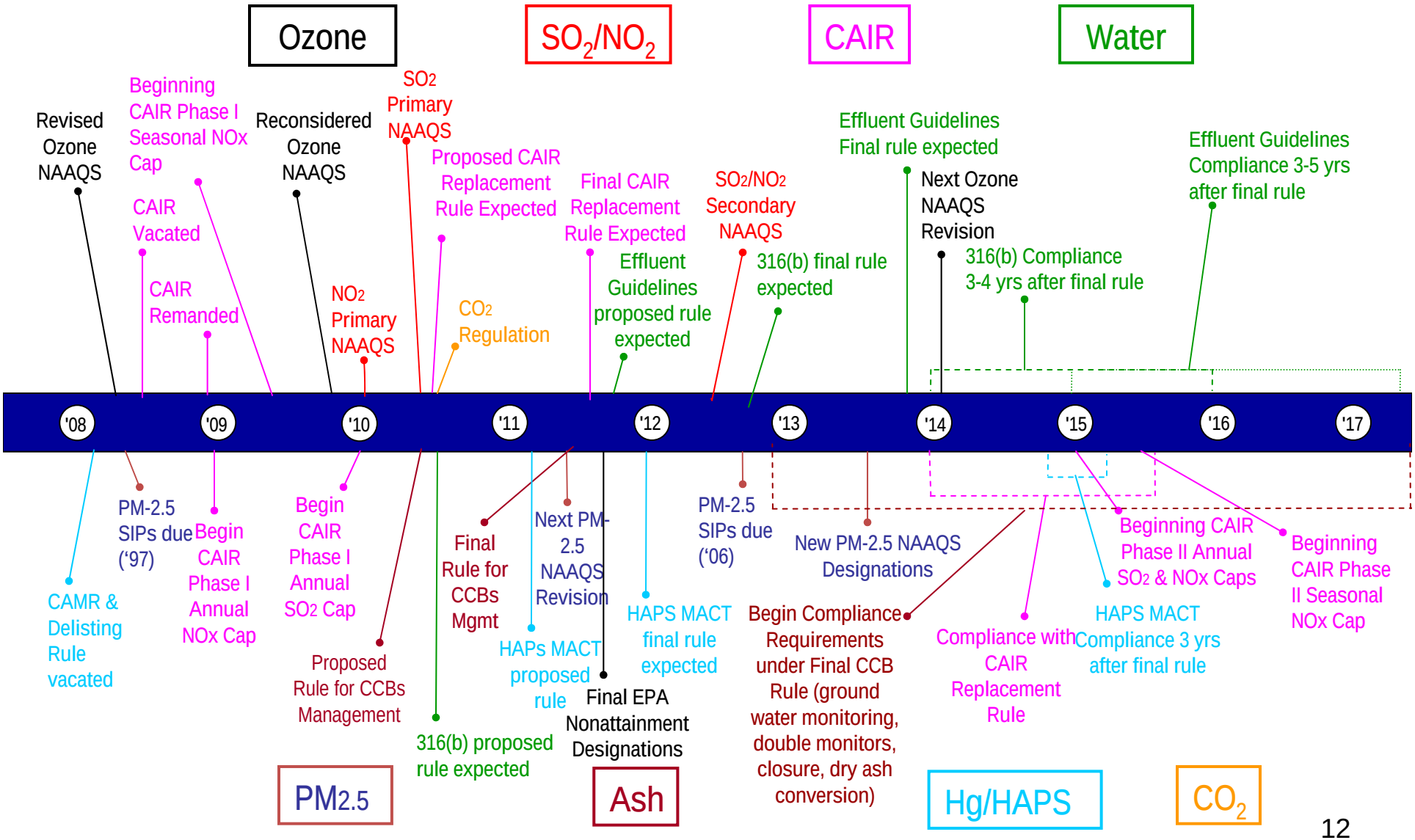

-- adapted from Wegman (EPA) Updated 2.15.10

Alternative Approaches

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Utility-Sector Only Bill

Energy Policy Only Bill

- Jeff Bingaman (Energy and Natural Resources Committee Chairman), proposal includes:
  - Renewable Energy Standard (RES): 15% by 2020
  - Transmission: Enhanced planning, FERC backstop siting authority for designated projects, and cost allocation provisions
  - Energy Efficiency: Building and appliance standards, retrofit and grant programs

Cantwell CLEAR Act proposal

2010 Washington State Energy Related Policy Initiatives

Western Climate Initiative

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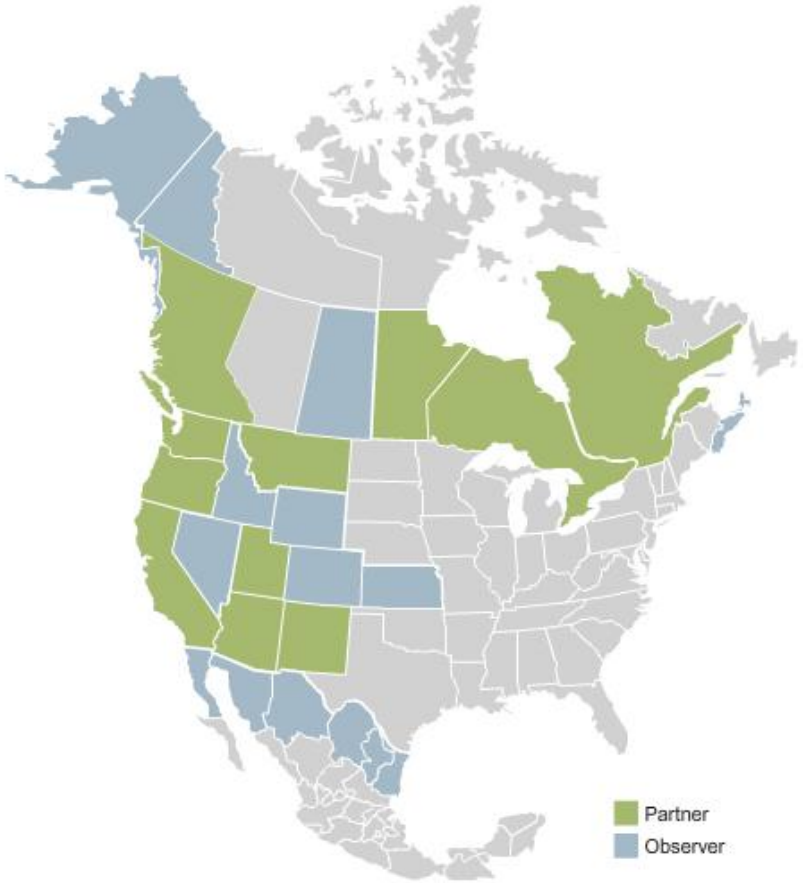
- A regional agreement to reduce greenhouse gas emissions through a cap-and-trade program, with additional reduction strategies through complementary policies and offsets.
  - 4 U.S. States
  - 7 Canadian Provinces
- Final design document to be unveiled shortly.



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2011 IRP Development

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- Overview of Process
- Discuss Scenarios/Sensitivities
- Share Some Draft Assumptions
- Touch Base on Policy Issues Along Way

IRP process

50,000’ Level

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The Plan

4. Decisions
Lowest Reasonable Cost Mix

3. Analysis
Consistent
Detailed

2. Identify Alternatives
Commercially Viable
Demand Side & Supply Side

1. Resource Needs
Capacity, Energy
RPS, Flexibility

Electric Peak Capacity Resource Need

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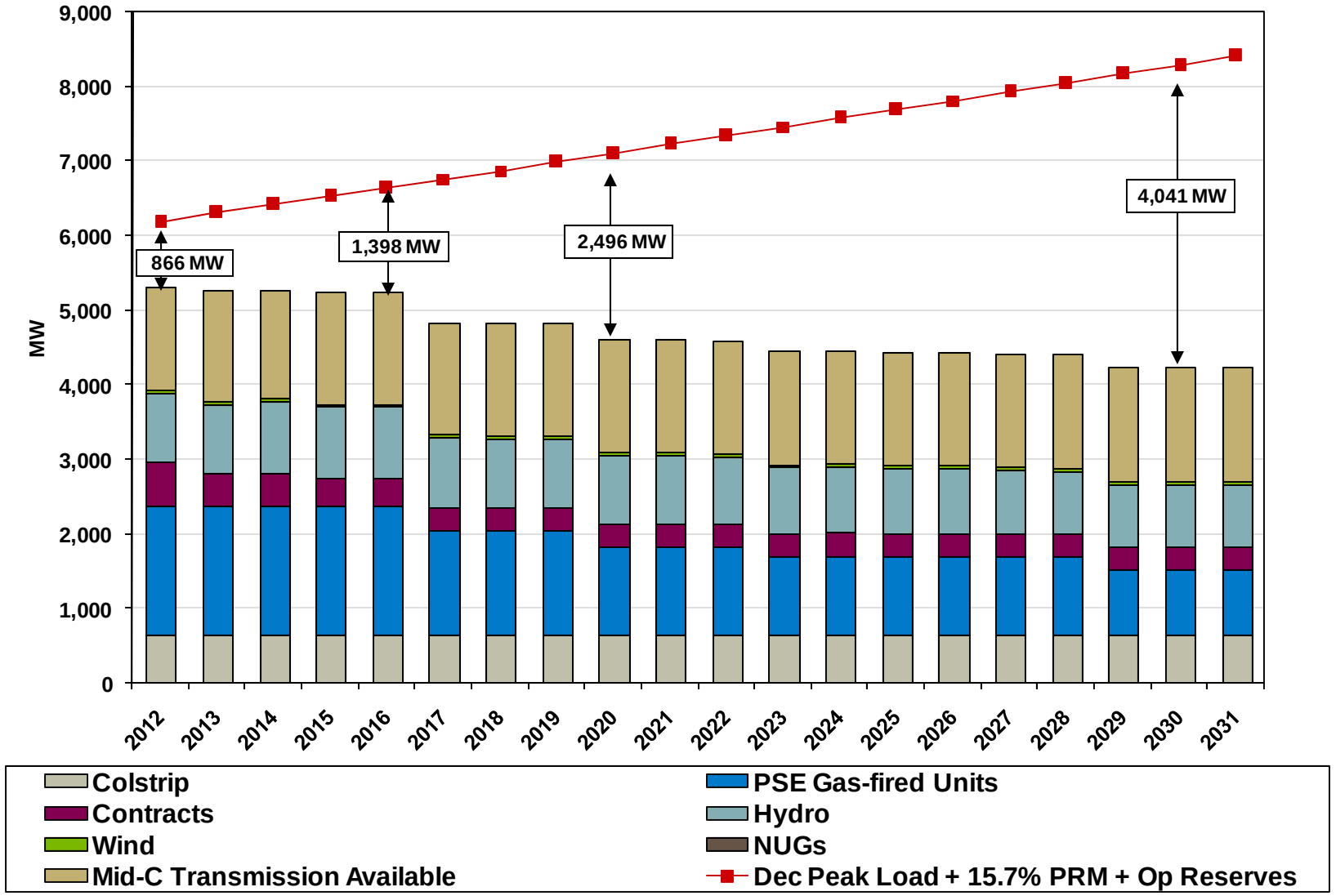
Draft 07/15/10



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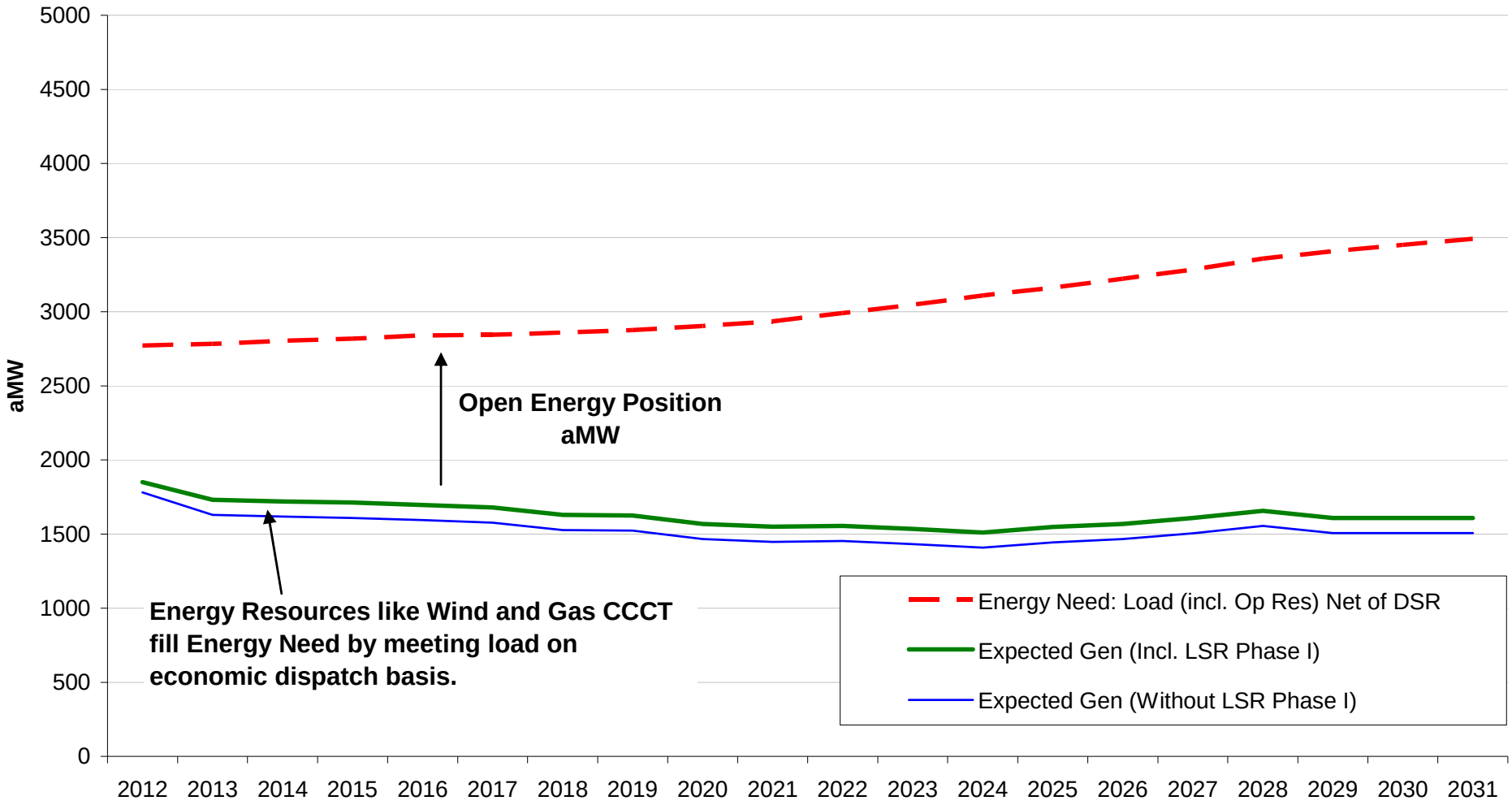
Energy Need

Customer Energy Needs Relative to Economic Dispatch of Existing Portfolio



Renewable Resource Need

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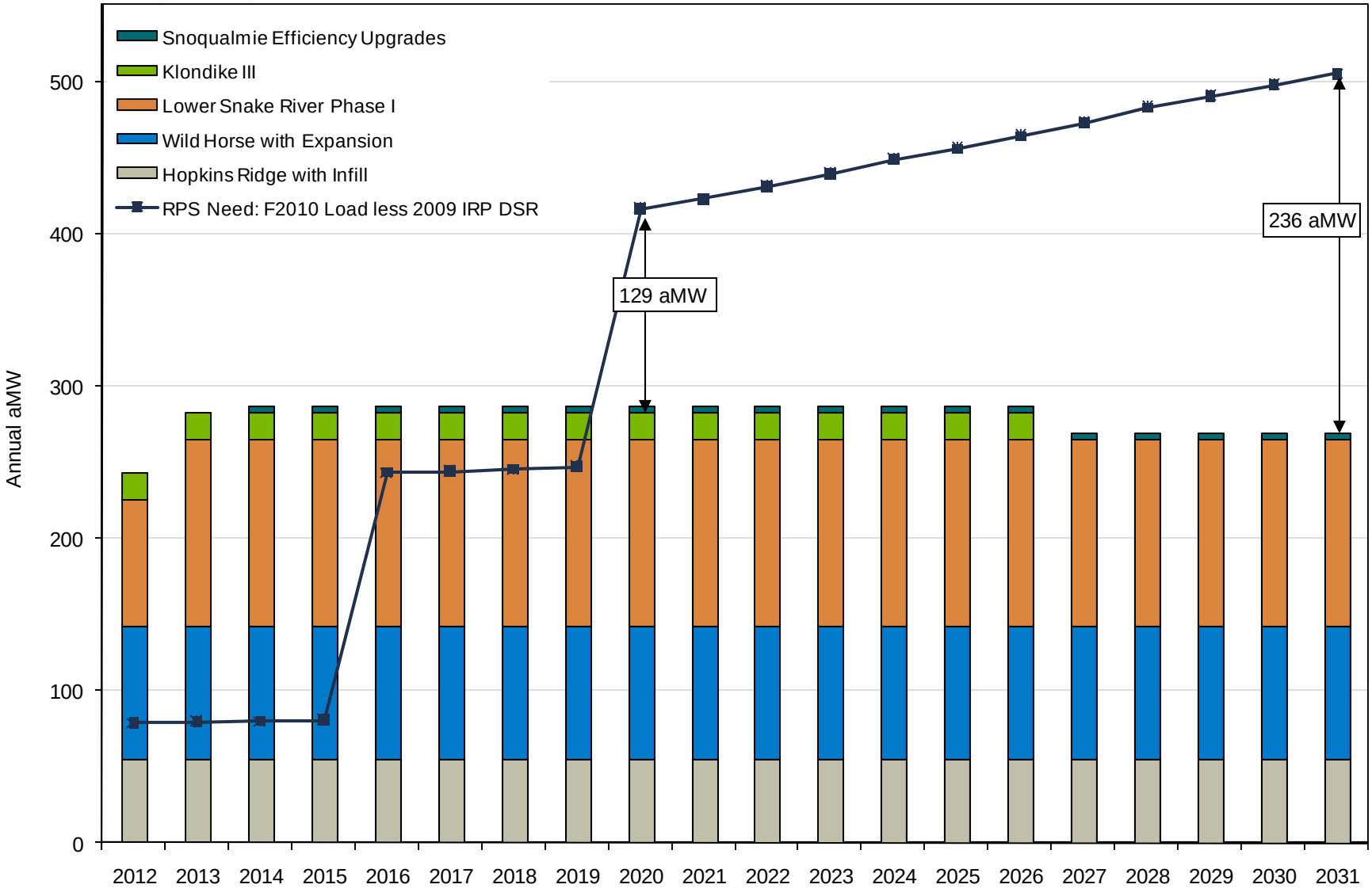
Draft 7/15/2010



Need for Flexibility…Reserves

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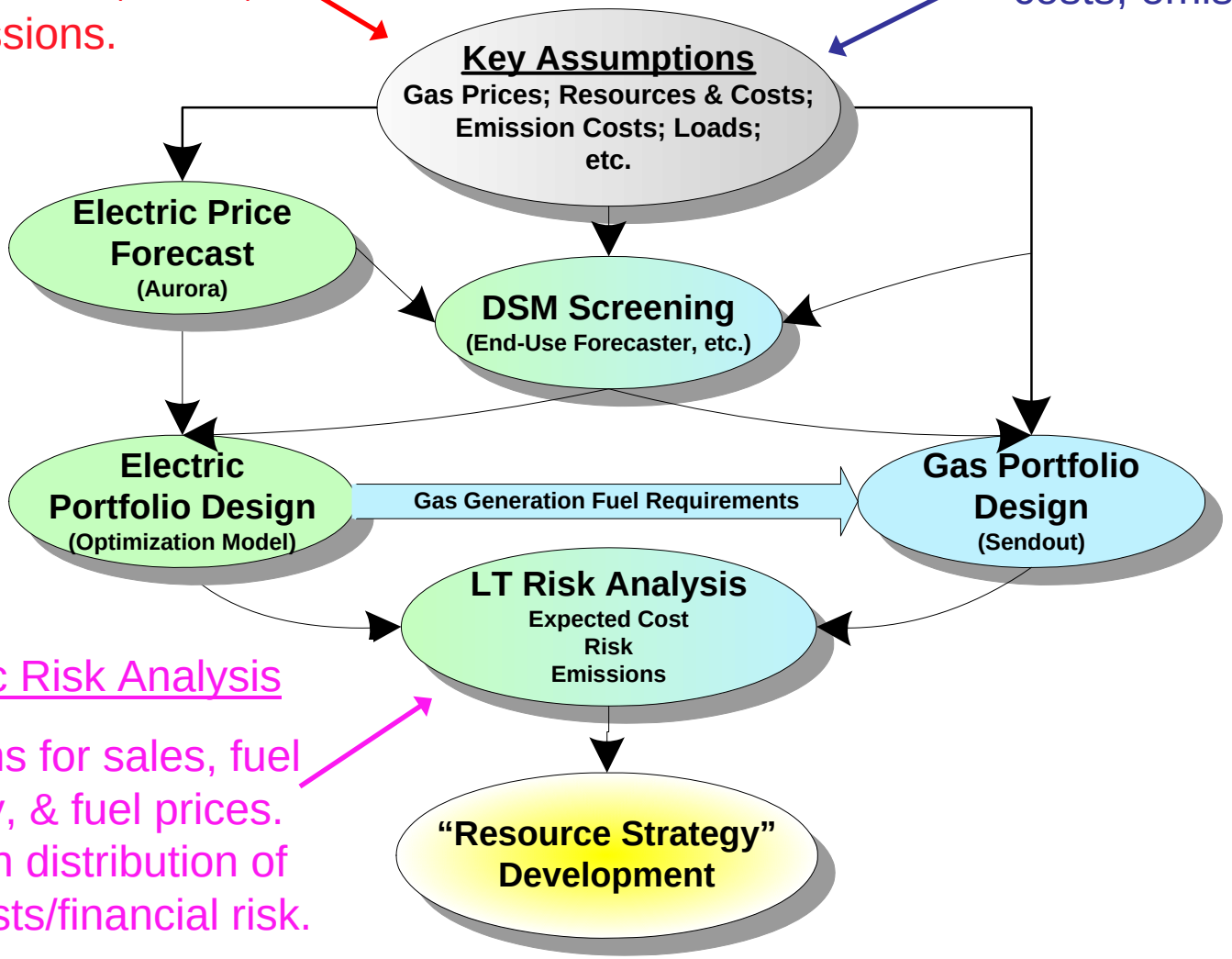
Three Levels of Risk Analyses—30,000' Level

Scenarios

Integrated sets of assumptions to simulate possible futures. Impacts on builds, costs, emissions.

Sensitivity

Impact of one key assumption on builds, costs, emissions.



Stochastic Risk Analysis

Distributions for sales, fuel availability, & fuel prices. Impacts on distribution of portfolio costs/financial risk.

Scenarios

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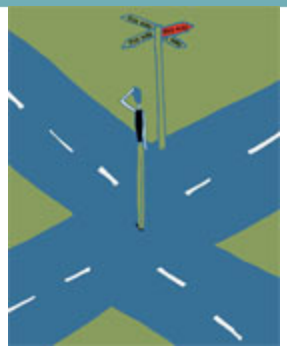


	Load Growth	Gas Price	CO2 Price	Renew Tax Incent
Business as Usual	Base	Mid	None	No Extension
Green World	Low	High	High	Extension
Low Growth	Low	Low	None	No Extension
High Growth	High	High	Mid	Limited Extension

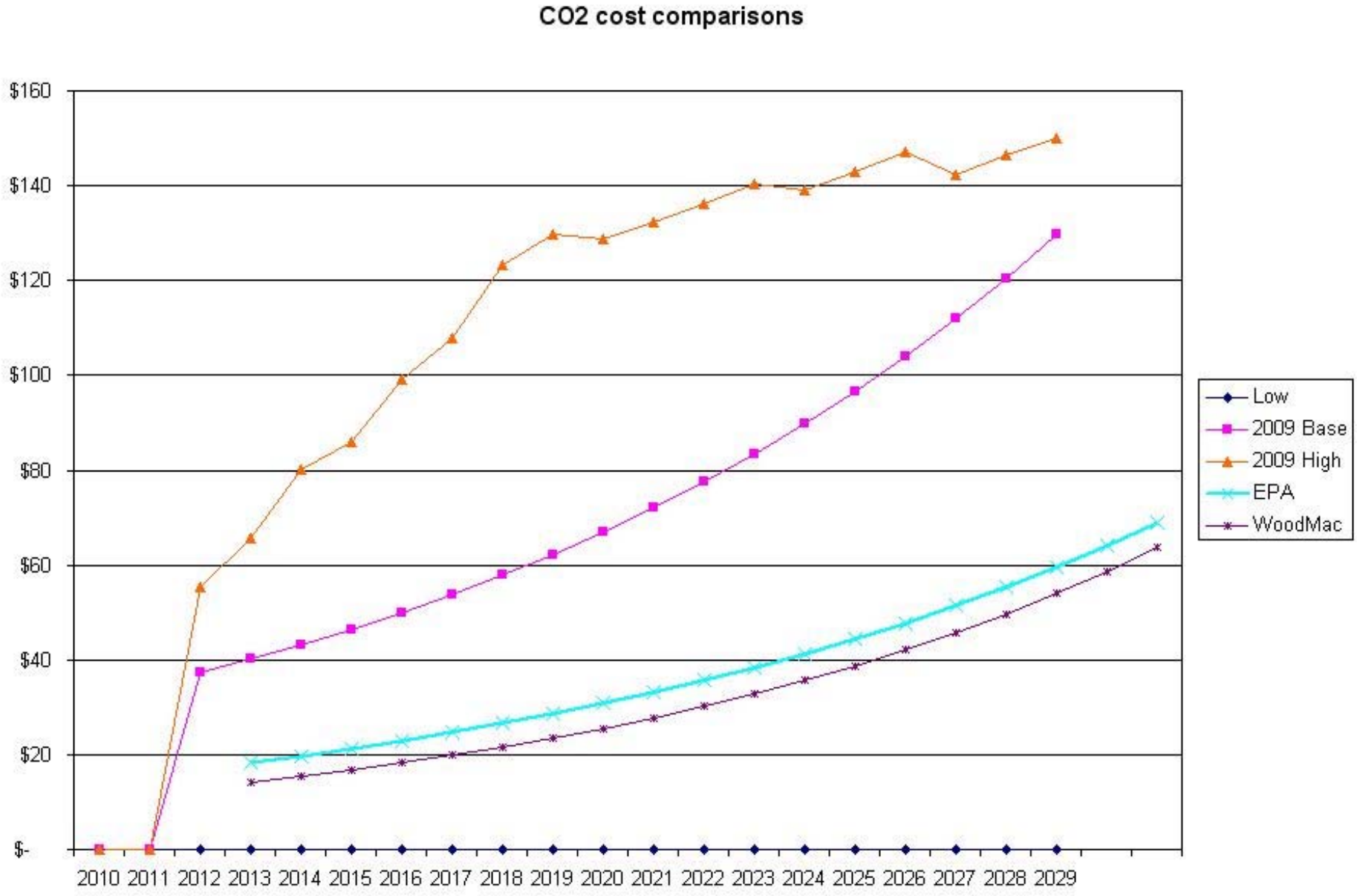
Sensitivities

- Carbon Costs…Sensitivity for BAU
  - Maybe blend in plan: Lost Opportunity DSM with CO2 Cost, Retrofit without
- Impact of Changes to Regional Coal Fleet
  - Boardman and Centralia Coal Plants Replaced with Gas by 2020
  - Then additional…what if Colstrip shut down by 2020
- WA State RPS
  - Impact on regional CO2 emissions
  - Impact on PSE portfolio costs
  - Higher/Lower Requirements?
- Transportation Loads
  - Impact on regional CO2 emissions
  - With and without load management?
- Conservation Cost Adjustment
  - With and without 10% DSM kicker

Assumptions

- Carbon Prices
- Gas Prices
- Electric Resource Alternatives…to date
- Gas Resource Alternatives…to date

Carbon Costs…Review



Gas Price Trends

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- Near term prices (thru 2015) have come down since March 2009
- Forecasts of longer term prices have not come down
  - Shale gas & horizontal drilling has greatly expanded supply
  - However, there are several factors that will tend to increase demand and reduce U.S. supply
    - Federal Carbon Legislation would prompt switching from coal to gas-fired generation
    - Coal Plant Retirements due to sulfur dioxide and mercury regulation
    - Relatively low gas prices will lead Gas Intensive Industry such as domestic petrochemicals to return to service or expand
    - Diversion of LNG into higher priced markets
    - Continued decline in Canadian imports
    - Natural Gas Vehicles
    - Residential and Commercial heating conversions

Compare Short-term Gas Price Forecasts

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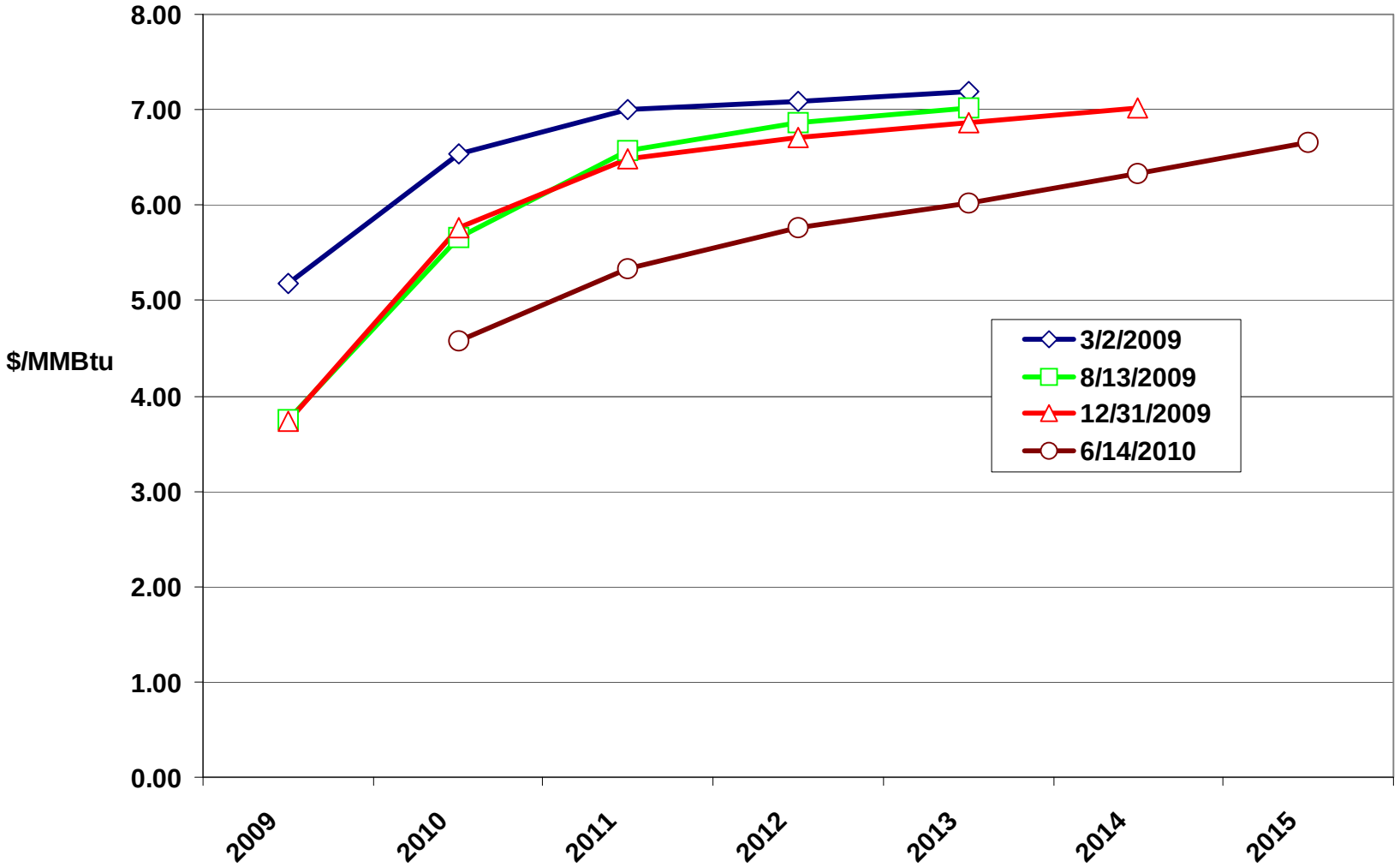
3 Month Average Forward Marks, Sumas Hub



Compare Competing Fuel Prices 2003-2014

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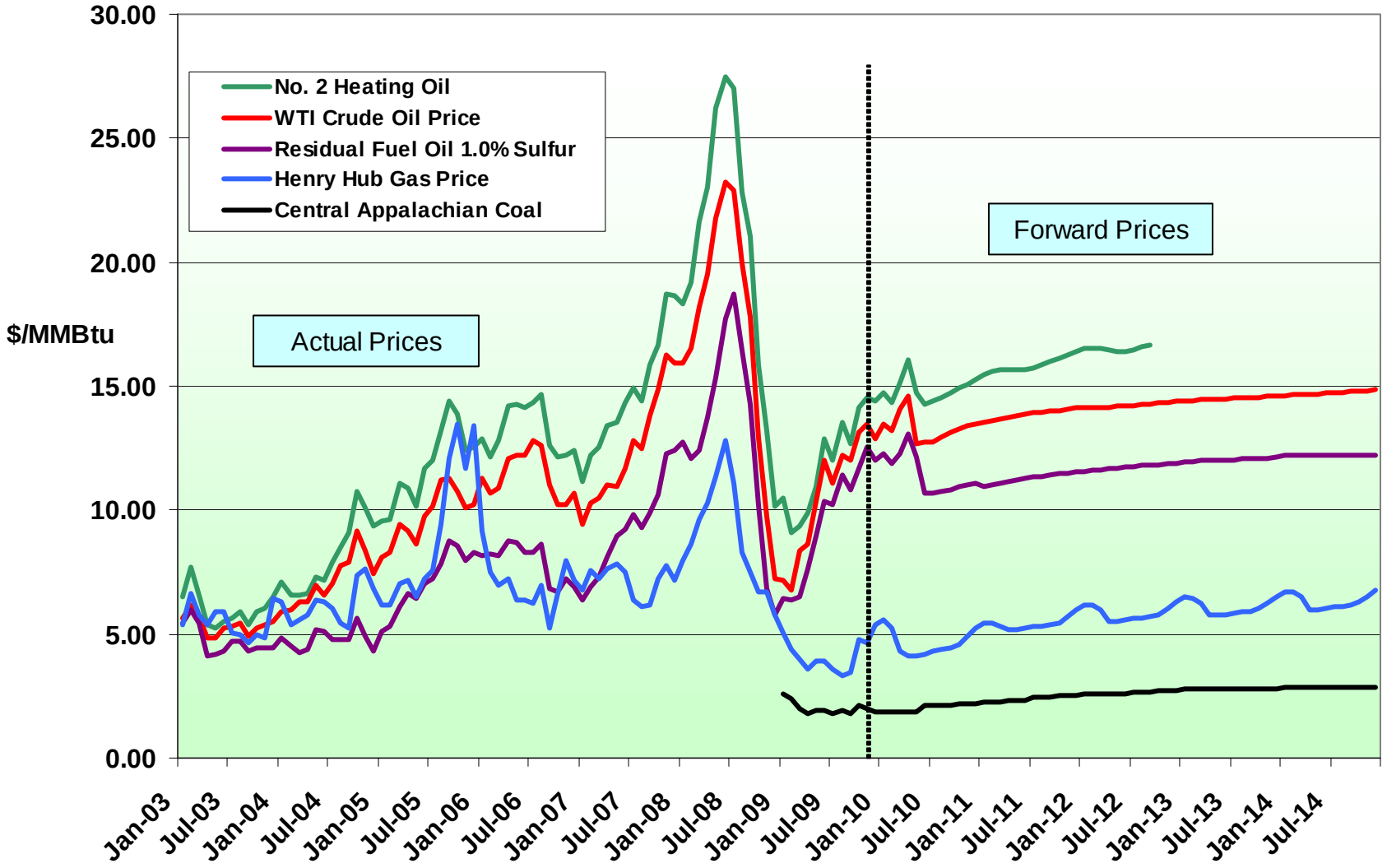
(Historical - prompt month settlement prices)
(Forward - forward prices as of 5/28/2010)



Development of Gas Price Forecasts

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- Base – Forward Marks thru 2015 + Wood Mackenzie April 2010 Long-term View for 2016-2031
- Low and High – Wood Mack February 2010 Forecasts for PSE
- Very Low – Prices remain constant at the 2012 Low price in nominal terms thru 2031 ($4.20/MMBtu)
- Very High – Prices about $1.61 higher than the high forecast

Levelized Gas Prices

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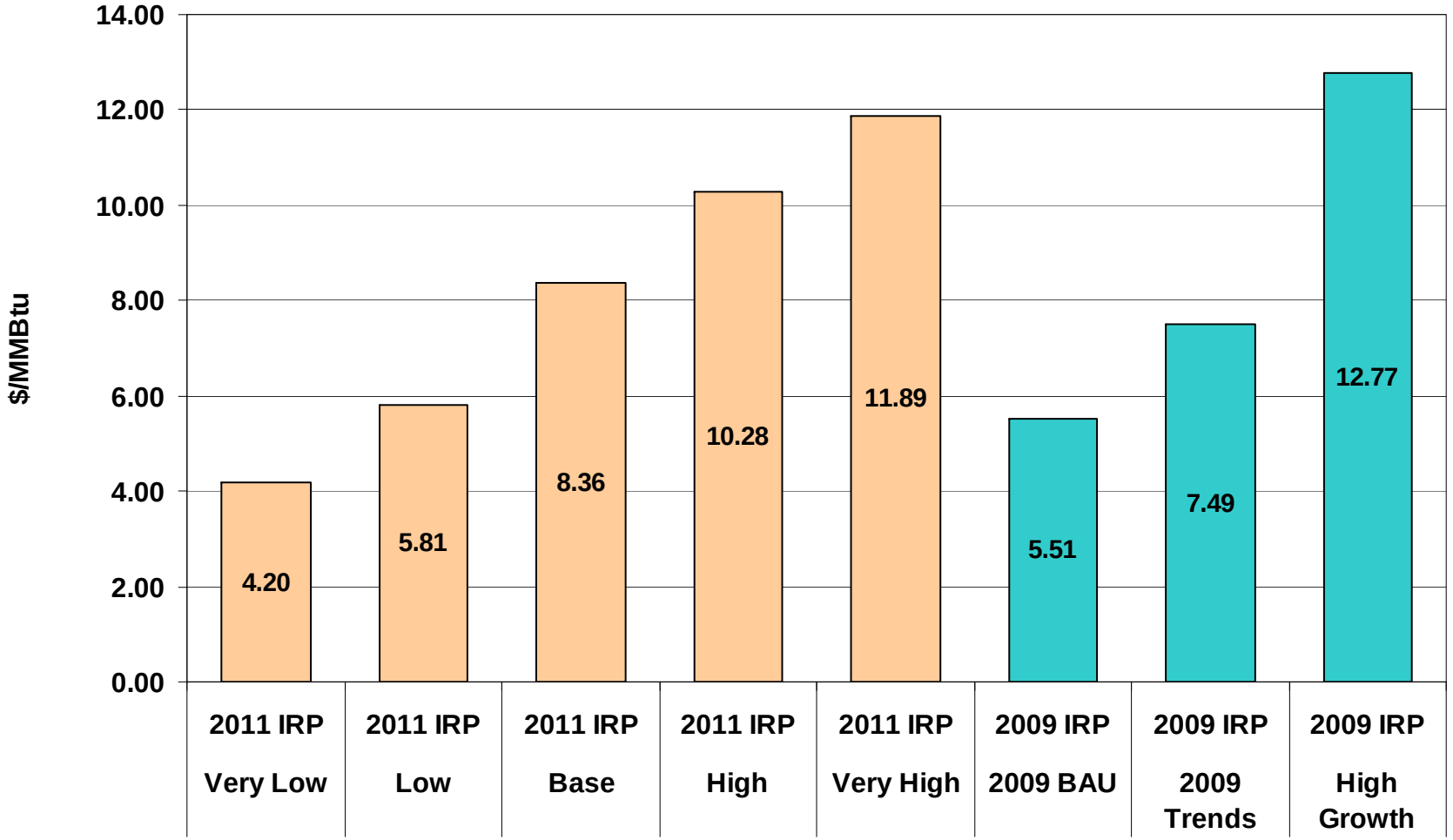
Draft 7/22/2010

(Sumas Hub, 20 year levelized - 2012-31, nominal $)



Electric Resource Alternatives & Assumptions - Draft

Resource Type	ISO Capacity (MW)	All In Cost (2010 $/kW)	Heat Rate (MMBtu/KWh)
CCCT 5000F4 (Primary + DF)	325	1,543	7,083
SCCT 7FA.05	207	999	10,250
SCCT 5000F4	197	972	10,437
SCCT LMS 100	100	1,352	9,213
Reciprocating Engine	176	1,812	8,869
Conventional Coal ?	600	4,800	9,500
Wind	100	2,304	N/A
Long-Haul Wind	tbd	tbd	tbd
Geothermal?	tbd	tbd	tbd
Biomass	25	4,327	14,118

Nuclear

Unbundled RECs

Utility Scale Solar

Concentrating Solar Thermal

Carbon Sequestration

Off Shore Wind

Demand Side Resource – Analysis

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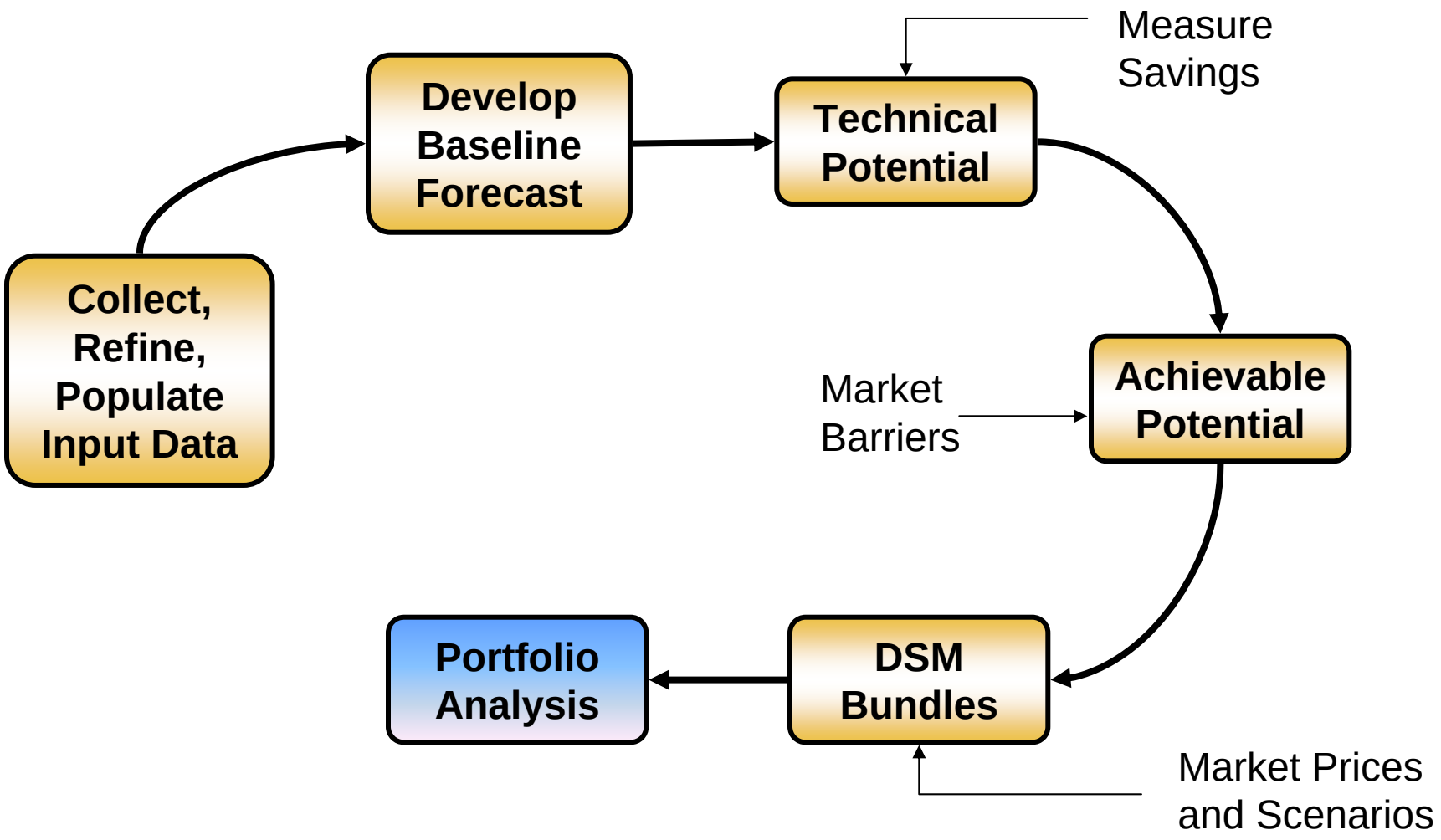

Demand Side Resource - Analysis

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- 2011 DSR Analysis:
  - Ramp Rates by End Use Type
  - Demand Response – Longer Curtailment per Event
  - Temperature Sensitivity of DSR capacity
  - 10% Power Act Conservation Credit
- Status:
  - Update Assumptions: Measures, Load Shapes, Measure Costs, Market Factors, Codes & Standards, etc.
  - Working on temperature sensitivity analysis for the LOLP

Gas Sales Peak Capacity Resource Need

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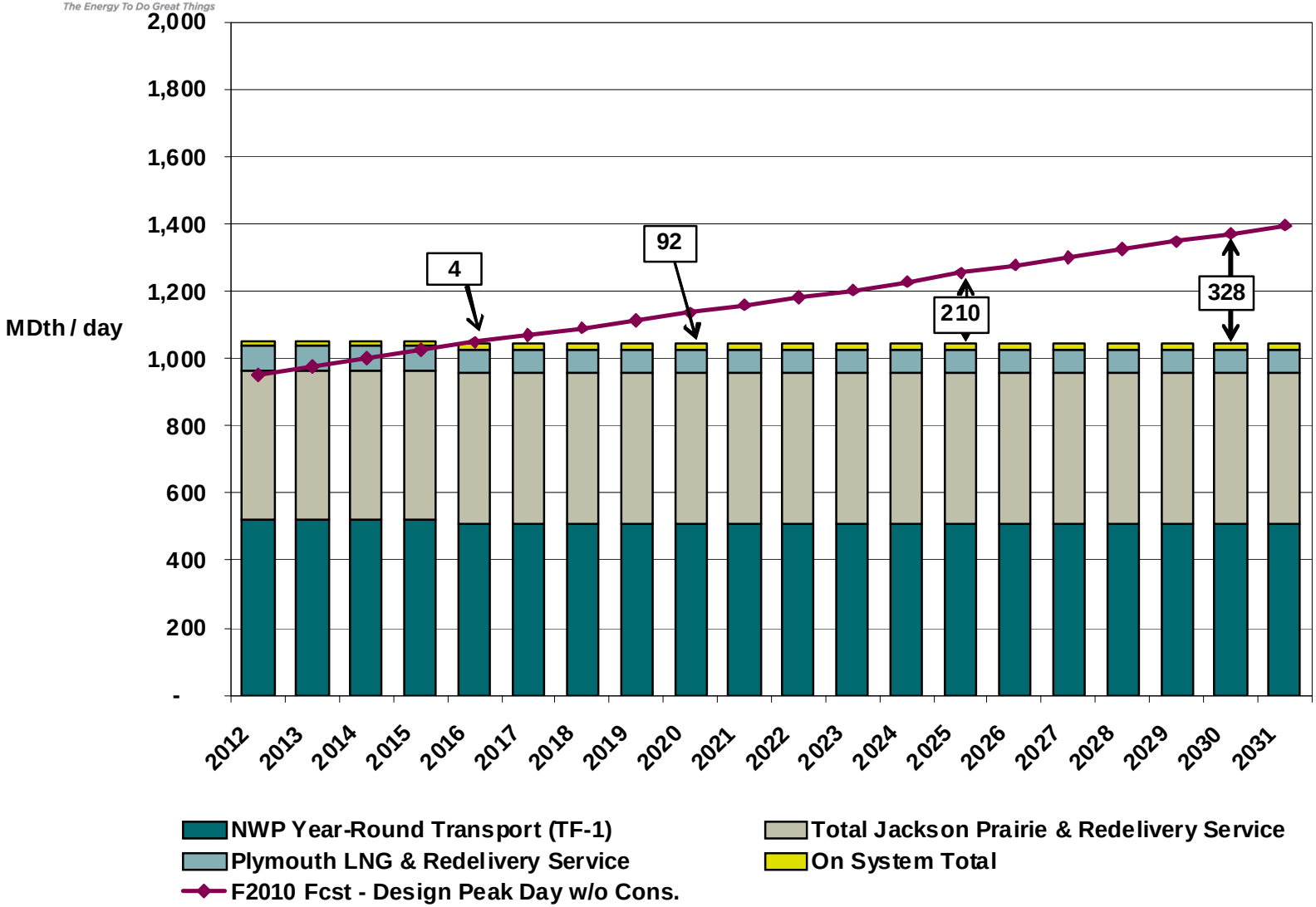
Draft 7/19/10



Gas for Generation Peak Capacity Resource Need

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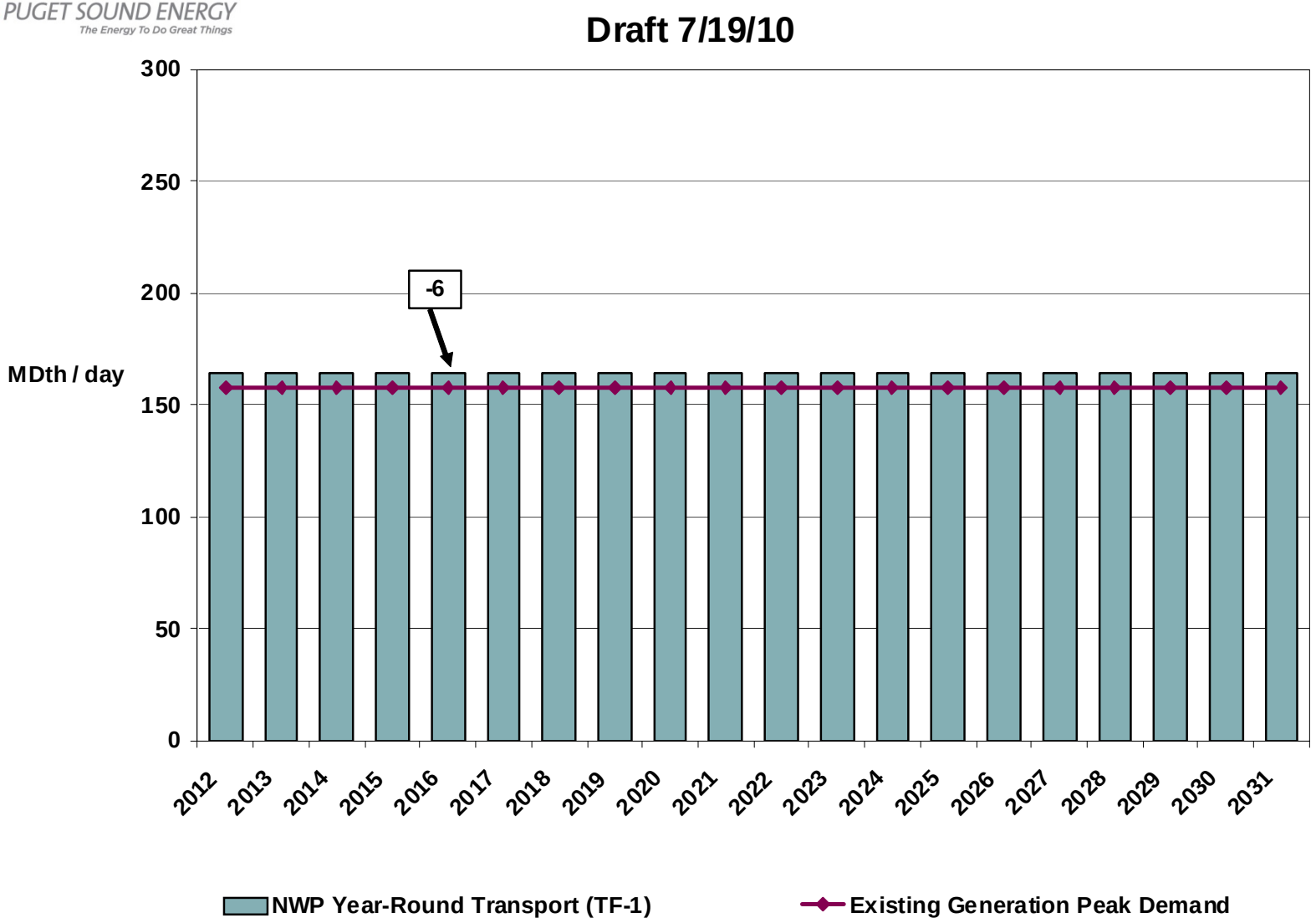

Gas Resource Alternatives - 1

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- Expansion of Westcoast & Northwest Pipelines
  - Gives access to Northern B.C. supply
  - Lower cost than Cross Cascades alternatives at this time
  - Expansions available beginning in 2014 (3 year lead time)
- Southern Crossing + Inland Pacific Connector
  - Gives access to AECO via TransCanada expansions & NWP expansions
  - Up to 100 MDth expansion of Terasen Southern Crossing pipeline
  - Expansion available beginning in 2014 (3 year lead time)

Gas Resource Alternatives - 2

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- Cross Cascades Pipeline
  - Gives access to Rockies and AECO gas at Stanfield & Malin
  - Expansion of NWP or alternative from Stanfield to PSE
  - Currently has higher cost that expansions to Northern B.C.
  - Consider later - expansion available in 2018-20 (3-5 year lead time)
- Regional LNG Storage
  - Regional location allowing for redelivery withdrawal service (3-5 year lead time)

Lunch Break

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Reserve Requirement for Wind

IRP Advisory Group Meeting

Irena Netik

Manager, Renewable Resources Integration

July 22, 2010

Objectives

- The purpose of this presentation is to:
  - Discuss reserve impacts of wind.
  - Share preliminary reserve requirements results.

Definition of Reserves

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- The reliability of the bulk power system is maintained through the Reliability Standards.
  - Developed and enforced by North American Electric Reliability Corporation (NERC).
  - Provide the planning and operating rules that electric utilities follow to ensure the most reliable system possible.
- Reserves are part of the Reliability Standards and require that adequate generating capacity be available at all times to maintain scheduled frequency and avoid loss of firm load following transmission or generation contingencies.

Reserves Impacted by Wind

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- No wind: Operating Reserves = Regulation + Contingency
- With wind: Total Reserves = Regulation + Contingency + Following

Reserves	Operating Reserves Definitions
Net Load & Wind **Regulation**	Automatic Generation Control (AGC) that balances fast variations in load/wind with generation over short time frames of seconds to minutes.
Net Load & Wind **Following**	Balance the natural volatility of wind generation and forecast error over longer time intervals of several minutes to hours.
Contingency	Spinning & non-spinning reserves used in the event of a system contingency such as a loss of a generating capacity. 5% of Hydro + 5% of Wind + 7% of Thermal generation
Total	Regulation + Following + Contingency

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Regulation Requirements

Regulation Requirements

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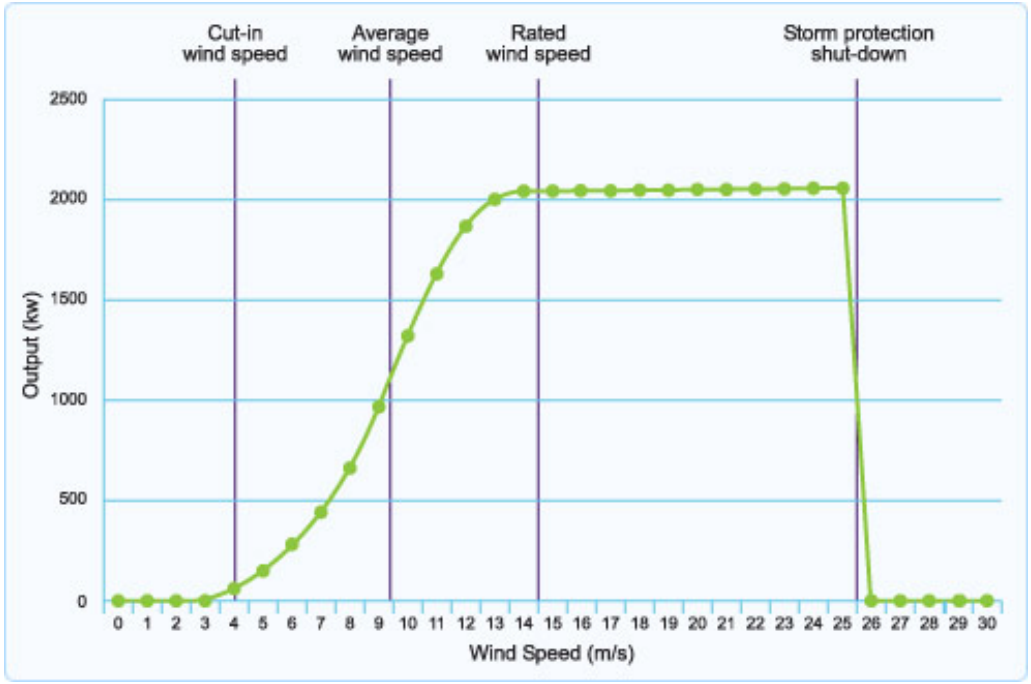
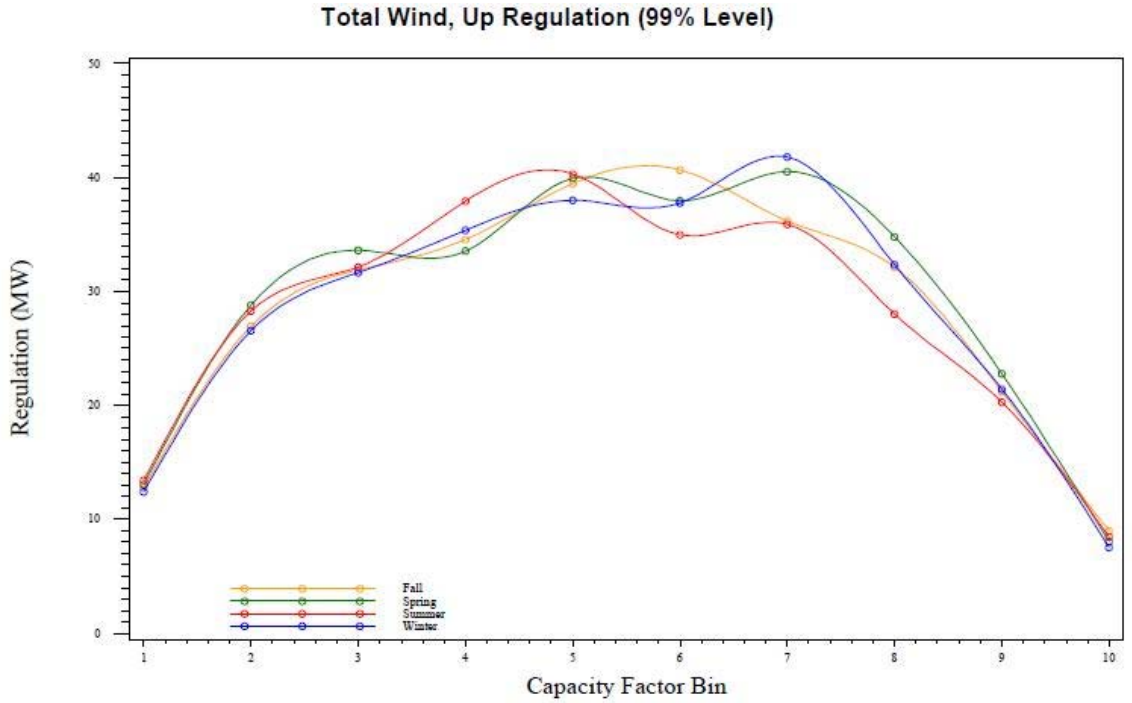
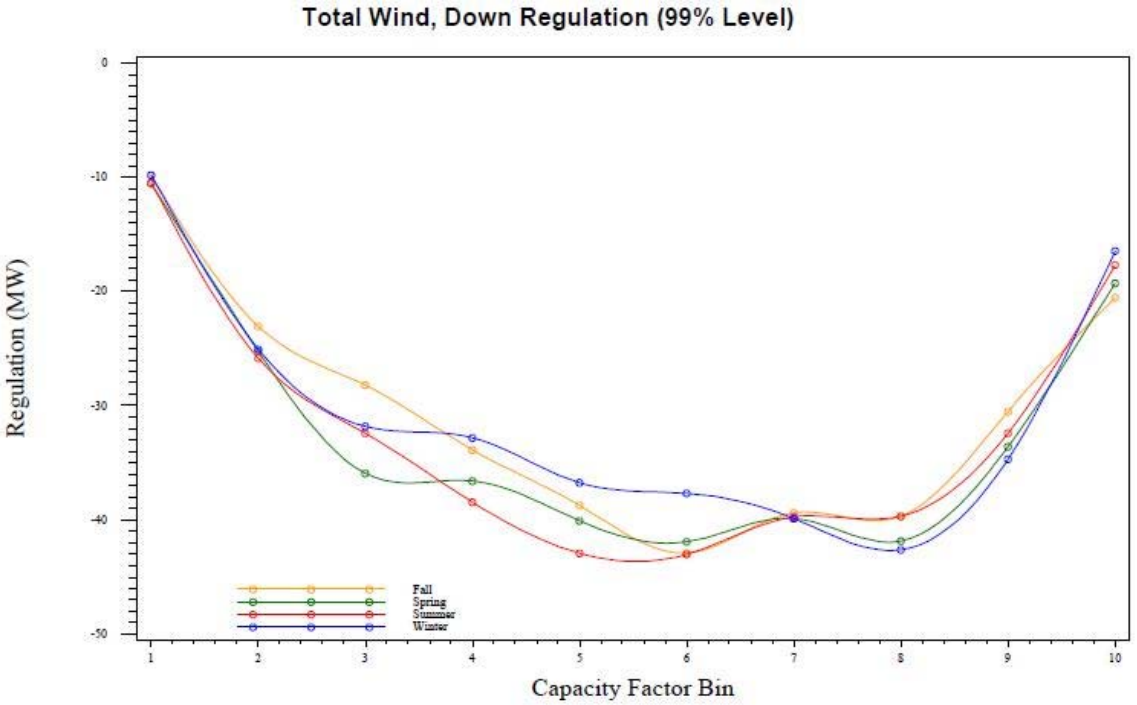
- The amount of regulating reserves is largely dependent on wind speed and the turbine's power curve, rather than temporal characteristics or the level of wind output.
- At low and high generation, changes in wind speed have a relatively small effect on output. Changes in wind speed at the center of the curve have a relatively large impact on output.



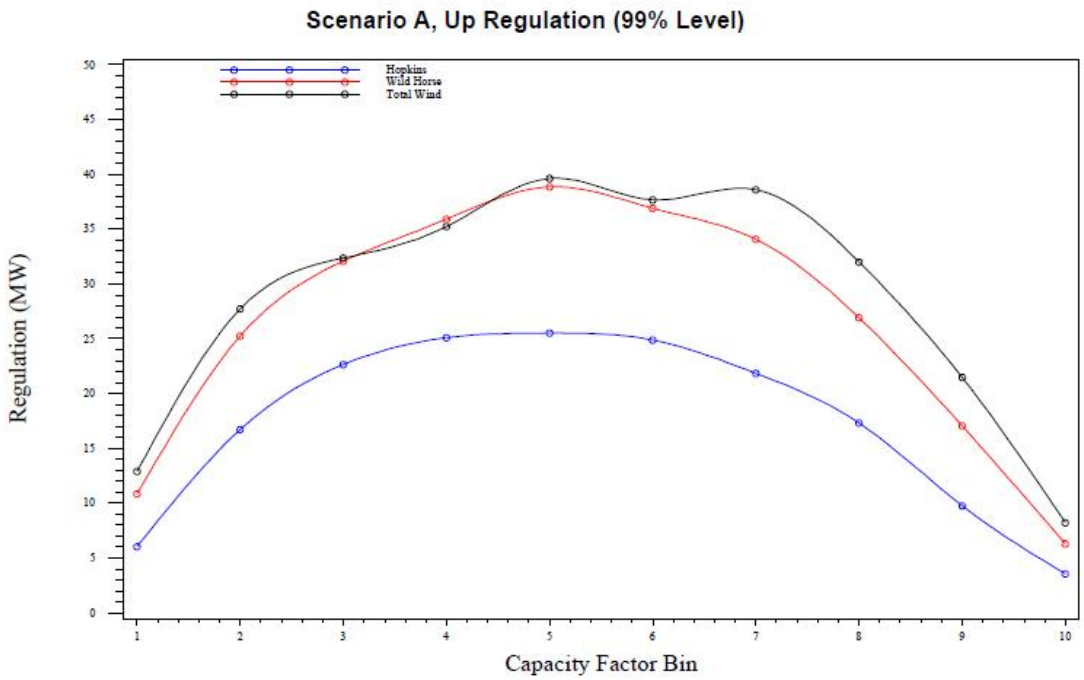
Regulation Requirements

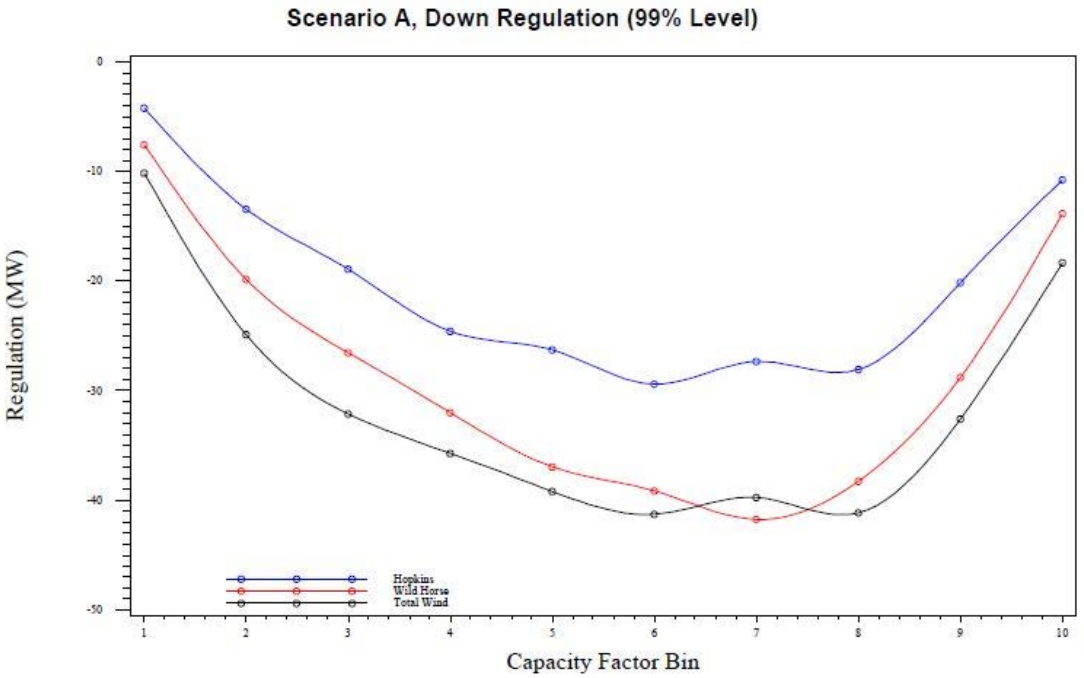




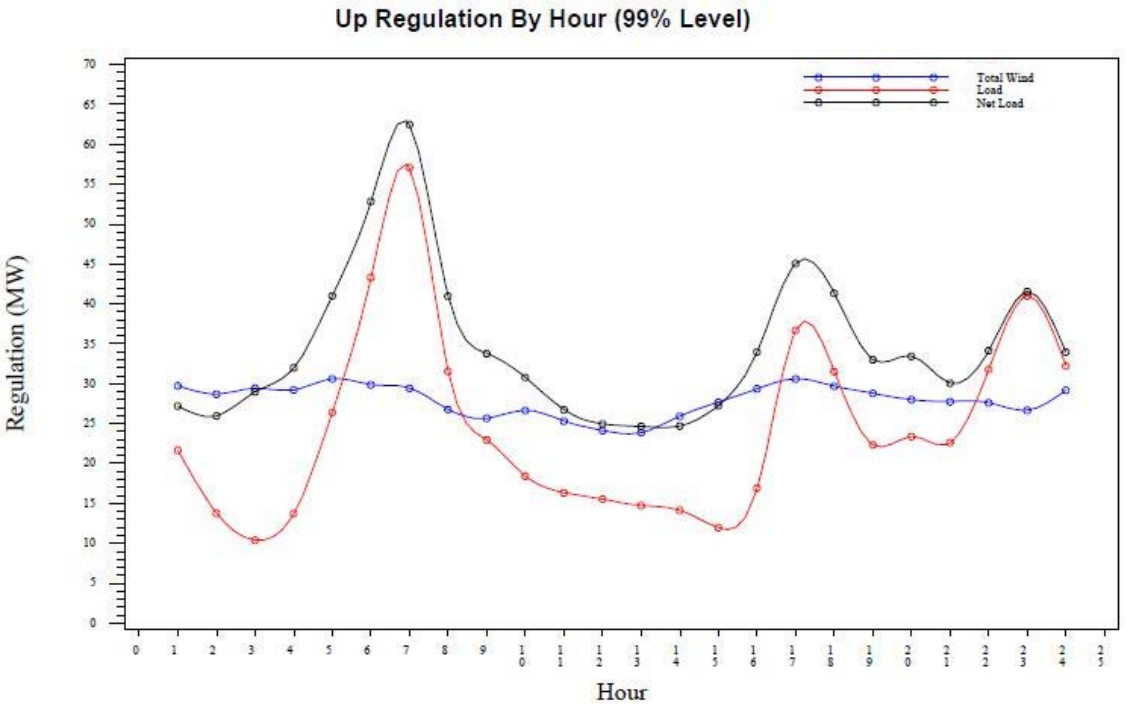
- Seasonal up and down regulation requirements for Wild Horse (273 MW) and Hopkins Ridge (157 MW).
- Seasons are defined as:
  Spring: Mar-May
  Summer: Jun-Aug
  Fall: Sep-Nov
  Winter: Dec-Feb
- Capacity Factor Bins represent generation levels as percent of capacity.
- Most regulation is needed when the wind is generating between 50-70% of capacity.

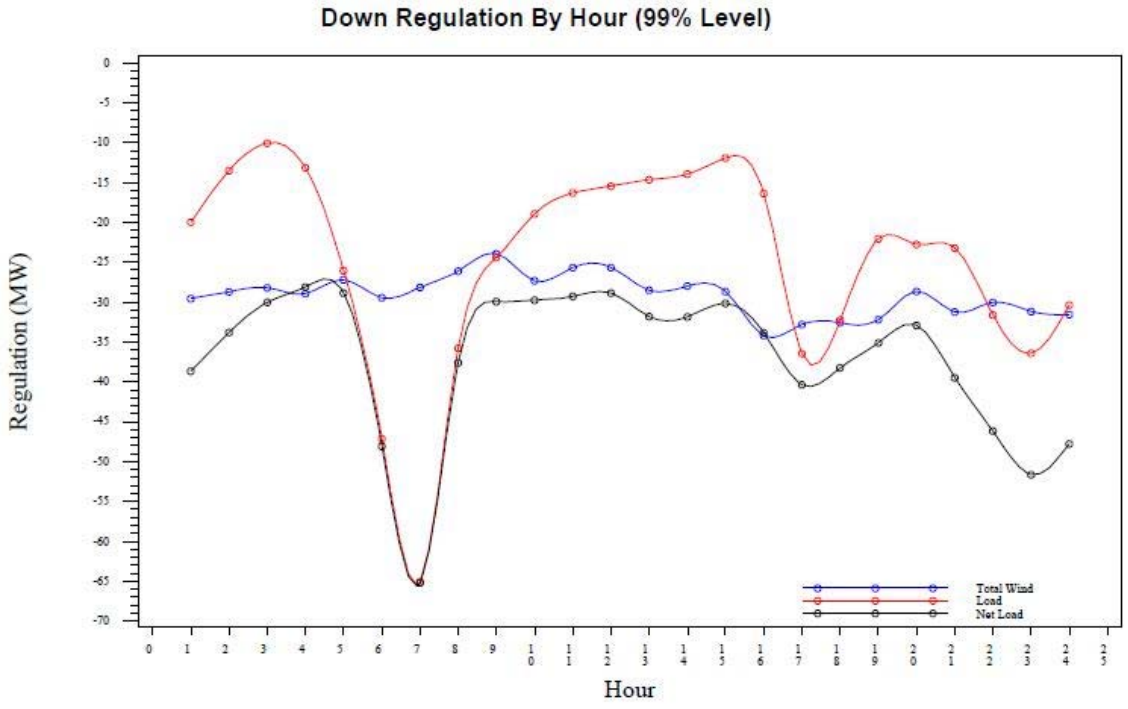
Regulation Requirements





- Up and down regulation requirements for Wild Horse (273 MW) and Hopkins Ridge (157 MW).
- Capacity Factor Bins represent generation levels as percent of capacity.
- Regulation needed for total wind is always less than the sum of Wild Horse and Hopkins Ridge regulation, due to lack of correlation between farms.





Regulation Requirements

- Hourly up and down regulation requirements for Wild Horse (273 MW) and Hopkins Ridge (157 MW).
- Net load is the net impact of load and wind generation.
- Regulation requirements for wind remain fairly constant across the day.
- Net load regulation requirement is always lower than the sum of load regulation and wind regulation.
- Most of regulation for load is needed during the morning ramp and that drives the net regulation requirements.

Following Requirements

Following Requirements

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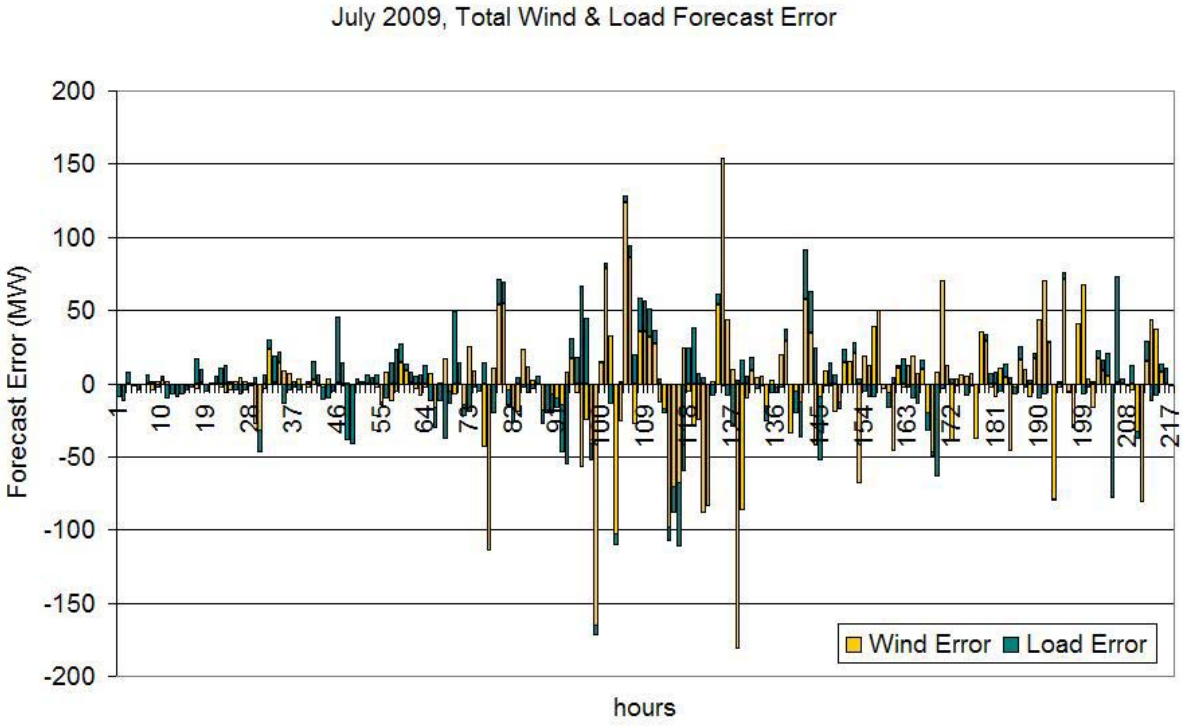
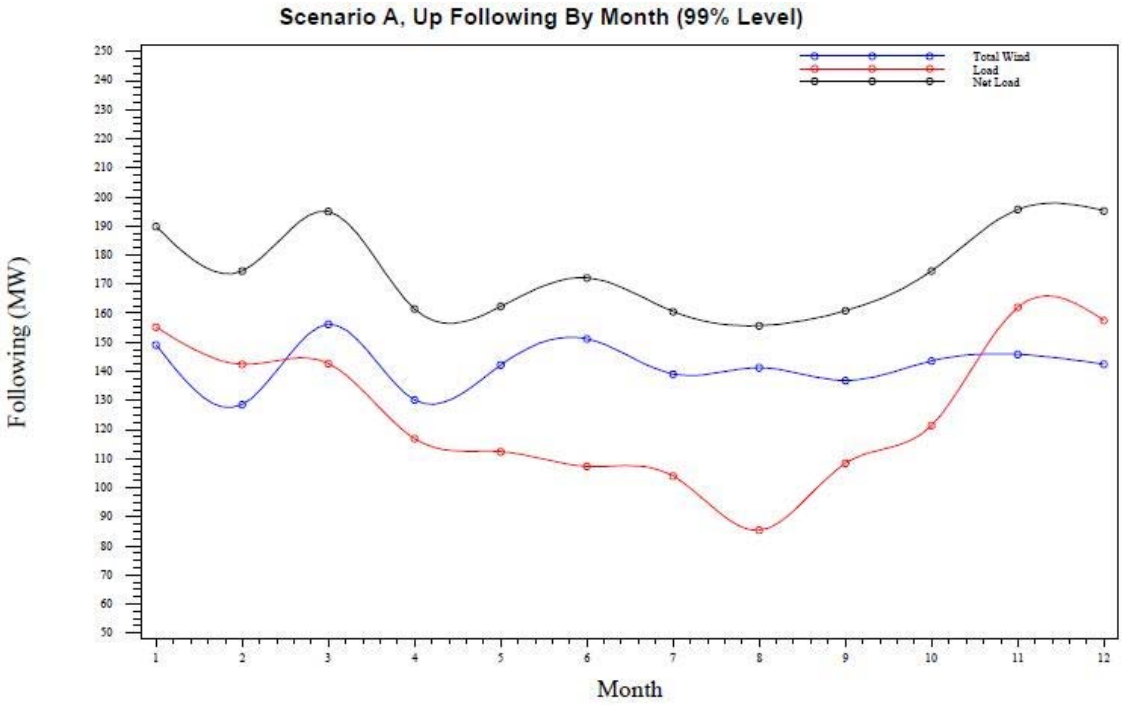
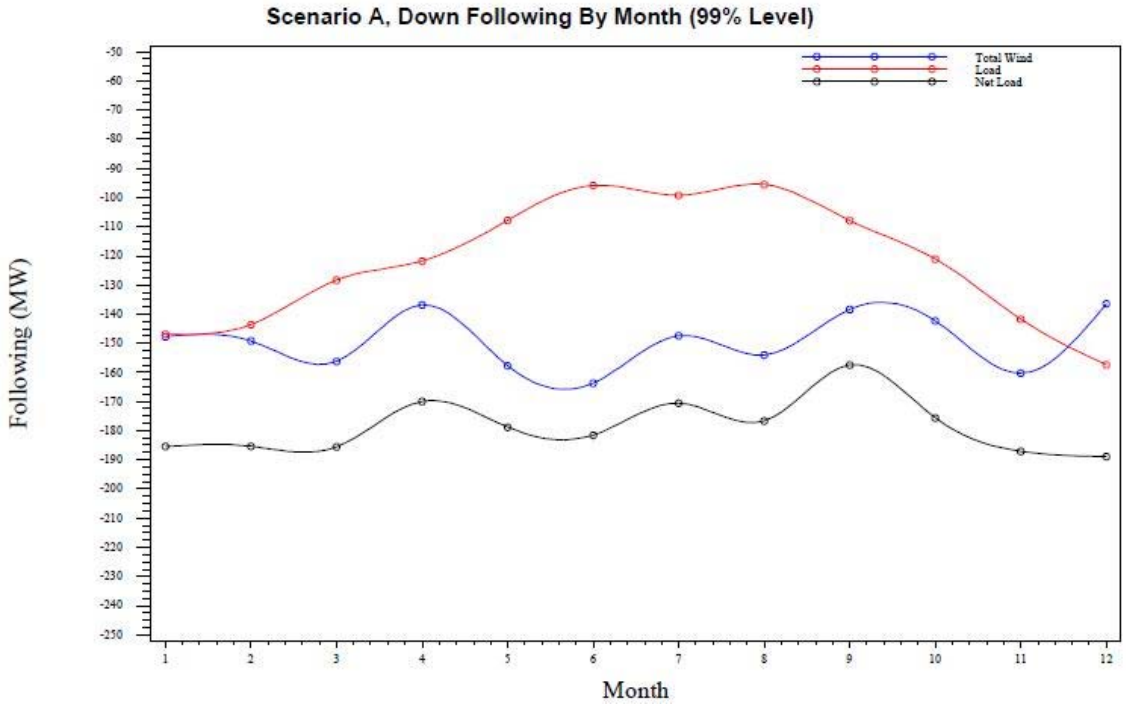
- The magnitude of following reserves is driven primarily by the hour-ahead forecast error and not actual wind speed and generation variability.
- At longer time horizons the wind following requirement should be more considerate of the farm's wind profile – time of day, season, generation, climate patterns (El Nino).

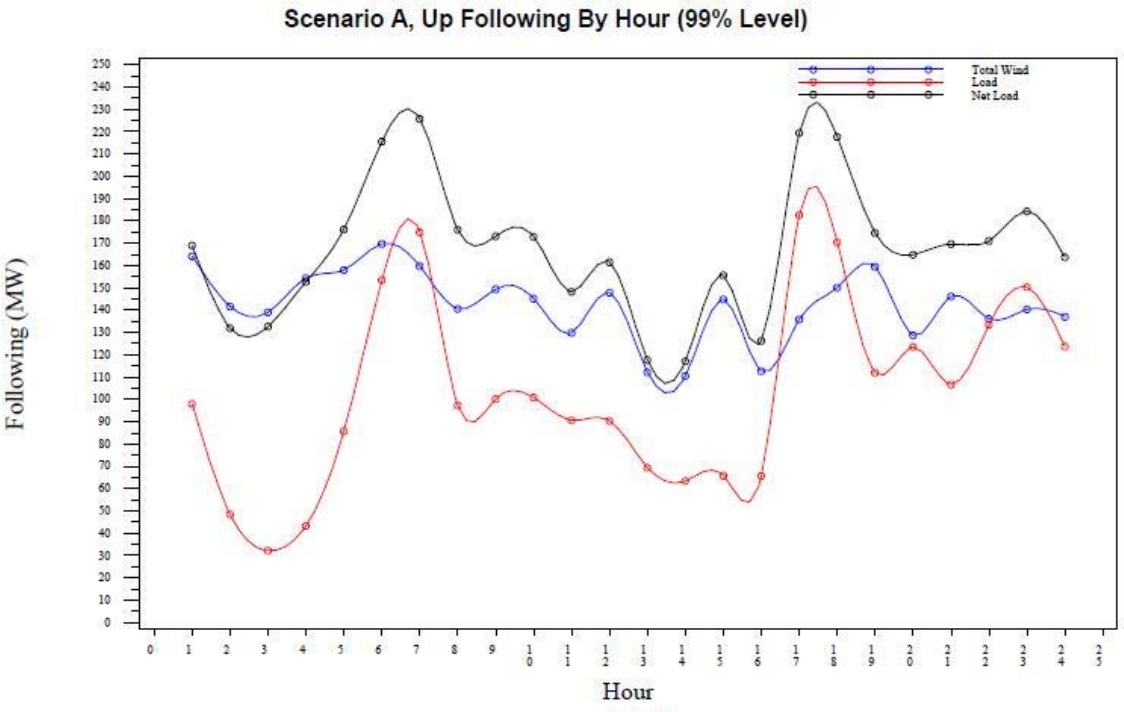


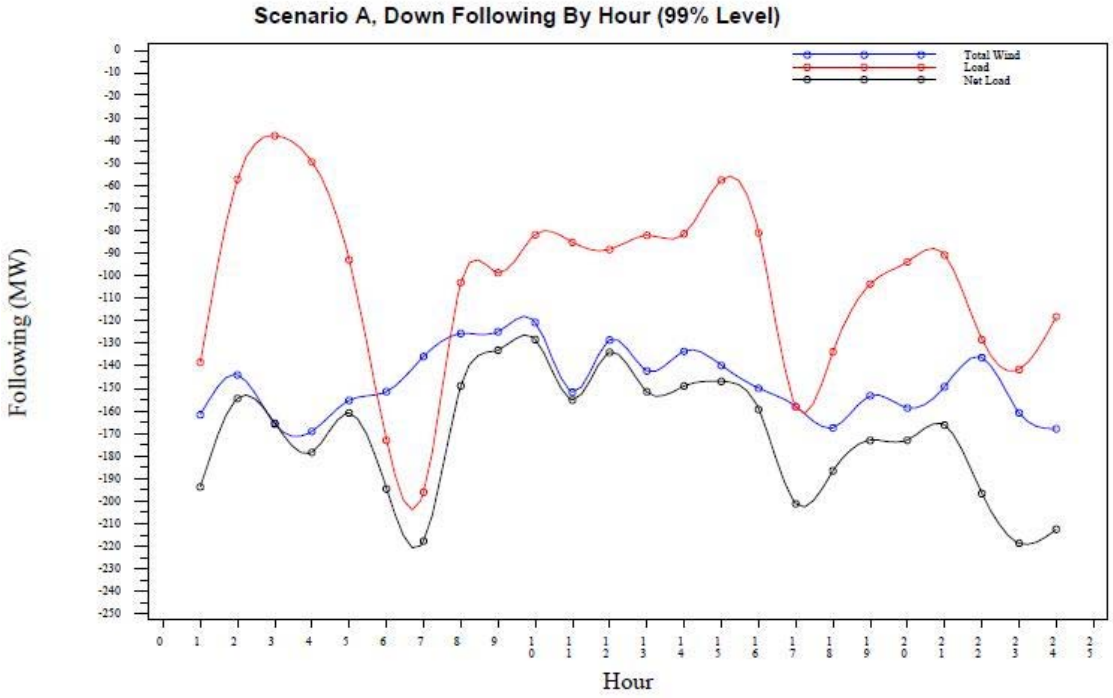
Following Requirements





- Up and down following requirements for Wild Horse (273 MW), Hopkins Ridge (157 MW) and load.
- Net load is the net impact of load and wind generation.
- Net load following requirement is always lower than the sum of load following and wind following.
- Load following is lower in the summer months.





Following Requirements

- Up and down following requirements for Wild Horse (273 MW) and Hopkins Ridge (157 MW).
- Most of the load following is needed during the morning and evening ramps.
- Wind following is needed across the entire day.

Following Requirements

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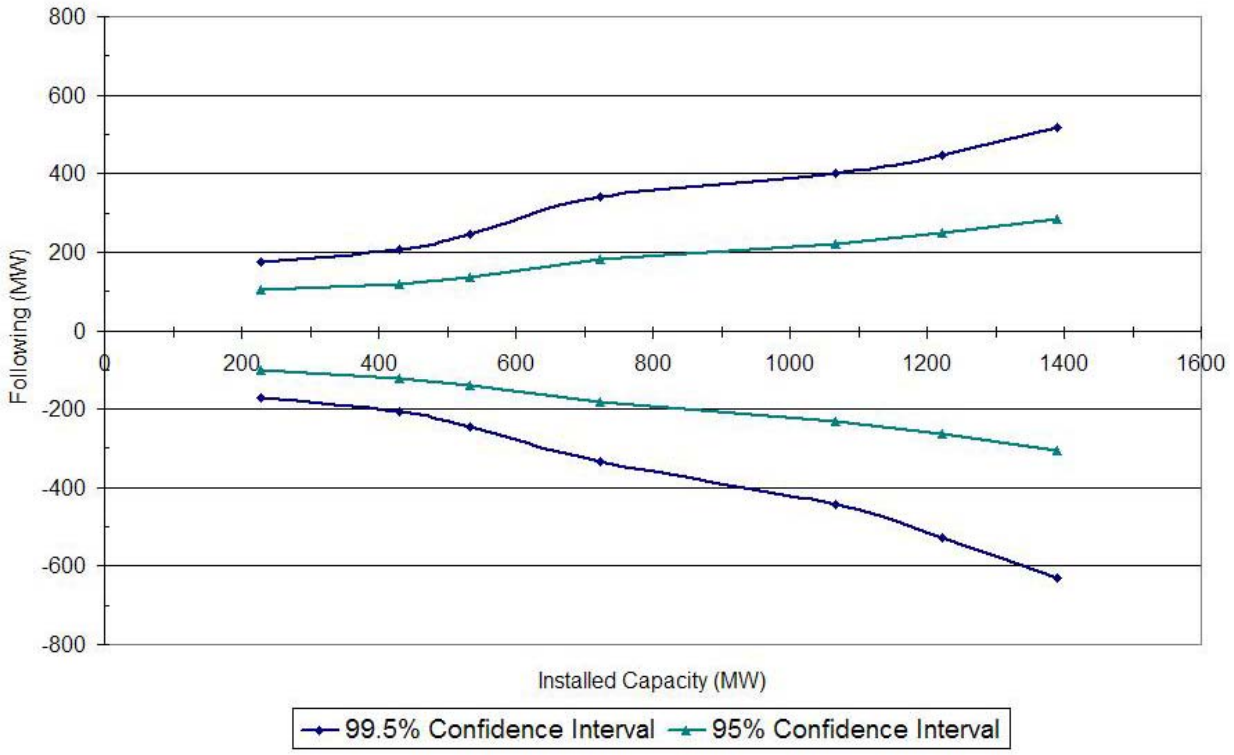
The Energy To Do Great Things

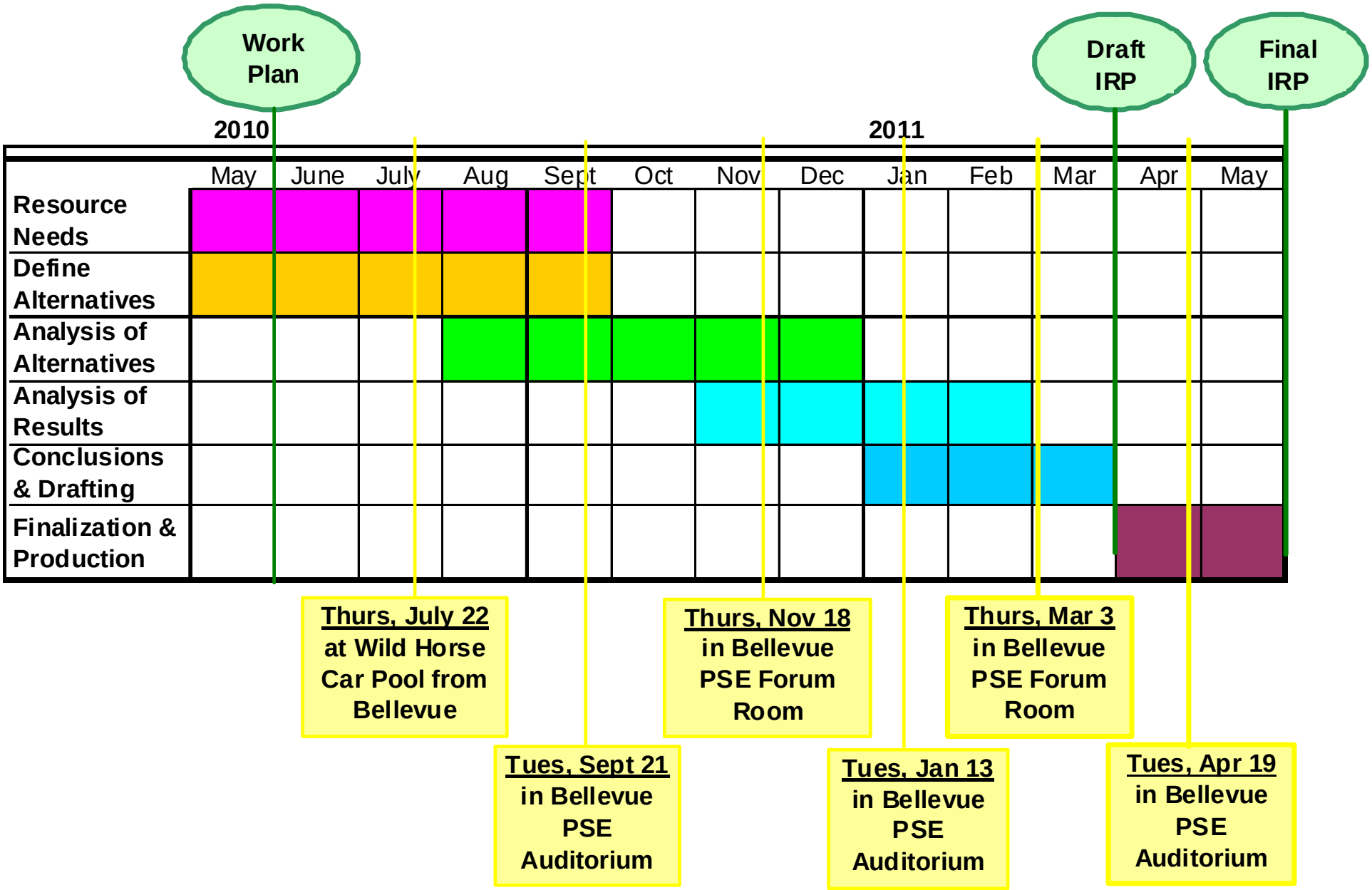
- Net load and wind following requirements with 1400 MW of installed wind at the 99.5% confidence interval result in an additional 200 MW of following requirements compared with the 95% confidence interval.



Conclusions

- Increased reserves, regulation and following, are needed to accommodate more wind.
- Up and down following are not symmetrical and can vary depending on time of day and season. They should be evaluated separately for operations.
- Compared to following, the range of up and down regulation is not as time of day and seasonally dependent however it should still be evaluated separately for operations.
- More reserves are required when wind generation is mid-range of the nameplate production.
- Uncertainty in the amount of wind generation to be delivered in the next hour impacts the reserves. Improving the wind forecast will reduce reserve requirements.

Anticipated 2011 IRP Work Plan Schedule for Public Participation



IRP Advisory Group Meeting

October 7, 2010

PUGET SOUND ENERGY

The Energy To Do Great Things

Road Map for Today

- Introductions
- Overview of Process
- “Methodology” for Demand-Side Resources
- Scenarios & Sensitivities

- Lunch Break

- Resource Alternatives
- Assumptions: Gas Prices, CO2 Costs, Load Forecast
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Process Overview & Check In

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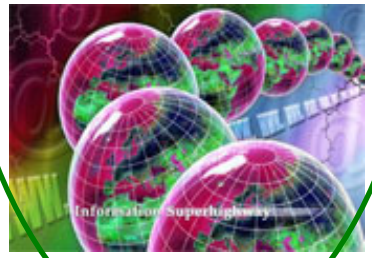
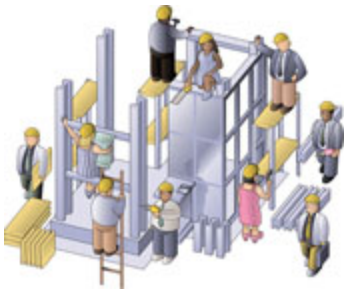
Uncertain Future Market Conditions

- Policies
- Costs
- Region Demand
- Scenarios



How PSE Can Respond to Uncertainties

- Least Cost Resource Mix
- Impact of Uncertainty on Mix
- Results of Analysis



Resource Plan Decision

- Analysis of Results
- Qualitative & Quantitative
- Application of Judgment
- Supported Decision

IRP process

50,000’ Level

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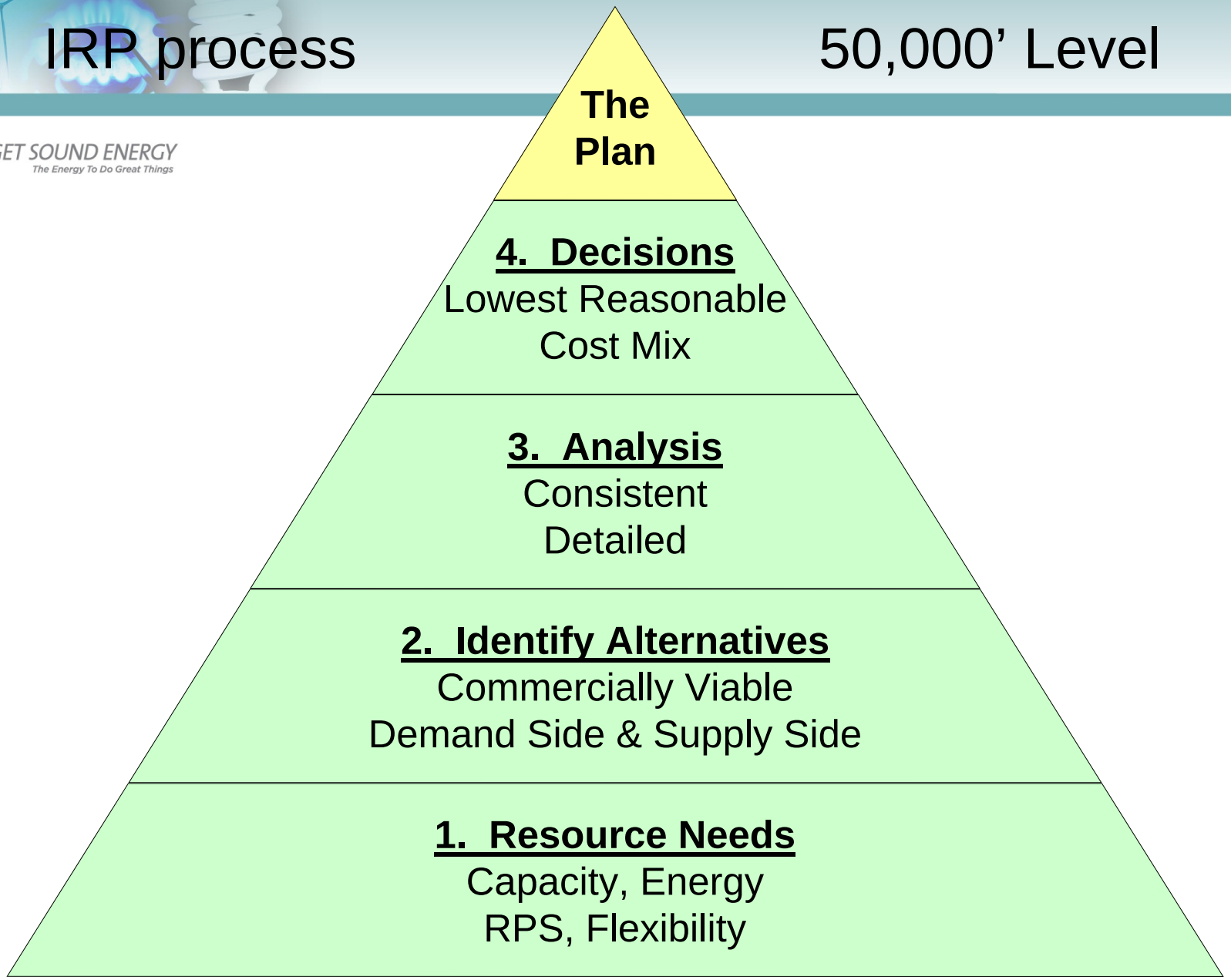

Three Levels of Risk Analyses—30,000' Level

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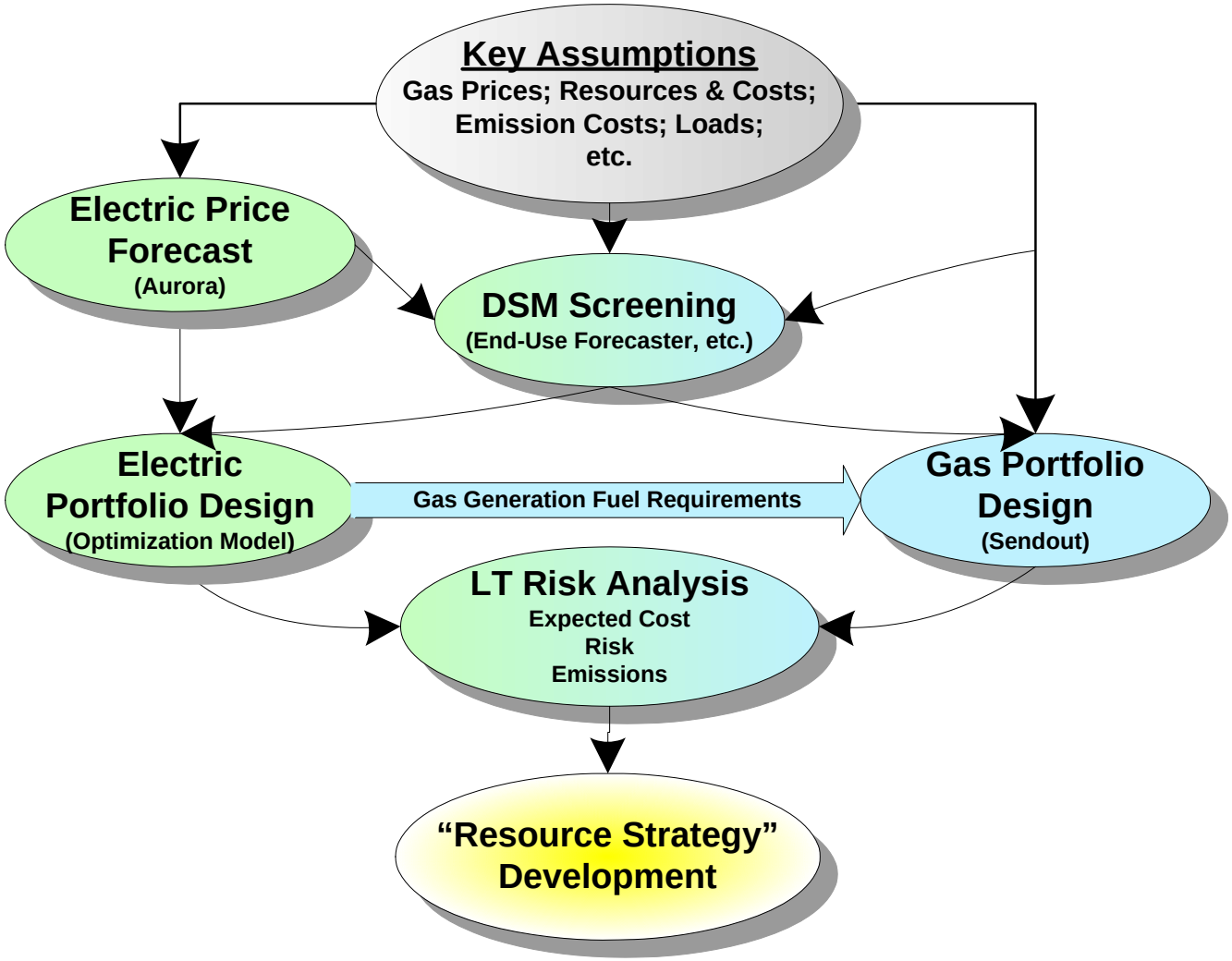
Resource Planning
Portfolio Analysis Process



DRAFT Base Electric Peak Capacity Resource Need

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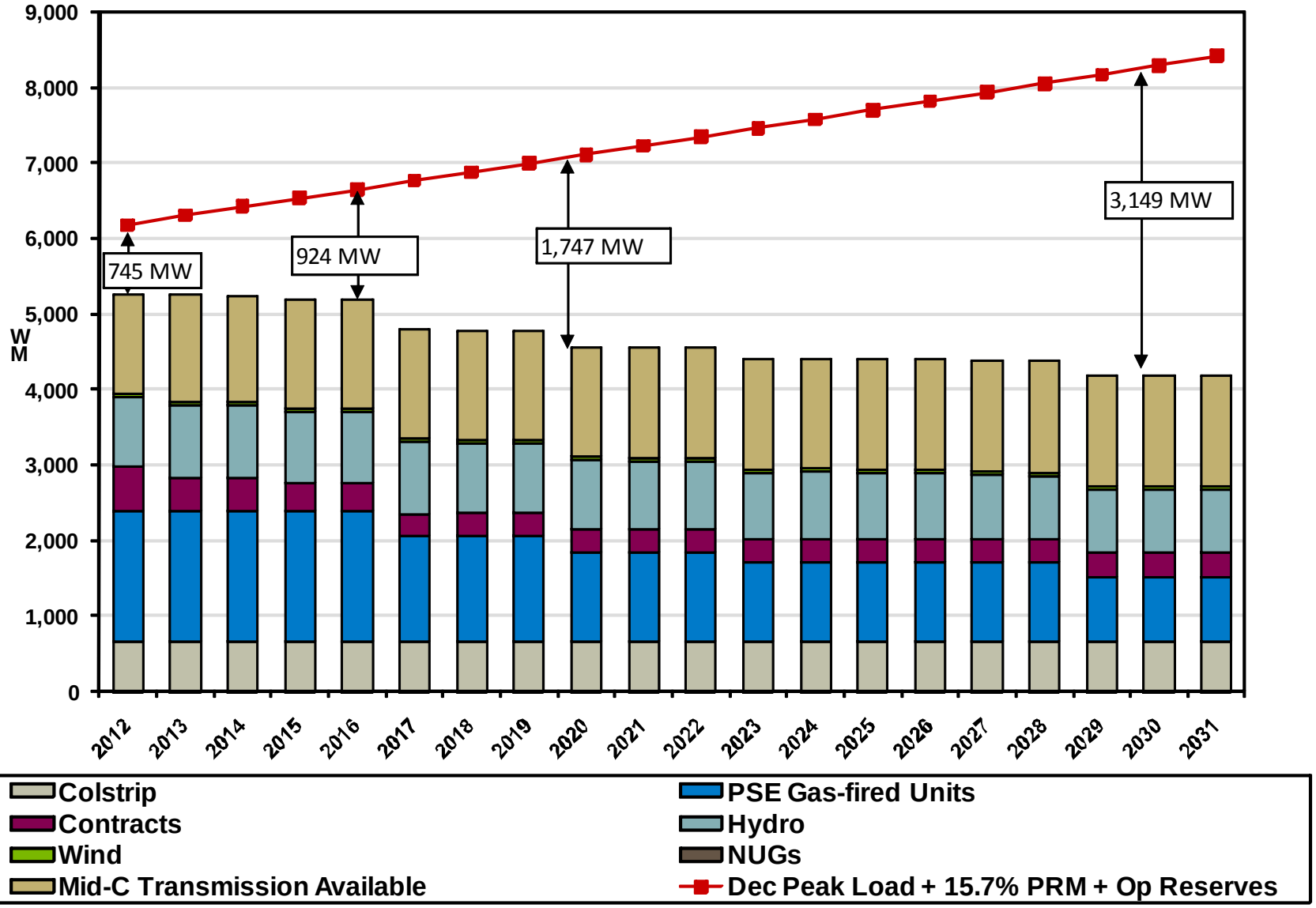
The Energy To Do Great Things

Draft 09/13/10



DRAFT Base REC Need

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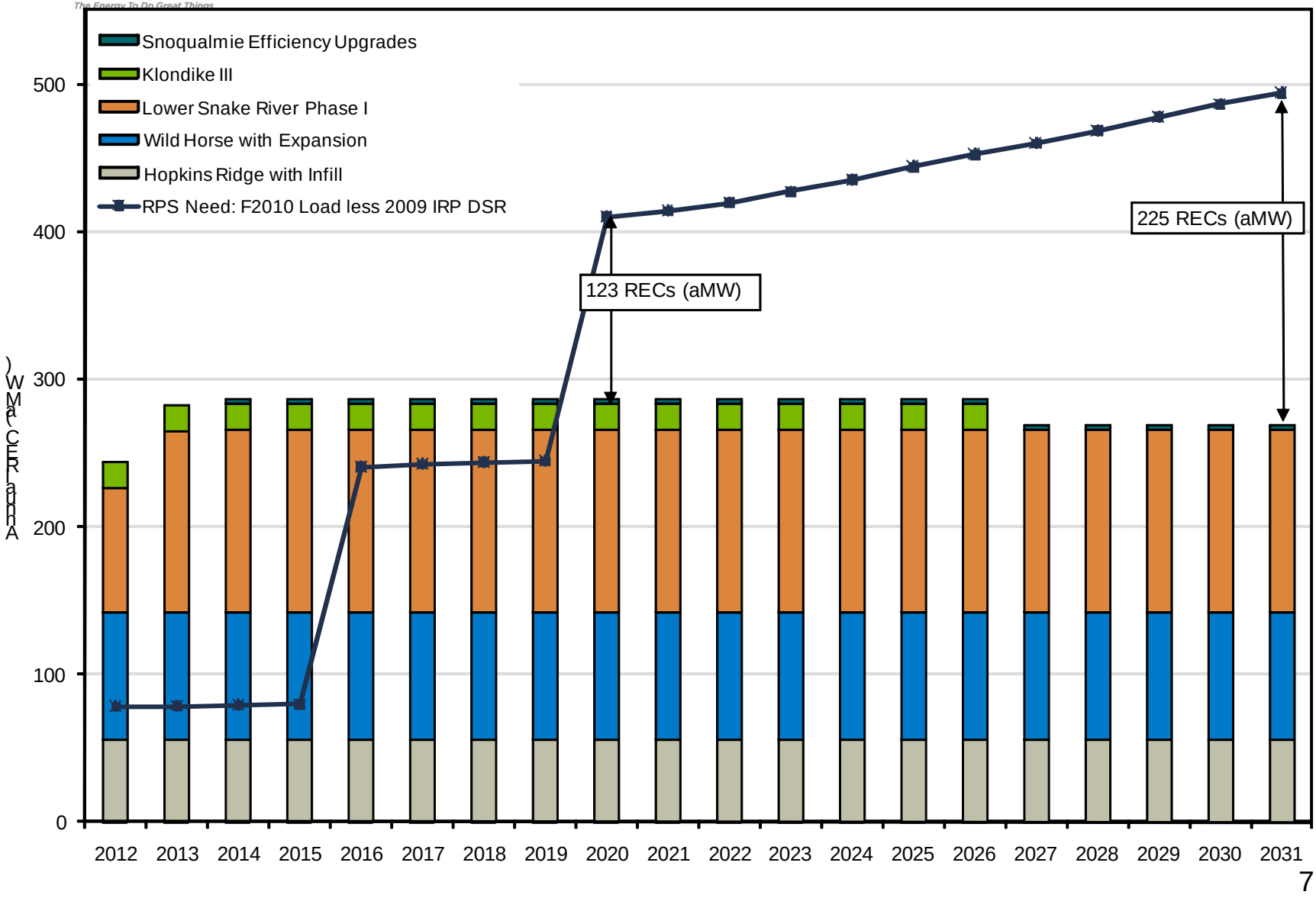
The Energy To Do Great Things

Draft 10/06/2010



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Translating PSE Approach to Council Methodology

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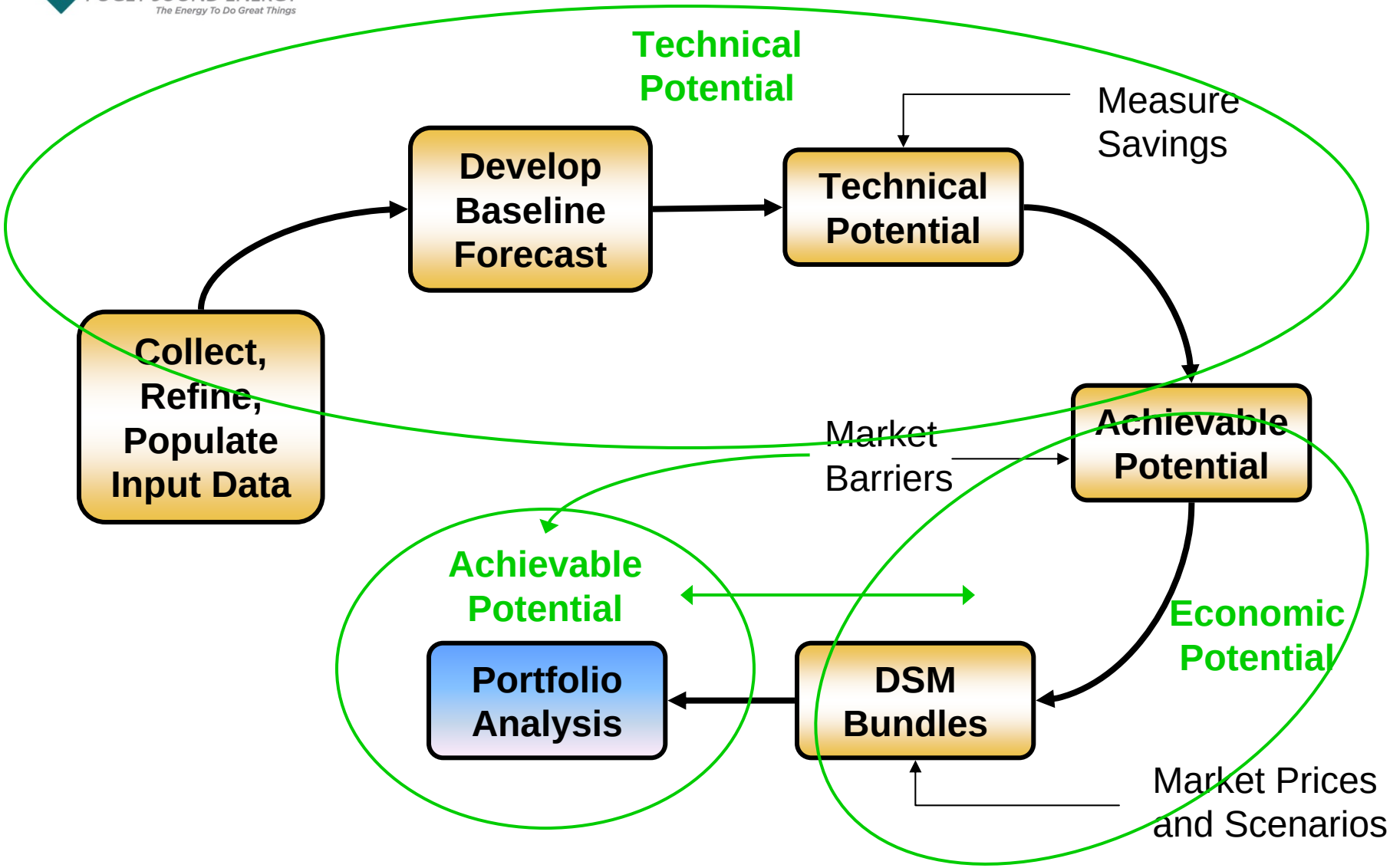
The Energy To Do Great Things



Consistency with Council Methodology

http://www.nwcouncil.org/energy/powerplan/6/supplycurves/I937/default.htm

Council

Technical Potential	Economic Potential	Achievable Potential
See 2. a & b	**See 3. a - e**	**See 4. a - c**
-Wide array tech, all sectors	-Econ Screening-TRC	-Targets from IRP Analysis
-Saturations	-Shaped Energy/Capacity	-DSM Versus All Resources
-New/Existing Units	-Full Incremental Cost	-B&C from Econ Screen
-Measure Life/Substitutions	-T&D Savings & Losses	-Lost Opportunity/Discretion
-Measure Shapes	-"Environmental Benefits"	-Adjusted Historic Ramps
-Measure Interactions	-NEB/10% Credit	-Revise Based on Exp.

PSE

Technical Potential	Economic Potential	Achievable Potential
See 2. a & b	**See 3. a - e**	**See 4. a - c**
☑ Wide array tech, all sectors	☑ Econ Screening-Bundles	☑ Targets from IRP Analysis
☑ Saturations	☑ Shaped Energy/Capacity	☑ DSM Versus All Resources
☑ New/existing units	☑ Full Incremental Cost	☑ B&C from Econ Screen
☑ Measure life/substitutions	☑ T&D Savings & Losses	☑ Lost Opportunity/Discretion
☑ Measure shapes	☑ Environmental Benefits"	☑ Adjusted Historic Ramps
☑ Measure interactions	? ~~NEB/10% Credit~~	☑ Revise Based on Exp.

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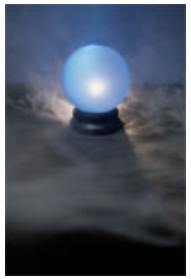

- Lunch Break
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Scenarios/Sensitivities…Some Key Assumptions

Scenarios			
	Load Growth	**Gas Price**	**CO2 Price**
Base	Base	Mid	*None
Green World	Low	High	High
Low Growth	Low	Low	*None
High Growth	High	High	*None
Sensitivities			
Base + CO_2 Costs	Base	Mid	Mid
No "NW" Coal	Base	Mid	*None
Very Hi Gas Price	Base	Very High	*None
Very Lo Gas Price	Base	Very Low	*None
Electric Vehicles	Base+EV	Mid	*None

***--Reflects RCW 80.70, ~$0.32/ton**

Note: Reflect Current Renewable Tax Incentive Structure in All Scenarios/Sensitivities

Sensitivities

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- Carbon Costs
  - Varies across scenarios
  - Sensitivity for Base
- No “Northwest” Coal
  - Boardman, Centralia, & Colstrip shut down by 2020
  - Impact on emissions & incremental costs…not rate impacts.
- Renewable Tax Incentives
  - Not planning to test possible extensions
  - Likelihood?
- Transportation Loads
  - Electric and Gas Transport?
- Gas Prices
  - Varies across scenarios
  - Also Very High & Very Low Sensitivities for Base

Road Map for Today

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Combustion Turbine Costs - DRAFT

Valuation Year	2010	CCCT		
	Units	Primary+DF	Frame SCCT	Aero SCCT
ISO Capacity	*MW*	325	197	200
Winter Capacity (avg Jan temp)	*MW*	334	213	200
Capital Cost (per kW Jan capacity)	*$/kW*	1,543	972	1,352
O&M - Fixed (ex. prop tax and ins., Jan cap)	*$/kW-yr*	21.97	17.65	21.86
O&M - Variable	*$/MWh*	0.44	0.41	0.66
Forced Outage Rate / Wind Cap. Factor	*%*	3.0%	3.0%	3.0%
Heat Rate - Baseload (HHV)	*Btu/kWh*	7,083 / 9,351	10,437	9,213
Gas Transport - Fixed	*$/kW-yr*	31.83	0.00	0.00
Gas Transport - Variable	*$/MWh*	2.04	5.19	4.59
Electric Transmission - Fixed	*$/kW-yr*	0.00	0.00	0.00
Electric Transmission - Variable	*$/MWh*	0.00	0.00	0.00
Emissions:				
SOx	*T/GWh*	0.04	0.05	0.04
NOx	*T/GWh*	0.03	0.05	0.04
CO_2	*T/GWh*	410	605	527
Hg	*T/GWh*	0	0	0
Location		*PSE Control*	*PSE Control*	*PSE Control*
Min Capacity	*%*	*57%*	*60%*	*18%*
Development & Construction Leadtime	*years*	*5.0*	*4.0*	*4.0*
First year Available		*2017*	*2016*	*2016*

Notes:

Projects are assumed to be greenfield commence development activities in Jan 2012.

Heatrates are increased by 2% from new and clean to account for typical degradation between major maintenance intervals.

Renewable Costs - DRAFT

Valuation Year	2010		
	Units	Wind	Biomass (wood)
ISO Capacity	*MW*	100	25
Winter Capacity (avg Jan temp)	*MW*	100	25
Capital Cost (per kW Jan capacity)	*$/kW*	2,293	4,327
O&M - Fixed (ex. prop tax and ins., Jan cap)	*$/kW-yr*	16.73	193.29
O&M - Variable	*$/MWh*	3.50	3.39
Forced Outage Rate / Wind Cap. Factor	*%*	30.0%	6.3%
Heat Rate - Baseload (HHV)	*Btu/kWh*		14,118
Gas Transport - Fixed	*$/kW-yr*		
Gas Transport - Variable	*$/MWh*		
Electric Transmission - Fixed	*$/kW-yr*	34.26	0.00
Electric Transmission - Variable	*$/MWh*	3.32	0.00
Emissions:			
SOx	*T/GWh*		0.18
NOx	*T/GWh*		0.53
CO_2	*T/GWh*		0
Hg	*T/GWh*		0
Location		*BPA Control*	*PSE Control*
Min Capacity	*%*		*60%*
Development & Construction Leadtime	*years*	*3.0*	*4.5*
First year Available		*2015*	*2017*

Notes:

Biomass projects are assumed to be greenfield and commence development activities in Jan 2012.

Wind is assumed to be mid-development cycle. Development timeline for complete greenfield wind can be up to 10 years.

Gas Supply Alternatives

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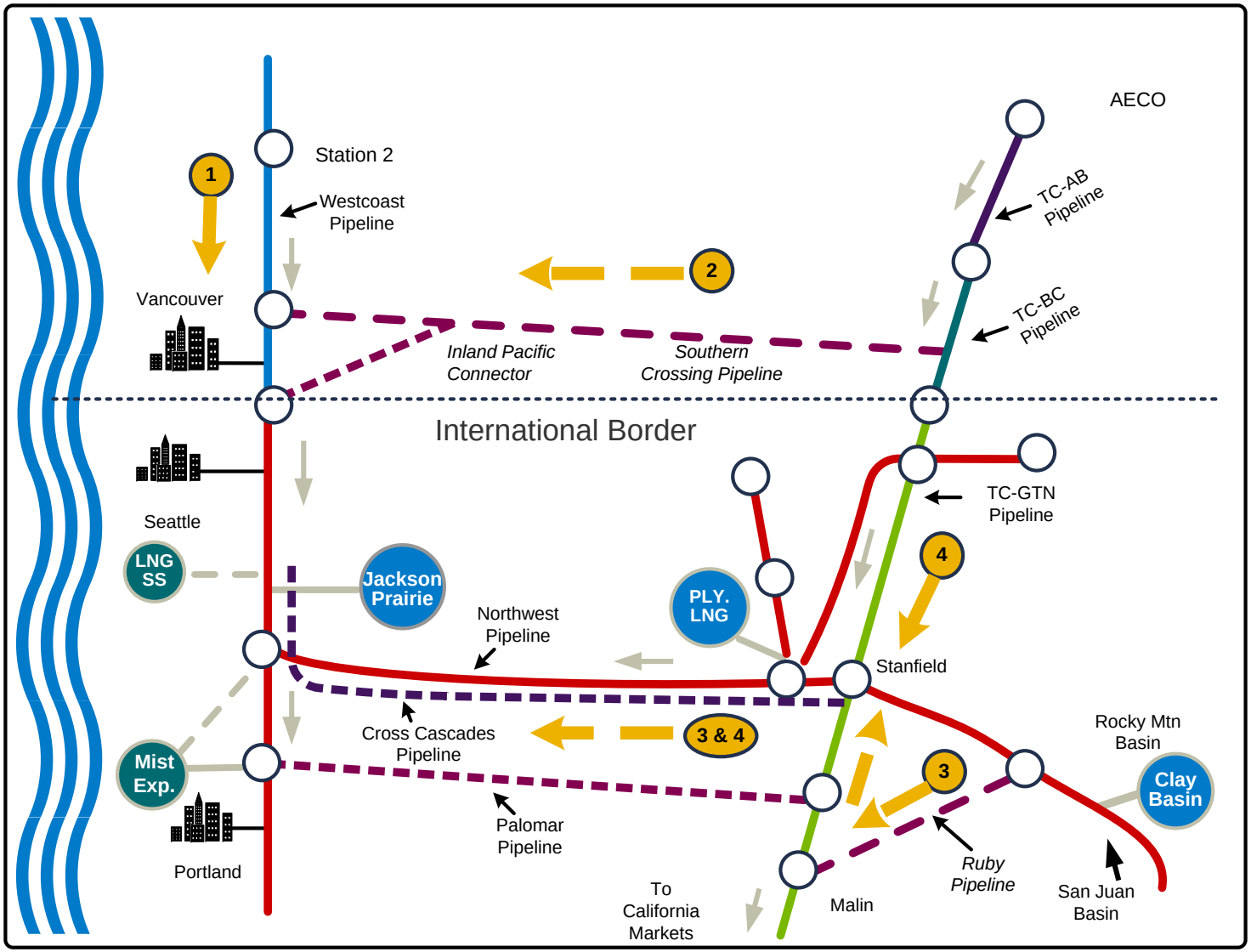
The Energy To Do Great Things



Gas Resource Alternatives - 1

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- Expansion of Westcoast & Northwest Pipelines
  - Gives access to Northern B.C. supply
  - Lower cost than Cross Cascades alternatives at this time
  - Expansions available beginning in 2014 (3 year lead time)
- Southern Crossing + Inland Pacific Connector
  - Gives access to AECO via TransCanada expansions & NWP expansions
  - Up to 100 MDth expansion of Terasen Southern Crossing pipeline
  - Expansion available beginning in 2014 (3 year lead time)

Gas Resource Alternatives - 2

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- Cross Cascades Pipeline
  - Gives access to Rockies and AECO gas at Stanfield & Malin
  - Expansion of NWP or alternative from Stanfield to PSE
  - Currently has higher cost that expansions to Northern B.C.
  - Consider later - expansion available in 2018-20 (3-5 year lead time)
- Regional LNG Storage
  - Regional location allowing for redelivery withdrawal service (3-5 year lead time)

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Levelized Gas Prices

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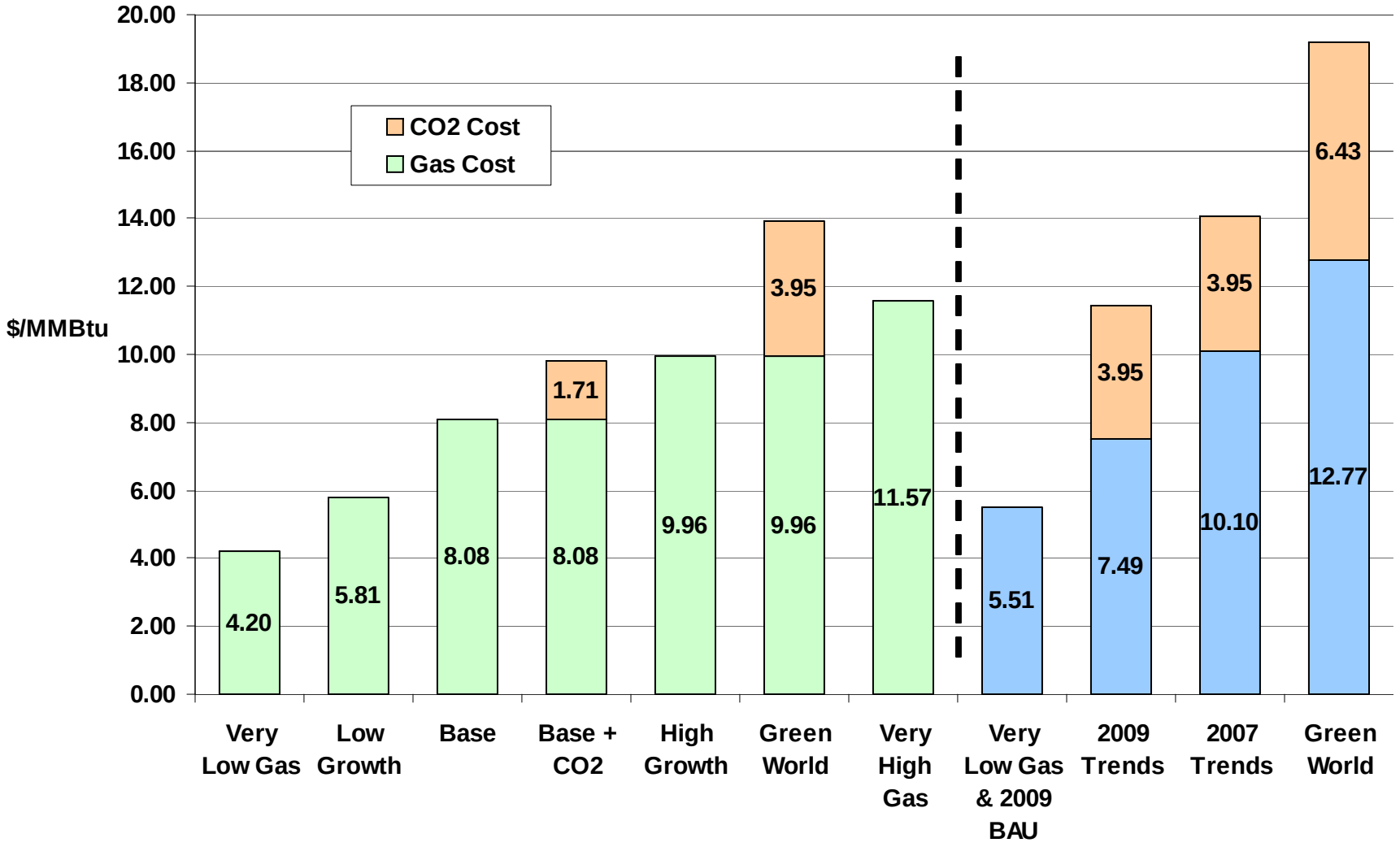
The Energy To Do Great Things

Draft - 10/07/10

(Sumas Hub, 20 year levelized - 2012-31, nominal $)



Gas Price Trends

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The Energy To Do Great Things

- Near term prices (thru 2015) have come down since March 2009
- Forecasts of longer term prices have not come down
  - Shale gas & horizontal drilling has greatly expanded supply
  - However, there are several factors that will tend to increase demand and reduce U.S. supply
    - Federal Carbon Legislation would prompt switching from coal to gas-fired generation
    - Coal Plant Retirements due to sulfur dioxide and mercury regulation
    - Relatively low gas prices will lead Gas Intensive Industry such as domestic petrochemicals to return to service or expand
    - Diversion of LNG into higher priced markets
    - Continued decline in Canadian imports
    - Natural Gas Vehicles
    - Residential and Commercial heating conversions

Development of Gas Price Forecasts

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- Base – Forward Marks thru 2015 + Wood Mackenzie April 2010 Long-term View for 2016-2031
- Low and High – Wood Mack February 2010 Forecasts for PSE
- Very Low – Prices remain constant at the 2012 Low price in nominal terms thru 2031 ($4.20/MMBtu)
- Very High – Prices about $1.61 higher than the high forecast

CO2 cost comparisons

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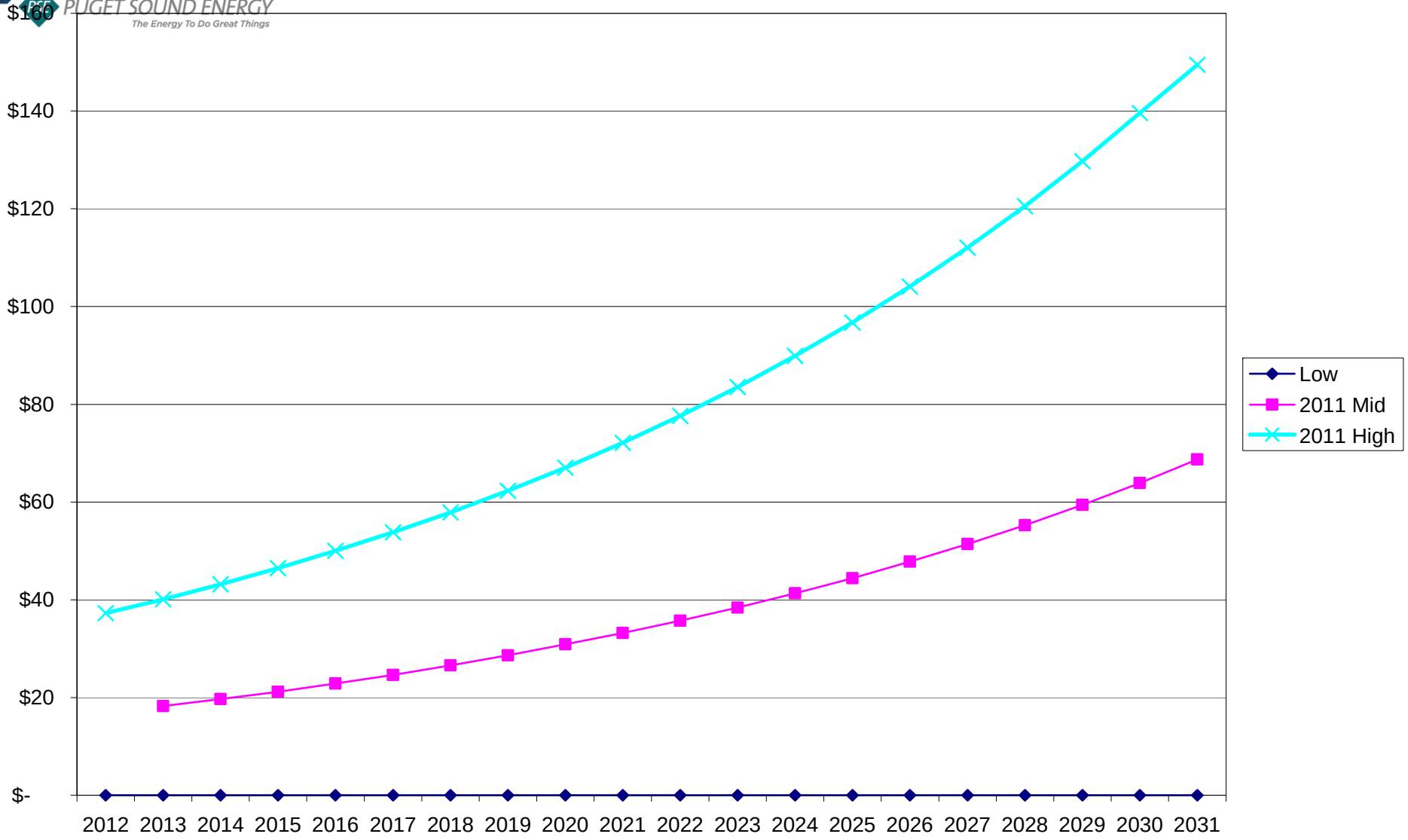
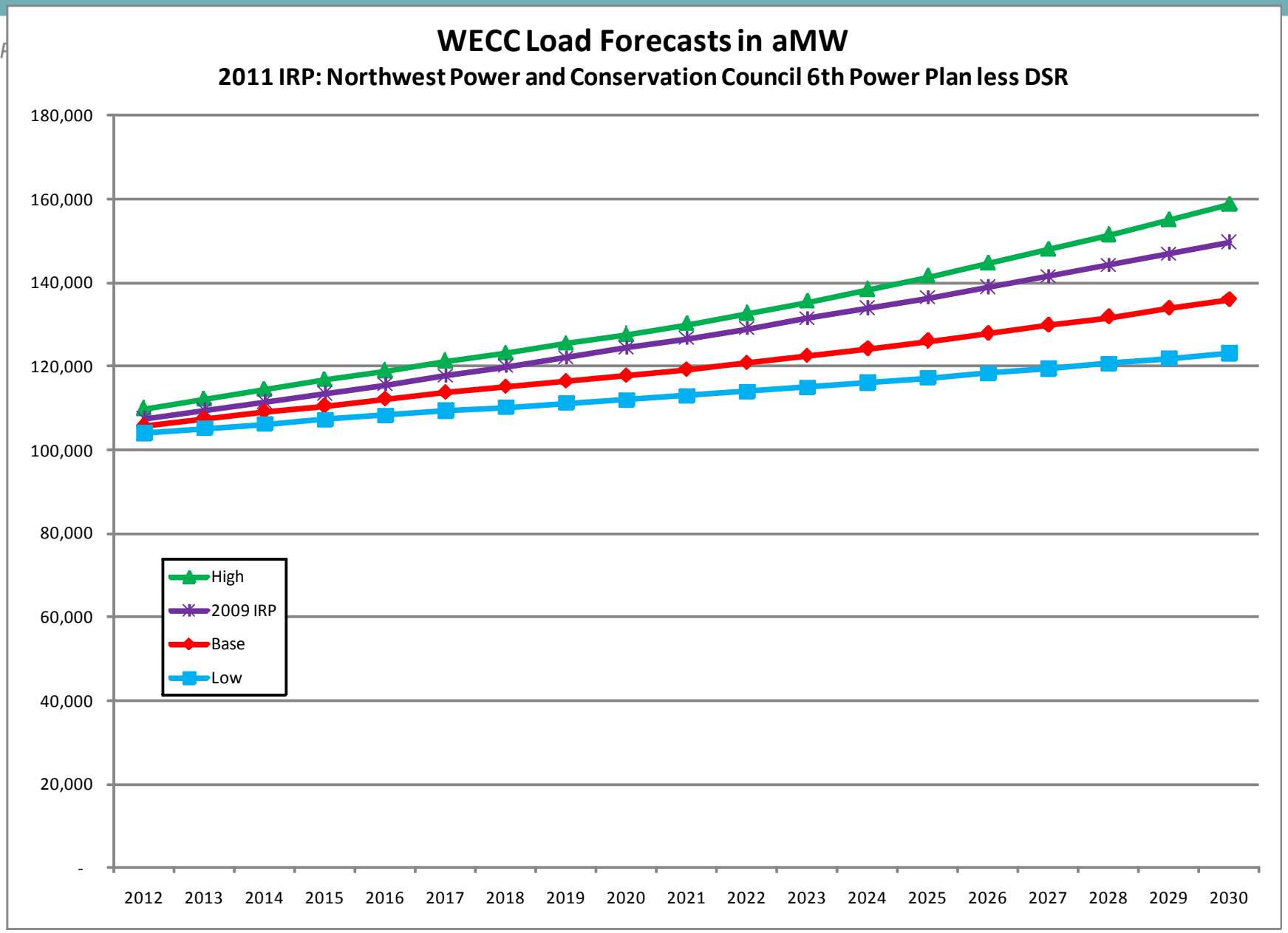
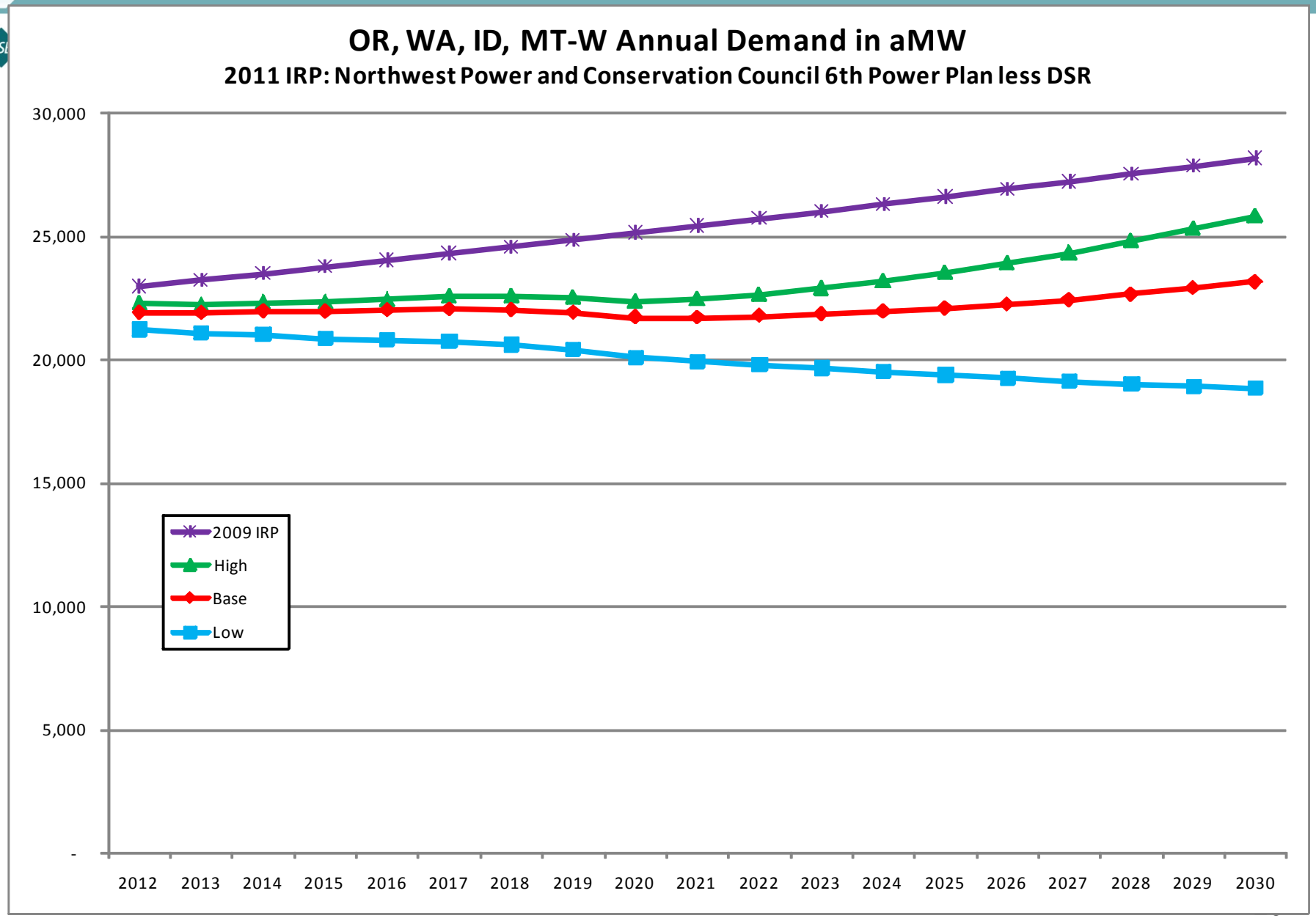
The Energy To Do Great Things



WECC Demand Forecast



Pacific Northwest Demand Forecast



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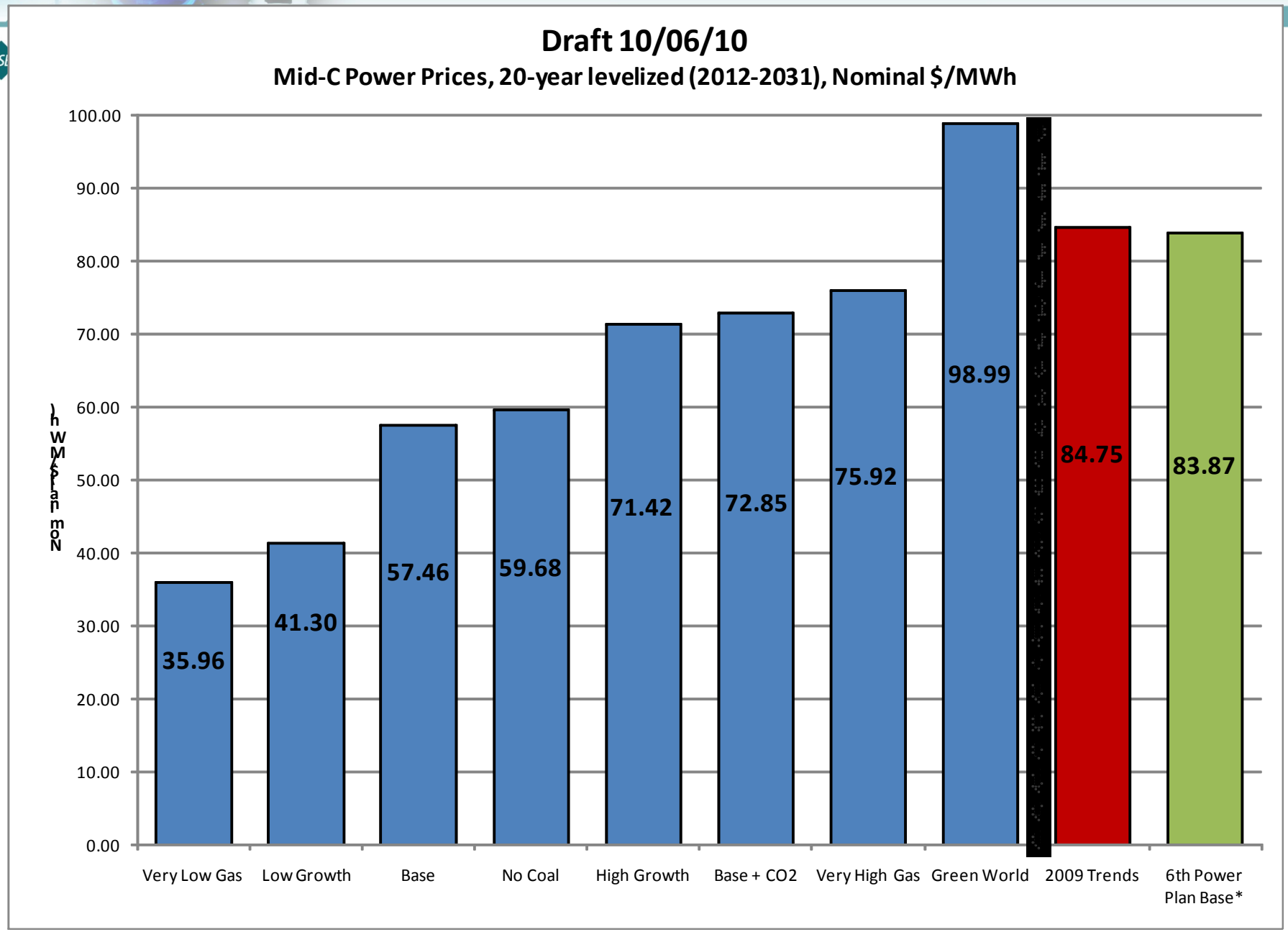
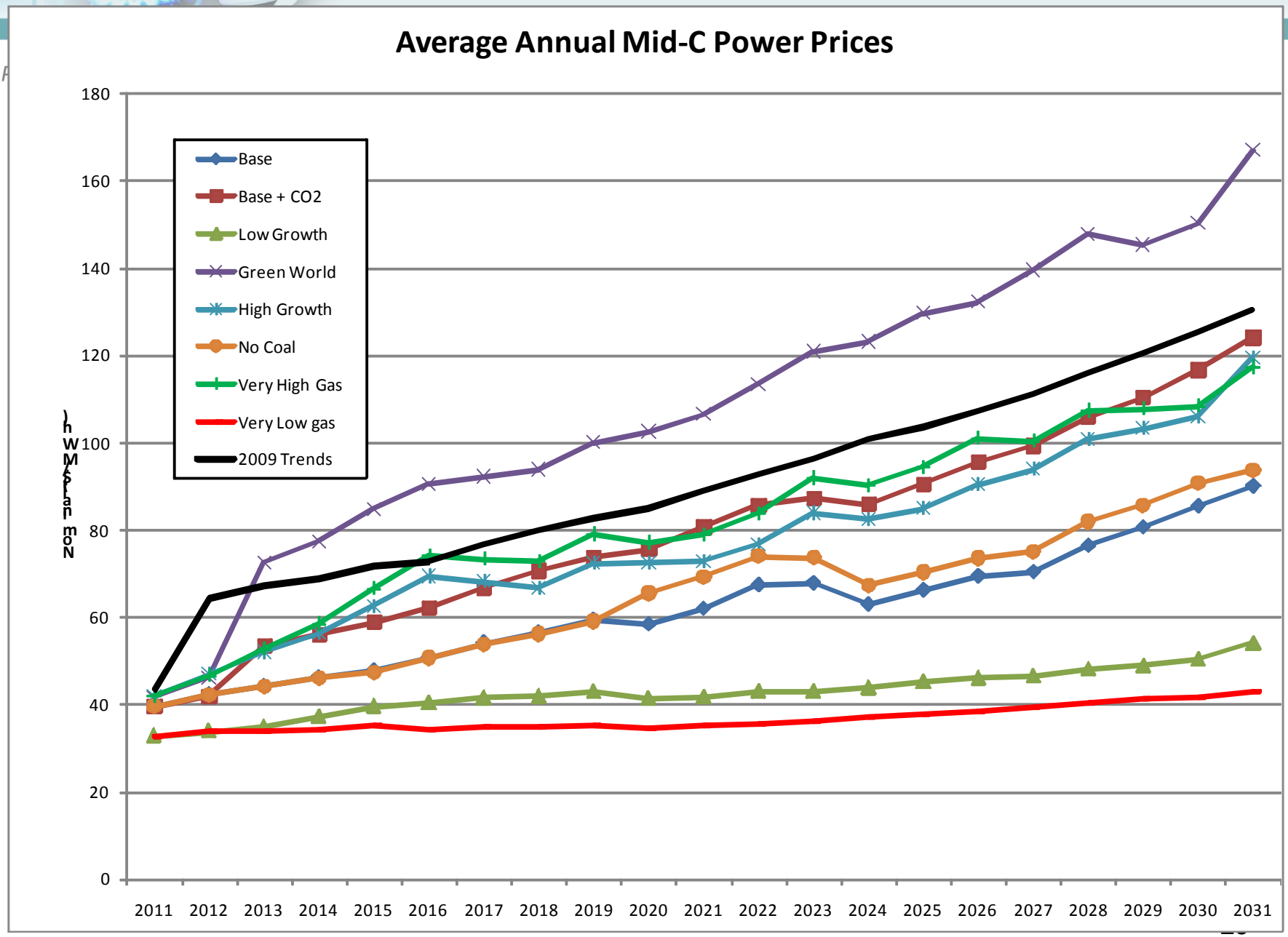
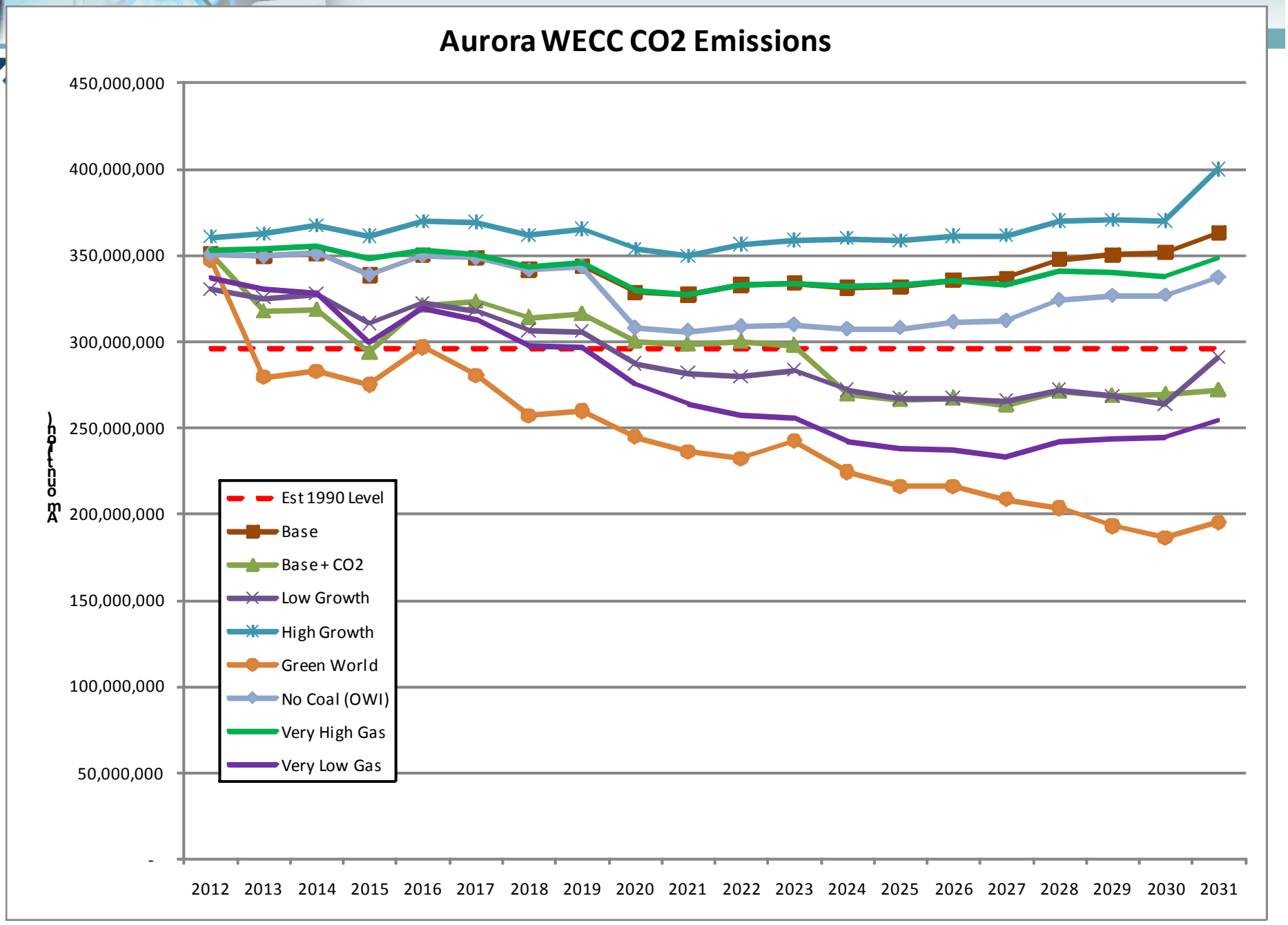
Levelized Power Price by Scenario, Nominal

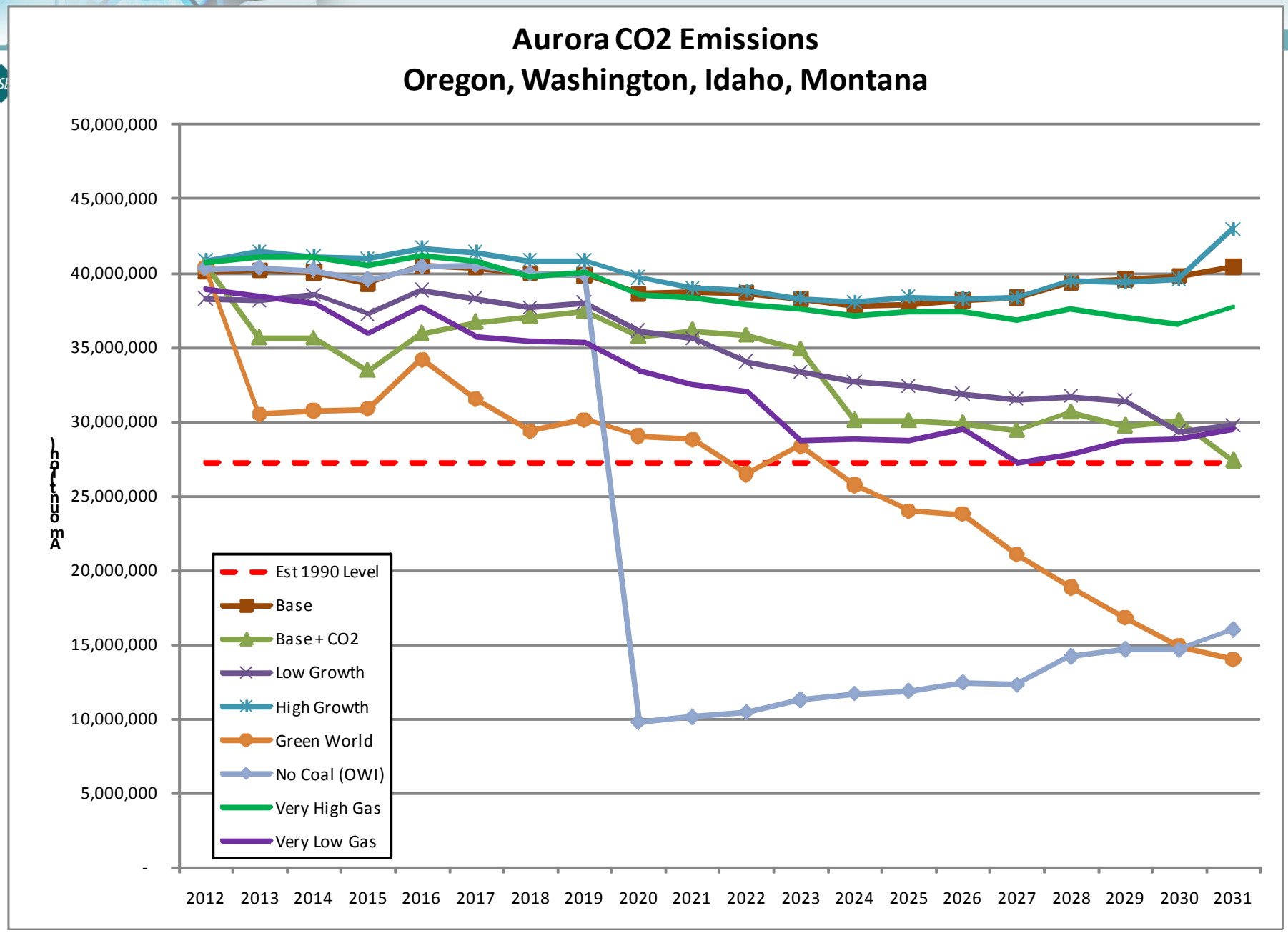


Draft – Annual Mid-C Power Prices



Draft


Aurora WECC CO2 Emissions
450,000,000
400,000,000
350,000,000
300,000,000
250,000,000
200,000,000
150,000,000
100,000,000
50,000,000
-
Short tons
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
Est 1990 Level
Base
Base + CO2
Low Growth
High Growth
Green World
No Coal (OWI)
Very High Gas
Very Low Gas


Aurora CO2 Emissions
Oregon, Washington, Idaho, Montana
50,000,000
45,000,000
40,000,000
35,000,000
30,000,000
25,000,000
20,000,000
15,000,000
10,000,000
5,000,000
-
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
Est 1990 Level
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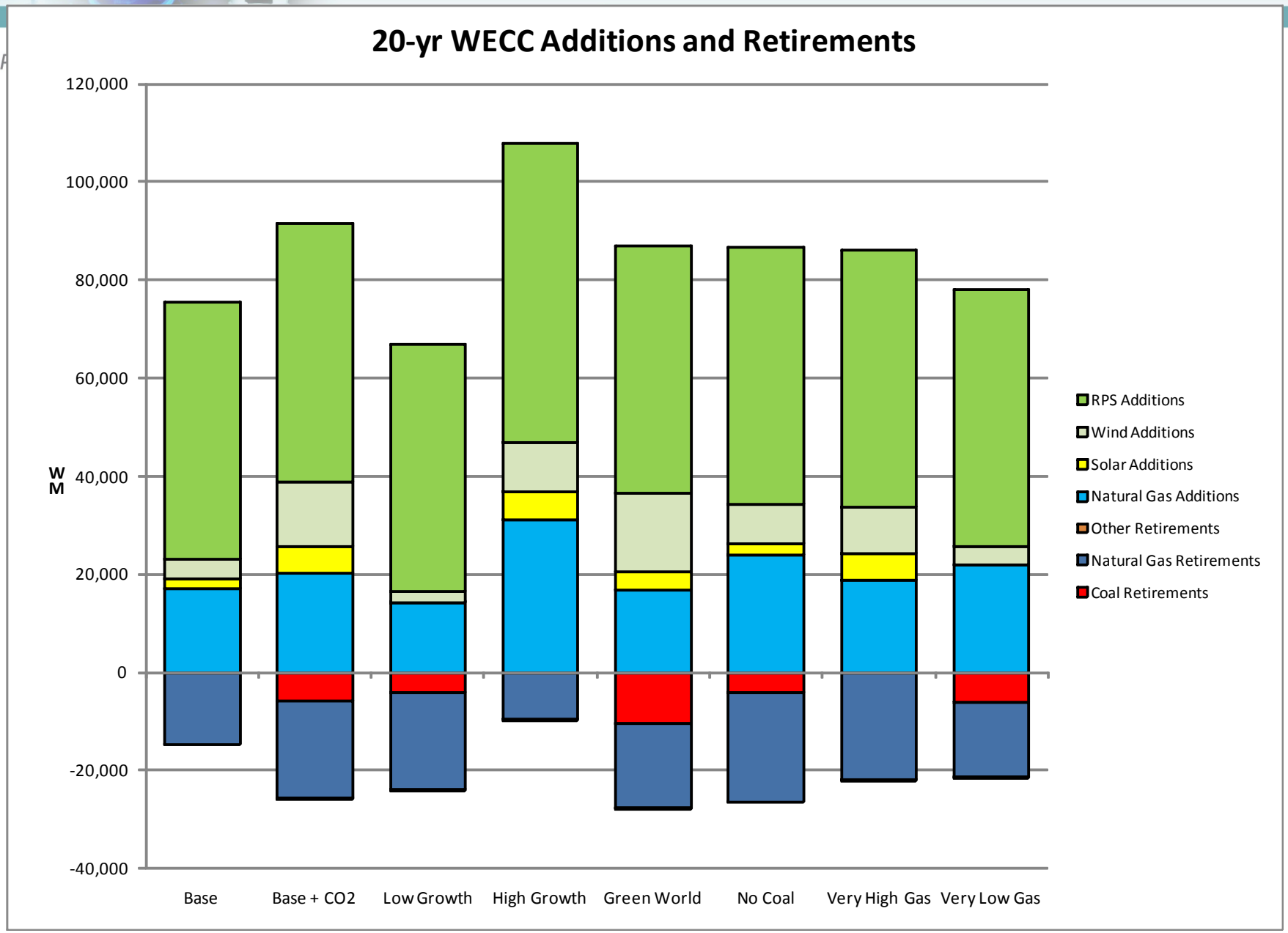
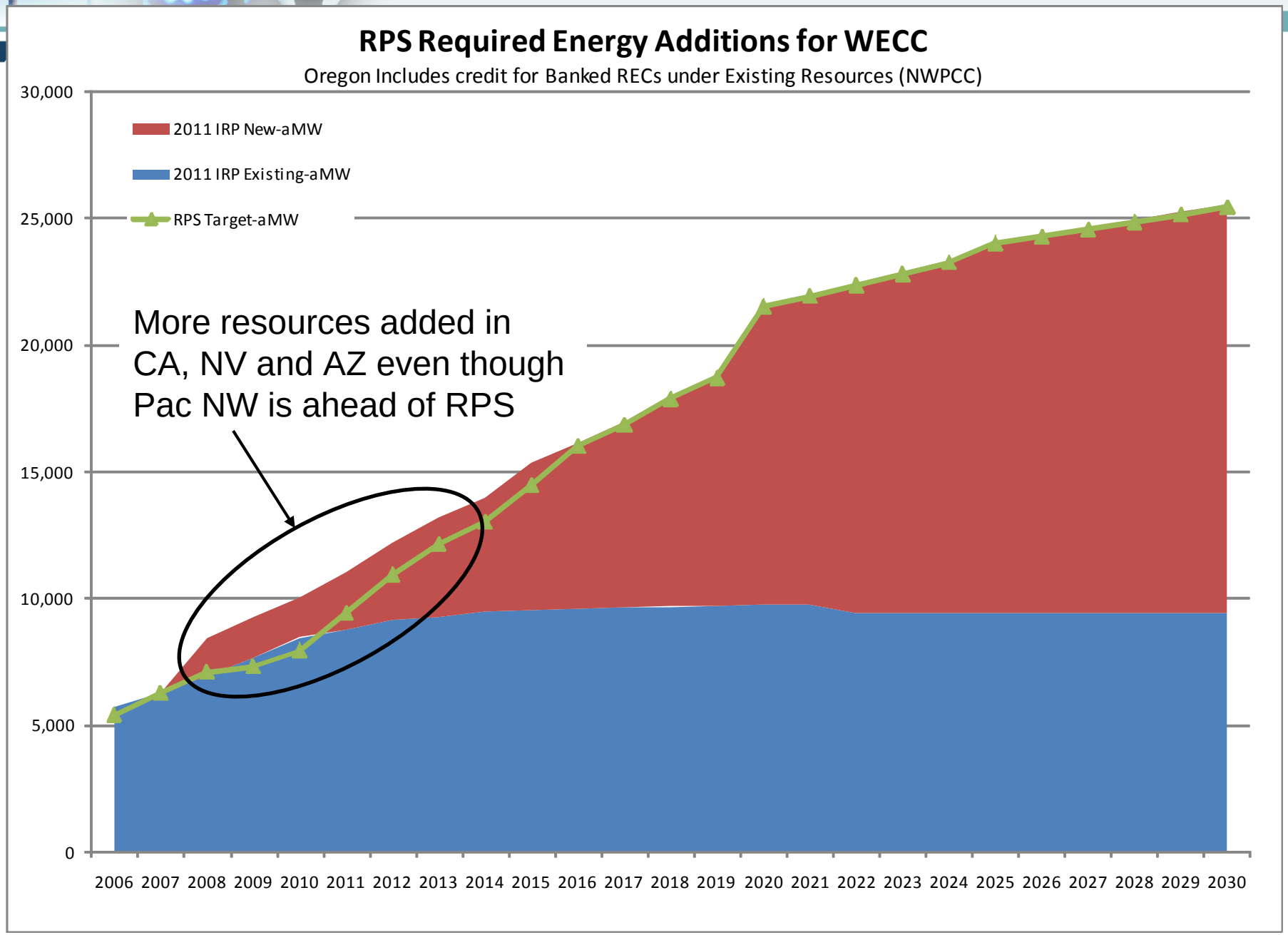
Base + CO2
Low Growth
High Growth
Green World
No Coal (OWI)
Very High Gas
Very Low Gas


20-yr WECC Additions and Retirements
120,000
100,000
80,000
60,000
40,000
20,000
0
-20,000
-40,000
MW
Base
Base + CO2
Low Growth
High Growth
Green World
No Coal
Very High Gas
Very Low Gas
RPS Additions
Wind Additions
Solar Additions
Natural Gas Additions
Other Retirements
Natural Gas Retirements
Coal Retirements

RPS Energy Additions for WECC



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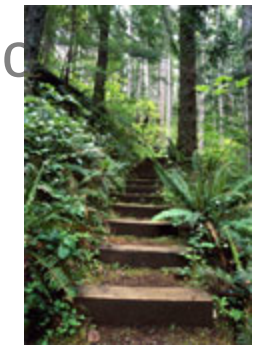
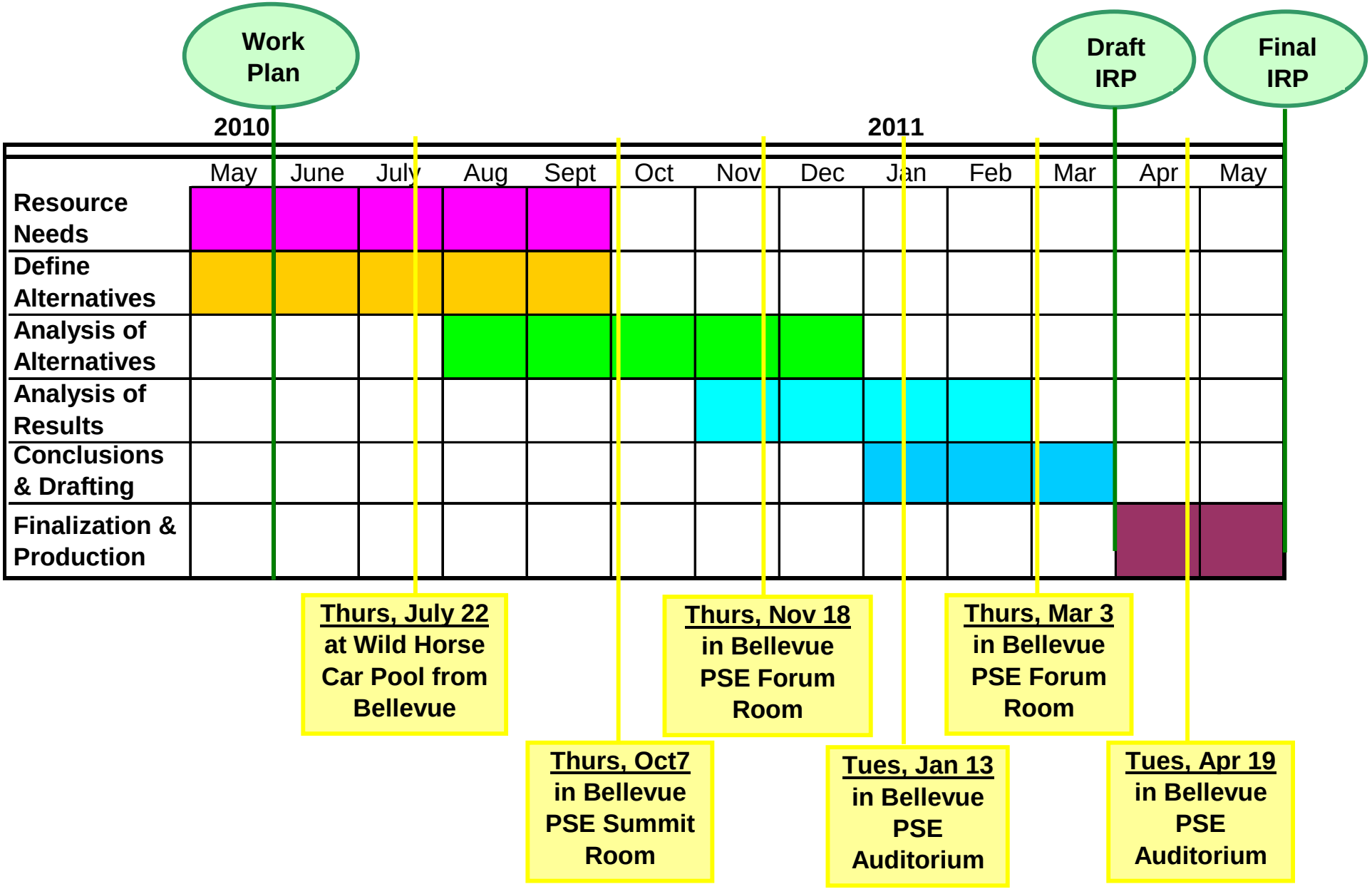


Anticipated 2011 IRP Work Plan Schedule for Public Participation

Updated August 27, 2010



Draft Agenda for Nov. 18 Meeting

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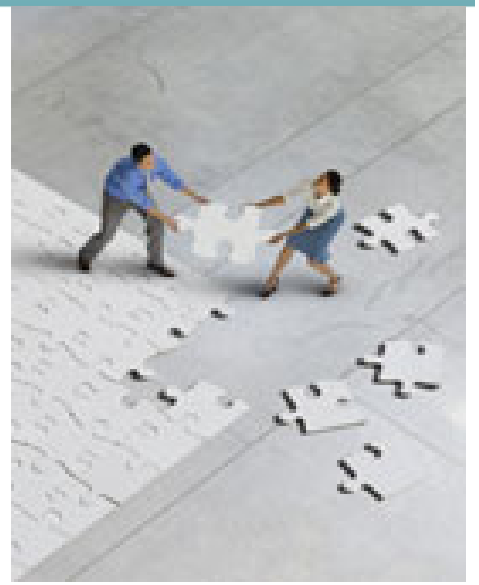
The Energy To Do Great Things



- Resource Needs
  - PSE Load Forecasts-Electric & Gas
  - Loss of Load Probability
  - Renewable Need
  - Gas Sales Resource Needs
- Assumptions/Updates
- Conservation Supply Curves: Detailed Review
- Conservation Methodology Update

2011 IRP Advisory Group Meeting

November 18, 2010

PUGET SOUND ENERGY

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Road Map for Today

PUGET SOUND ENERGY
The Energy To Do Great Things

- Introductions & Kick-off
- Load Forecast Review
- Resource Needs
  - Electric: Renewable Energy and Capacity
  - Wind Contribution: ELCC Analysis
  - Gas Sales
- Lunch Break
- Demand-Side Resource Assessment Process
- Technical Achieve Potenial—Electric and Gas

Load Forecast-Introduction

F2010 Forecast

- PSE's official long-term customer and sales forecast
- Completed in March 2010
- Approved for official company use in May 2010

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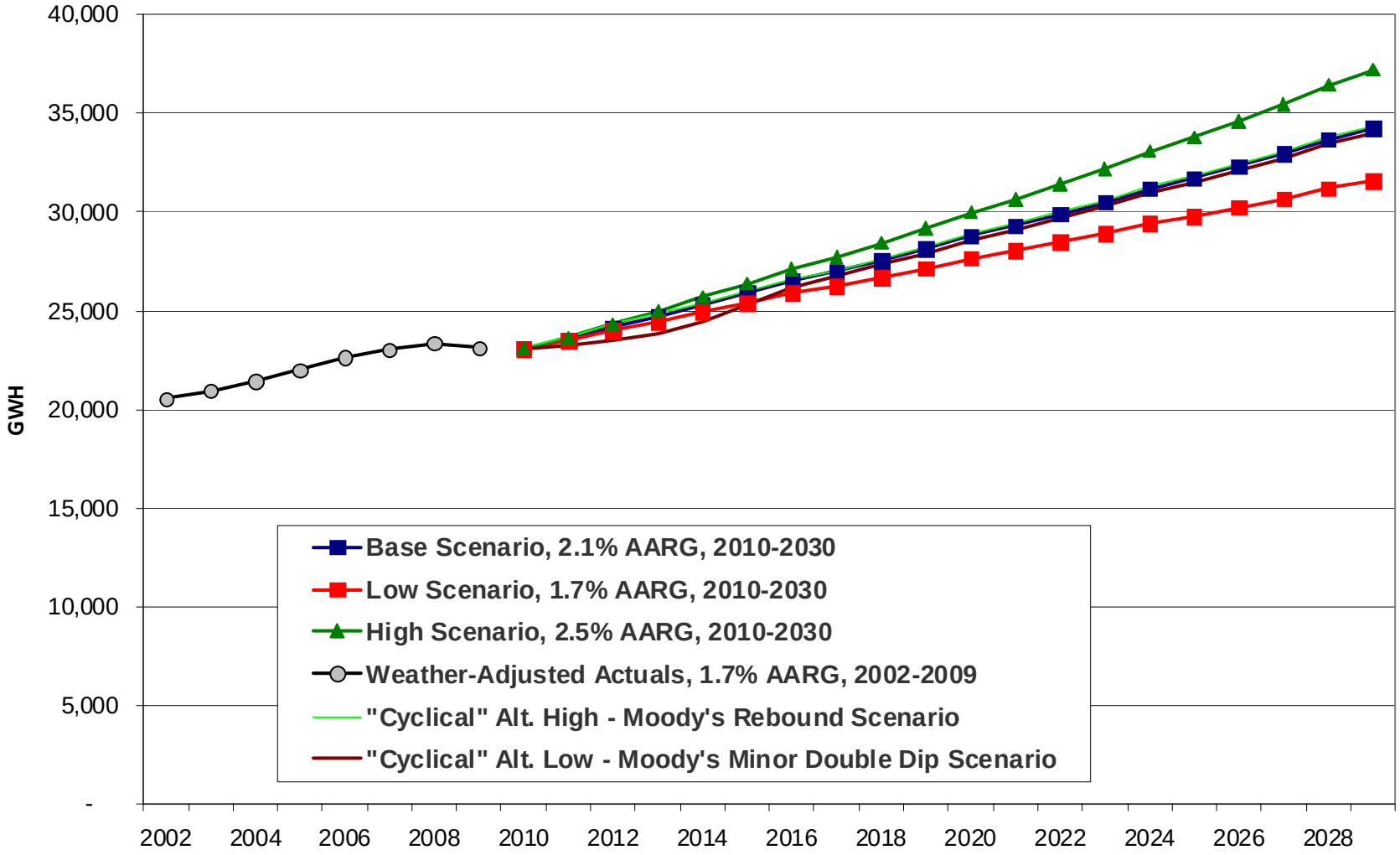
Electric Load Forecast Scenarios

No New Demand-side Resources



Current Load Forecast vs F2008R Forecast

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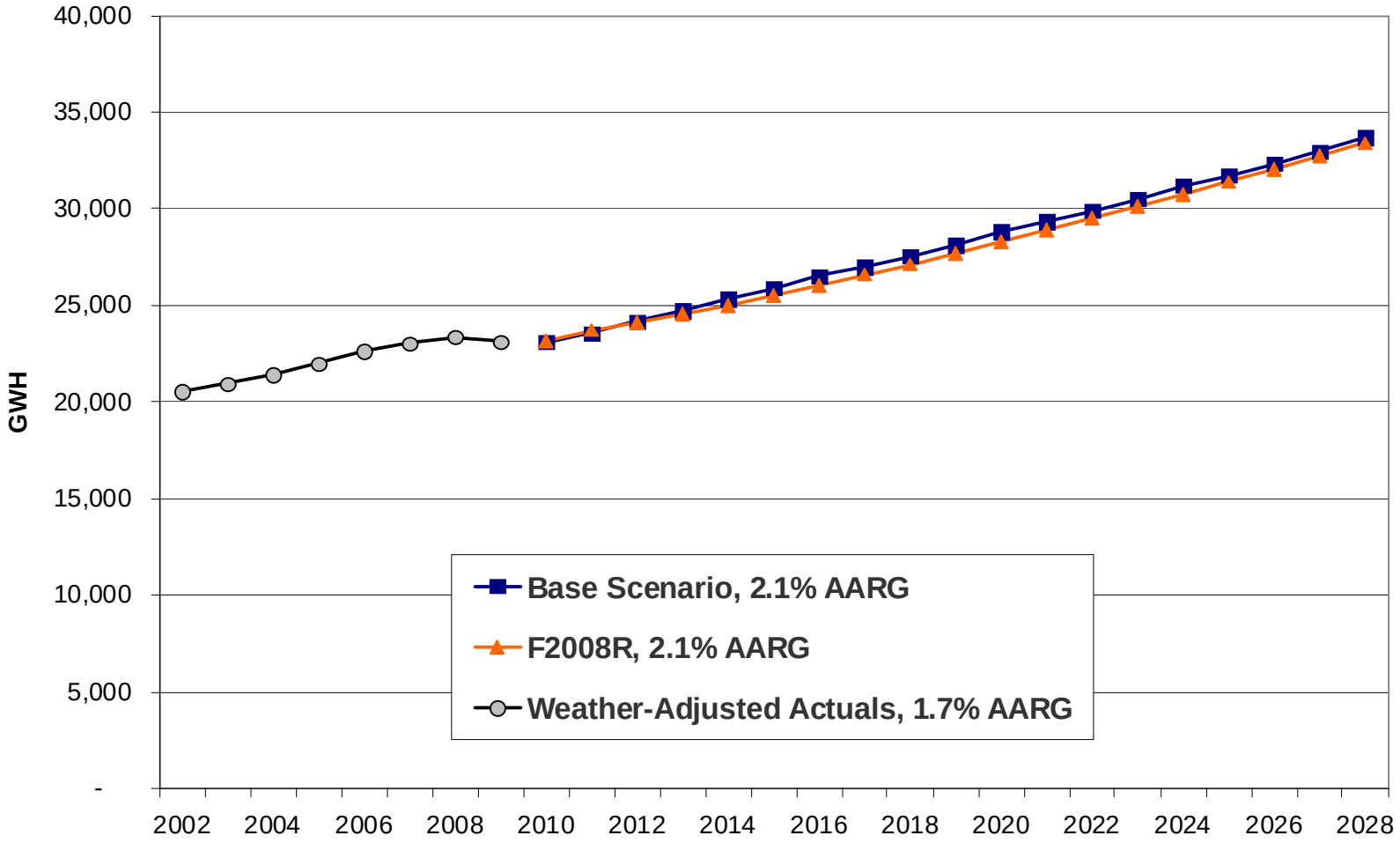
Electric Load Forecast, F10 vs F08R

No New Demand-side Resources



Electric Peak Forecast

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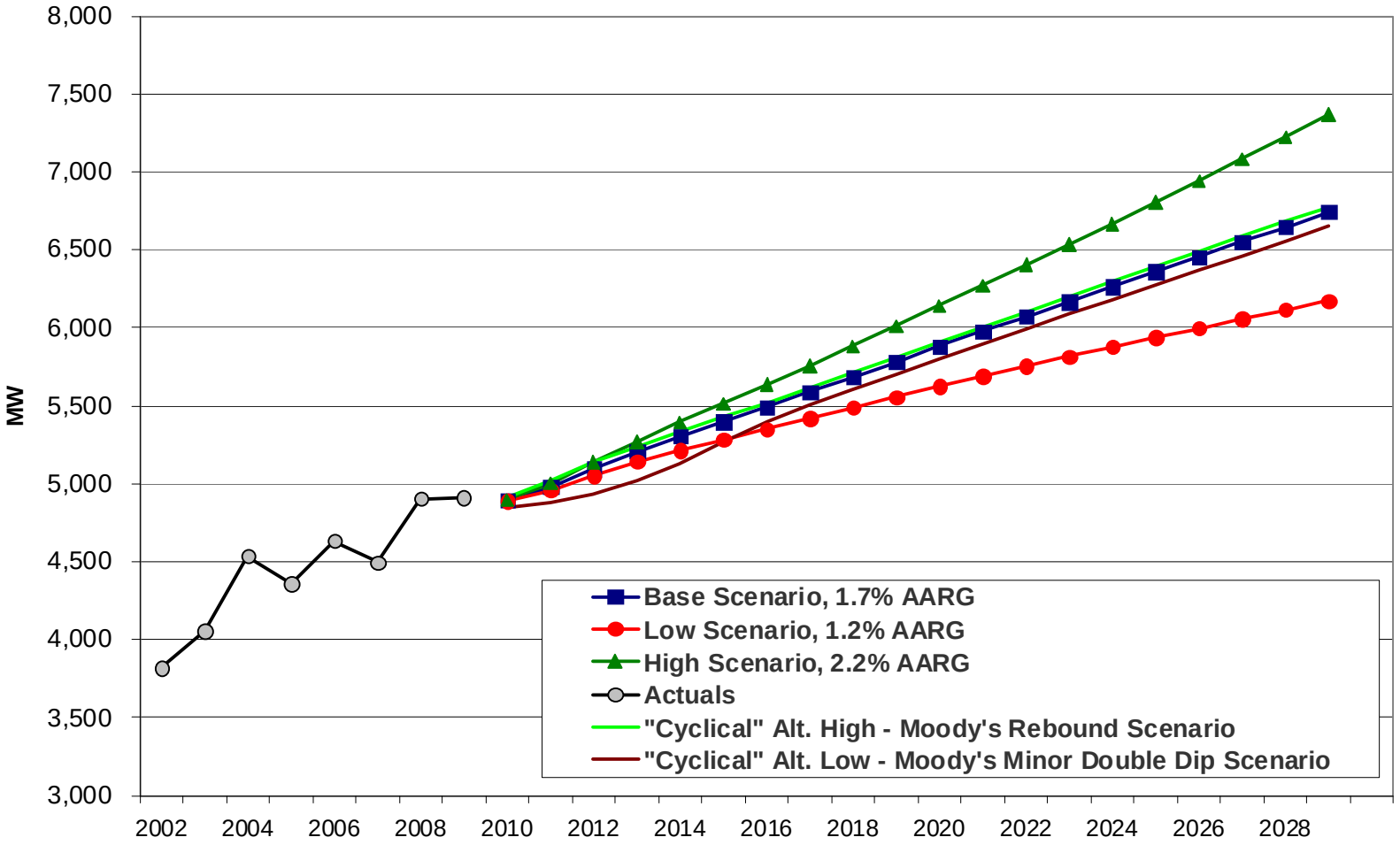
Annual Hourly Electric Peak Load Forecast Scenarios

No New Demand-side Resources, 23F at Peak Hr



Historical peak loads are not weather-adjusted

Gas Load Forecast

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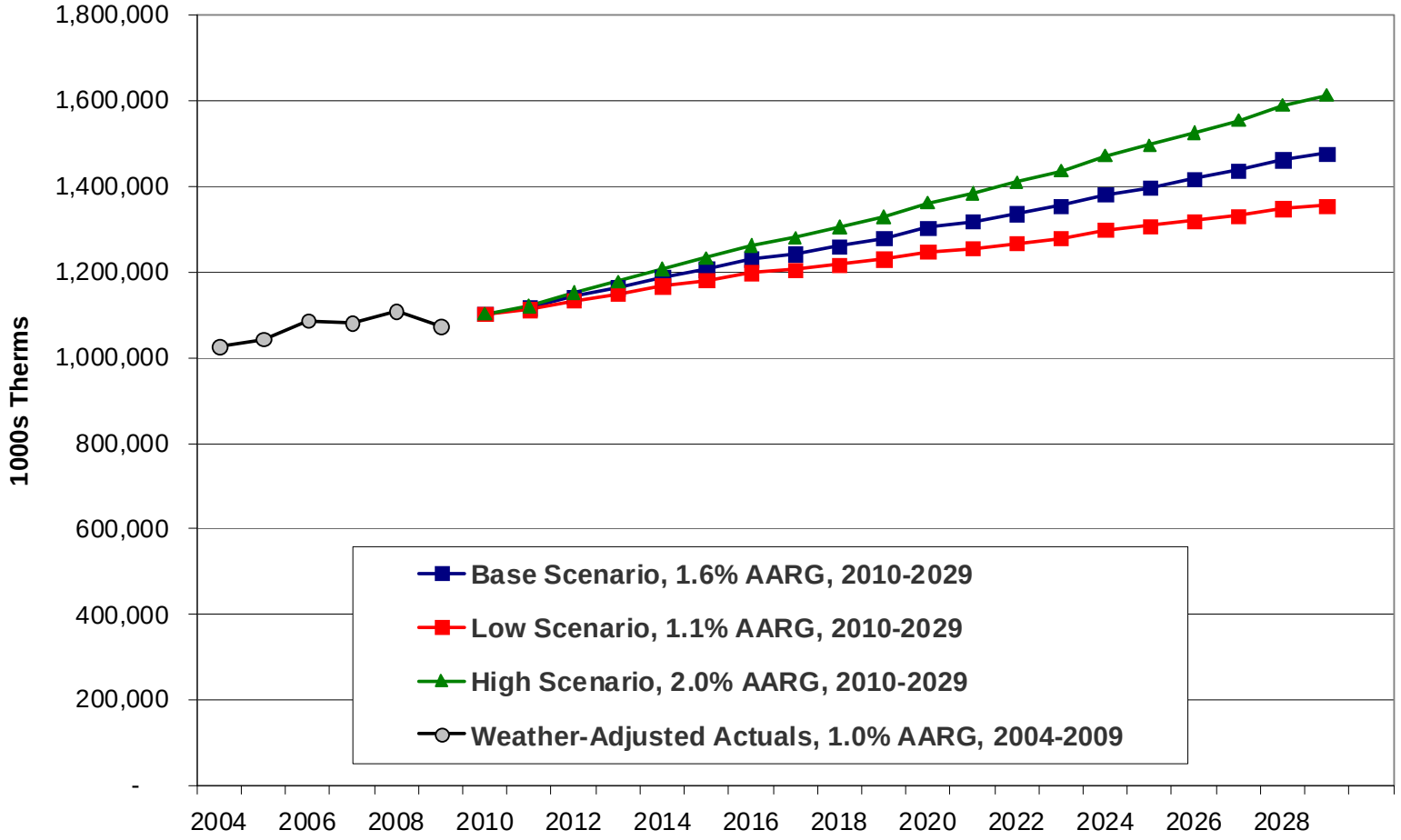
Gas Load Forecast Scenarios

No New Demand-side Resources



- Weather-adjusted Firm loads grew 1.4% annually, 2004-2009, despite recession and conservation
- Weather-adjusted Firms loads grew 2.8% annually, 2004-2008

Gas Peak Load Forecast

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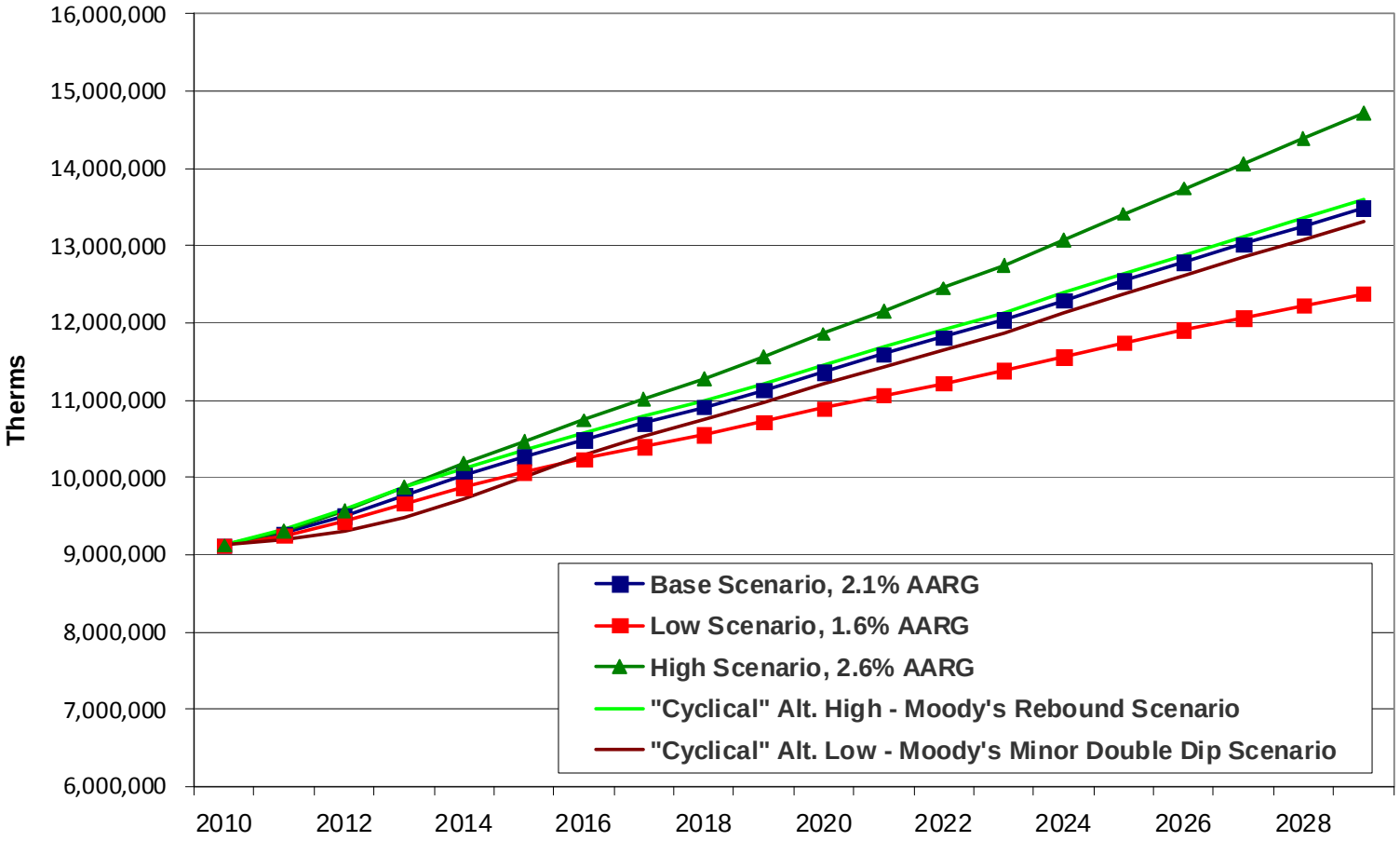
Annual Daily Gas Load Peak Forecast Scenarios

No New Demand-side Resources, 52 HDD Peak



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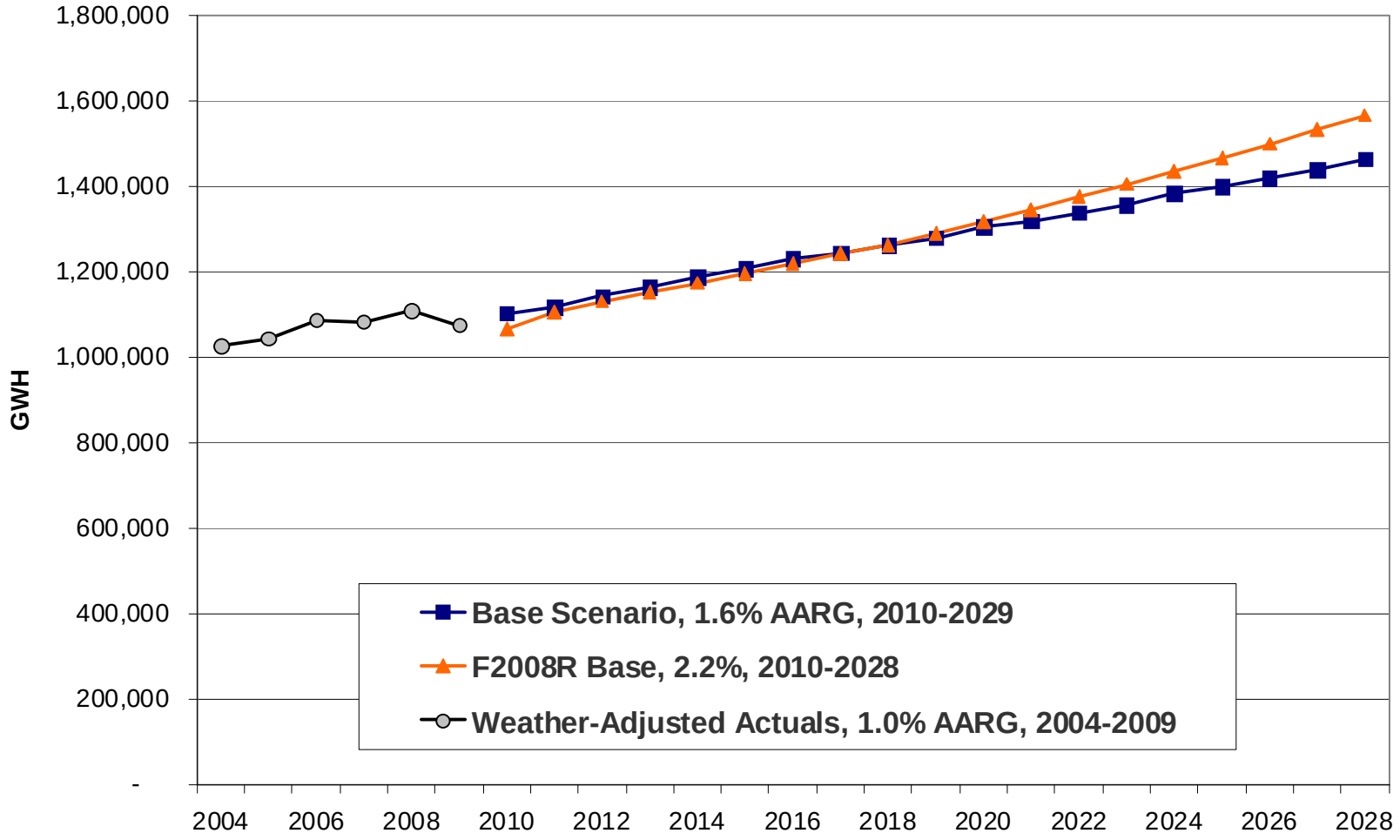
Gas Load Forecast, F10 vs F08R

No New Demand-side Resources



PSE Load Forecasting Process

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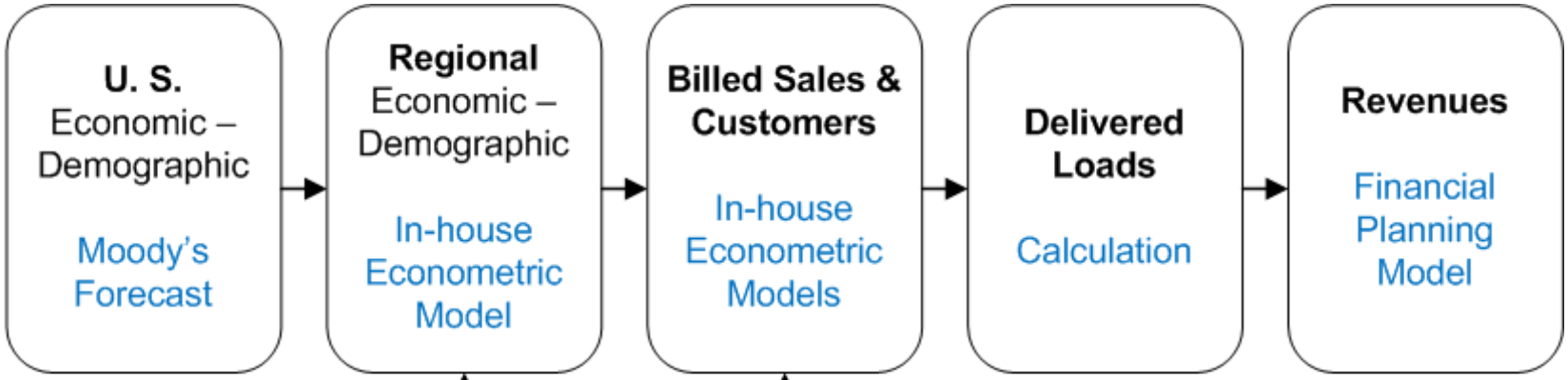
Forecast Models



Major Inputs

Major Forecast Variables

Electric	
Residential	
UPC	Customers
Unemployment Retail Rates Long-term Technology Trends	Population Building Permits
Commercial	
UPC	Customers
Employment Retail Rates Long-term Technology Trends	Employment
Industrial	
UPC	Customers
Manufacturing Employment Retail Rates	Manufacturing Employment

Gas	
Residential	
UPC	Customers
Unemployment Retail Rates Long-term Technology Trends	Households Building Permits Conversion Rate
Commercial	
UPC	Customers
Employment Retail Rates	Employment
Industrial	
UPC	Customers
Manufacturing Employment Retail Rates	Manufacturing Employment

- Use per customer (UPC) growth is a function of recent UPC growth, plus the effect of changes in variables such as prices, unemployment and employment
- Customer growth is a function of recent customer growth, plus the effect of changes in variables such as population or manufacturing employment

Macroeconomic Scenarios

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- **Structural** Scenarios are based on Washington's Office of Financial Management's population projections
  - Low-to-Base (11-County): -0.4% Population AARG
  - High-to-Base (11-County): +0.4% Population AARG
- Estimates the long-term structural change to customer growth rather than shorter cyclical impacts

- **Cyclical** Scenarios are based on Moody's Macroeconomic scenarios
- Estimates the short-term change to economic variables based on different national economic outcomes

Unemployment Impacts Residential Loads

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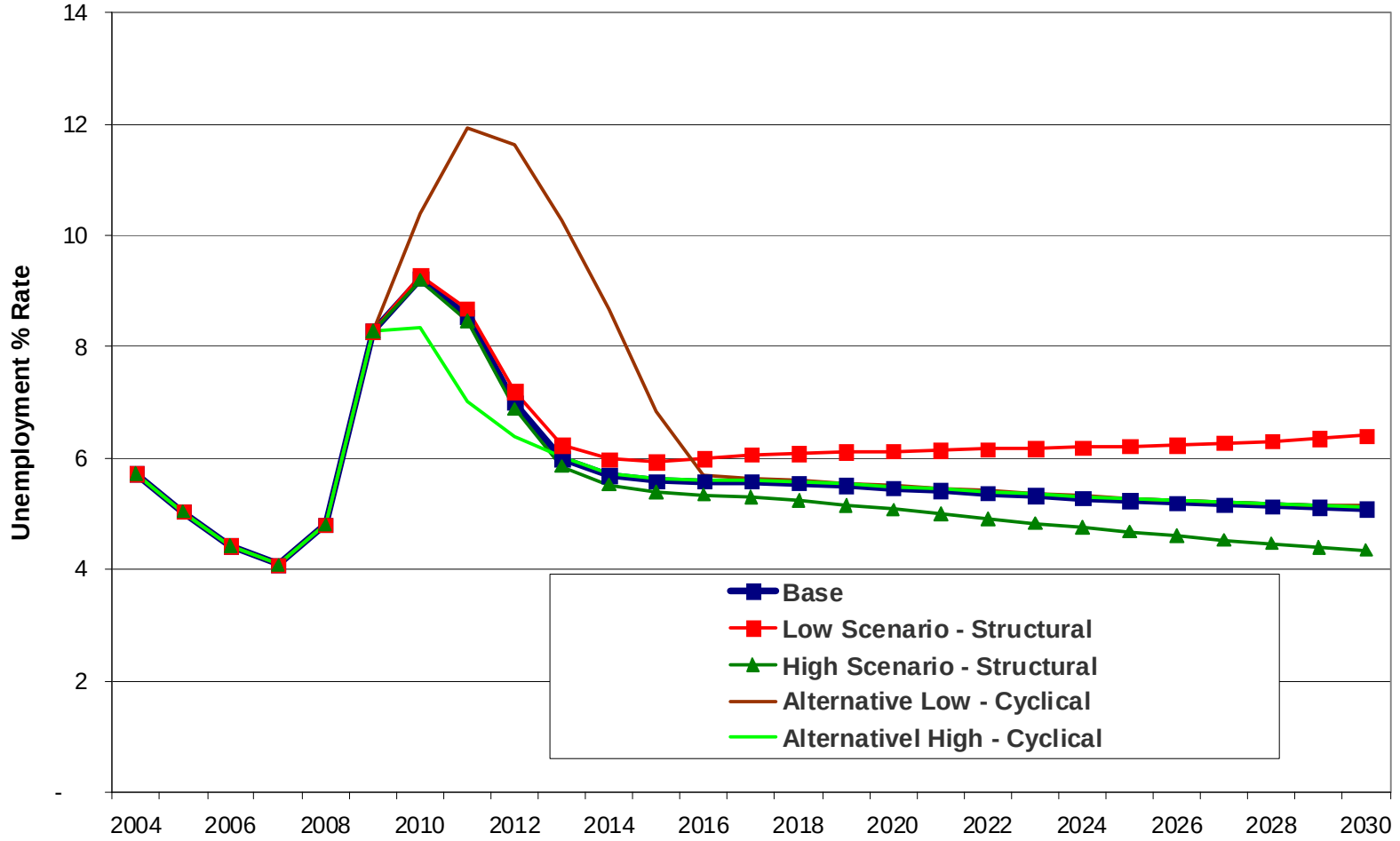
Unemployment - Macro Scenarios

Gas Service Territory



Employment Impacts Commercial Loads

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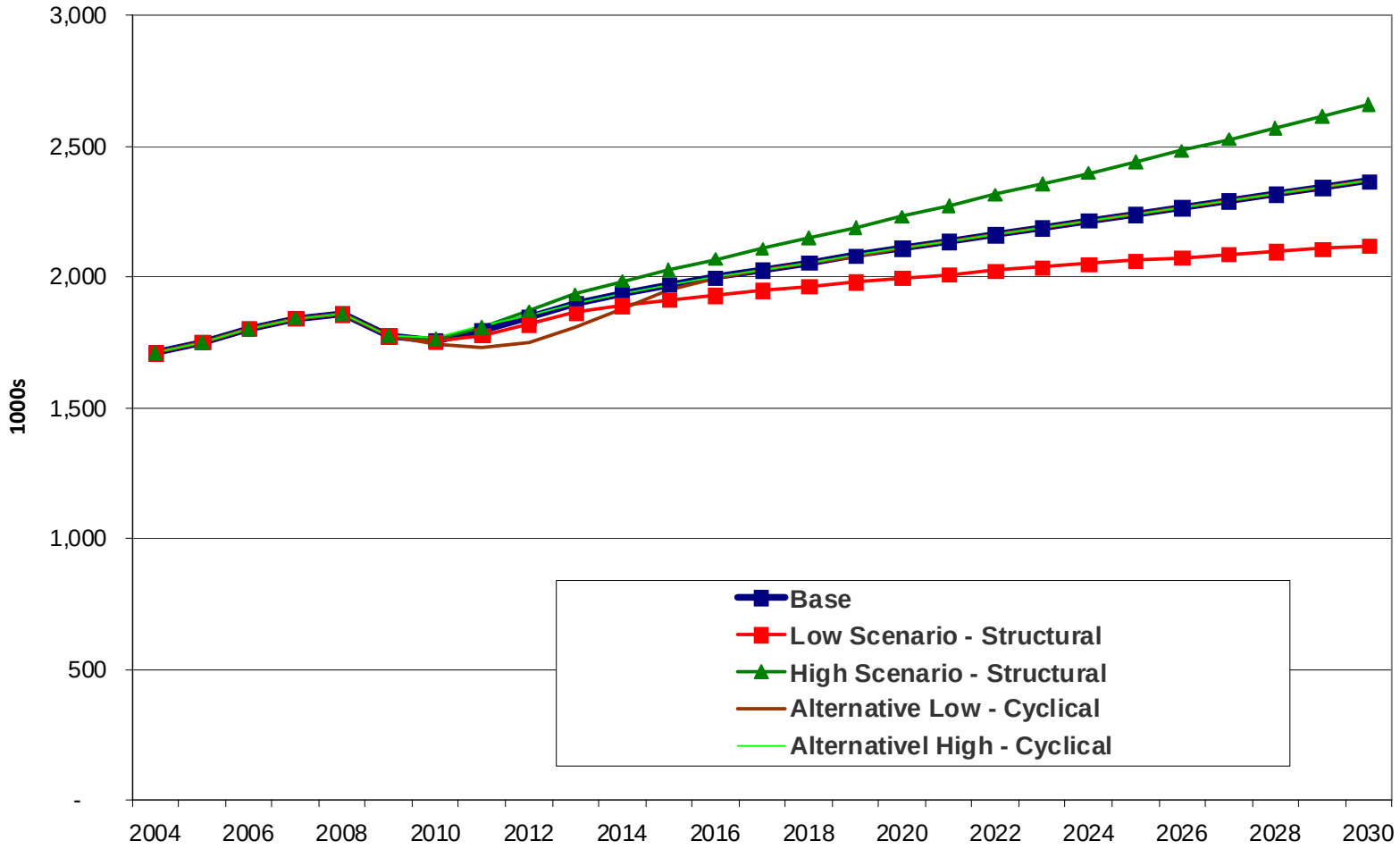
Employment - Macro Scenarios

Gas Service Territory



Population Impacts Customer Growth

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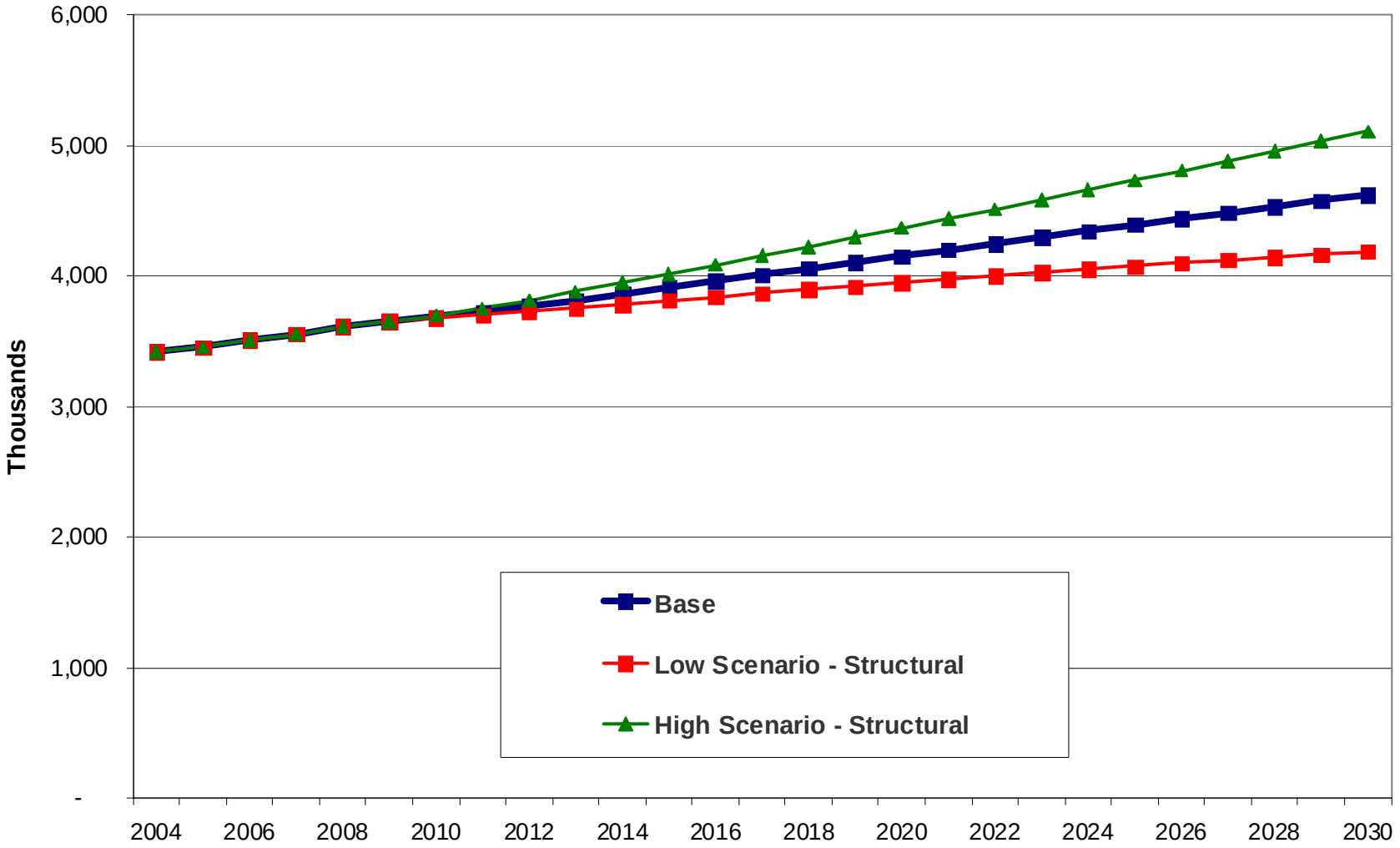
Population - Macro Scenarios

Gas Service Territory



Additional Questions

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Check-In

- Introductions & Kick-off
- Load Forecast Review
- Resource Needs
  - Electric: Renewable Energy and Capacity
  - Wind Contribution: ELCC Analysis
  - Gas Sales
- Lunch Break
- Demand-Side Resource Assessment Process
- Technical Achieve Potential—Electric and Gas

Draft Estimated Renewable Energy Target

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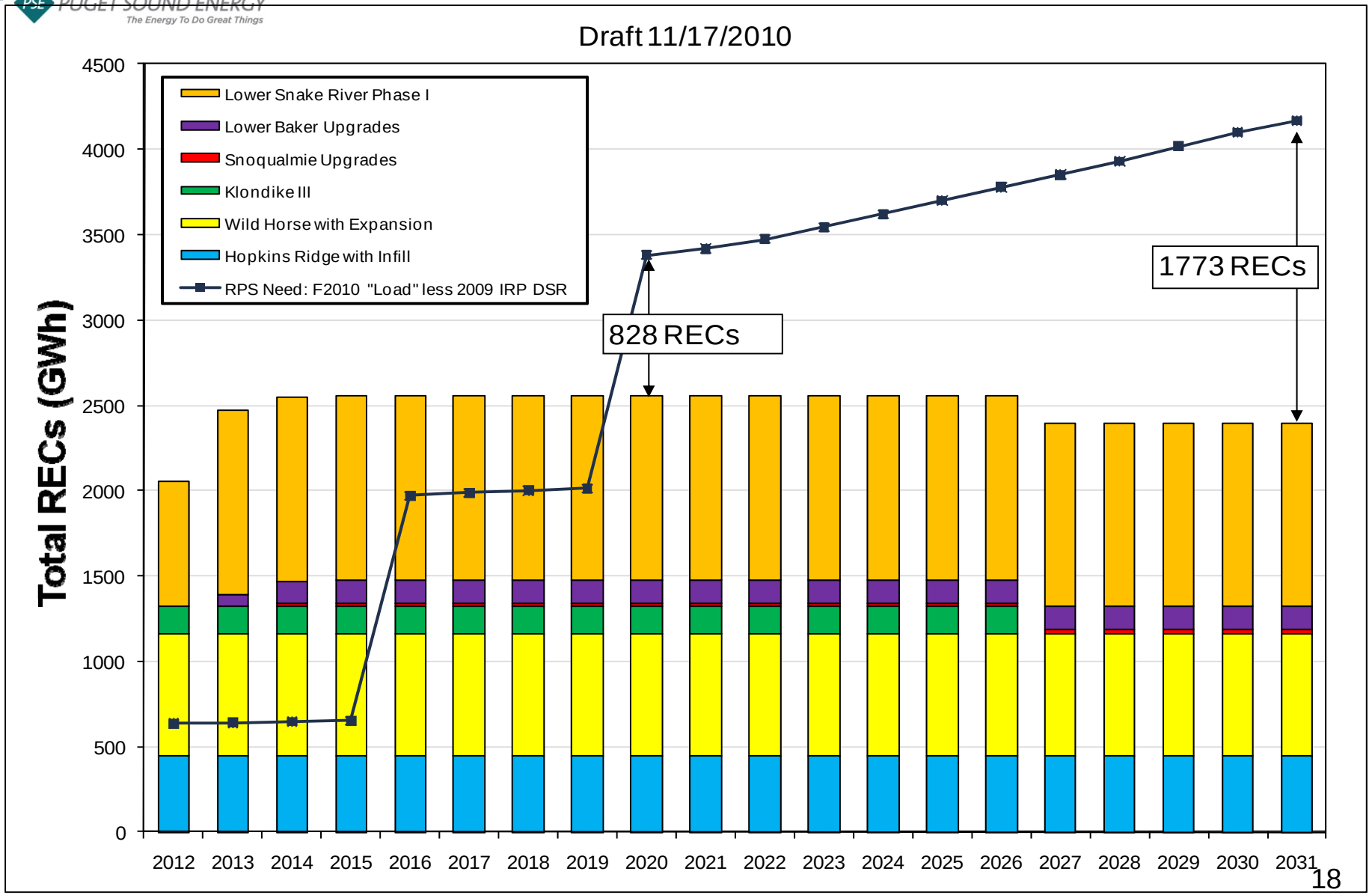

2009 IRP Addendum

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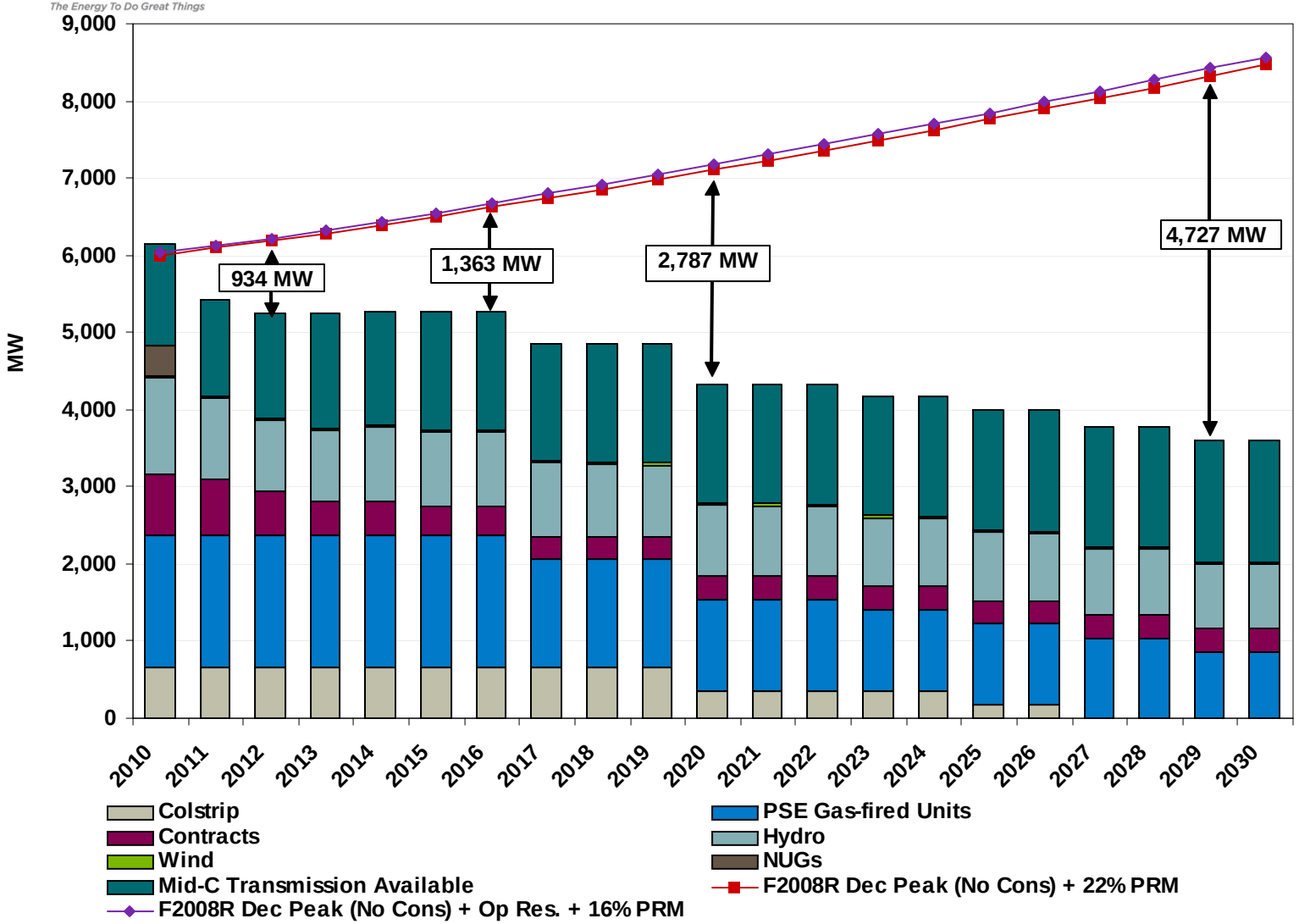

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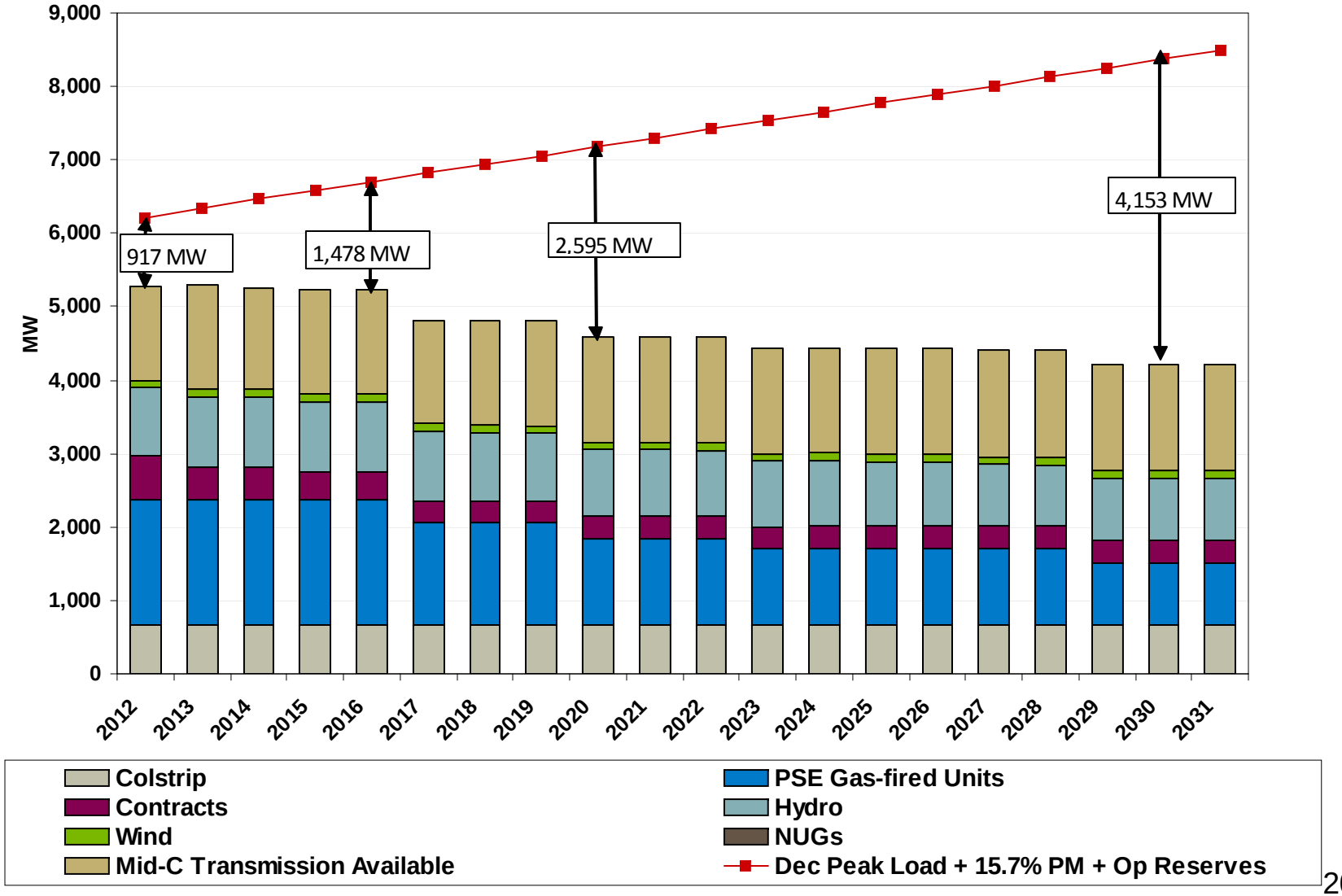
Draft 11/18/10



Compare 2009 IRP Addendum & Draft 2011 IRP for 2012

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	Need in 2012	Change	Cumulative Change	Notes
2009 IRP Addendum	**934**			Used 22% PM to account for both PM & operating reserves
Update of PM & Operating Reserves Calculation	923	-11	-11	Use 15.7%PM and account for operating reserves of 7% on existing thermal, 5% on hydro and wind, and 7% on generic (future resources)
Update from F2008R to F2010 Load Forecast	946	23	12	Increase 2012 normal peak load from 5,071 to 5,090 MW (19 MW increase)
Increase 449 customer allocation of Mid-C	999	53	65	Increase 449 customer allocation of Mid-C transmission from 250 to 300 MW based on historical coincidental peak data
Include new contracts	969	-30	35	Include dairy digester contracts of 2 MWs & 25 MW purchase for 2012
Include LSR Phase 1	951	-18	17	LSR Phase 1 capacity of 342.7 MW at 5% = 17 MW
Increase wind capacity contribution	917	-34	-17	Increase assumed wind capacity contribution from 5% for all plants to individual plant capacity contributions consistent with ELCC study results

Wind ELCC Study

- Goal: Estimate Capacity Contribution of Wind to PSE's Portfolio
  - Feedback: Don't rely on generic 5% capacity regional studies.
- Standard Effective Load Carrying Capability Approach
  - Estimate equivalent thermal resource to achieve same impact on LOLP as the wind added.
- Key Findings:
  - Wind is not the go-to capacity resource.
  - PSE's existing wind has slightly higher capacity value than previously assumed based on regional study @ 5%.
  - Adding more wind in same location shows declining capacity contribution…similar to trends in PacifiCorp's '07 IRP.
  - Diversity makes a difference…if you squint.
  - Note: Individual utility portfolio & load are important.

Effective Load Carrying Capability Study Results

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Table 1
Effective Load Carrying Capability of Wind

Summary All Wind	Wind Capacity	Effective Thermal Capacity	ELCC	
Hopkins Ridge	157	23	14.8%	
Wild Horse	272	39	14.5%	(Supply Only)
Lower Snake River	342	33	9.6%	
Generic SE WA (w/Added Trans)	100	2	1.8%	
Generic Kittitas (w/Added Trans)	100	5	4.9%	

Peeling Back Layers of the Onion

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ELCC-Analytical Framework

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- Incorporate given amount of wind into LOLP model

- Determine corresponding amount of peaker to match LOLP impact

Hopkins Ridge	Starting Capacity	Wind Addition	Thermal Addition	Resulting LOLP
Add Hopkins Ridge	5684	157	1150	5%
"Equivalent" Peaker	5684	0	1173	5%
			-23	
Hopkins Ridge Capacity:	157			
Equivalent Peaker:	23			
Ratio: ELCC Hopkins Ridge:	14.8%			
Starting + Effective Hopkins:	5707			

Wind Distributions

- Derived from 3.5 years of historical data from Hopkins Ridge and Wild Horse
- Draws of daily profiles are made within each month
- Each day has an equal probability of being chosen
- Draws across wind farms are synchronized on a daily basis
- LSR draws are based on lagged Hopkins profile scaled to its nameplate capacity
- Generic SE WA or Kittitas wind profiles are based on Hopkins or Wild Horse profiles, respectively, and scaled to 100 MW capacity

Example of Daily Wind Profile Draws for December 1

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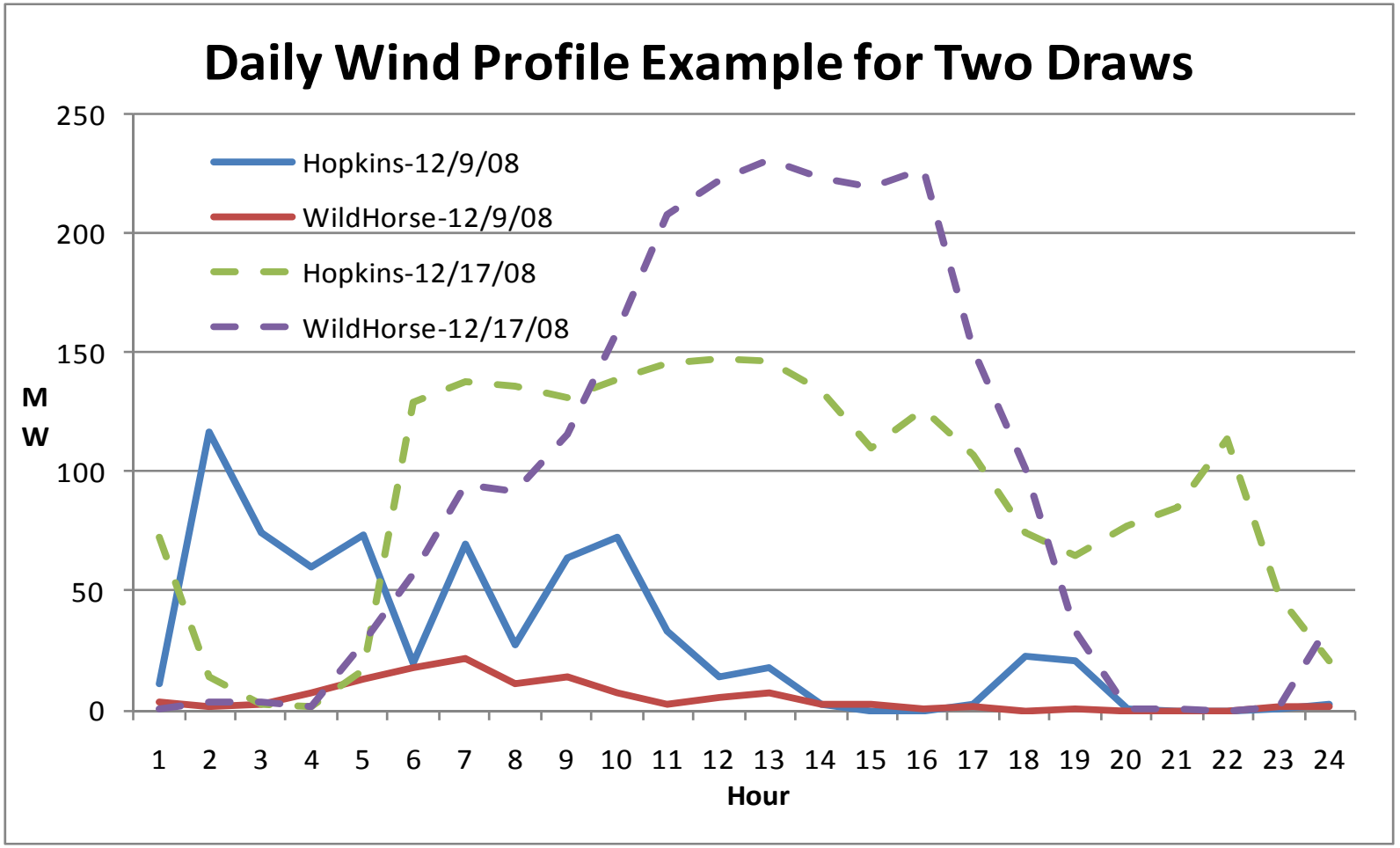

Wind ELCC Conclusion

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- Key Findings:
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  - Adding more wind in same location shows declining capacity contribution…similar to trends in PacifiCorp's '07 IRP.
  - Diversity makes a difference…if you squint.
  - Note: Individual utility portfolio & load are important.

Gas Sales Peak Capacity Resource Need

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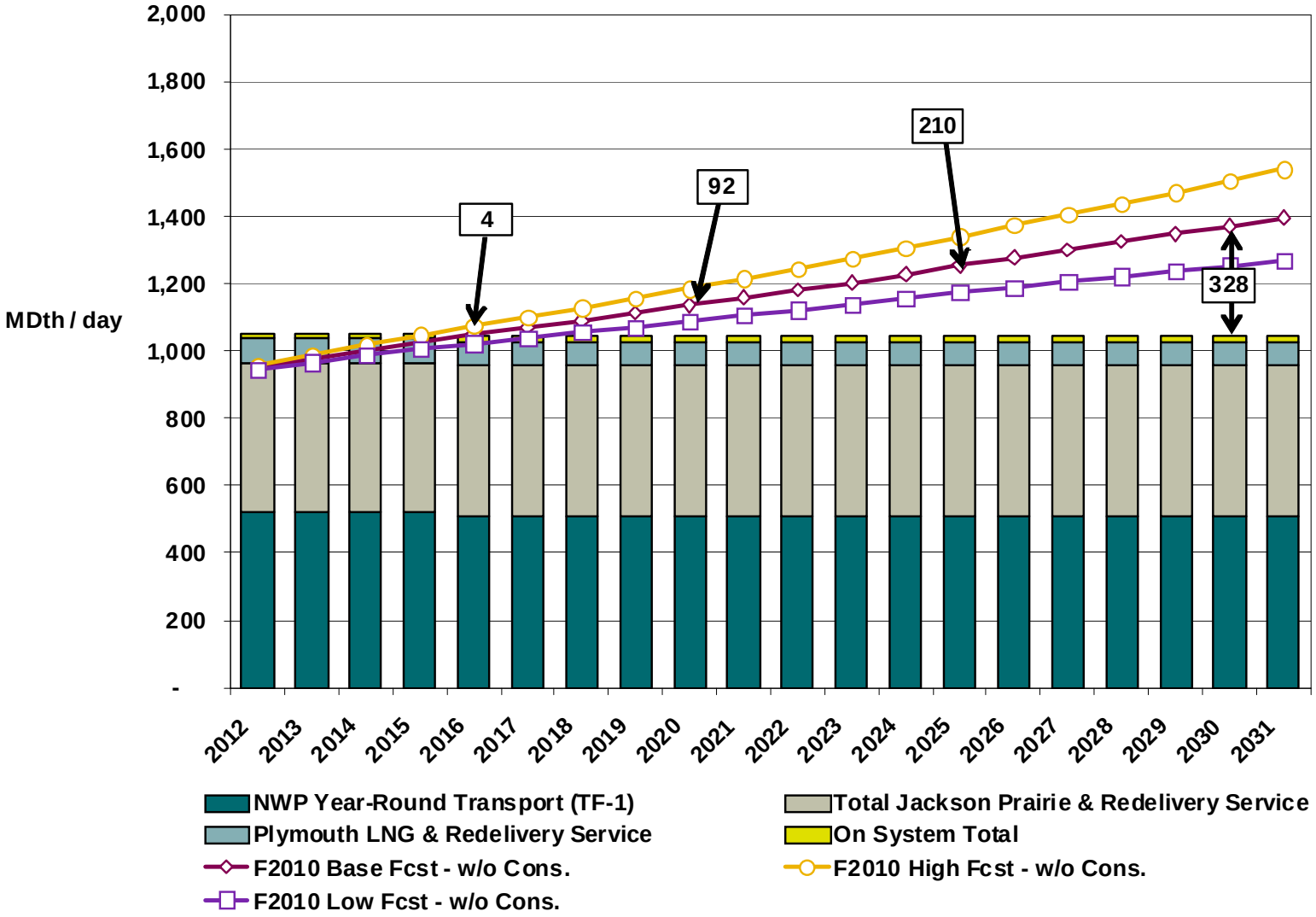
Draft 11/11/10



Check-In

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Translating PSE Approach to Council Methodology

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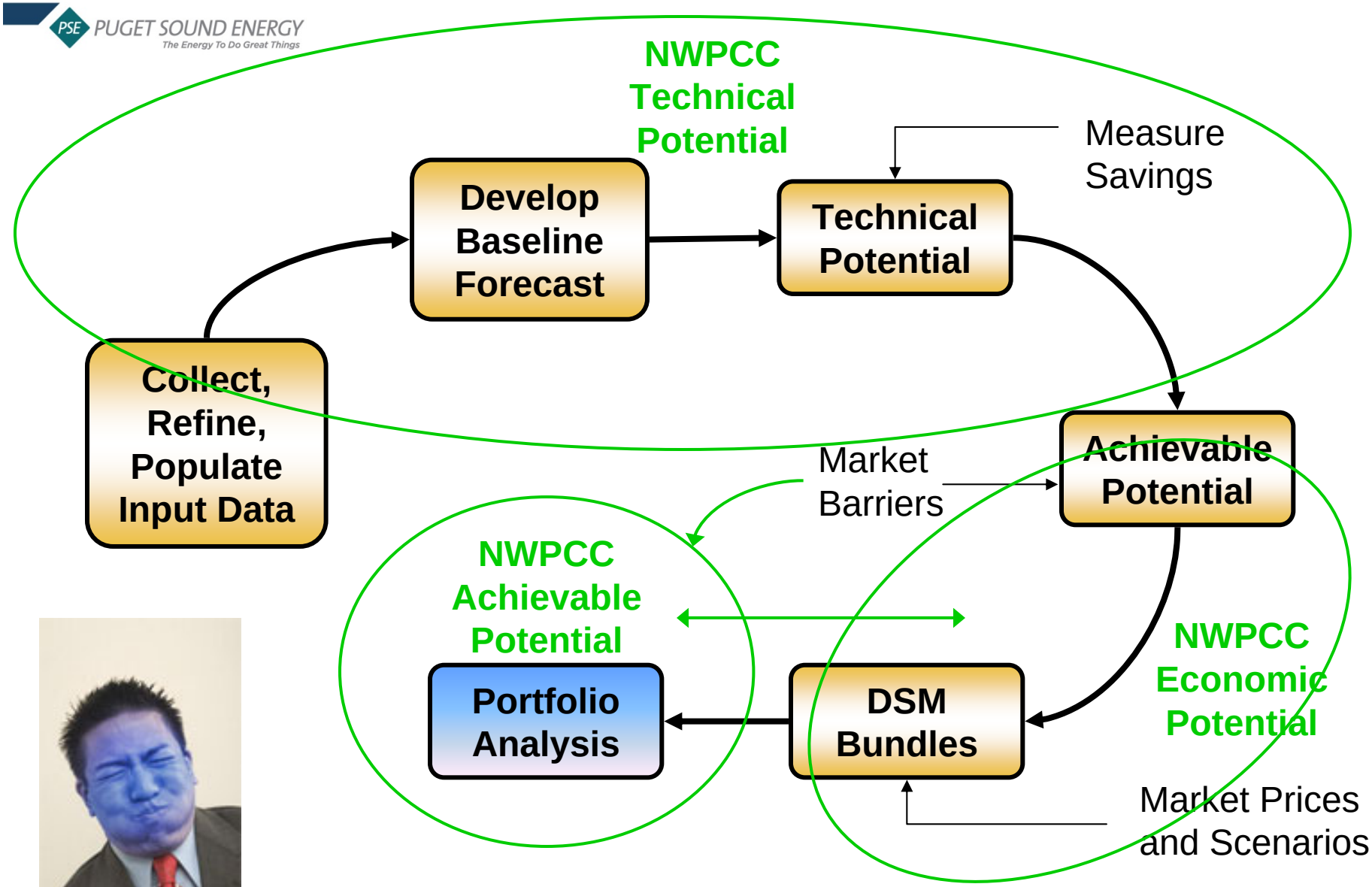

Consistency with Council Methodology

http://www.nwcouncil.org/energy/powerplan/6/supplycurves/I937/default.htm

Council

Technical Potential	Economic Potential	Achievable Potential
See 2. a & b	**See 3. a - e**	**See 4. a - c**
-Wide array tech, all sectors	-Econ Screening-TRC	-Targets from IRP Analysis
-Saturations	-Shaped Energy/Capacity	-DSM Versus All Resources
-New/Existing Units	-Full Incremental Cost	-B&C from Econ Screen
-Measure Life/Substitutions	-T&D Savings & Losses	-Lost Opportunity/Discretion
-Measure Shapes	-"Environmental Benefits"	-Adjusted Historic Ramps
-Measure Interactions	-NEB/10% Credit	-Revise Based on Exp.

PSE

Technical Potential	Economic Potential	Achievable Potential
See 2. a & b	**See 3. a - e**	**See 4. a - c**
☑ Wide array tech, all sectors	☑ Econ Screening-Bundles	☑ Targets from IRP Analysis
☑ Saturations	☑ Shaped Energy/Capacity	☑ DSM Versus All Resources
☑ New/existing units	☑ Full Incremental Cost	☑ B&C from Econ Screen
☑ Measure life/substitutions	☑ T&D Savings & Losses	☑ Lost Opportunity/Discretion
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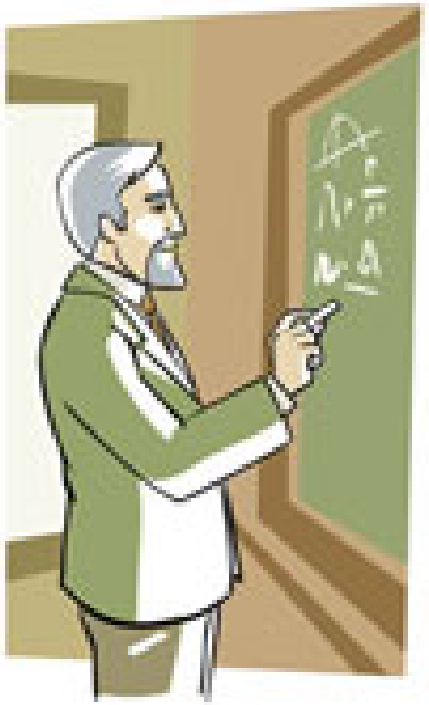
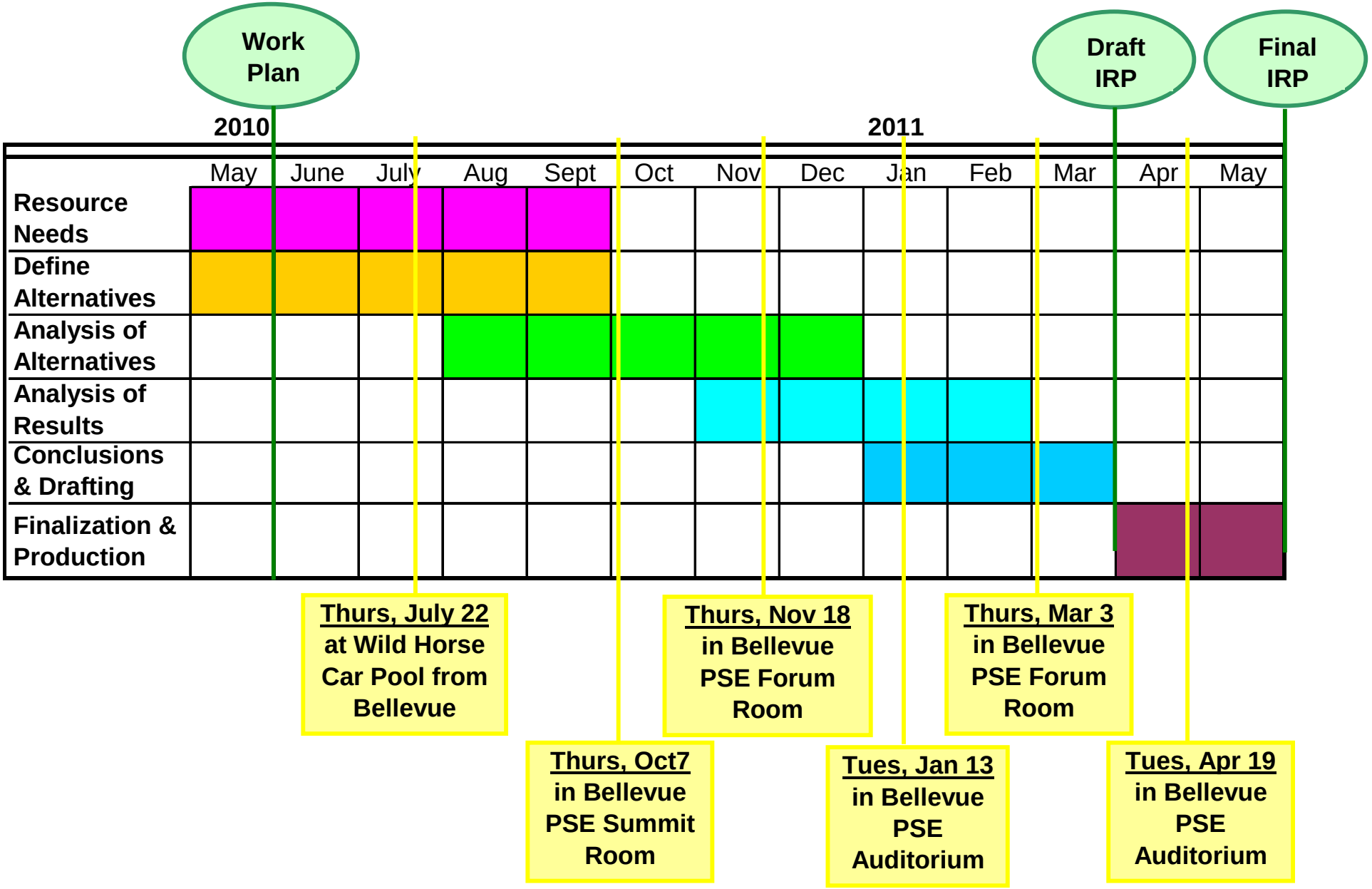
PUGET SOUND ENERGY
The Energy To Do Great Things



Anticipated 2011 IRP Work Plan Schedule for Public Participation

Updated August 27, 2010



2011 IRP Advisory Group Meeting

PUGET SOUND ENERGY

January 13, 2011

Agenda

- Informal Networking…9:00 – 9:20 am
- Introductions & Kickoff…9:20 – 9:35 am
- Review: Process & Scenarios…9:35 – 10:00 am
- Electric Portfolio Results…10 – 11:30 am
- Electric Next Steps…11:30 – 11:45 am

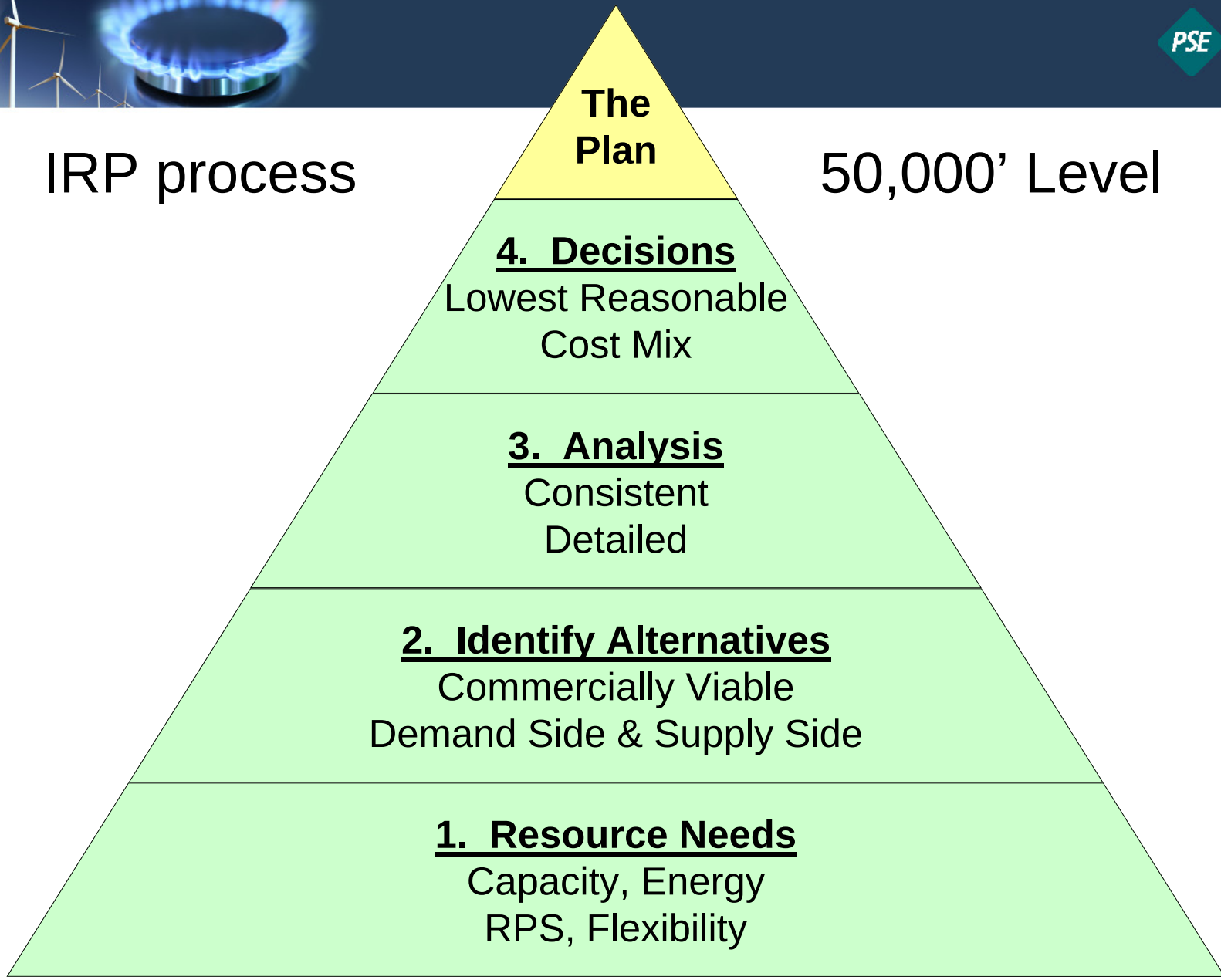
- Lunch Break…11:45 – 12:30 pm

- Gas Portfolio Results…12:30 – 2:00 pm
- Gas Next Steps…2:00 – 2:15 pm
- Document Organization & Next Steps…2:15 – 2:30 pm
- Wrap-Up…2:30 – 2:45 pm

Introductions

IRP process

50,000’ Level



Process Overview

Uncertain Future Market Conditions

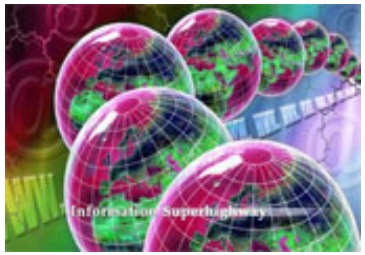
- Policies
- Costs
- Region Demand
- Scenarios

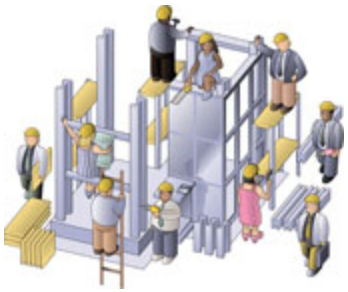
How PSE Can Respond to Uncertainties

- Least Cost Resource Mix
- Impact of Uncertainty on Mix
- Results of Analysis

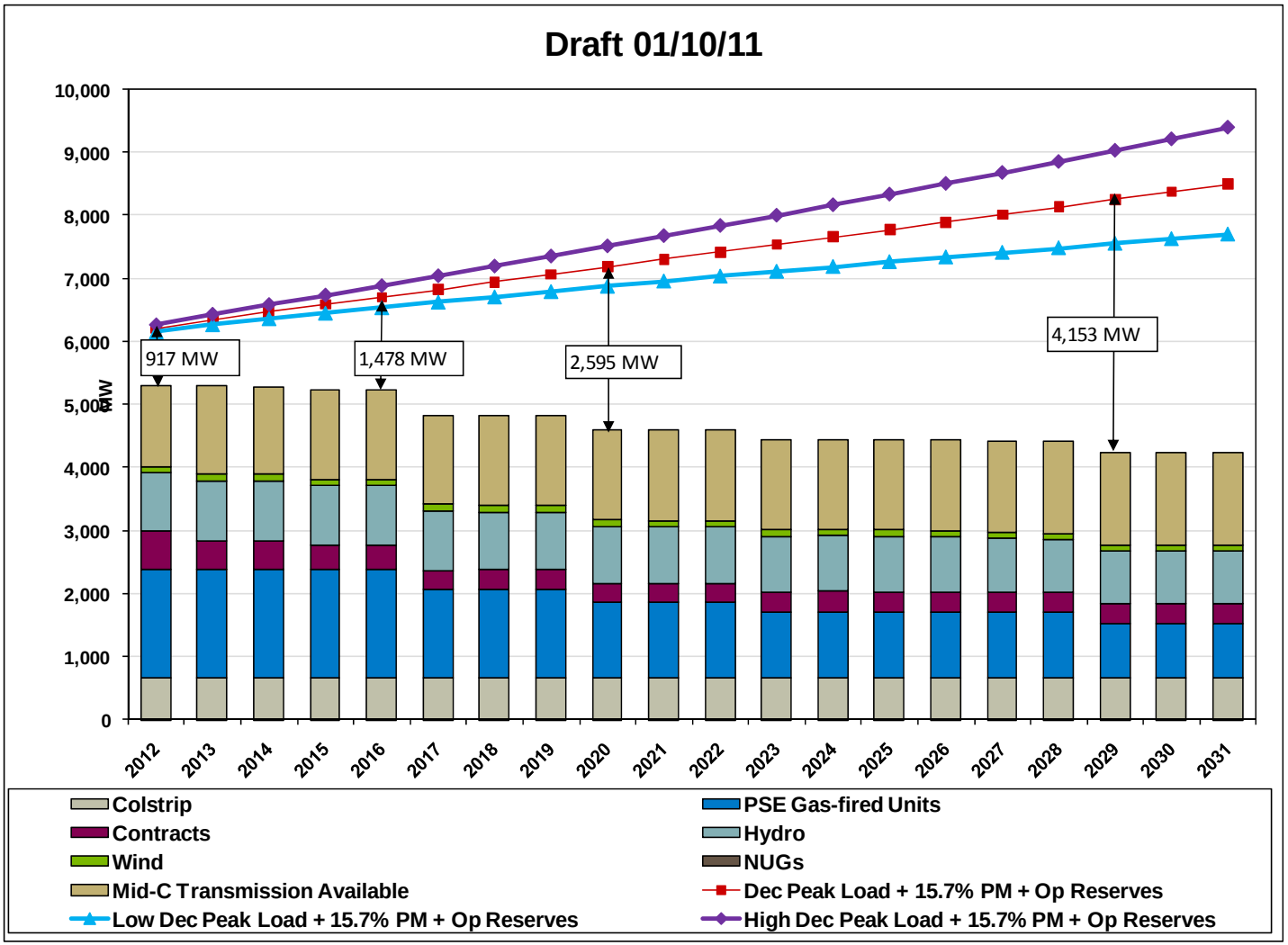
Resource Plan Decision

- Analysis of Results
- Qualitative & Quantitative
- Application of Judgment
- Supported Decision

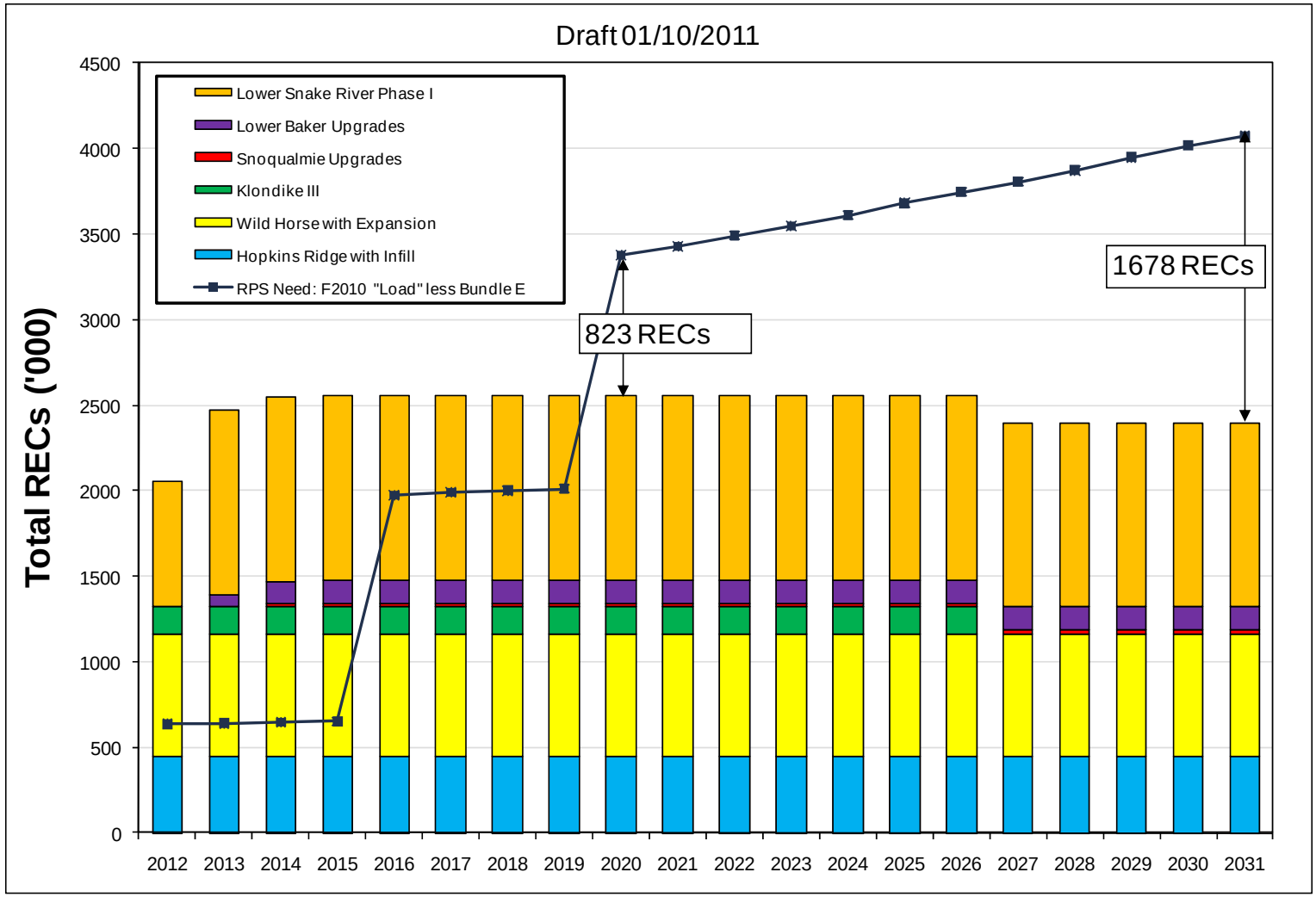




Draft 2011 IRP



Draft Estimated Renewable Energy Target



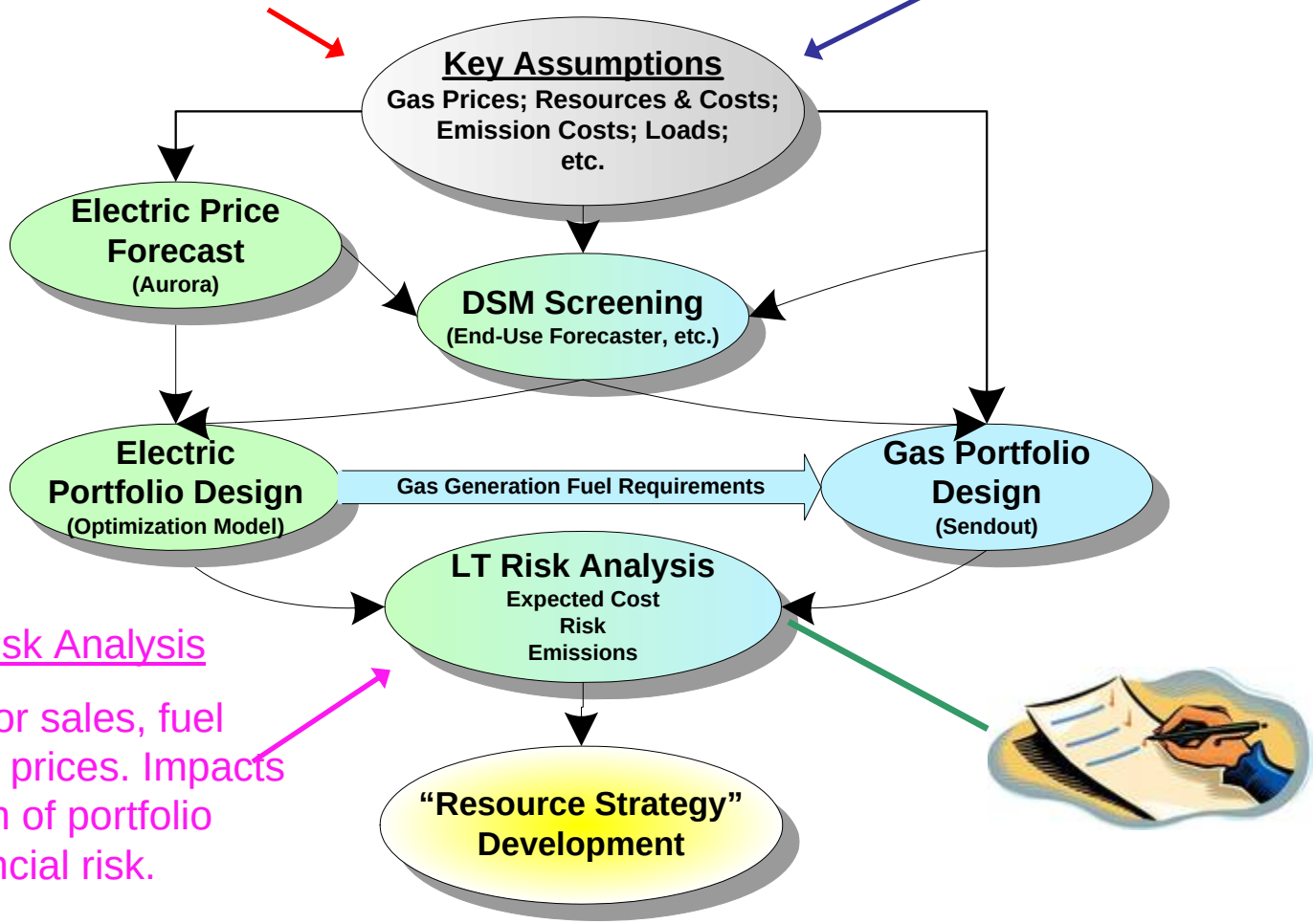
Scenarios

Integrated sets of assumptions to simulate possible futures. Impacts on builds, costs, emissions.

Sensitivity

Impact of one key assumption on builds, costs, emissions.

Resource Planning
Portfolio Analysis Process



Stochastic Risk Analysis

Distributions for sales, fuel availability, & fuel prices. Impacts on distribution of portfolio costs/financial risk.

Scenarios/Sensitivities…Some Key Assumptions

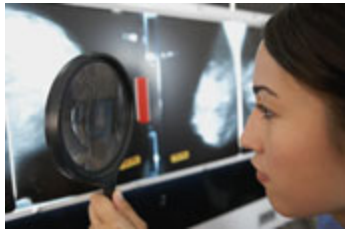
Scenarios			
	Load Growth	**Gas Price**	**CO2 Price**
Base	Base	Mid	*None
Green World	Low	High	High
Low Growth	Low	Low	*None
High Growth	High	High	*None
Sensitivities			
Base + CO_2 Costs	Base	Mid	Mid
No "NW" Coal	Base	Mid	*None
Very Hi Gas Price	Base	Very High	*None
Very Lo Gas Price	Base	Very Low	*None
Electric Vehicles	Base+EV	Mid	*None

***--Reflects RCW 80.70, ~$0.32/ton**

Note: Reflect Current Renewable Tax Incentive Structure in All Scenarios/Sensitivities

From Oct 7 Meeting

Sensitivities



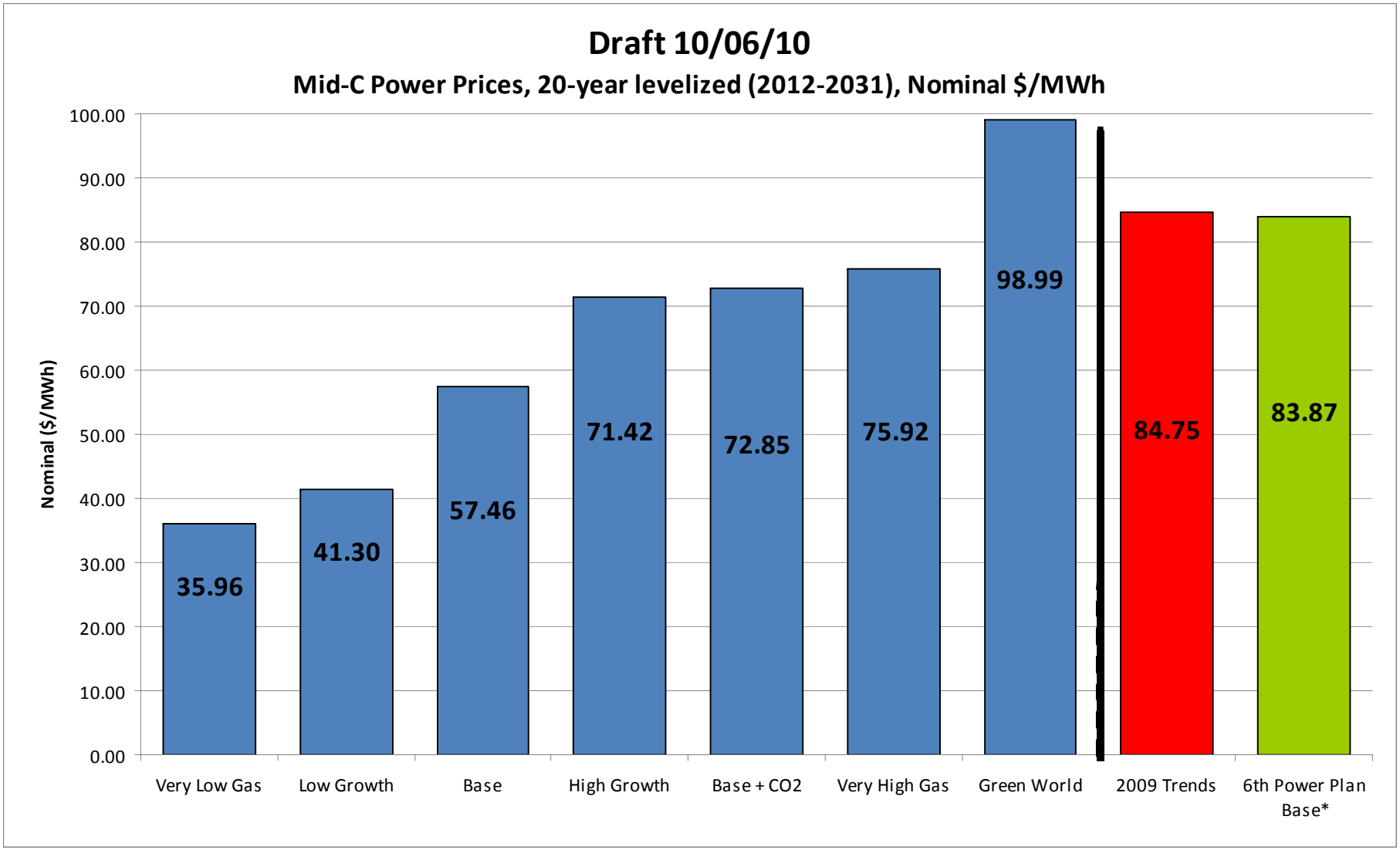
- Carbon Costs
  - Varies across scenarios
  - Sensitivity for Base
- No “Northwest” Coal
  - Boardman, Centralia, & Colstrip shut down by 2020
  - Impact on emissions & incremental costs…not rate impacts.
- Renewable Tax Incentives
  - Not planning to test possible extensions
  - Likelihood?

Update

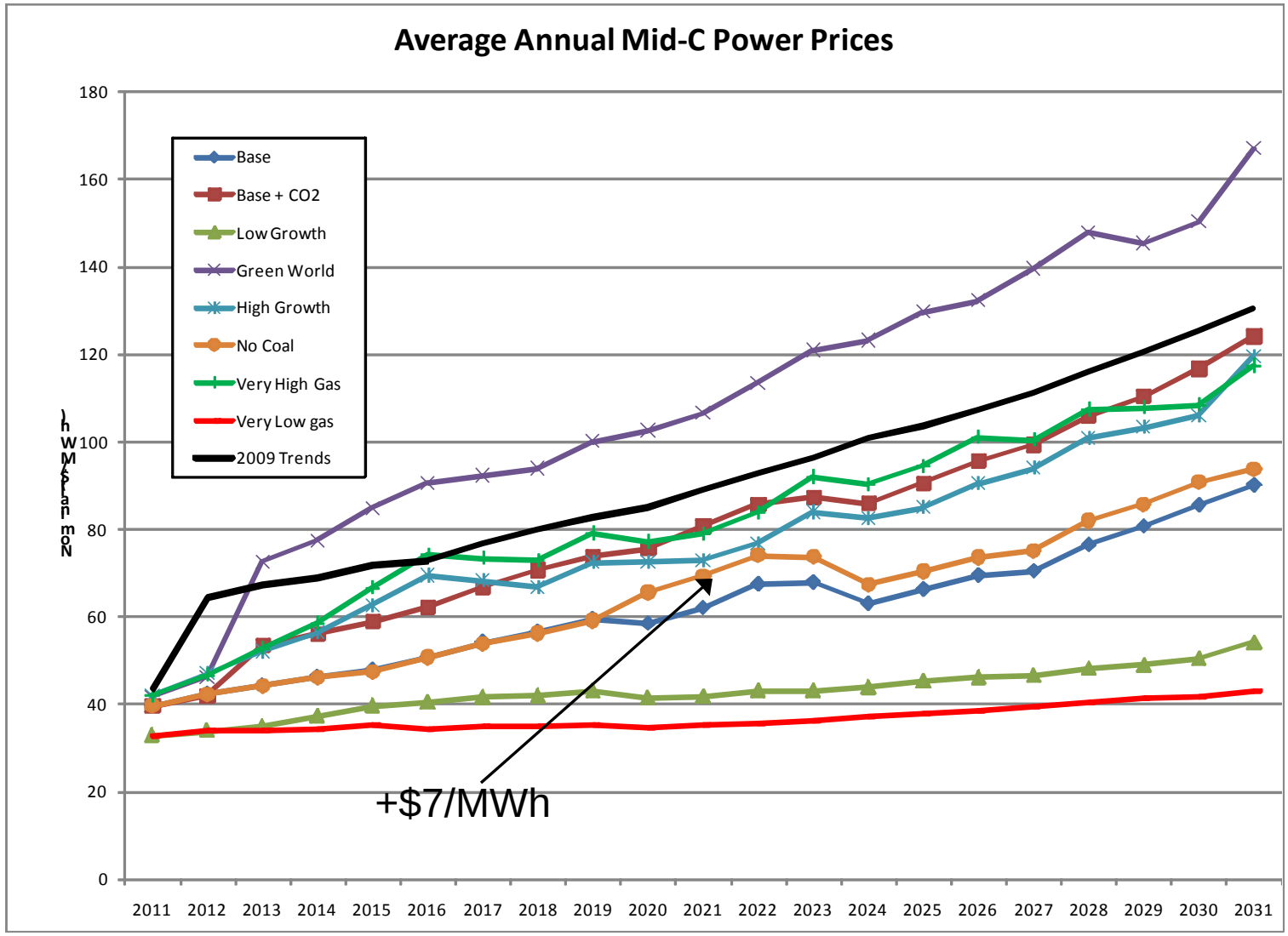
- Transportation Loads
  - Electric and Gas Transport?
- Gas Prices
  - Varies across scenarios
  - Also Very High & Very Low Sensitivities for Base

But Wait, There's More!

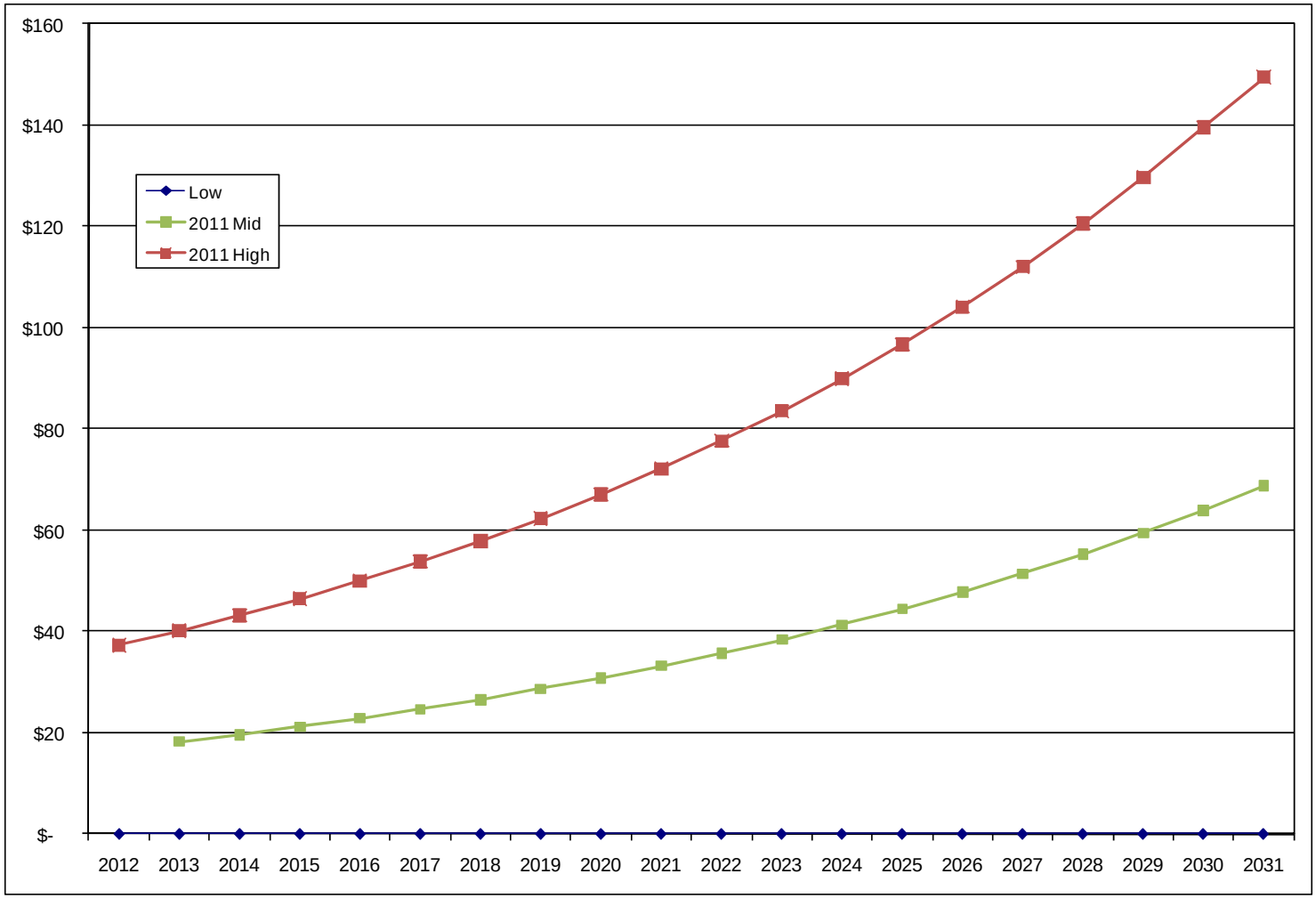
- Included New Resource Alternative
  - Additional Transmission to Market
- DSR Ramp Rates
  - Council vs 10-year ramp rate
- Included Renewable Tax Incentive Sensitivity
  - Based on Feedback from last meeting
  - 2013, 2016, 2020, & 2031
- Peaker Versus CCCT Sensitivities
  - Drilled down on peakers versus CCCT
  - Fixed gas transport costs for peakers
  - Cost, risk, market exposure, position, emissions


Draft 10/06/10
Mid-C Power Prices, 20-year levelized (2012-2031), Nominal $/MWh
Nominal ($/MWh)
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
35.96
41.30
57.46
71.42
72.85
75.92
98.99
84.75
83.87
Very Low Gas
Low Growth
Base
High Growth
Base + CO2
Very High Gas
Green World
2009 Trends
6th Power Plan Base*

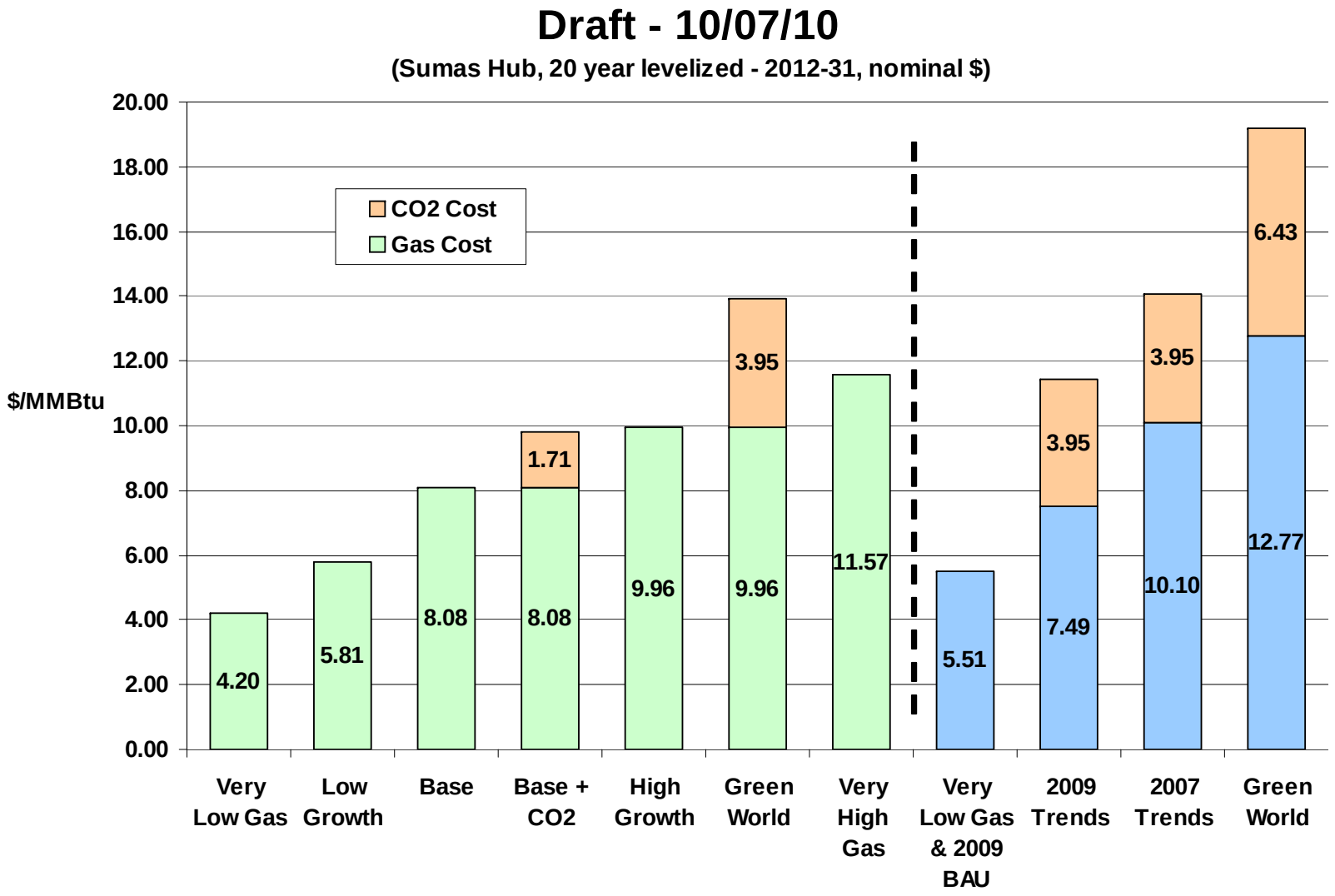
Annual Mid-C Power Prices



CO_2 Prices


$160
$140
$120
$100
$80
$60
$40
$20
$-
Low
2011 Mid
2011 High
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031

Levelized Gas Prices

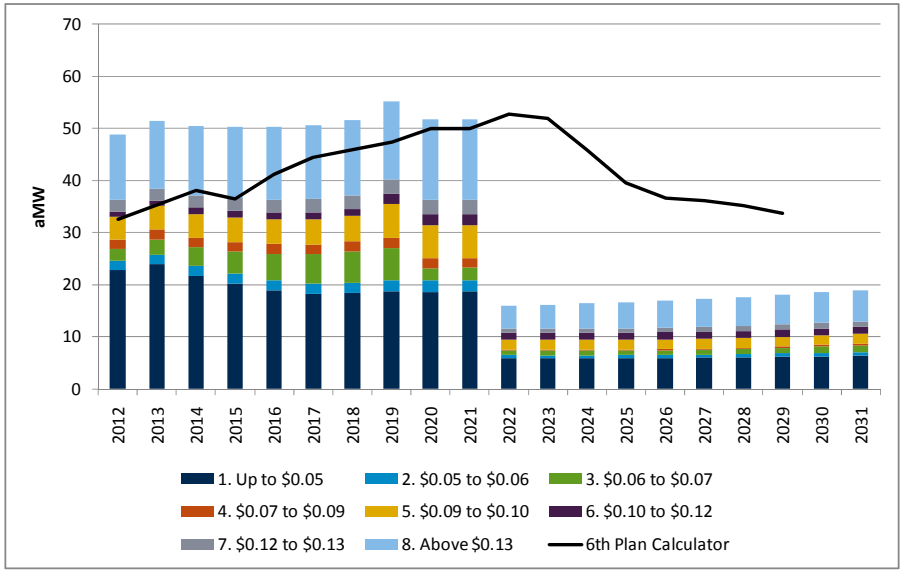


DSR Annual Energy Savings Comparison

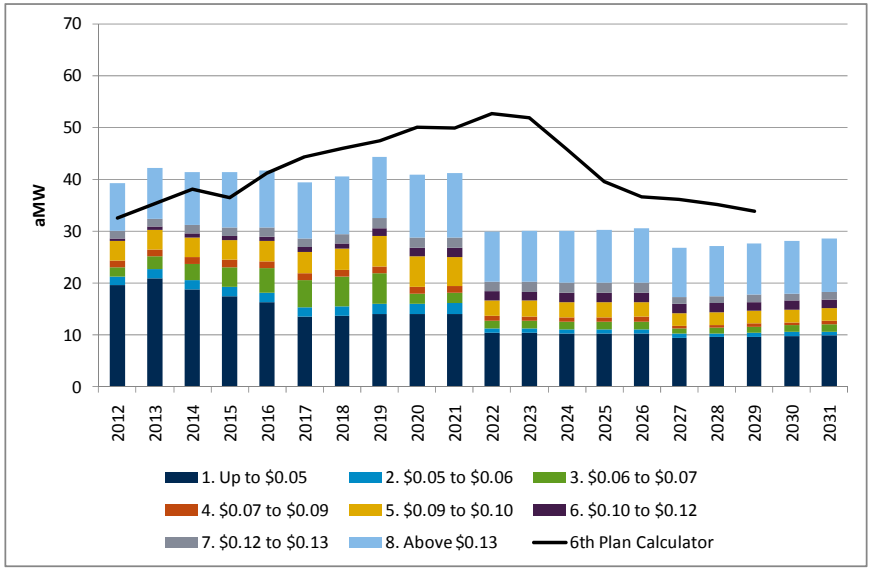
Bundle	Price Cut-Offs for Bundles	2011 IRP Annual aMW PSE Ramp	
		2012	2031
A	< $55	27	327
B	Bundle A + ($55 to $85)	33	438
C	Bundle B + ($85 to $115)	36	502
D	Bundle C + ($115 to $130)	38	528
E	Bundle D + ($130 to $150)	39	563
F	Bundle E + ($150 to $170)	41	587
G	Bundle F + ($170 to $190)	42	597
H	Bundle G + (>= $190)	50	737
EISA		4	186
DE		1	37

Electric Achievable Technical Potential Ramp Sensitivity

2011 IRP



2011 IRP with Council Ramp Rates



- Equivalent 20-year potential, but different timing
- Differences in ramping only for discretionary measures
- Council ramp rates lead to lower levels of acquisition in first ten years

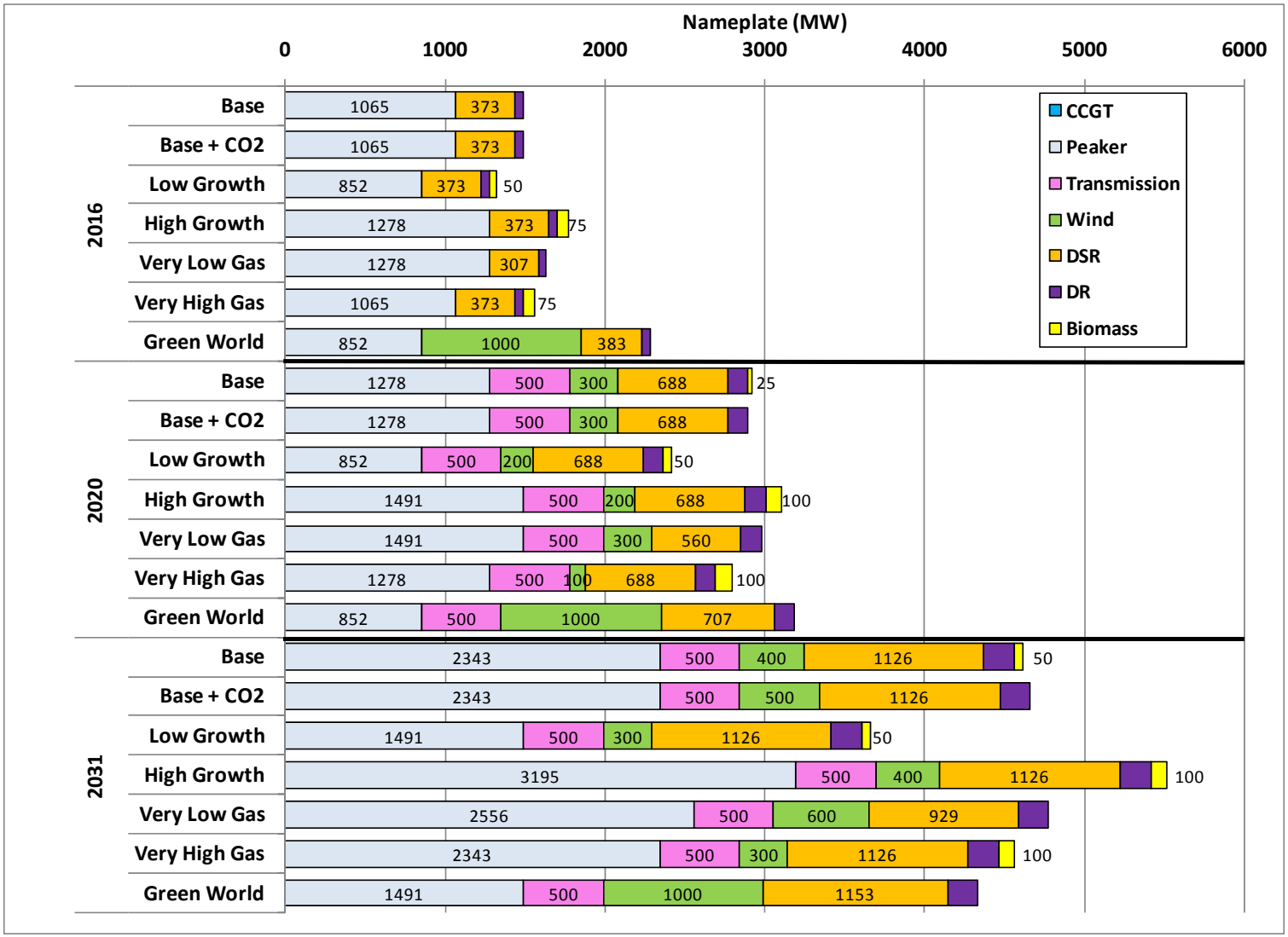
Electric Portfolio Analysis Results

- Summary Results of Portfolio Analysis
- Review Resource Needs
- Results of Scenario and Sensitivity Analysis
- Next Steps

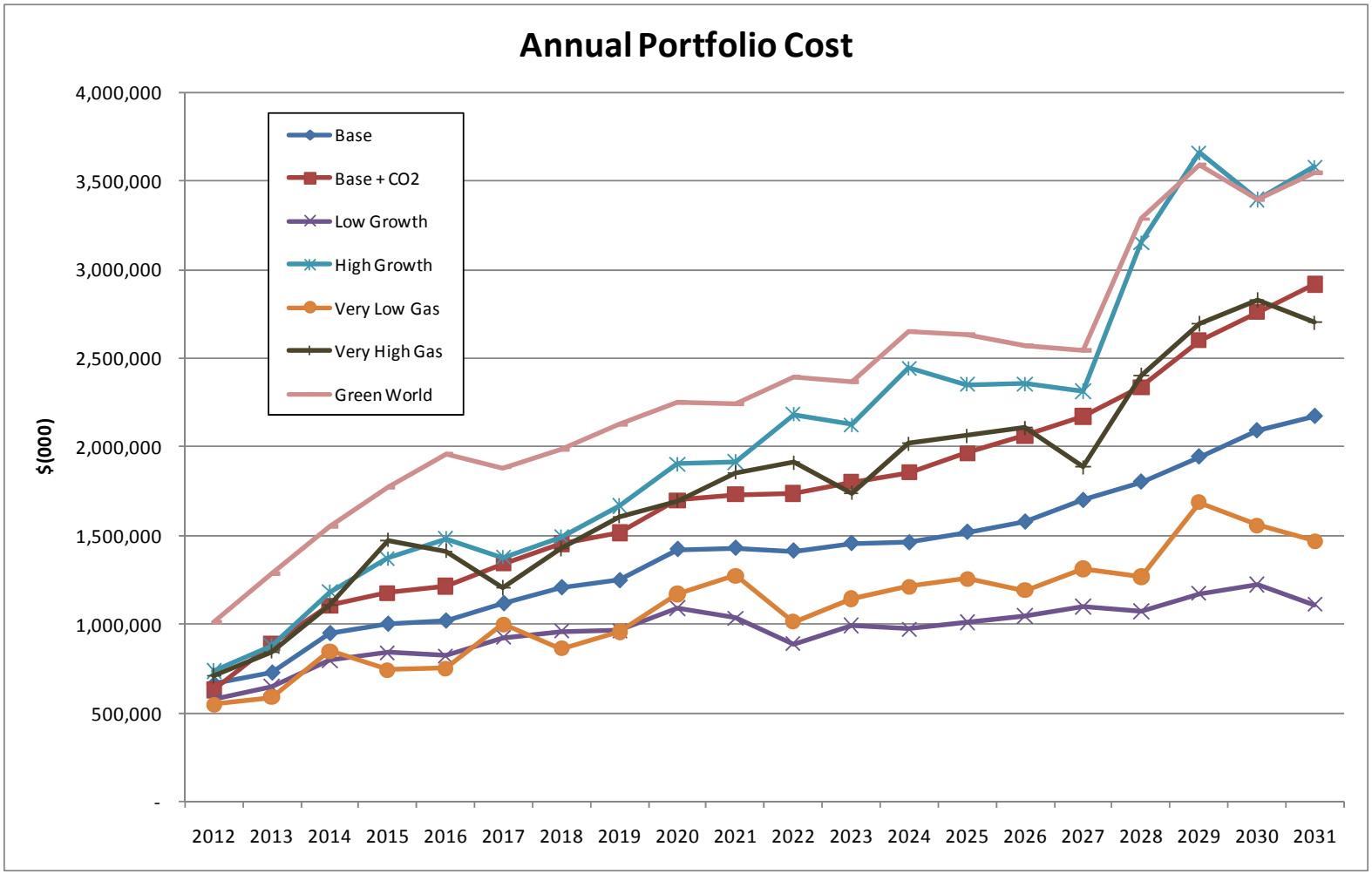
Summary of Portfolio Analysis Results

- Demand-Side Resources
  - Almost same aMW as 2009 IRP
  - 10-Year Acceleration modestly more cost effective than Council Ramp Rates
- Renewables
  - Existing wind plus Baker, Snoqualmie, & LSR Phase I (including 1.2x REC) covers RPS need till 2020
  - Extension of federal financial incentives accelerates timing & lowers cost
- Market and Thermal Resources Meet Remaining Capacity Needs
  - New peakers more cost effective than new CCCT
  - New transmission build to market looks cost effective
- Results May Vary Depending Upon Executable Alternatives
  - Analyzing assumptions on new builds
  - Additional PPAs not assumed
  - Availability of distressed assets not assumed

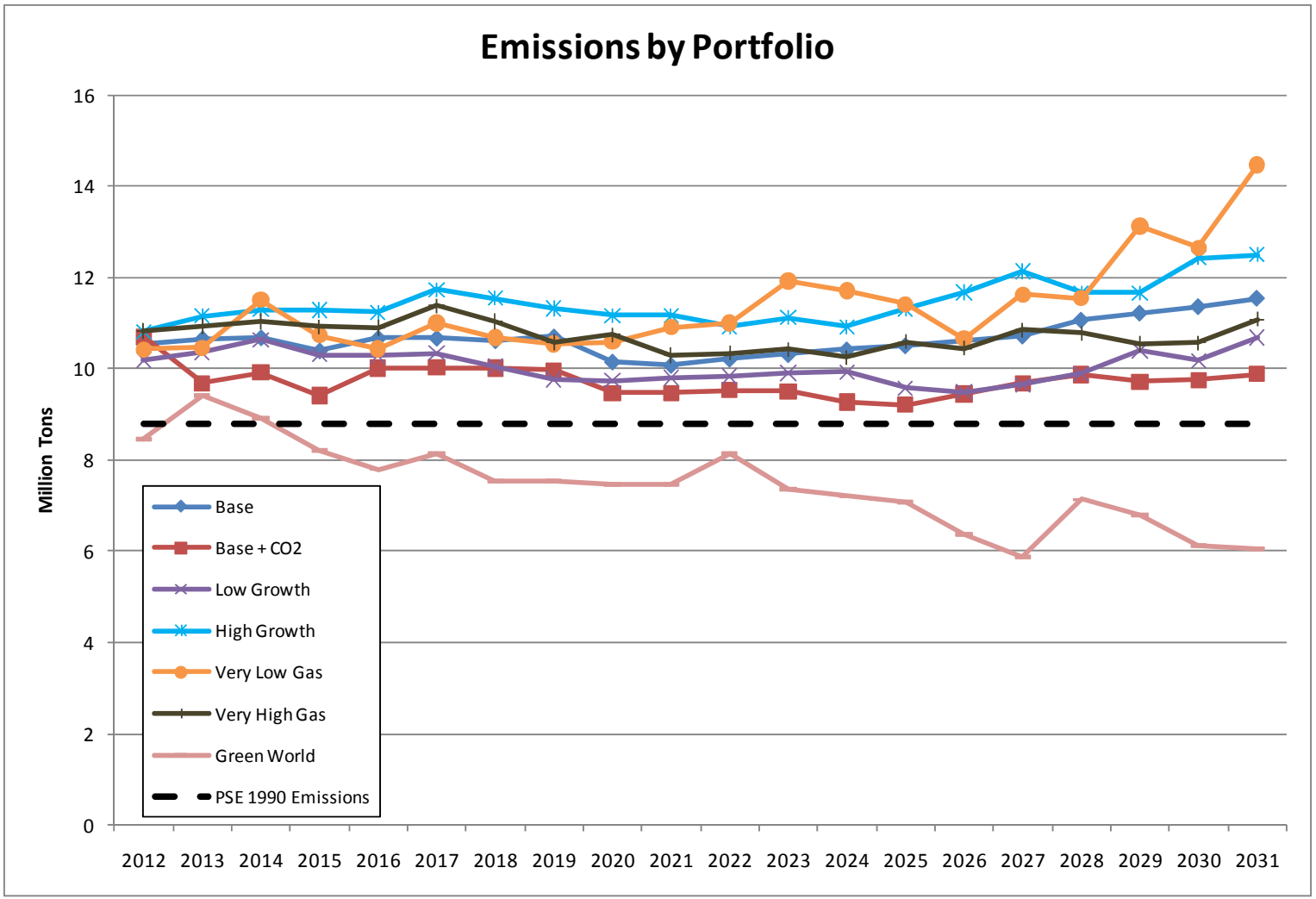
Draft 2011 Portfolio Nameplate Additions



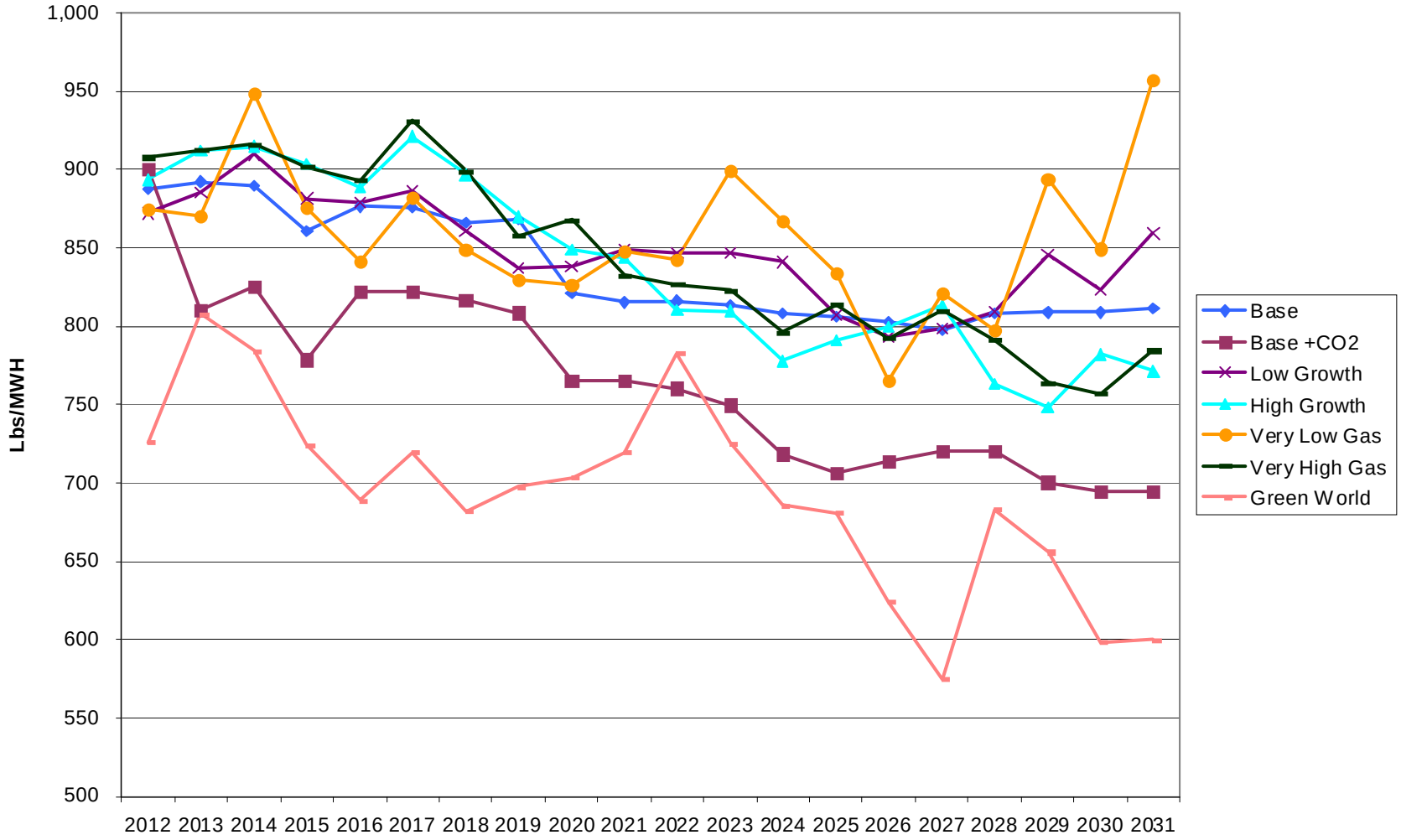
Draft 2011 Annual Incremental Revenue Requirement



Draft Forecast PSE Portfolio CO_2 Emissions



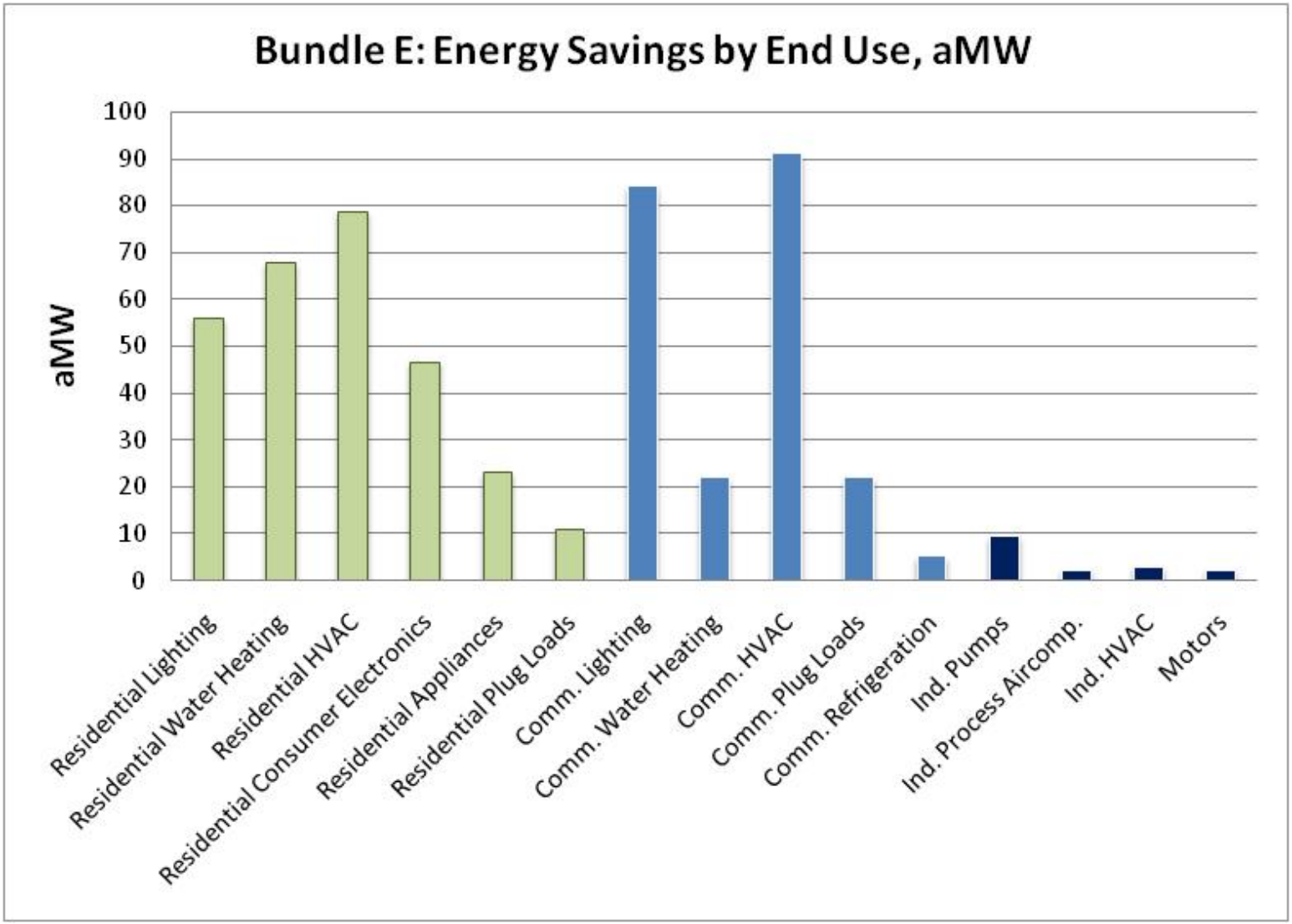
Carbon Intensity

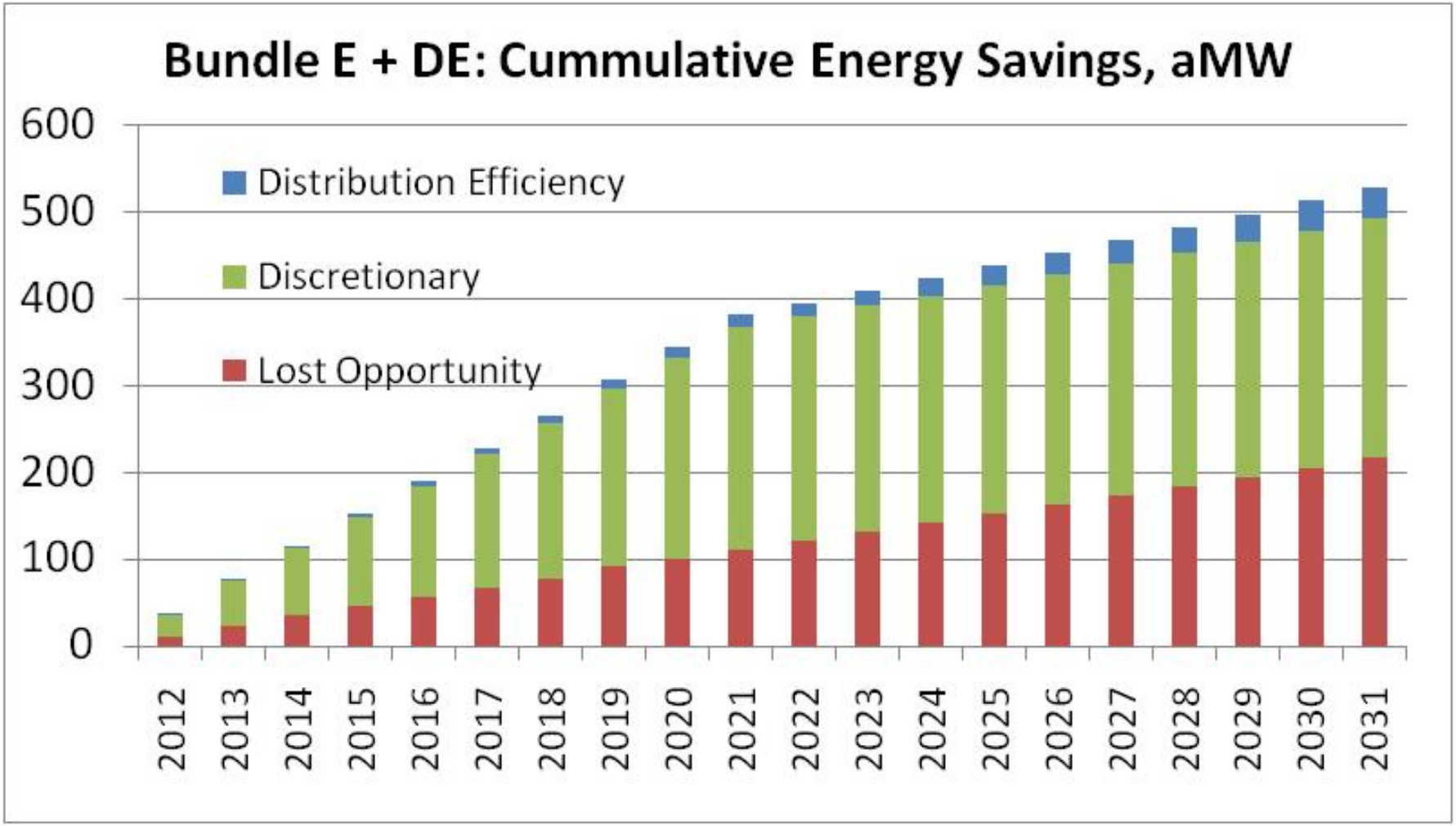


NPV Incremental Revenue Requirement For DSR Bundles

20-yr Expected Portfolio Cost
(Incremental Rev Req in $Billions)

Bundle	Base w/o DR	Base w/ DR
No DSR	$16.07	
A	$13.76	$13.72
B	$13.54	$13.50
C	$13.48	$13.45
D	$13.46	$13.38
E	$13.44	$13.36
F	$13.49	$13.41
G	$13.52	$13.45
H	$17.48	$17.45


Bundle E: Energy Savings by End Use, aMW
aMW
100
90
80
70
60
50
40
30
20
10
0
Residential Lighting
Residential Water Heating
Residential HVAC
Residential Consumer Electronics
Residential Appliances
Residential Plug Loads
Comm. Lighting
Comm. Water Heating
Comm. HVAC
Comm. Plug Loads
Comm. Refrigeration
Ind. Pumps
Ind. Process Aircomp.
Ind. HVAC
Motors


Bundle E + DE: Cummulative Energy Savings, aMW
600
500
400
300
200
100
0
Distribution Efficiency
Discretionary
Lost Opportunity
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031

Expected NPV Incr Rev Requirement and DSR Results

Scenarios & Sensitivities	20-yr NPV Expected Cost (Incremental Rev Req $Billions)	Bundle
Base	$13.36	E
Base + CO2	$15.93	E
Low Growth	$9.83	E
High Growth	$18.58	E
Very Low Gas	$10.87	B
Very High Gas	$16.45	E
Green World	$21.06	G

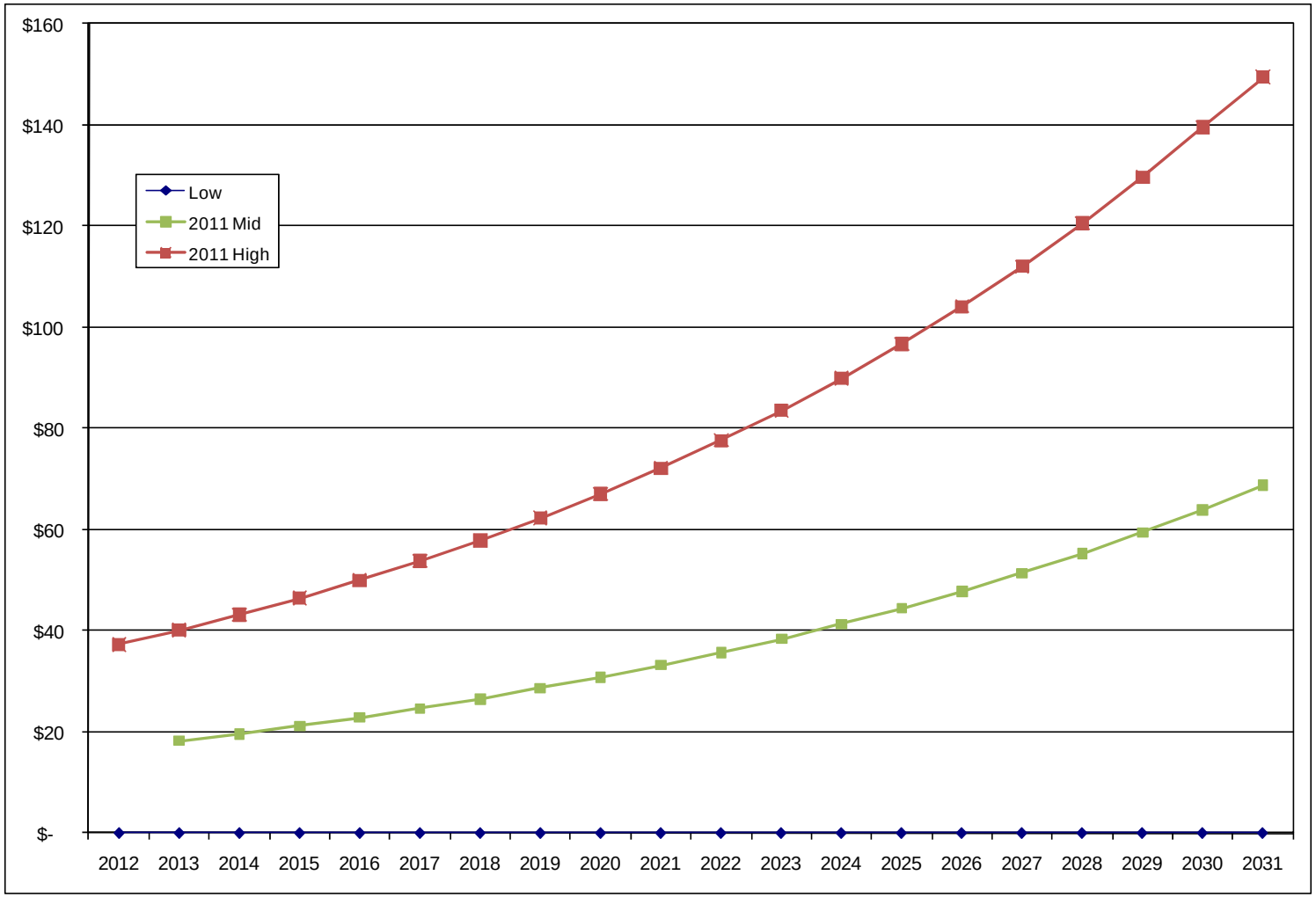
Test DSR Peak and Ramp in Base

Base Scenario	20-yr Expected Incr Rev Req ($Billions)	Bundle	DR
Base (PSE Ramp)	$13.36	E	Yes
Base + Council Ramp	$13.53	E	Yes

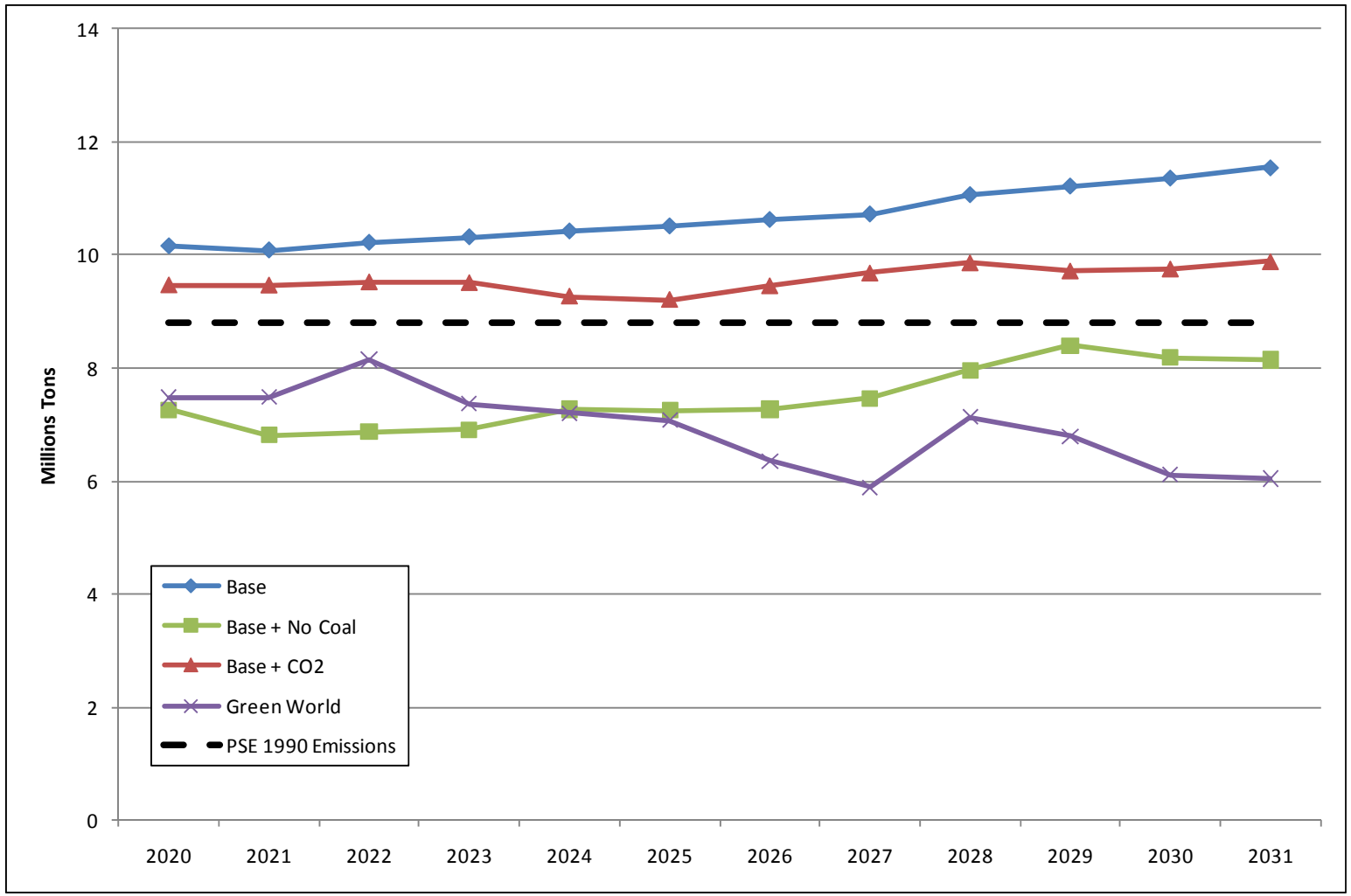
Comparison of Different “Carbon Policies”

- Costs and Emissions
- Base
- Base + CO_2
- Green World…more than just CO_2
- No Northwest Coal by 2020 Sensitivity

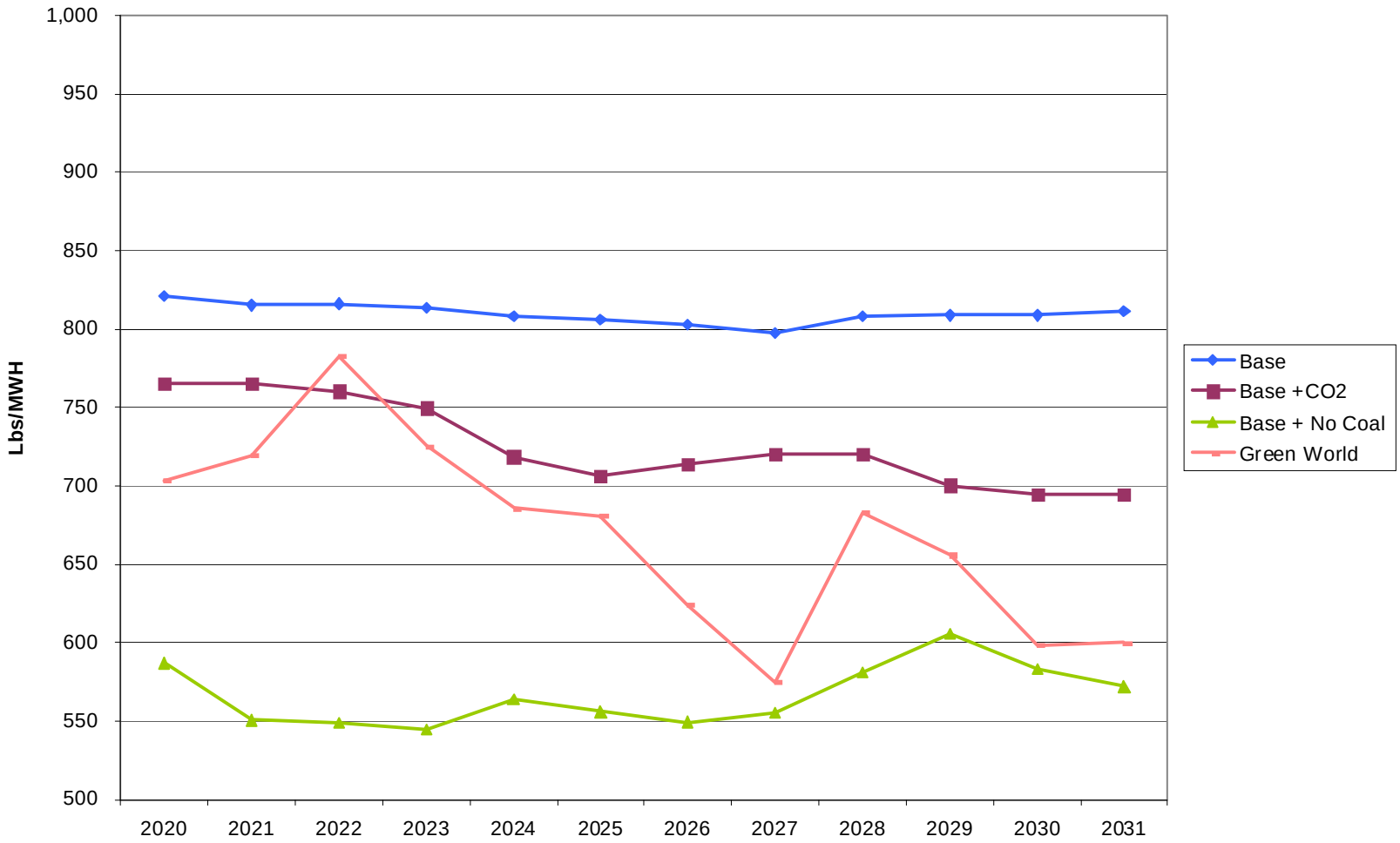
CO_2 Prices


$160
$140
$120
$100
$80
$60
$40
$20
$-
Low
2011 Mid
2011 High
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031

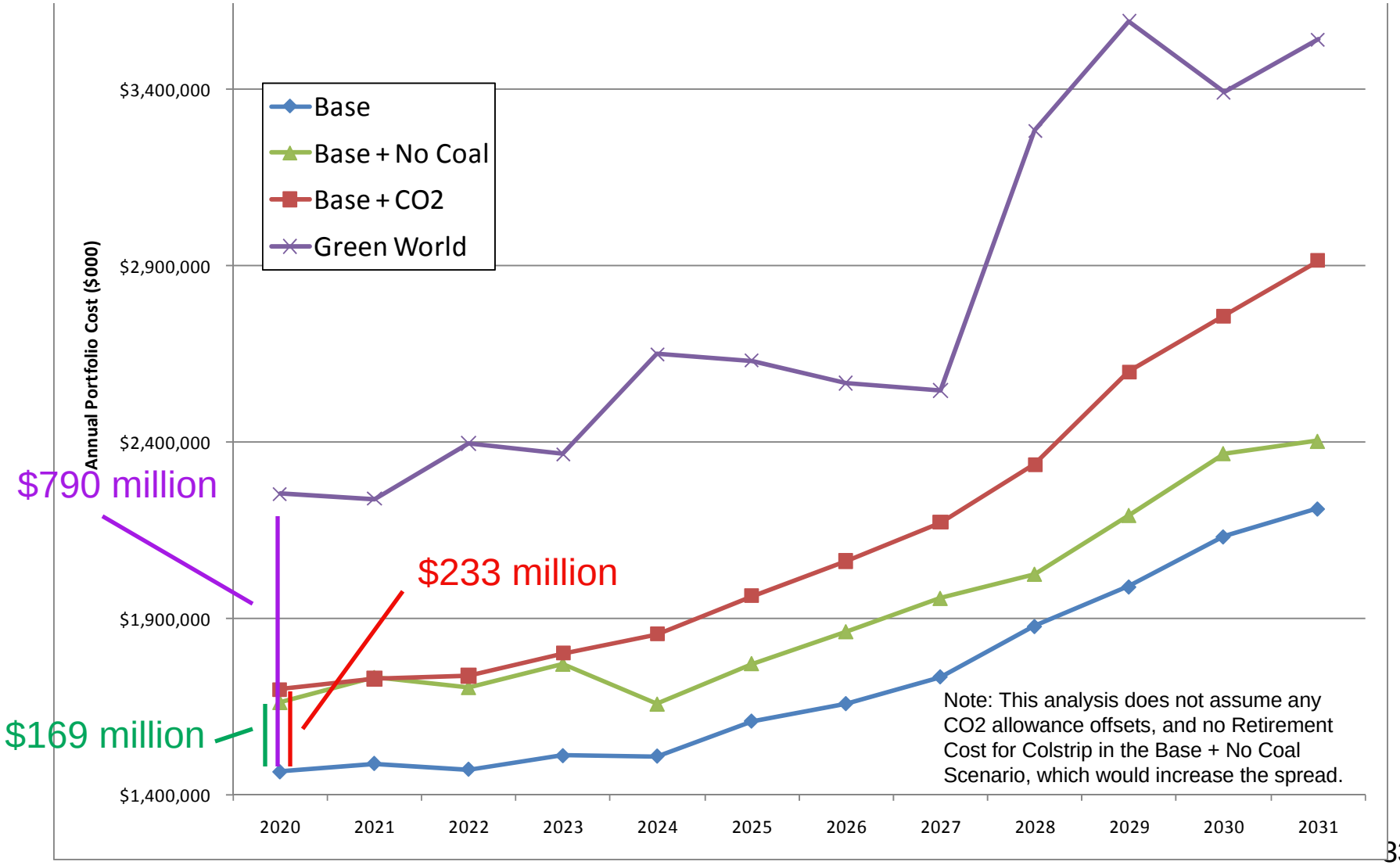
Comparison of CO_2 Emissions



Carbon Intensity



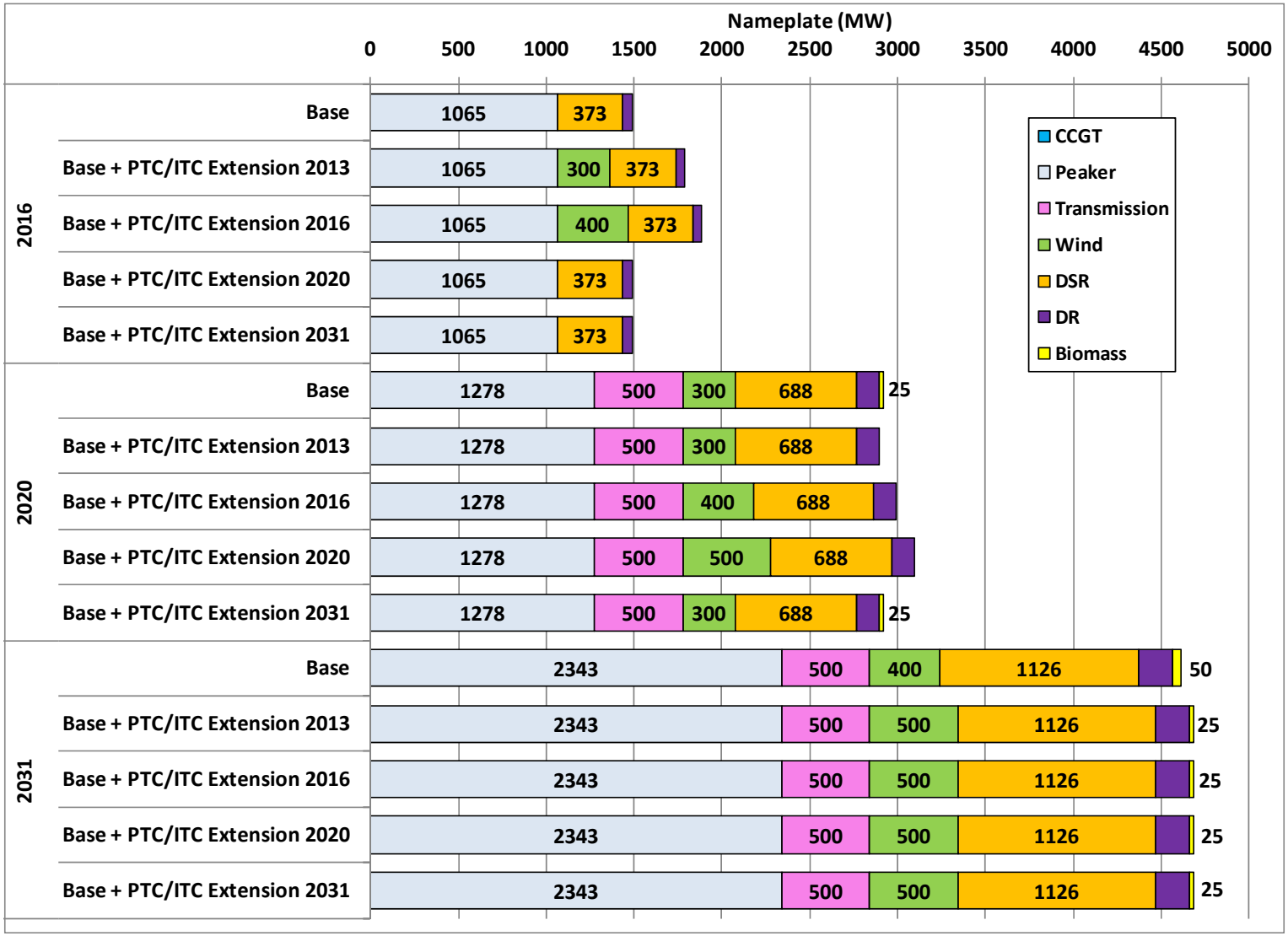
Impact on Annual Revenue Requirement



Impact of Extending Fed Financial Incentives for Renewables

- Examined impact on portfolio cost and timing
- Extensions considered: 2013, 2016, 2020, 2031
- PSE portfolio sensitivity
- Conclusions:
  - Could accelerate timing
  - Would reduce costs

Draft Comparison Nameplate Additions



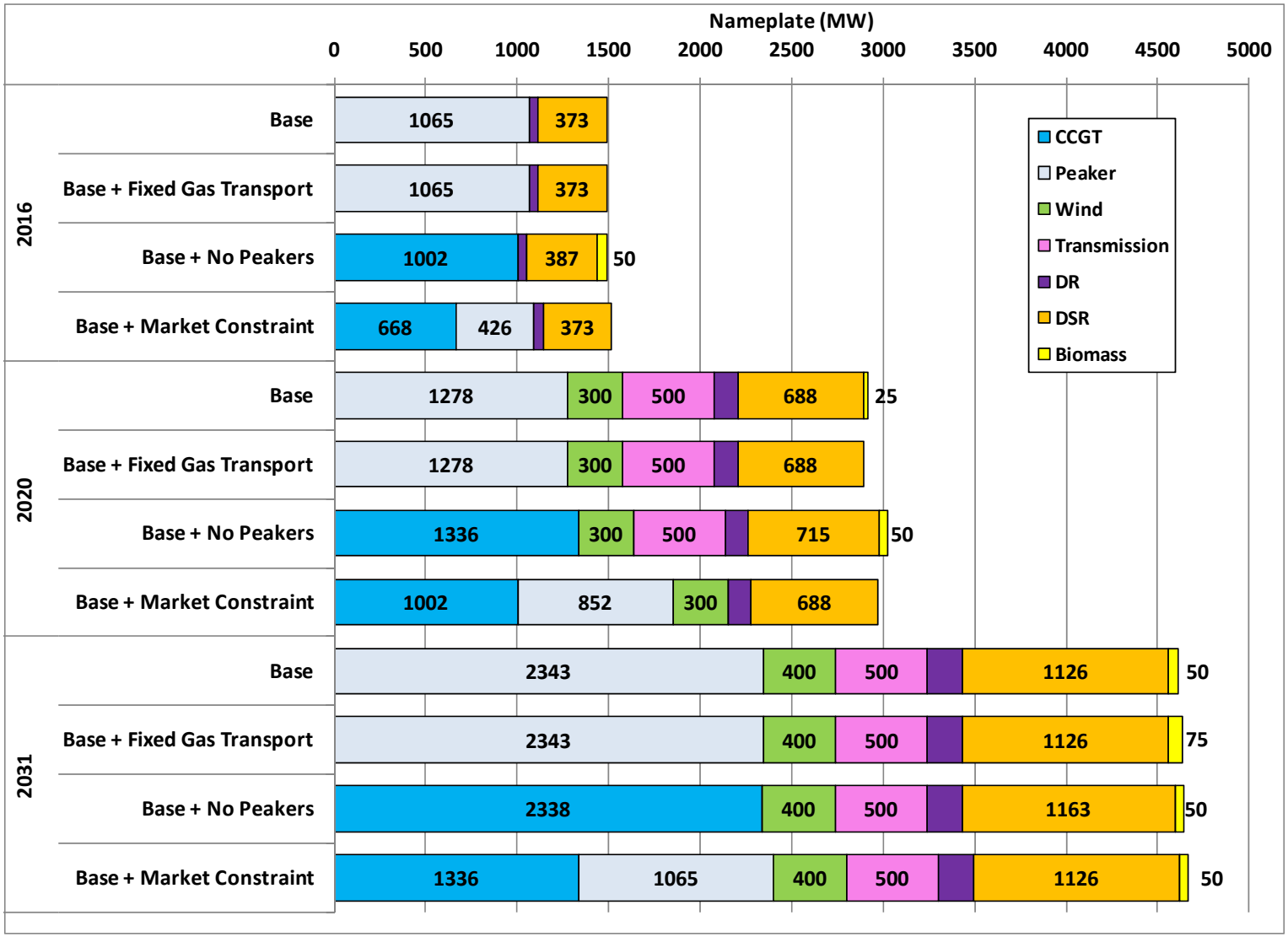
Draft Revenue Requirement Difference for PTC Sensitivity

Scenario	20-yr NPV Expected Cost (Incremental Rev Req $Billions)
Base	$13.36
Base + PTC/ITC Extension 2013	$13.33
Base + PTC/ITC Extension 2016	$13.27
Base + PTC/ITC Extension 2020	$13.24
Base + PTC/ITC Extension 2031	$13.24

Thermal Plant Sensitivities

- Examine tradeoffs of peakers versus CCCT.
- Cost, Cost Risk, Market Exposure
- Importance of PSE's risk management strategy

Draft Comparison Nameplate Additions



Draft Cost Difference for Base Sensitivities

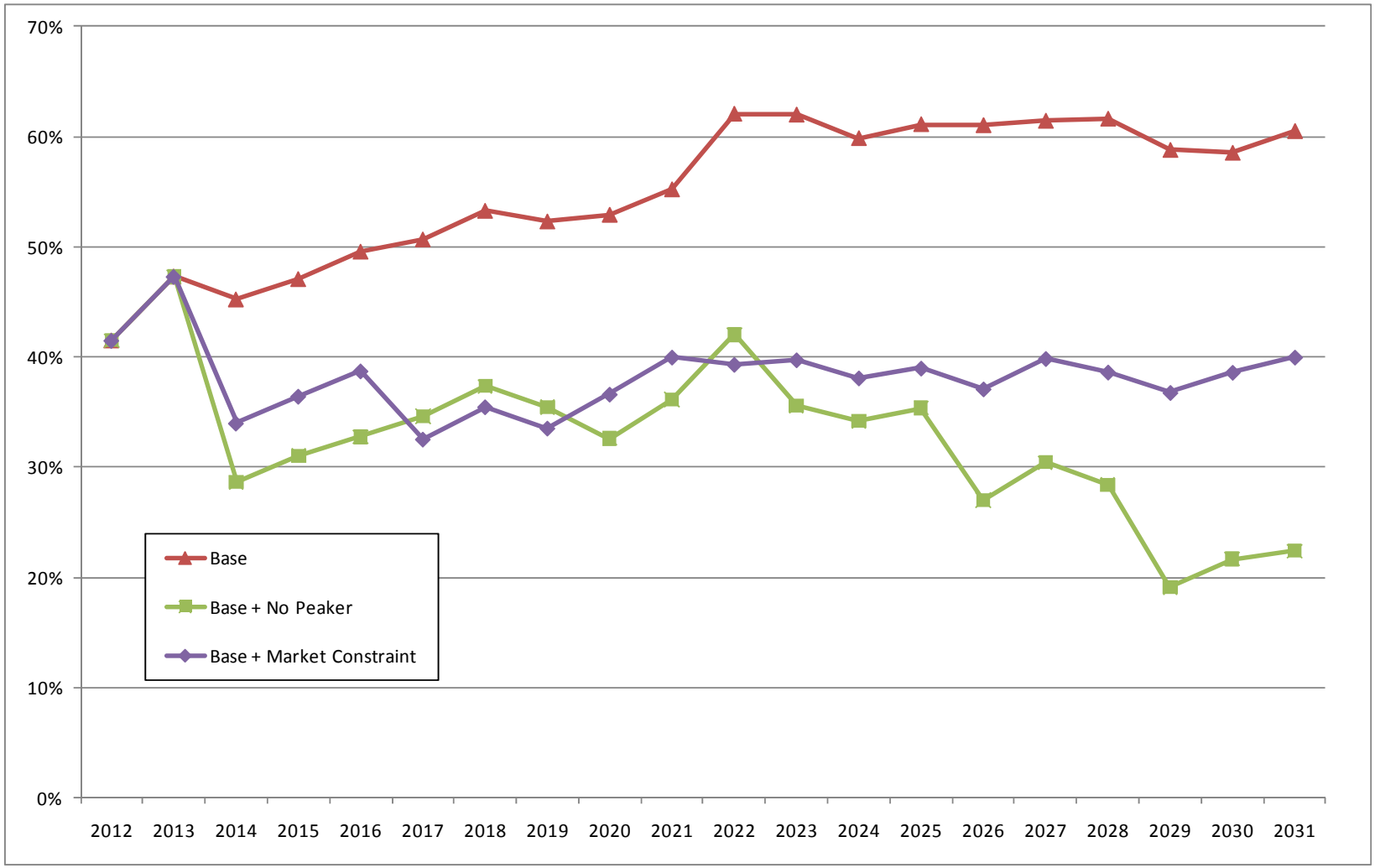
Scenario	20-yr NPV Expected Cost (Incremental Rev Req $Billions)
Base	$13.36
Base + Peaker Fixed Gas Transport Cost	$14.10
Base + No Peaker	$14.54
Base + Market Constraint	$14.26

Annualized Difference ~$120 million/yr

Non-Trivial

~$45 million/yr

Electric Market Exposure (Percent of Cost)



Electric Analysis—Next Steps

- Consider follow-up from today's dialogue
- Finish and polish cost risk analysis
- Ad Hoc as we learn

Lunch Break

Agenda

- Informal Networking…9:00 – 9:20 am
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- Wrap-Up…2:30 – 2:45 pm

Gas Planning Analysis

Gas Sales

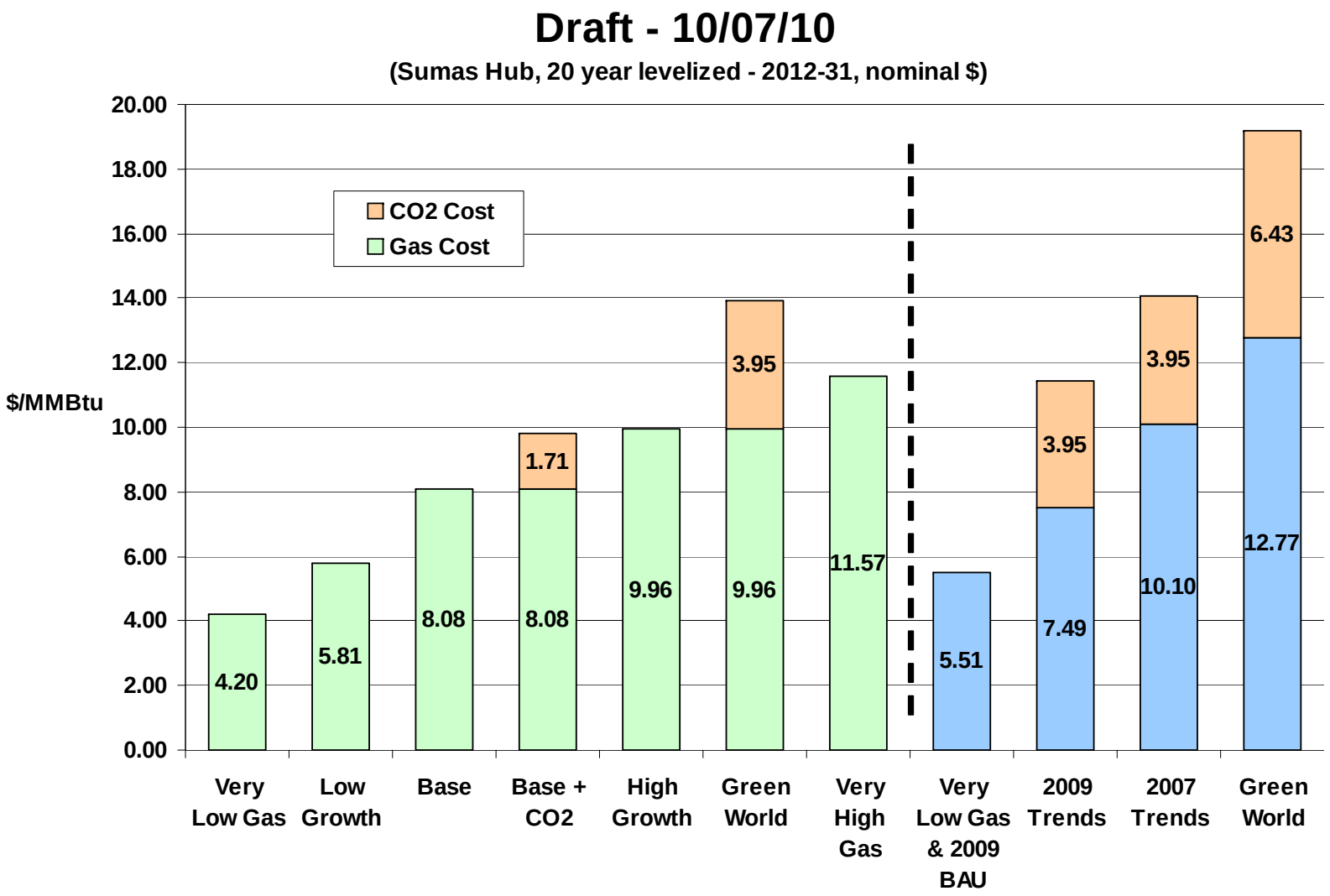
- Scenarios & Resource Alternatives Review
- Draft Model Results: Supply-Side
- Very Draft Model Results: Demand Side

Generation Fuel

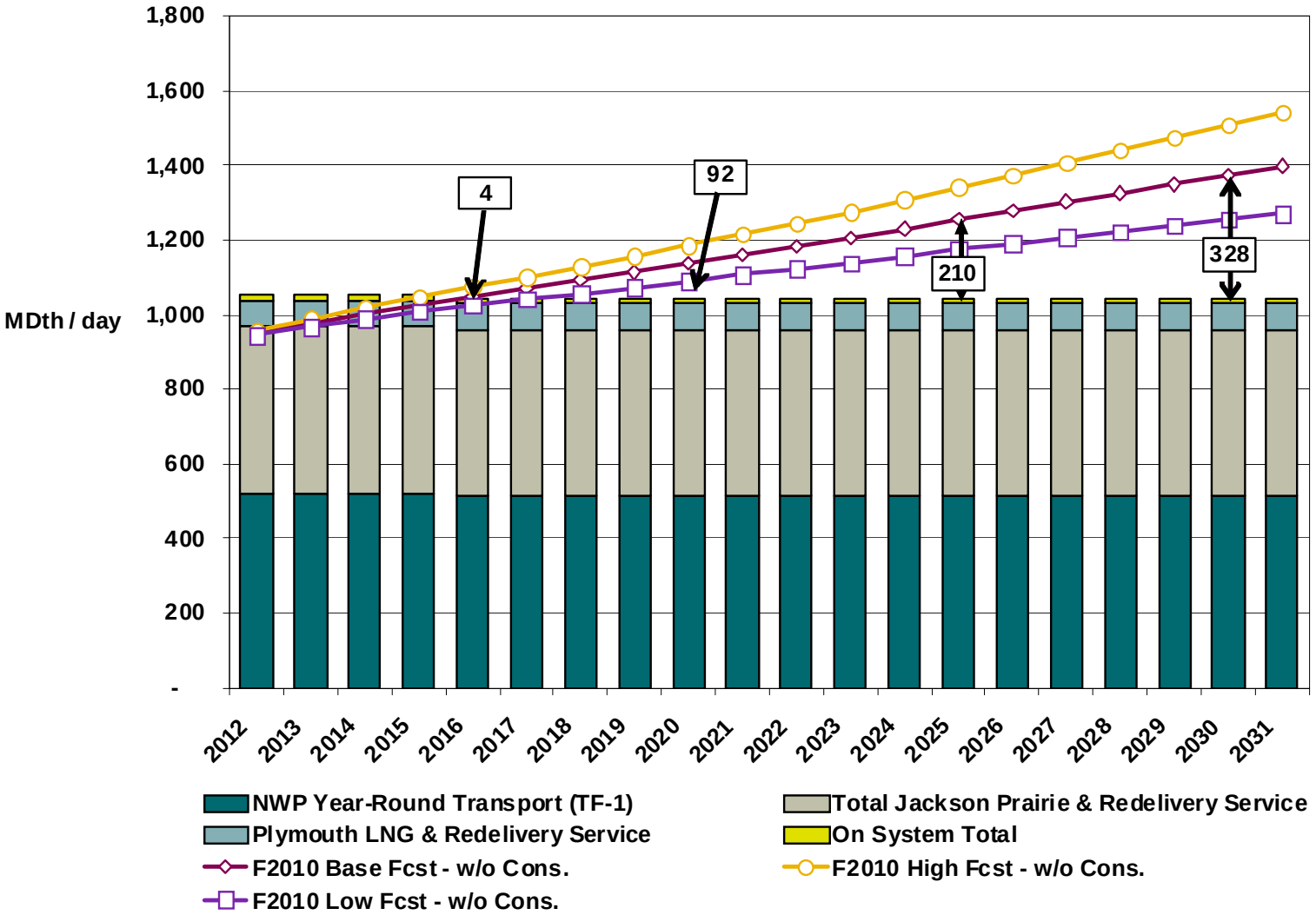
- Range of Resource Need
- Issues with Relative Swings

Next Steps

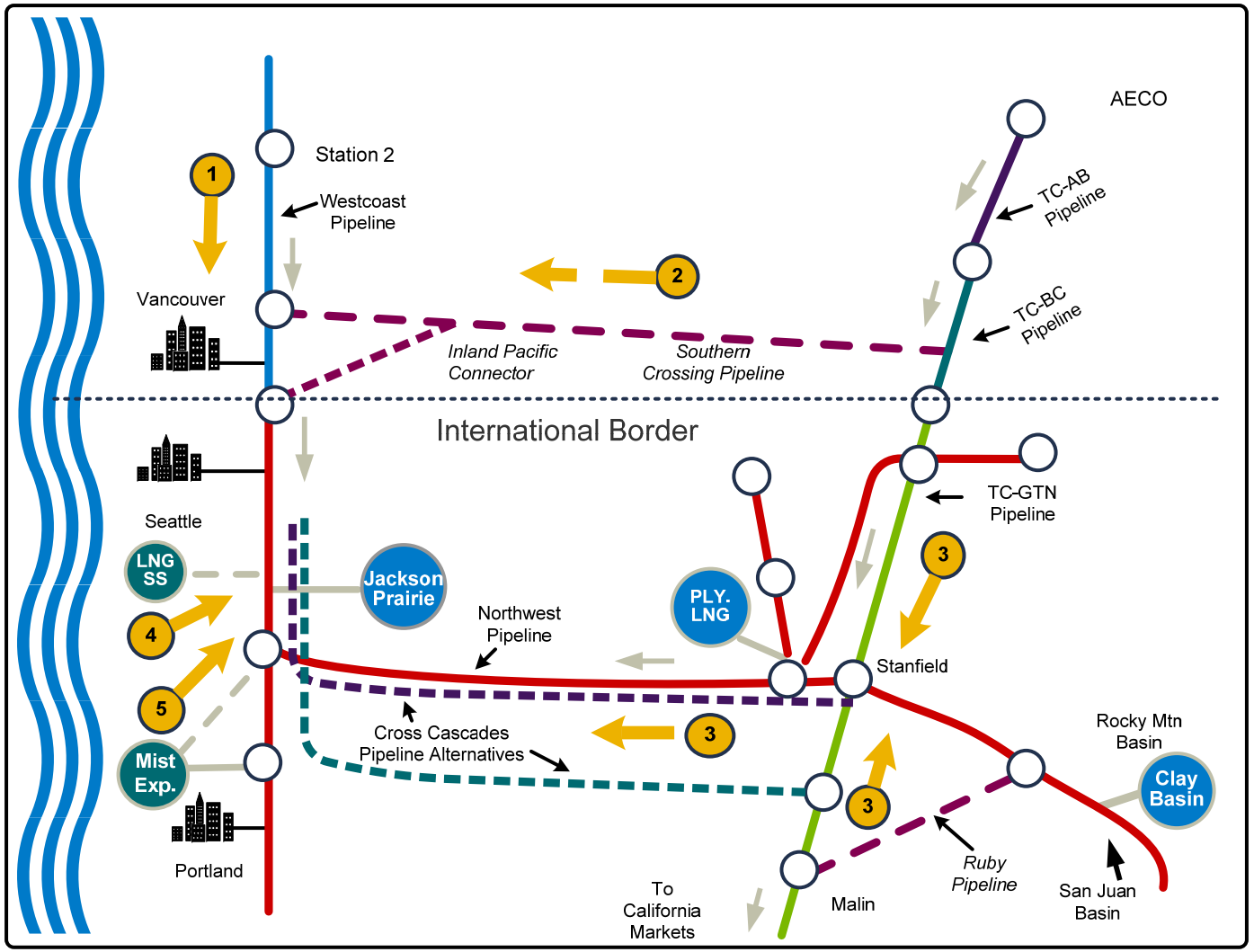
Levelized Gas Prices



Gas Sales Peak Capacity Resource Need



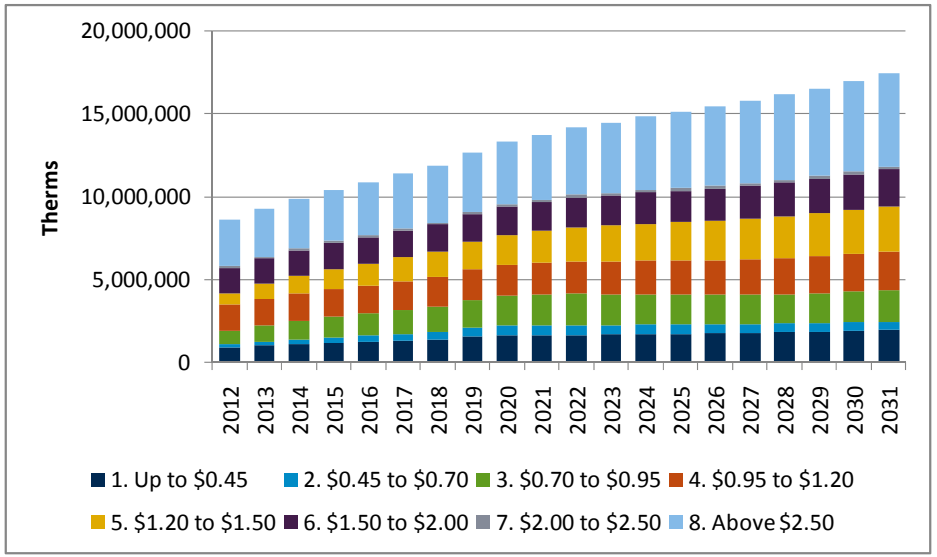
Gas Supply Alternatives



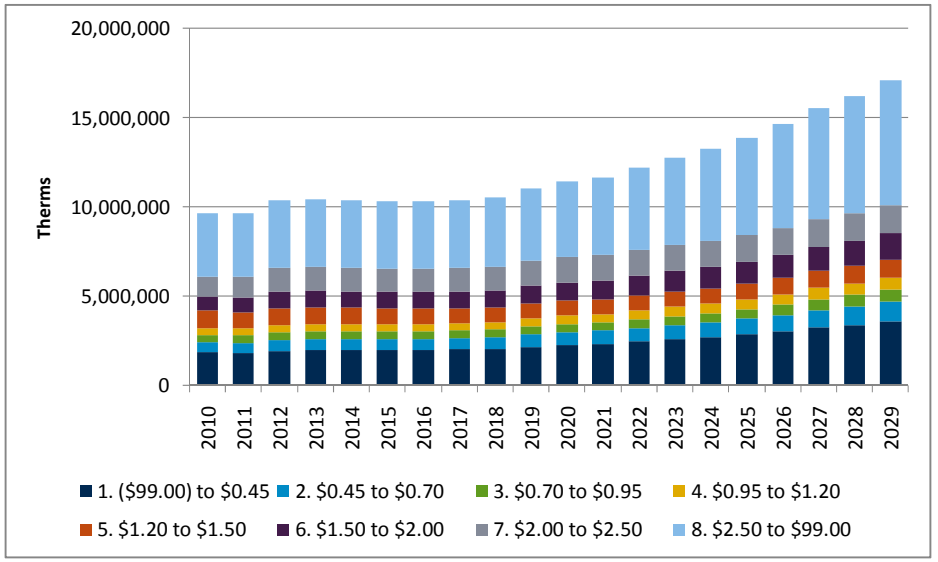
Natural Gas Demand-Side Resource Potentials (million therms)

	Technical Potential		Achievable Technical Potential	
Sector	**2011 IRP**	**2009 IRP**	**2011 IRP**	**2009 IRP**
Residential	306	263	185	162
Commercial	115	132	79	84
Industrial	7	12	5	9
Overall	428	407	269	255

2011 IRP



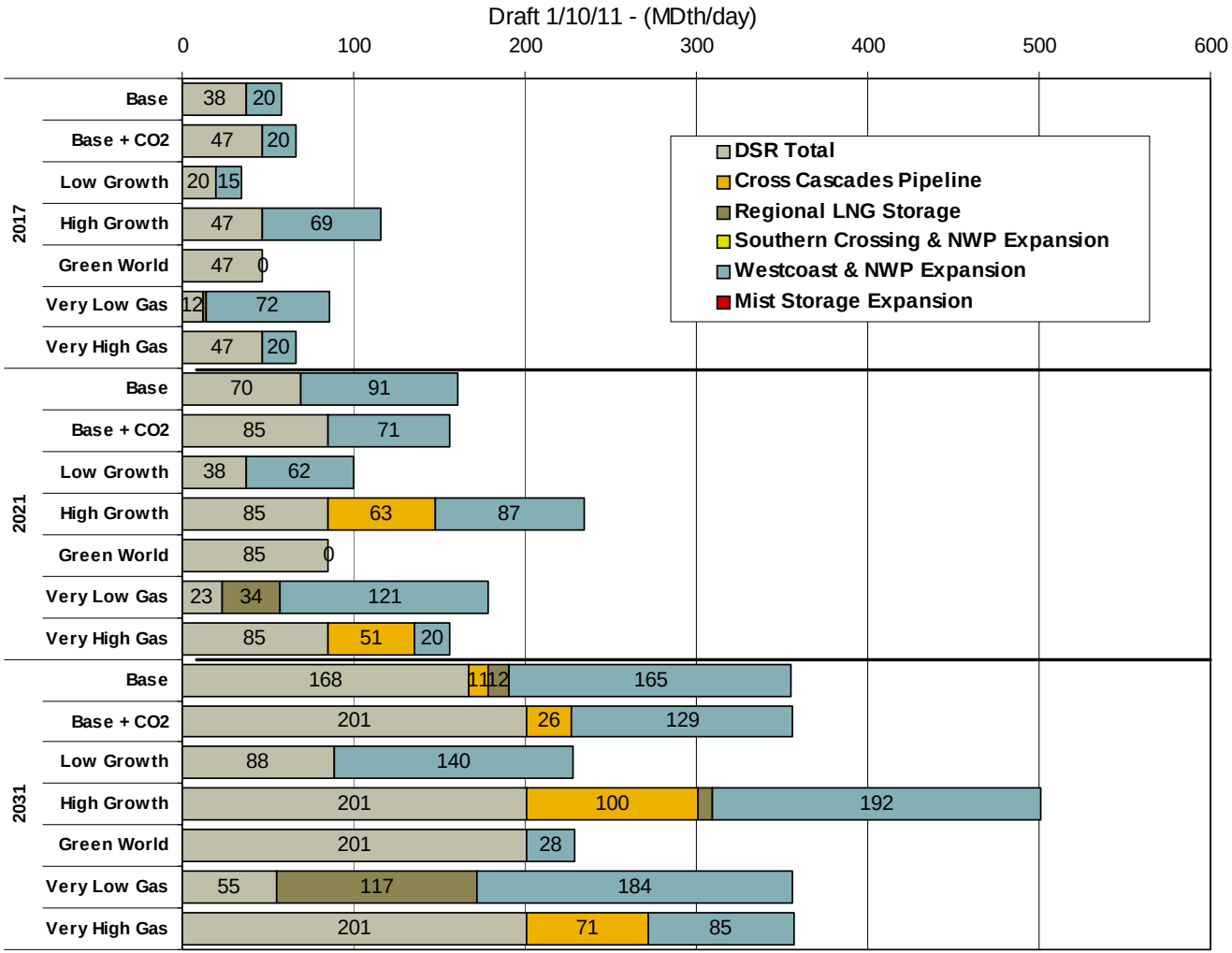
2009 IRP



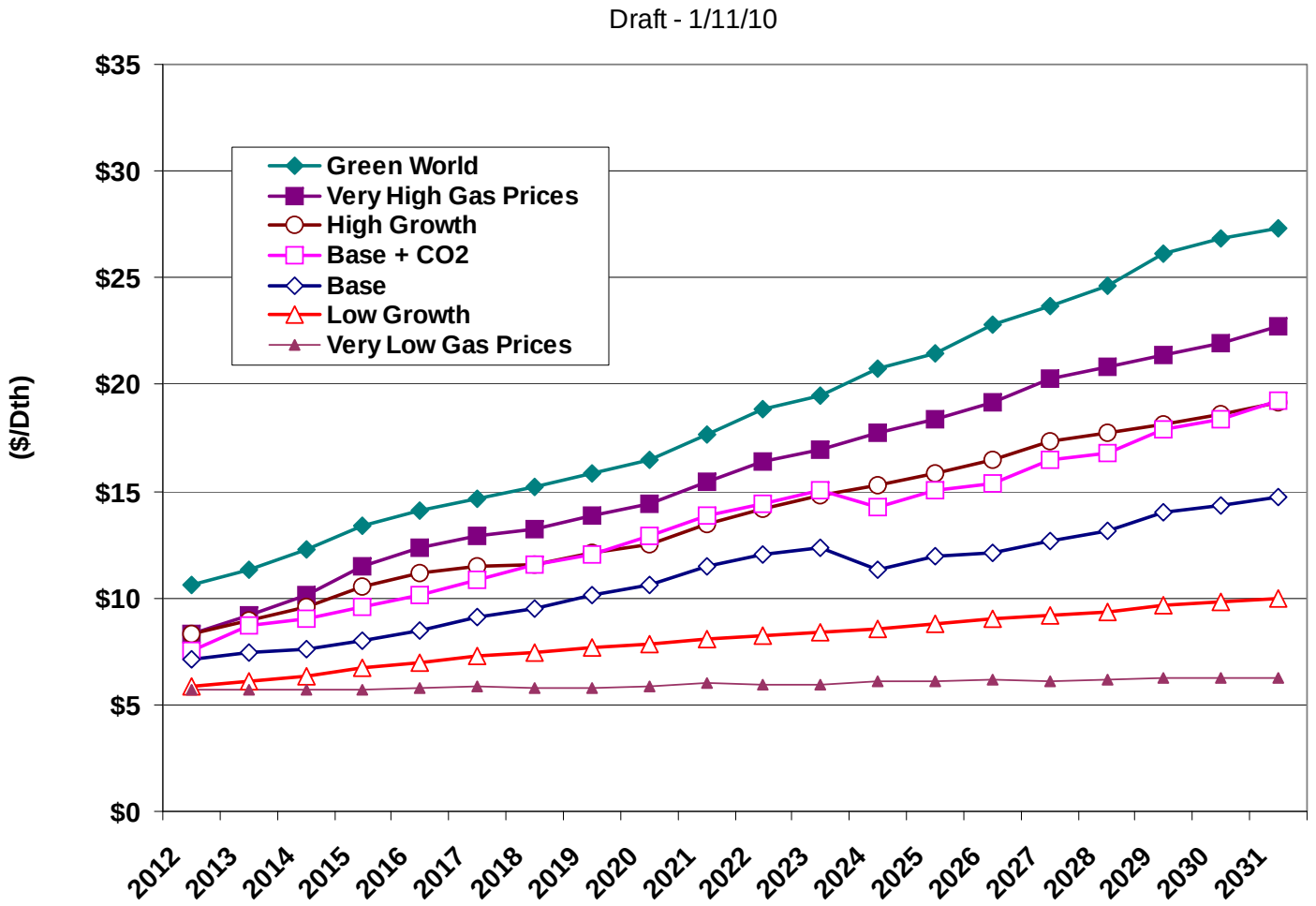
Draft - DSR Annual Gas Savings—Supply Curve

Bundle	Max Price Points for Bundles	Annual Savings (MDth)	
		2012	2031
A	< $4.50	100	3,428
B	< $7.00	122	4,635
C	< $9.50	208	7,945
D	< $12.00	352	11,399
E	< $15.00	410	14,967
F	< $20.00	556	18,373
G	< $25.00	573	18,808
H	< $99.00	850	27,015

Gas Sales Portfolio Capacity Additions



Average Portfolio Cost of Gas



First Draft - DSR Cost Bundle Selection

DRAFT

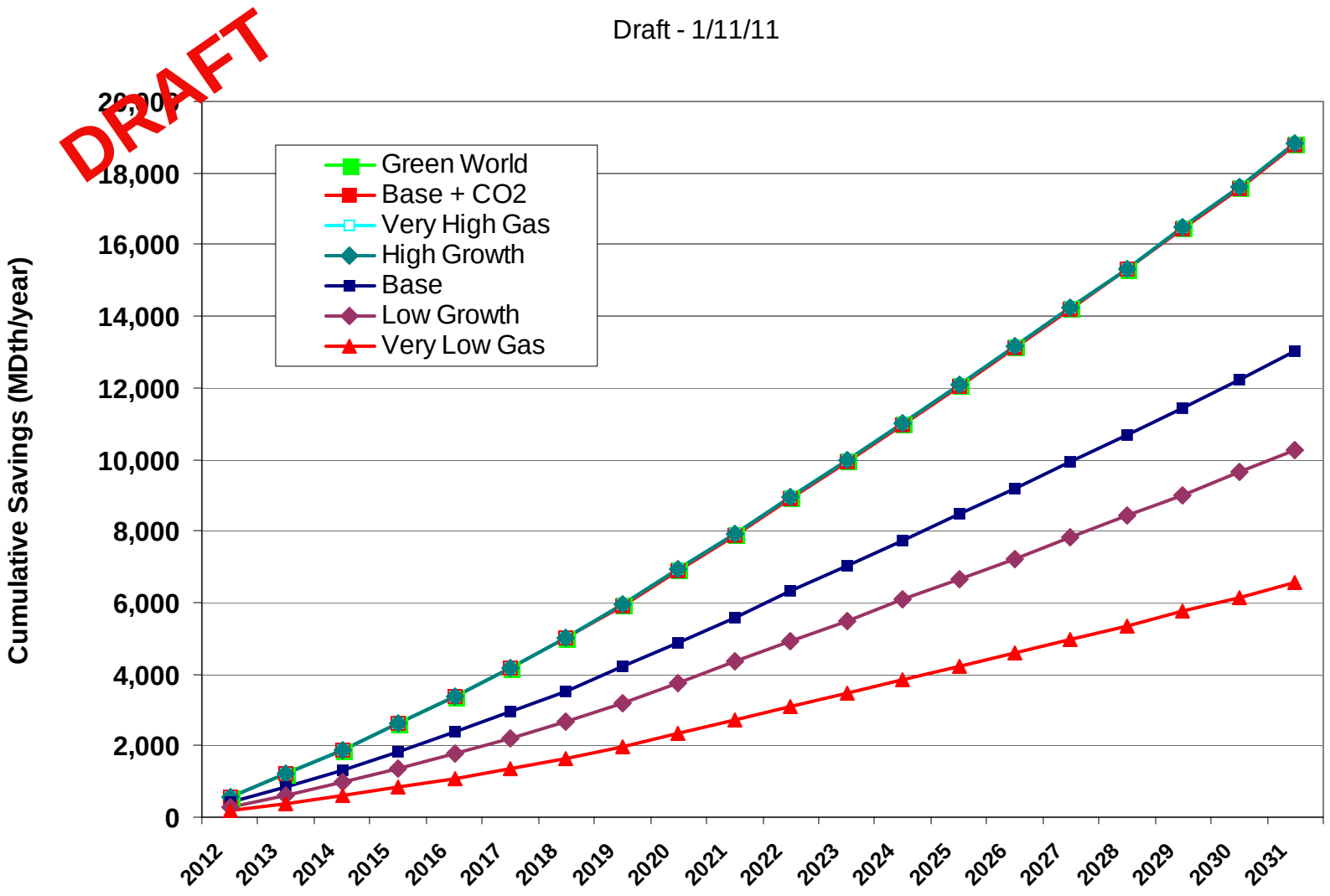
Sector	Base	Base + CO2	Low Growth	High Growth	Green World	Very Low Gas	Very High Gas
Residential	D	G	C	G	G	B	G
Commercial Firm	G	G	G	G	G	E	G
Commercial Interruptible	C	F	B	G	G	A	G
Industrial Firm	G	G	G	G	G	G	G
Industrial Interruptible	G	G	G	G	G	G	G

- Currently updating analysis to better target incremental benefits and costs like on electric side
- Results may change

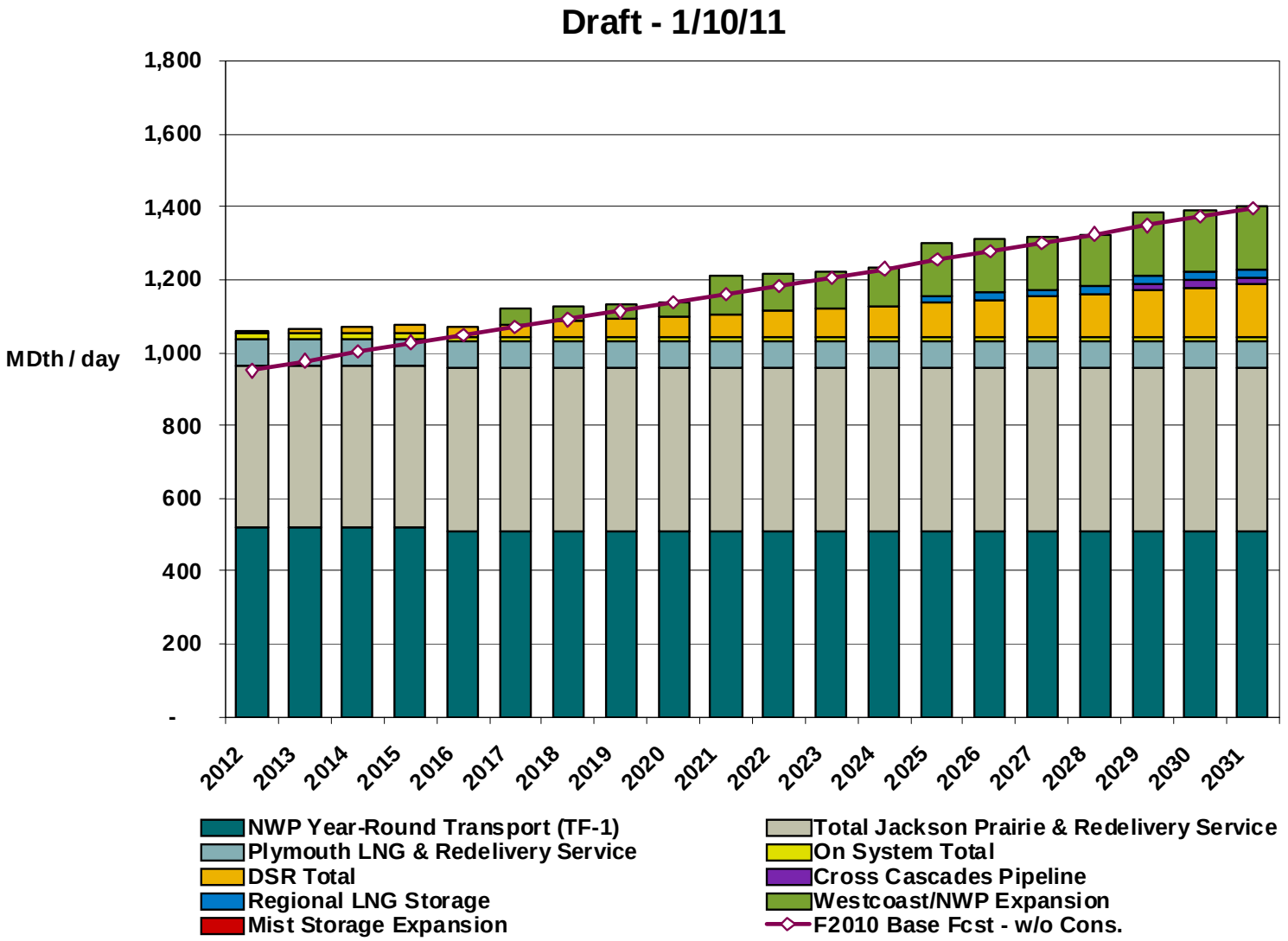
Draft - DSR Annual Peak and Energy Savings - 2031

Sector	Peak Day Savings (MDth/day)	Annual Energy Savings (MDth/yr)
Residential	74	7,140
Commercial Firm	67	4,890
Commercial Interruptible	-	473
Industrial Firm	1	452
Industrial Interruptible	-	51
Total	142	13,006

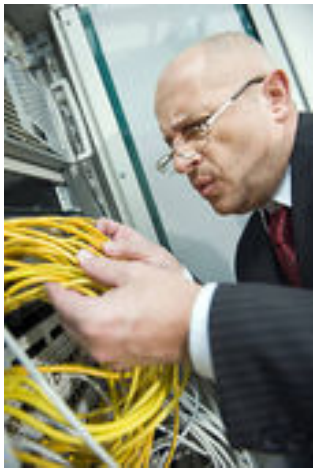
Energy Efficiency Savings by Scenario



Base Scenario Gas Sales Portfolio Results



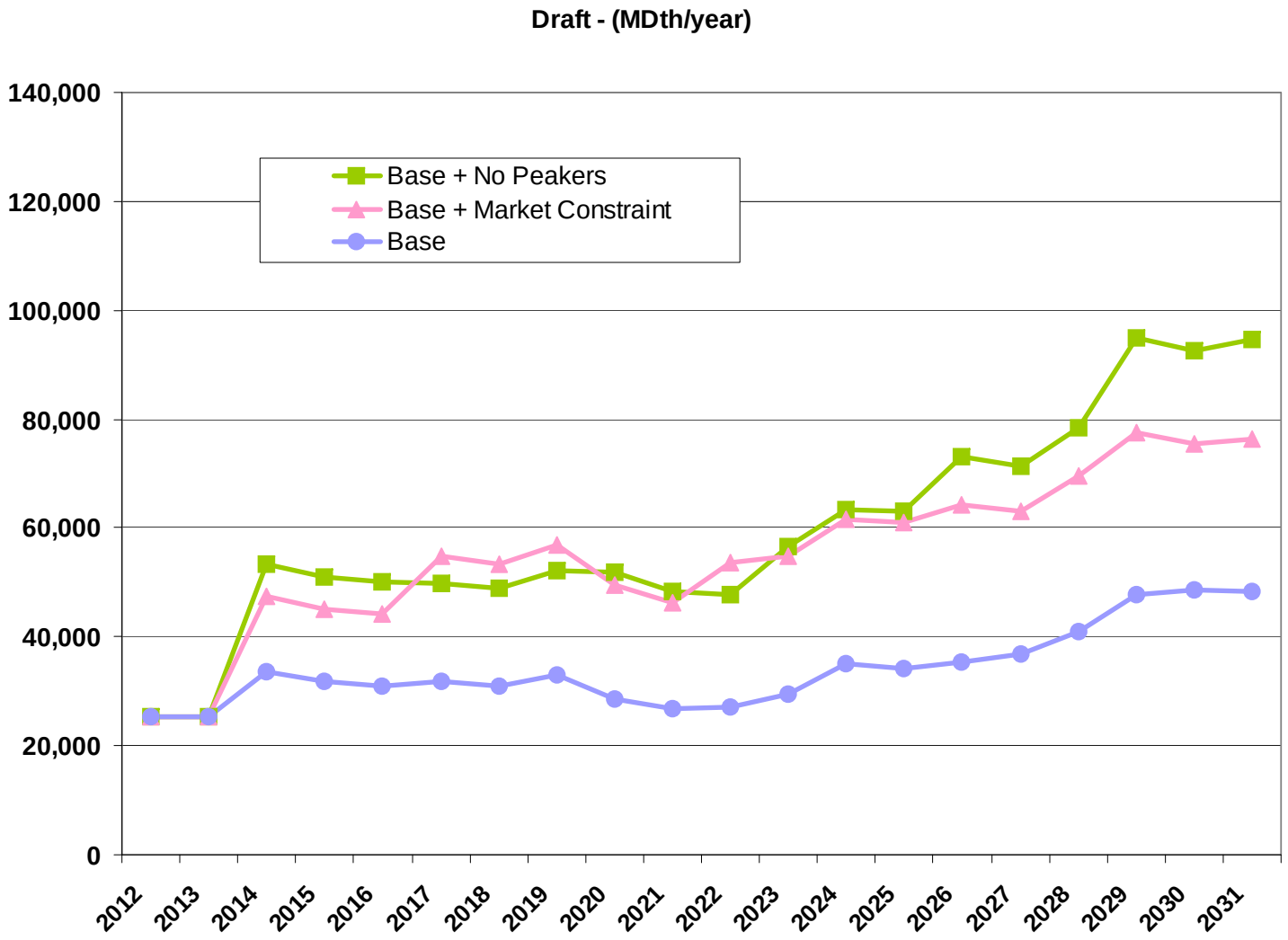
Gas for Generation Fuel



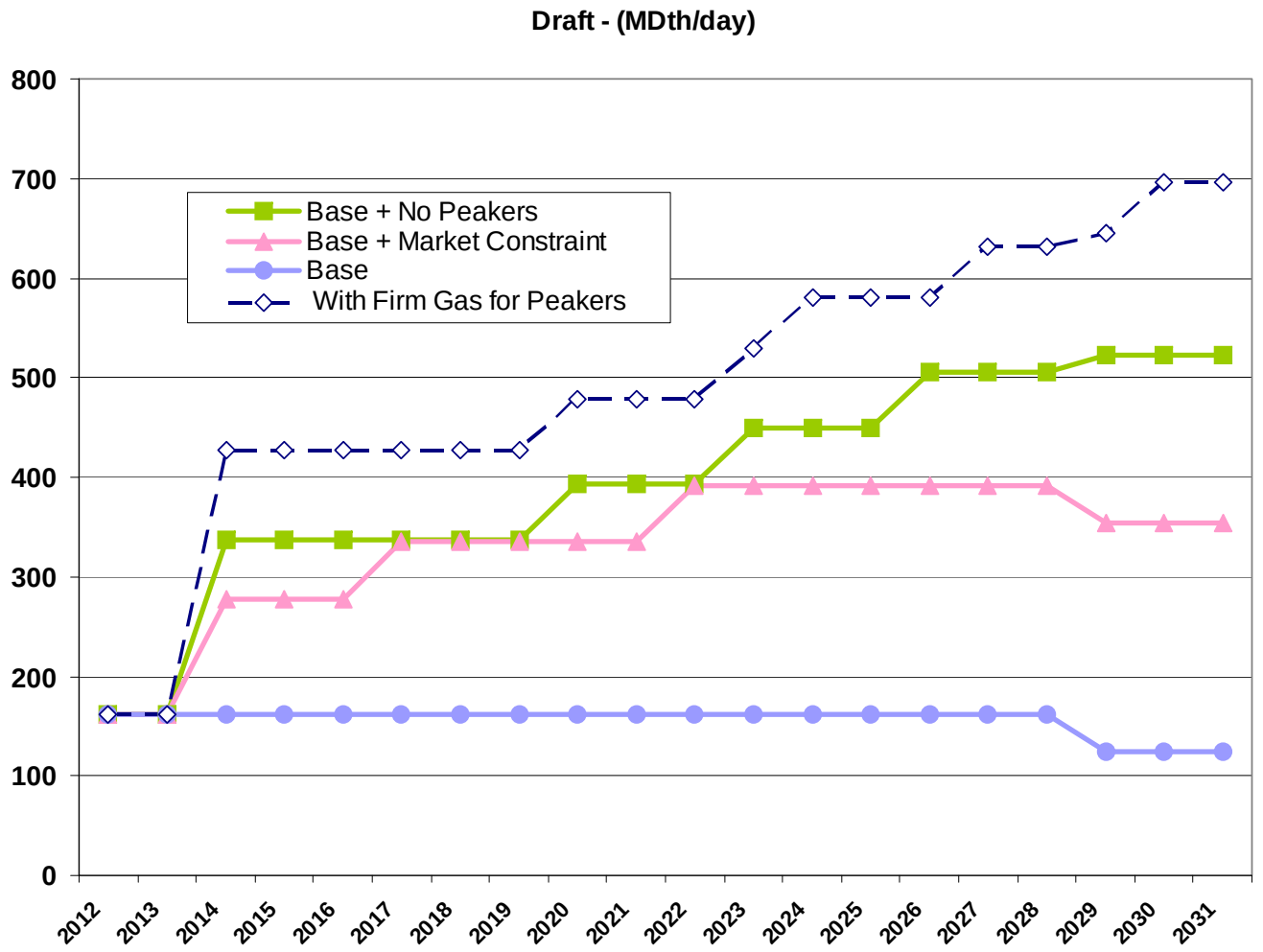
Check-in

- Range of “Need”
- Peakers w/Back-Up Oil—Big Issue for Fuel Supply
- Potential Significant Swings
- Peak Day Deliverability
- Fuel Supply

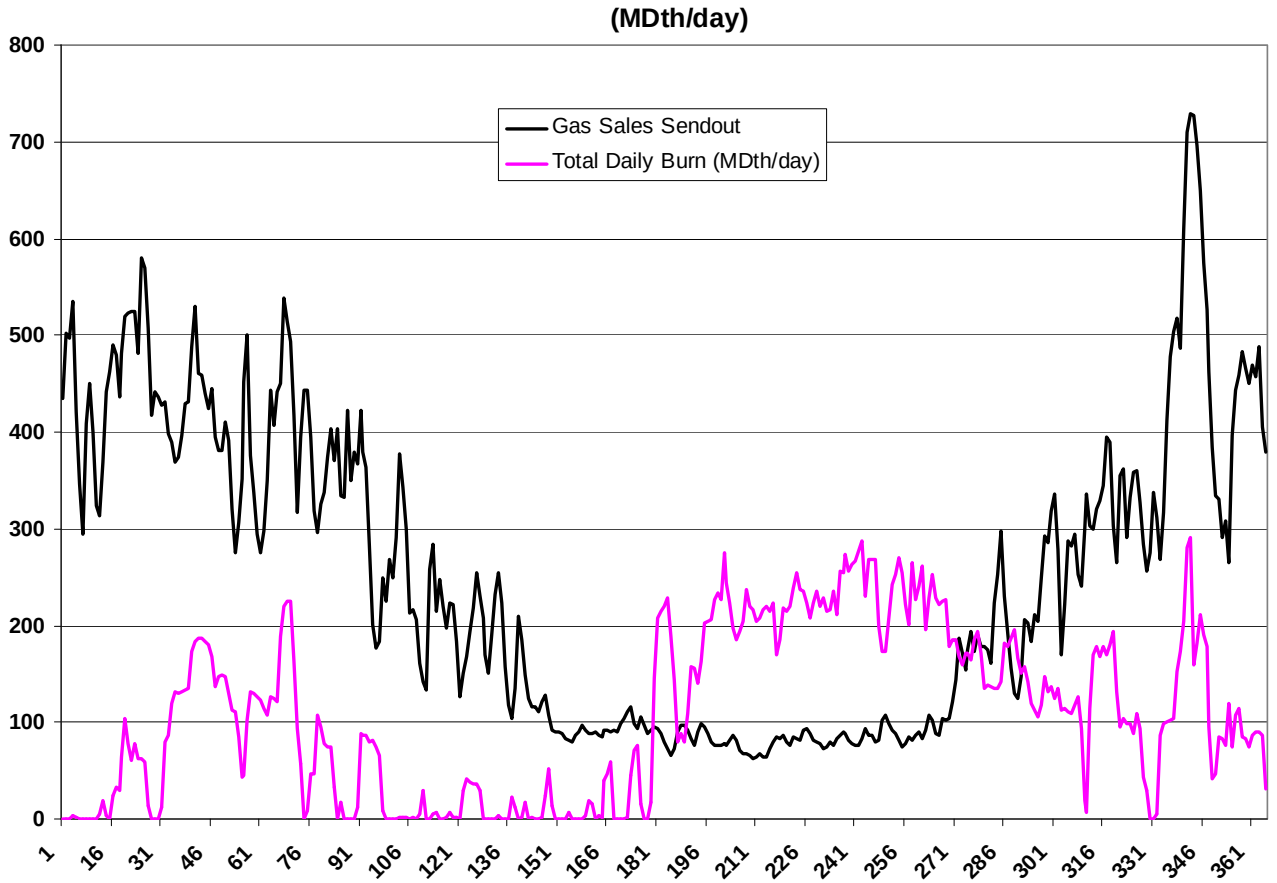
Annual Gas for Power Portfolio Gas Load



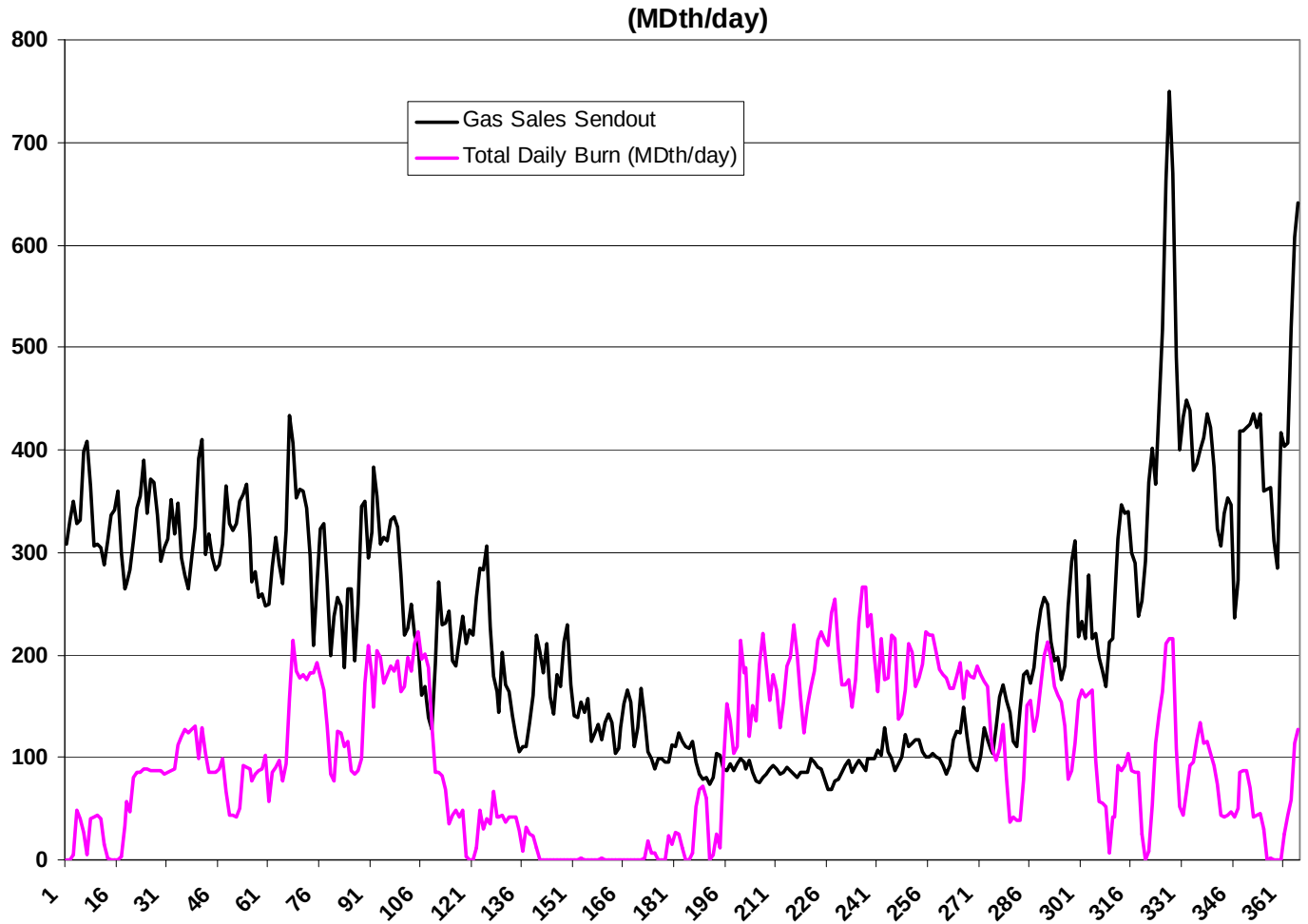
Gas for Power Portfolio Peak Day Load



Daily Gas Sales & Gas Turbine Burn - CY 2009



Daily Gas Sales & Gas Turbine Burn - CY 2010



Gas Load Volatility Statistics – (MDth/day)

CY 2009

	Gas Sales	Gas for Power
Max	729	290
Min	62	0
Average	250	110
Max Daily Increase	132	129
Max Daily Decrease	125	131
Volatility	0.1364	1.3658

CY 2010

	Gas Sales	Gas for Power
Max	751	266
Min	68	0
Average	227	99
Max Daily Increase	146	104
Max Daily Decrease	179	107
Volatility	0.1394	1.1444

Maximum demand for new peakers in 2020 = 318 MDth/day

Gas Analysis—Next Steps

- Continue work on DSR
- Do Sendout analyses for base gas for power scenario
- Consider follow-up from today's dialogue
- Ad Hoc as we learn

Agenda

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- Wrap-Up…2:30 – 2:45 pm

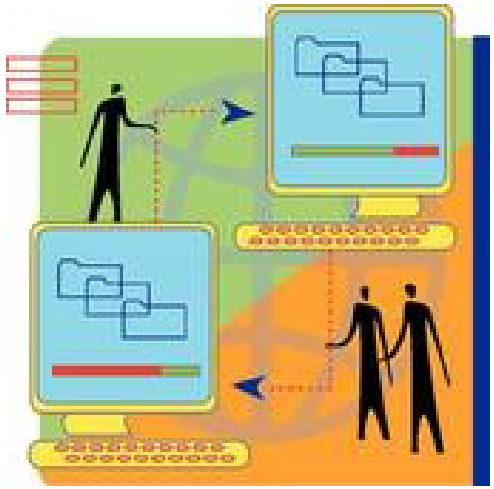
Document and Next Steps

Sections of 2011 IRP

- I. Executive Summary & Action Plan
- II. Planning Environment, Framework & Key Assumptions
- III. Electric Resources, Gas Resources, & Delivery System Planning
- Plus Key Definitions & Acronyms

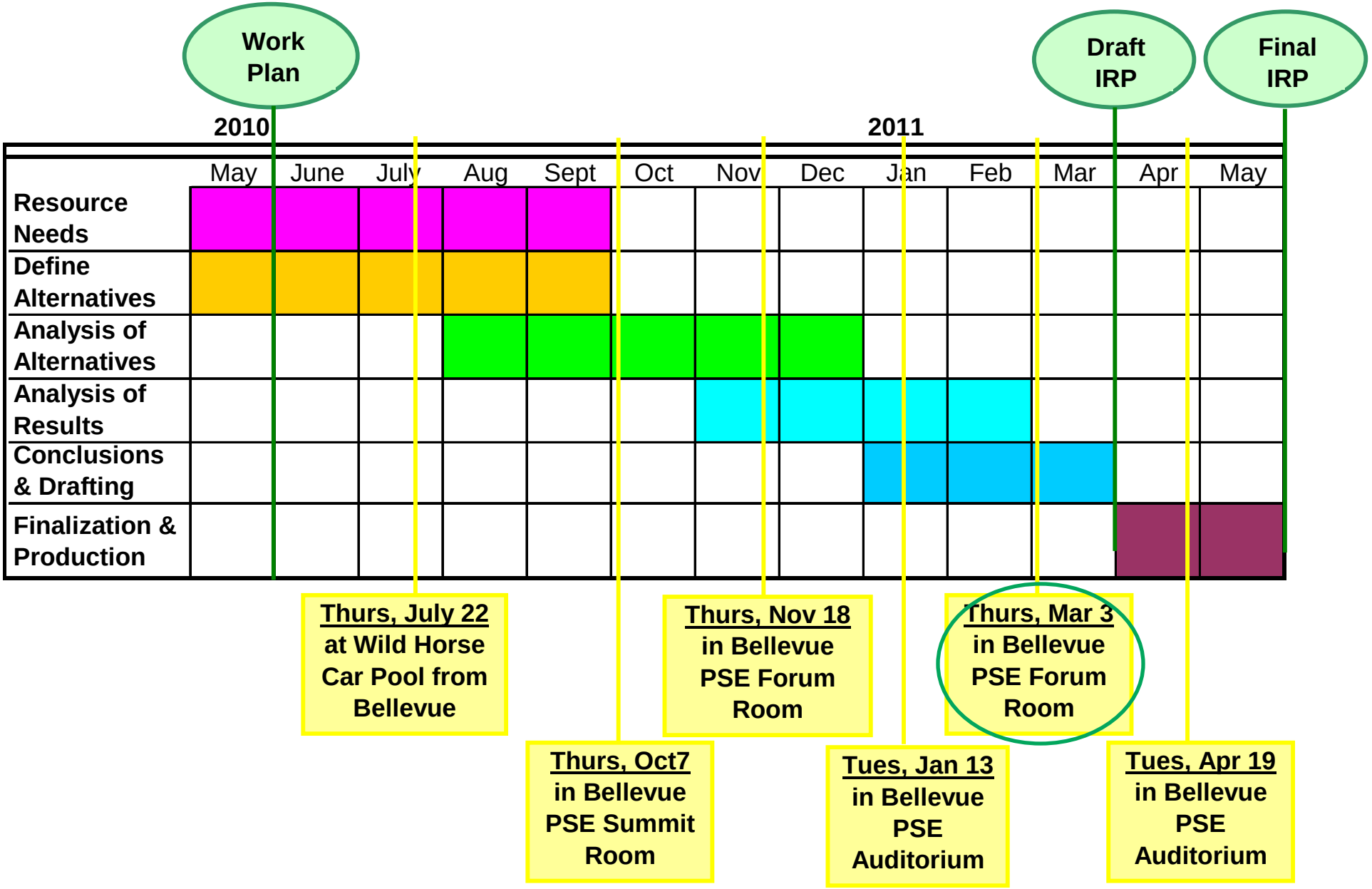
IRP Appendicies

- Public Participation
- Legal Requirements & Reports
- Environmental Matters
- Electric Resources-Existing and New Alternatives
- Regional Transmission
- Wind Integration
- Load Forecast
- Electric Analysis Results
- Gas Analysis Results
- DSR/Quantec Report
- Regional Resource Adequacy (?)



Anticipated 2011 IRP Work Plan Schedule for Public Participation

Updated August 27, 2010



IRP Advisory Group Meeting

PUGET SOUND ENERGY

March 15, 2011

Agenda

9:00 – 9:15 a.m.: Informal Networking
9:15 – 9:30 a.m.: Introductions & Kickoff
9:30 – 10:00 a.m.: Review Scenarios/Sensitivities
10:00 – 10:20 a.m.: Review Analytical Approaches
10:20 – 10:50 a.m.: Review Results of Scenarios/Portfolios
10:50 – 11:45 a.m.: Costs, Stochastic Risk Analysis, GHG Emissions
11:45 – 12:15 p.m.: Key Take-Aways and Draft Plan

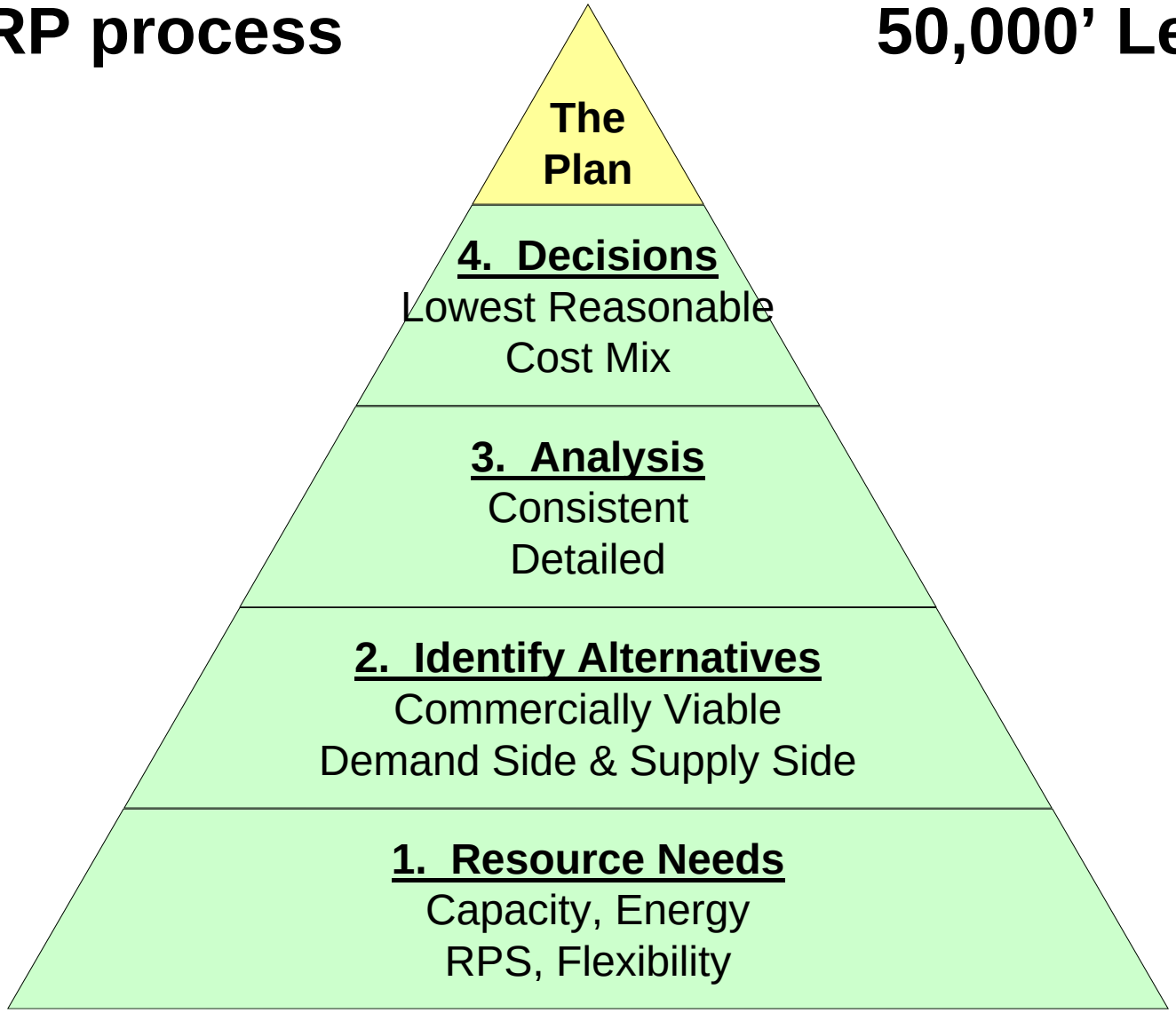
Lunch Break…12:15 – 12:45 p.m.

12:45 – 1:00 p.m.: Review Gas Scenarios
1:00 – 1:15 p.m.: Review Gas Resource Alternatives
1:15 – 2:00 p.m.: Results of Gas Sales Portfolio Analysis, Including DSR
2:00 – 2:30 p.m.: Key Take-Aways and Draft Plan
2:30 – 2:45 p.m.: Next Steps

Introductions

IRP process

50,000’ Level



Process Overview

Uncertain Future Market Conditions

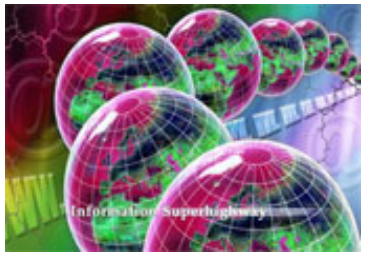
- Policies
- Costs
- Region Demand
- Scenarios

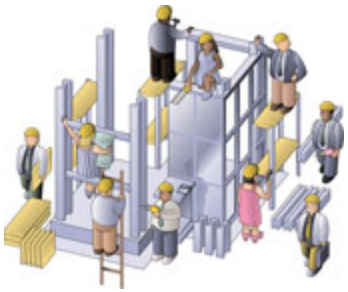
How PSE Can Respond to Uncertainties

- Least Cost Resource Mix
- Impact of Uncertainty on Mix
- Results of Analysis

Resource Plan Decision

- Analysis of Results
- Qualitative & Quantitative
- Application of Judgment
- Supported Decision





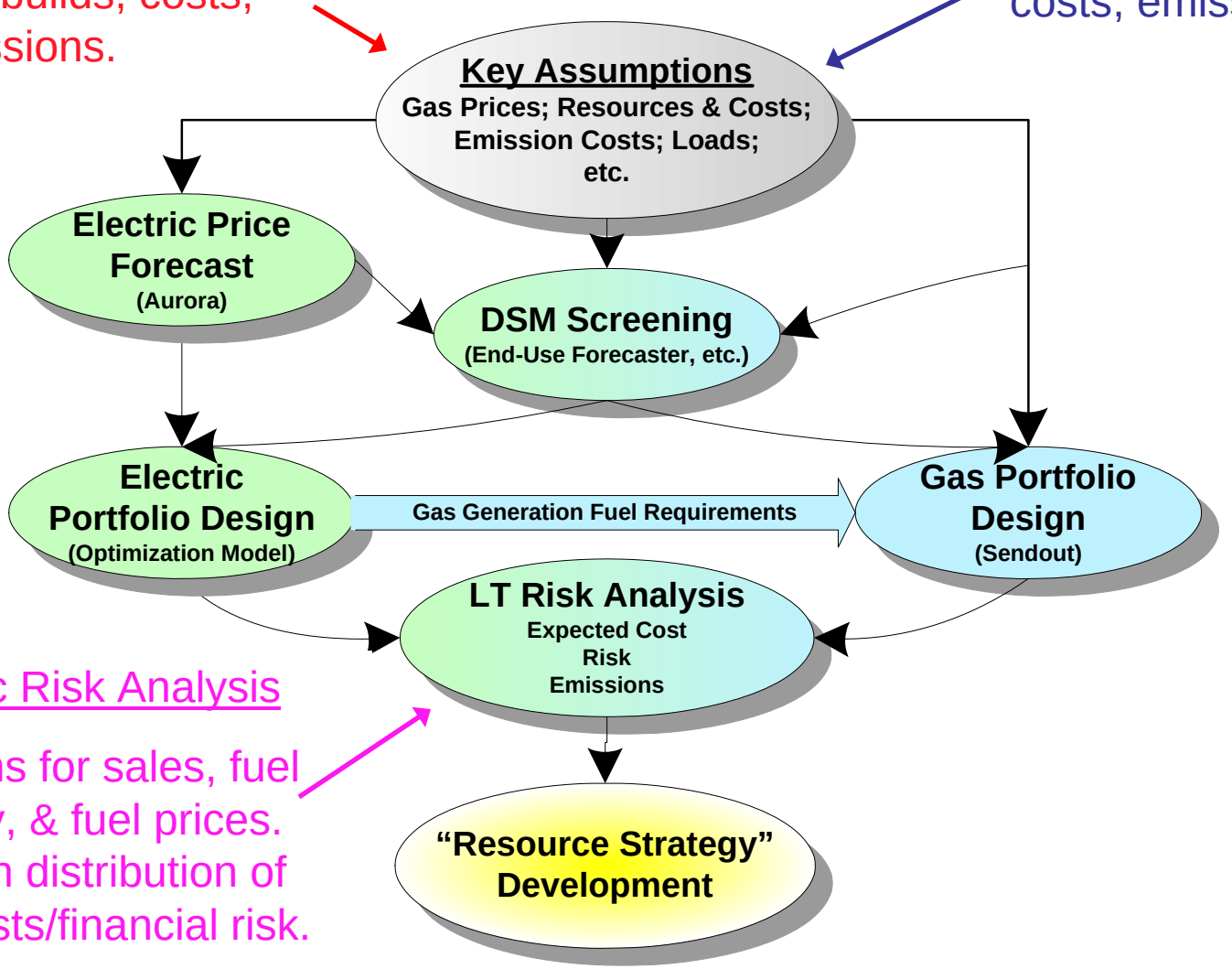
Three Levels of Risk Analysis—30,000' Level

Scenarios

Integrated sets of assumptions to simulate possible futures. Impacts on builds, costs, emissions.

Sensitivity

Impact of one key assumption on builds, costs, emissions.



Stochastic Risk Analysis

Distributions for sales, fuel availability, & fuel prices. Impacts on distribution of portfolio costs/financial risk.

Consistency with Council Methodology

http://www.nwcouncil.org/energy/powerplan/6/supplycurves/l937/default.htm

PUGET SOUND ENERGY

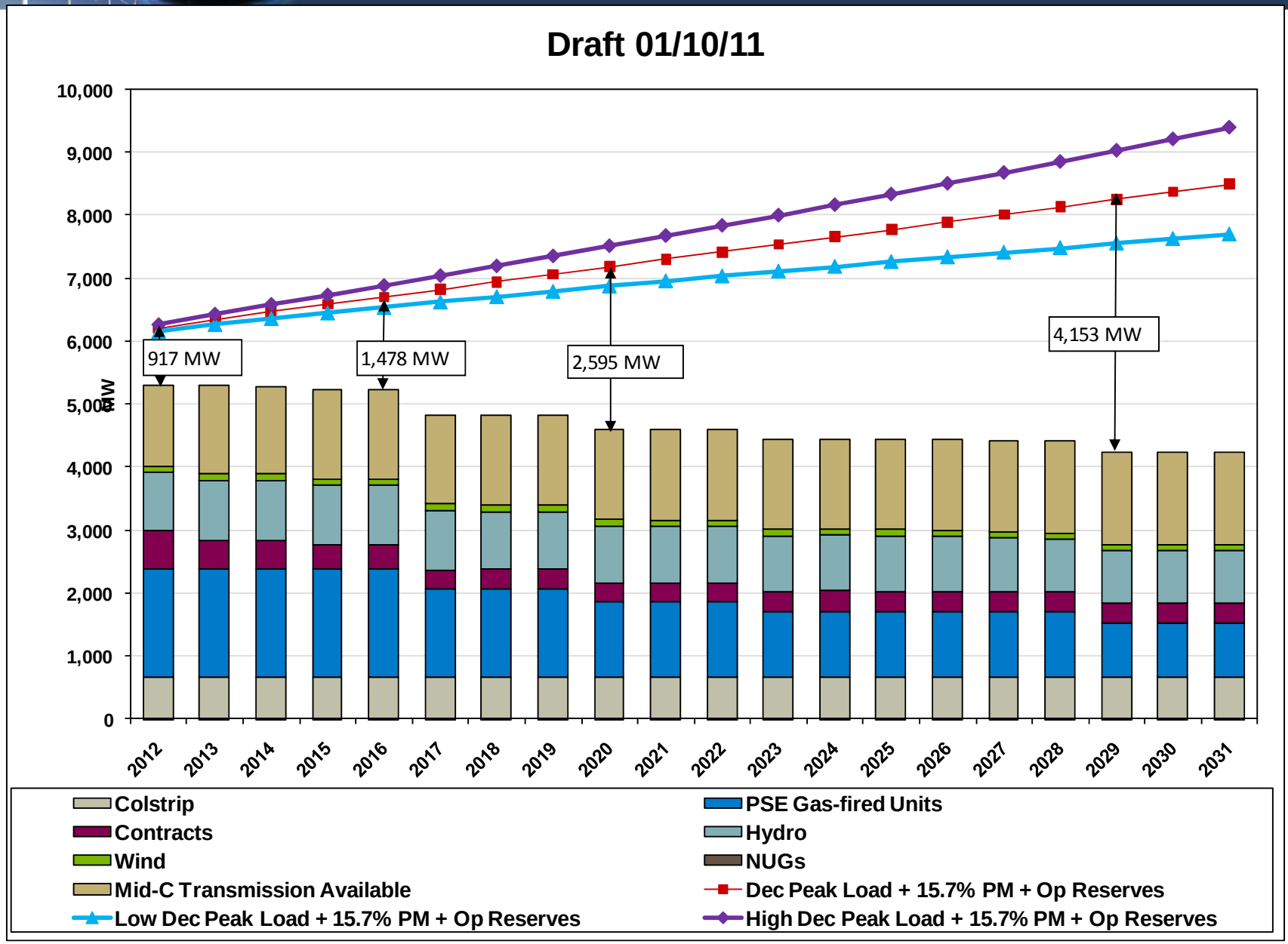
Council

Technical Potential	Economic Potential	Achievable Potential
See 2. a & b	**See 3. a - e**	**See 4. a - c**
-Wide array tech, all sectors	-Econ Screening-TRC	-Targets from IRP Analysis
-Saturations	-Shaped Energy/Capacity	-DSM Versus All Resources
-New/Existing Units	-Full Incremental Cost	-B&C from Econ Screen
-Measure Life/Substitutions	-T&D Savings & Losses	-Lost Opportunity/Discretion
-Measure Shapes	-"Environmental Benefits"	-Adjusted Historic Ramps
-Measure Interactions	-NEB/10% Credit	-Revise Based on Exp.

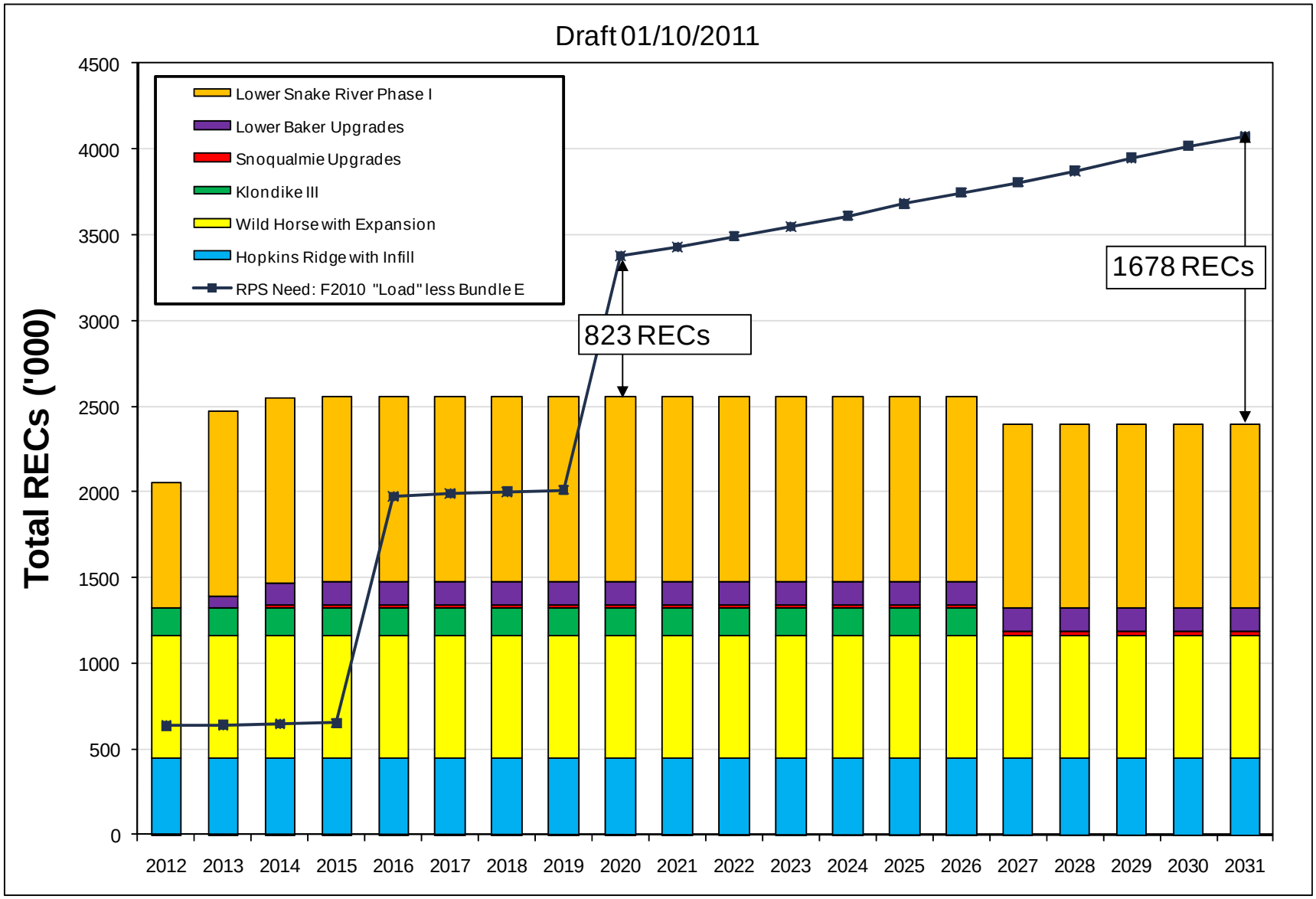
PSE

Technical Potential	Economic Potential	Achievable Potential
See 2. a & b	**See 3. a - e**	**See 4. a - c**
☑ Wide array tech, all sectors	☑ Econ Screening-Bundles	☑ Targets from IRP Analysis
☑ Saturations	☑ Shaped Energy/Capacity	☑ DSM Versus All Resources
☑ New/existing units	☑ Full Incremental Cost	☑ B&C from Econ Screen
☑ Measure life/substitutions	☑ T&D Savings & Losses	☑ Lost Opportunity/Discretion
☑ Measure shapes	☑ Environmental Benefits"	☑ Adjusted Historic Ramps
☑ Measure interactions	☑ NEB & 10% Credit	☑ Revise Based on Exp.

Draft 2011 IRP Peak-Hour Capacity Need



Draft Estimated Renewable Energy Target



Scenarios/Sensitivities…Some Key Assumptions

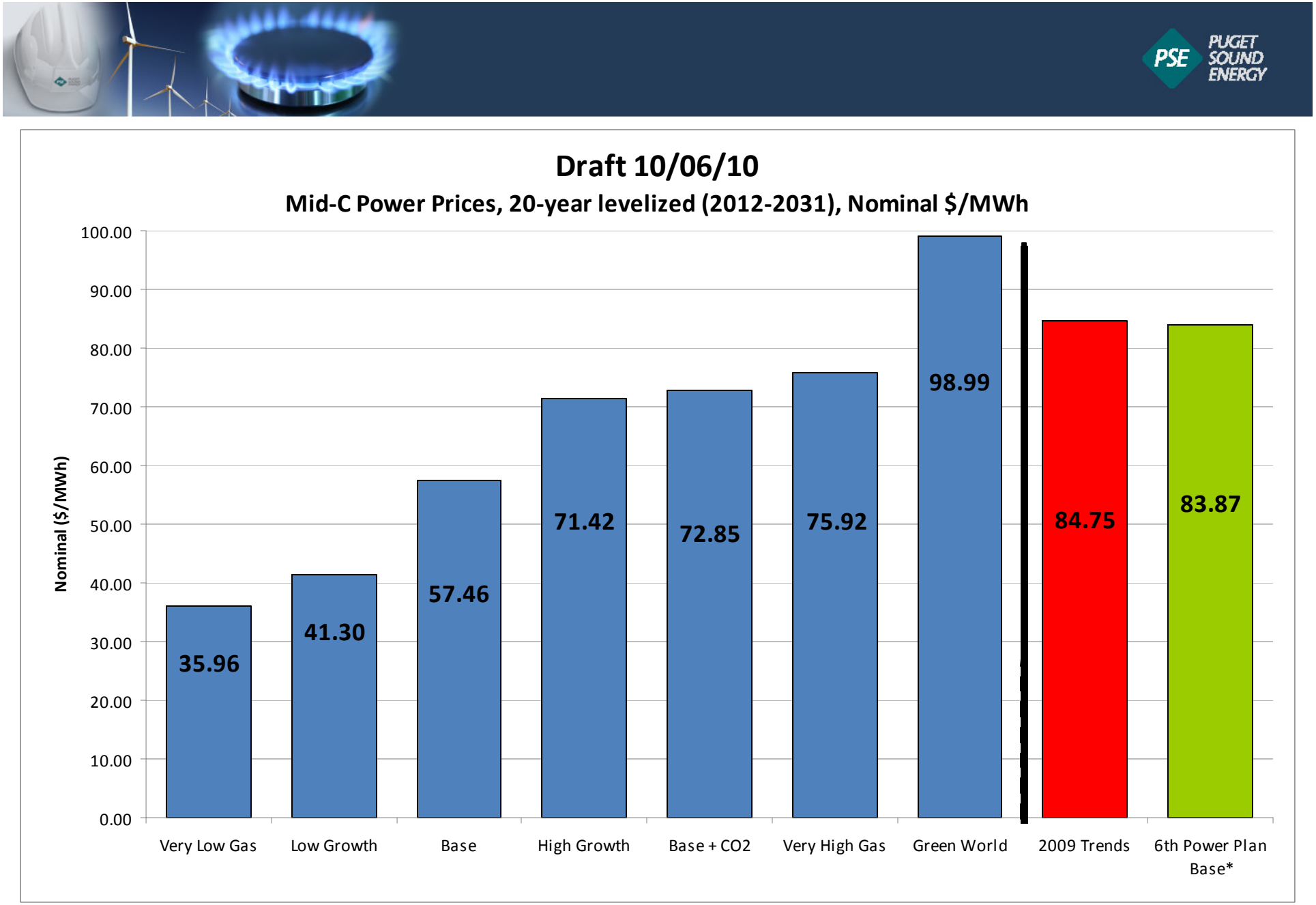
Scenarios			
	Load Growth	**Gas Price**	**CO2 Price**
Base	Base	Mid	*None
Green World	Low	High	High
Low Growth	Low	Low	*None
High Growth	High	High	*None
Sensitivities			
Base + CO_2 Costs	Base	Mid	Mid
No "NW" Coal	Base	Mid	*None
Very Hi Gas Price	Base	Very High	*None
Very Lo Gas Price	Base	Very Low	*None
Electric Vehicles	Base+EV	Mid	*None

***--Reflects RCW 80.70, ~$0.32/ton**

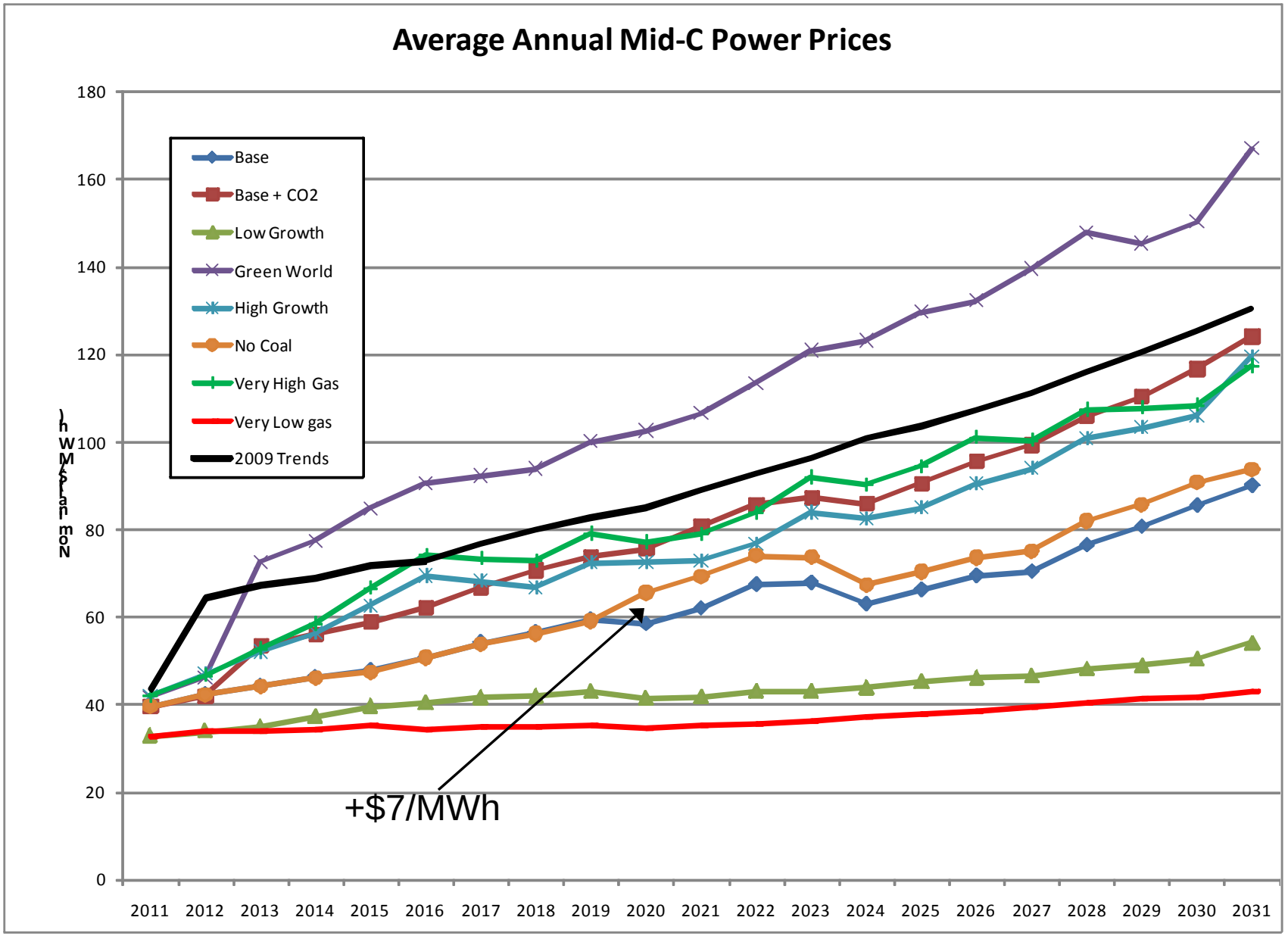
Note: Reflect Current Renewable Tax Incentive Structure in All Scenarios/Sensitivities

But Wait, There's More!

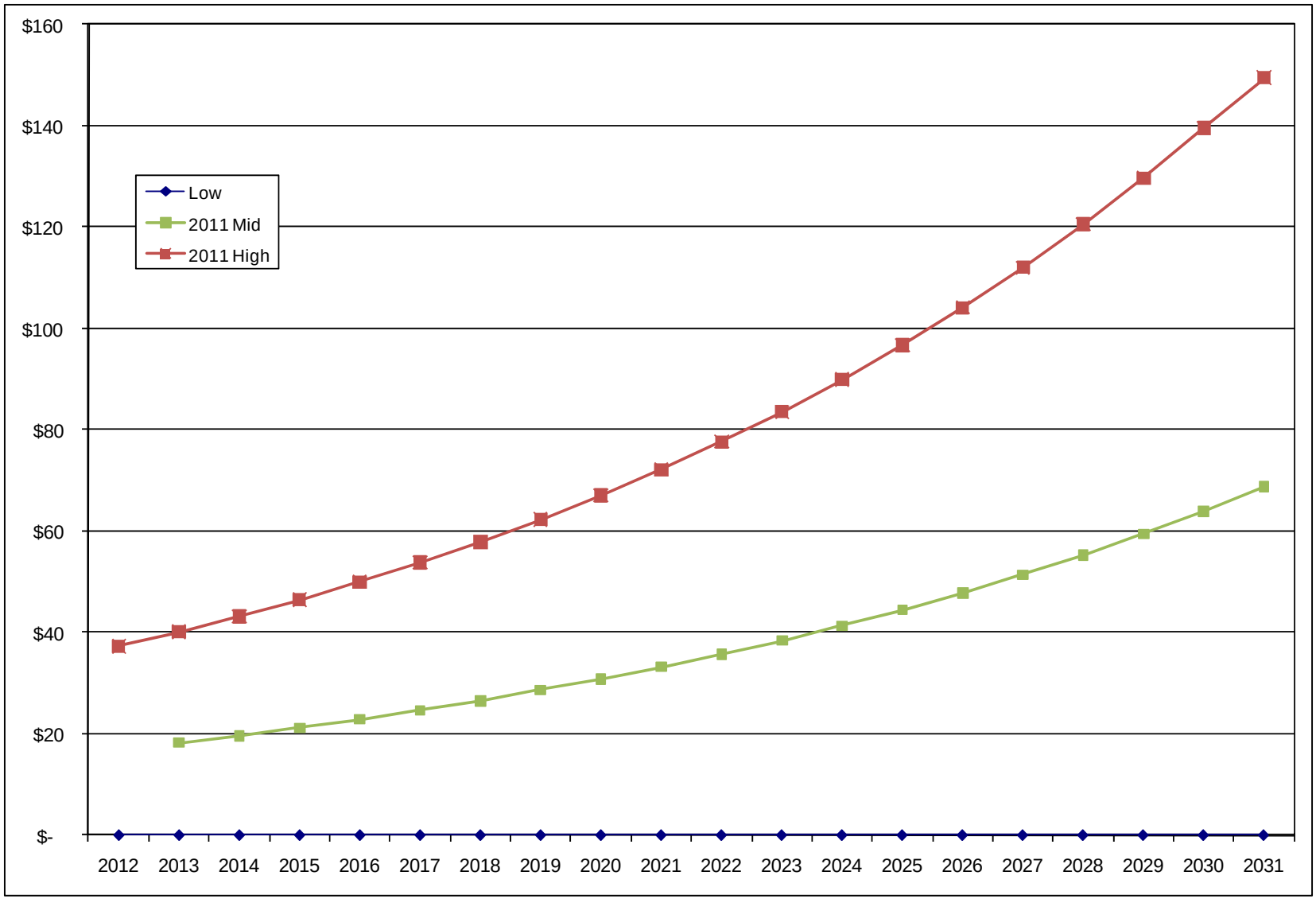
- Included New Resource Alternative
  - Additional Transmission to Market
- DSR Ramp Rates
  - Council vs 10-year ramp rate
- Included Renewable Tax Incentive Sensitivity
  - Based on Feedback from last meeting
  - 2013, 2016, 2020, & 2031
- Peaker Versus CCCT Sensitivities
  - Drilled down on peakers versus CCCT
  - Fixed gas transport costs for peakers
  - Cost, risk, market exposure, position, emissions


Draft 10/06/10
Mid-C Power Prices, 20-year levelized (2012-2031), Nominal $/MWh
Nominal ($/MWh)
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
35.96
41.30
57.46
71.42
72.85
75.92
98.99
84.75
83.87
Very Low Gas
Low Growth
Base
High Growth
Base + CO2
Very High Gas
Green World
2009 Trends
6th Power Plan Base*

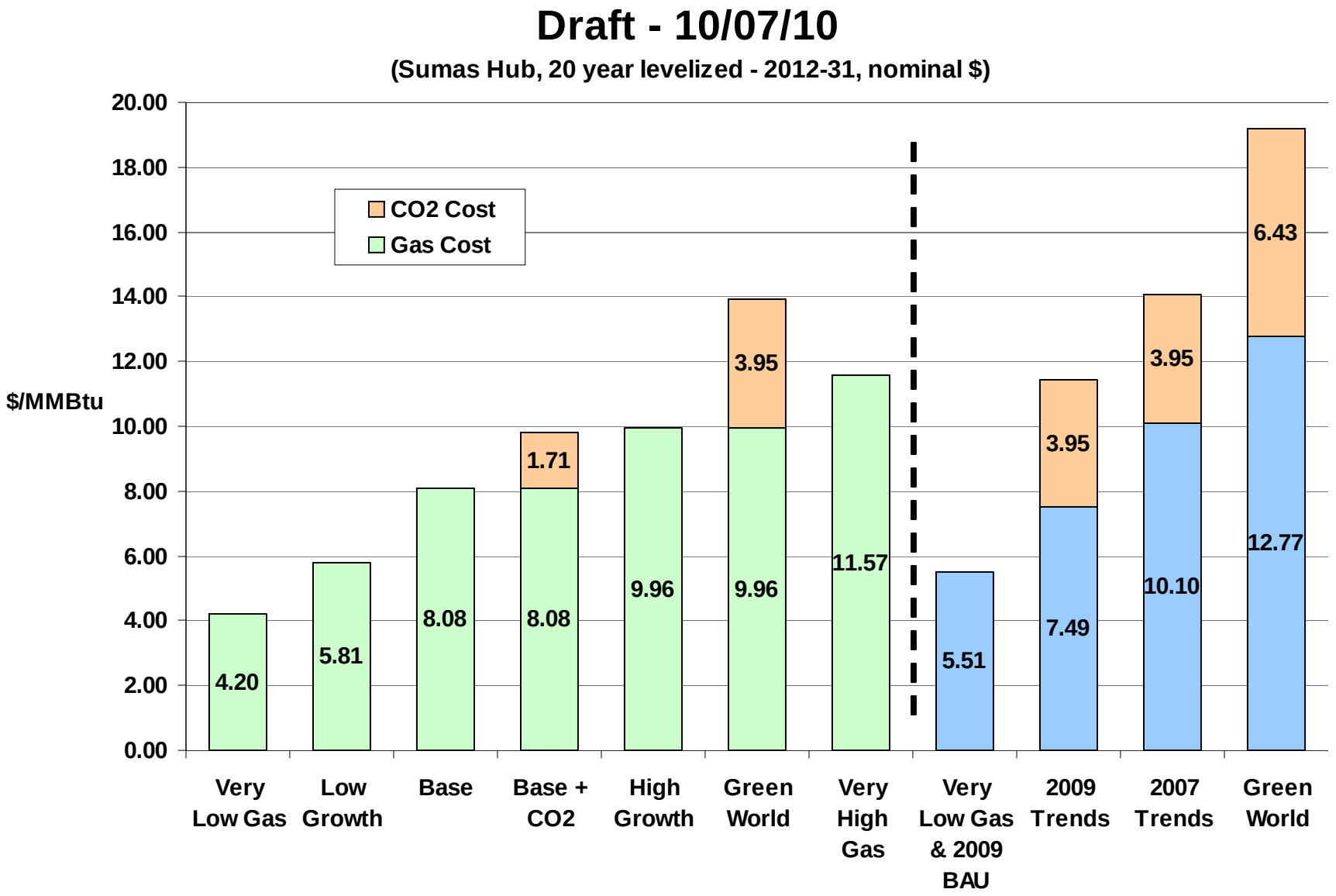
Annual Mid-C Power Prices



CO_2 Prices


$160
$140
$120
$100
$80
$60
$40
$20
$-
Low
2011 Mid
2011 High
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031

Levelized Gas Prices



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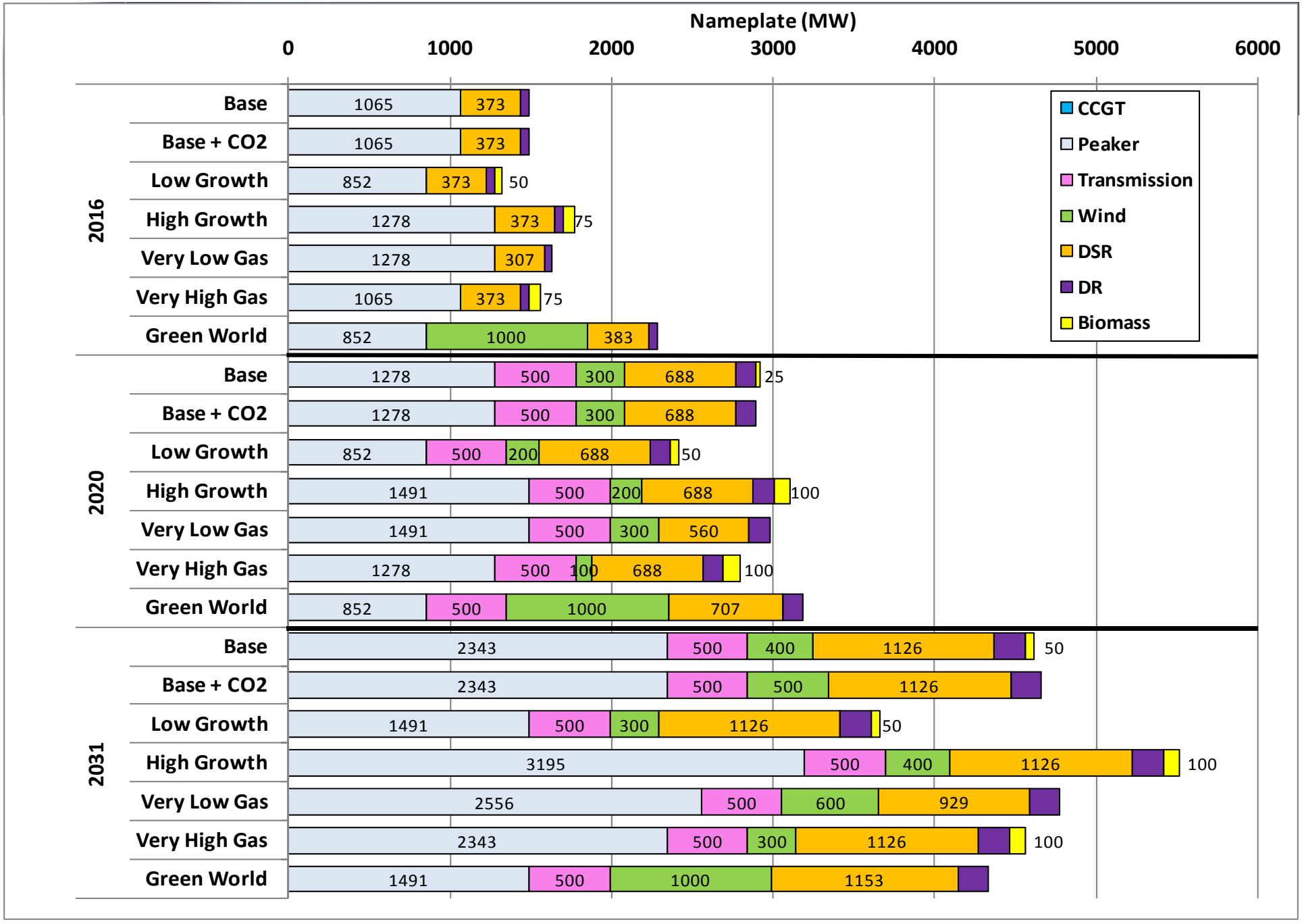

Nameplate (MW)
0
1000
2000
3000
4000
5000
6000
CCGT
Peaker
Transmission
Wind
DSR
DR
Biomass
2016
Base
1065
373
Base + CO2
1065
373
Low Growth
852
373
50
High Growth
1278
373
75
Very Low Gas
1278
307
Very High Gas
1065
373
75
Green World
852
1000
383
2020
Base
1278
500
300
688
25
Base + CO2
1278
500
300
688
Low Growth
852
500
200
688
50
High Growth
1491
500
200
688
100
Very Low Gas
1491
500
300
560
Very High Gas
1278
500
100
688
100
Green World
852
500
1000
707
2031
Base
2343
500
400
1126
50
Base + CO2
2343
500
500
1126
Low Growth
1491
500
300
1126
50
High Growth
3195
500
400
1126
100
Very Low Gas
2556
500
600
929
Very High Gas
2343
500
300
1126
100
Green World
1491
500
1000
1153

NPV Incremental Revenue Requirement For DSR Bundles

20-yr Expected Portfolio Cost
(Incremental Rev Req in $Billions)

Bundle	Base w/o DR	Base w/ DR
No DSR	$16.07	
A	$13.76	$13.72
B	$13.54	$13.50
C	$13.48	$13.45
D	$13.46	$13.38
E	$13.44	$13.36
F	$13.49	$13.41
G	$13.52	$13.45
H	$17.48	$17.45

Expected NPV Incr Rev Requirement and DSR Results

Scenarios & Sensitivities	20-yr NPV Expected Cost (Incremental Rev Req $Billions)	Bundle
Base	$13.36	E
Base + CO2	$15.93	E
Low Growth	$9.83	E
High Growth	$18.58	E
Very Low Gas	$10.87	B
Very High Gas	$16.45	E
Green World	$21.06	G

Test DSR Peak and Ramp in Base

Base Scenario	20-yr Expected Incr Rev Req ($Billions)	Bundle	DR
Base (PSE Ramp)	$13.36	E	Yes
Base + Council Ramp	$13.53	E	Yes

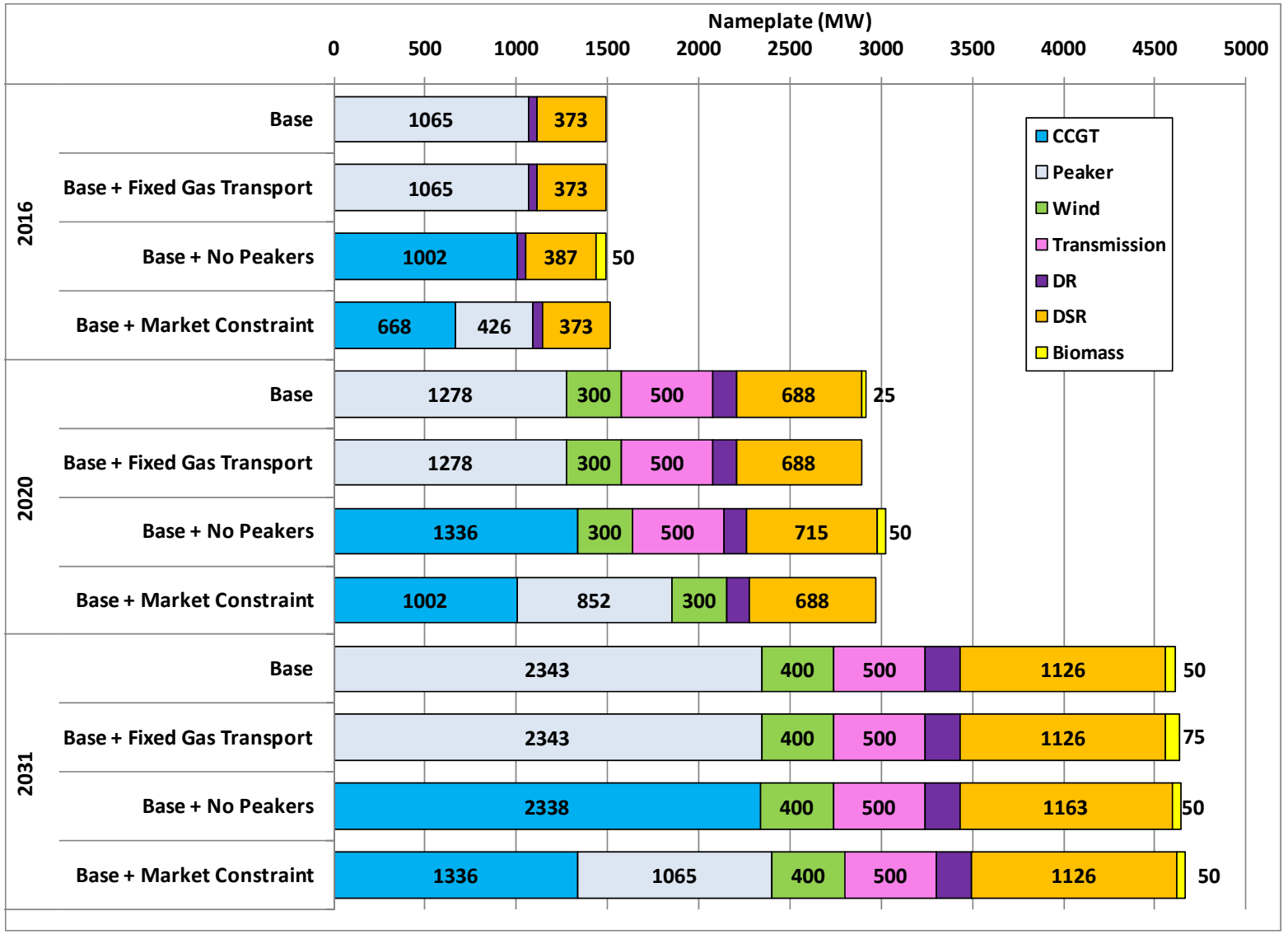
Draft Revenue Requirement Difference for PTC Sensitivity

Scenario	20-yr NPV Expected Cost (Incremental Rev Req $Billions)
Base	$13.36
Base + PTC/ITC Extension 2013	$13.33
Base + PTC/ITC Extension 2016	$13.27
Base + PTC/ITC Extension 2020	$13.24
Base + PTC/ITC Extension 2031	$13.24

What Does CCCT vs Peaker Mean?

- Cost
- Risk
- Energy Import Capability
- Fuel Supply
  - Oil back-up?

Portfolios to Test CCCT vs Peakers



Draft Cost Difference for Base Sensitivities

Scenario	20-yr NPV Expected Cost (Incremental Rev Req $Billions)
Base	$13.36
Base + Peaker Fixed Gas Transport Cost	$14.10
Base + No Peaker	$14.54
Base + Market Constraint	$14.26

Annualized Difference
~$120 million/yr

Non-Trivial

~$45 million/yr

CCCT Not Cost Effective Way to Reduce Risk

Trade Off Table ($Billions) 20-Year View

$1.18 Bil

Study Period	Base	Fixed Gas Transport	Market Constrained	No Peaker
20-yr NPV Expected Cost	$13.36	$14.10	$14.26	$14.54
20-yr NPV Power Cost	$10.36	$10.37	$10.17	$10.04
Tail Var 90 of Expected Cost	$17.90	$18.63	$18.41	$18.53
Tail Var 90 of Power Cost	$13.15	$13.14	$12.82	$12.60

$0.55 Bil

Question:

Increase expected revenue requirement by $1.18 Billion to reduce power cost risk by $.55 Billion?

CCCT Not Cost Effective Way to Reduce Risk v2

Trade Off Table 2021 Power Cost ($Billions)

$0.12 Bil

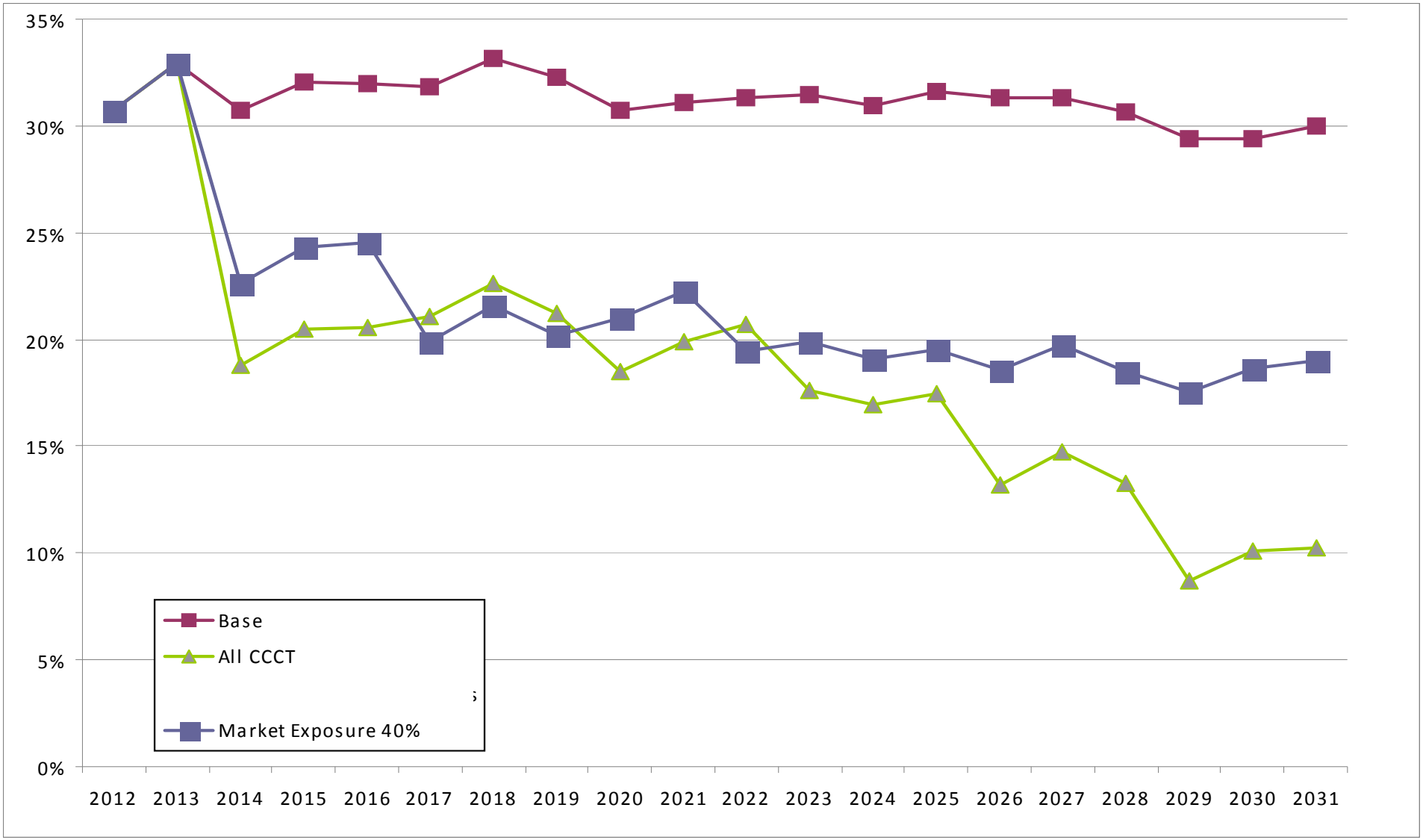
2021	Base	Fixed Gas Transport	Market Constrained	No Peaker
2021 Annual Expected Cost	$1.43	$ 1.49	$1.54	$1.55
2021 Annual Power Cost	$1.08	$1.08	$1.08	$1.06
Tail Var 90 of 2021 Power Cost	$1.42	$1.42	$1.41	$1.38

$0.04 Bil

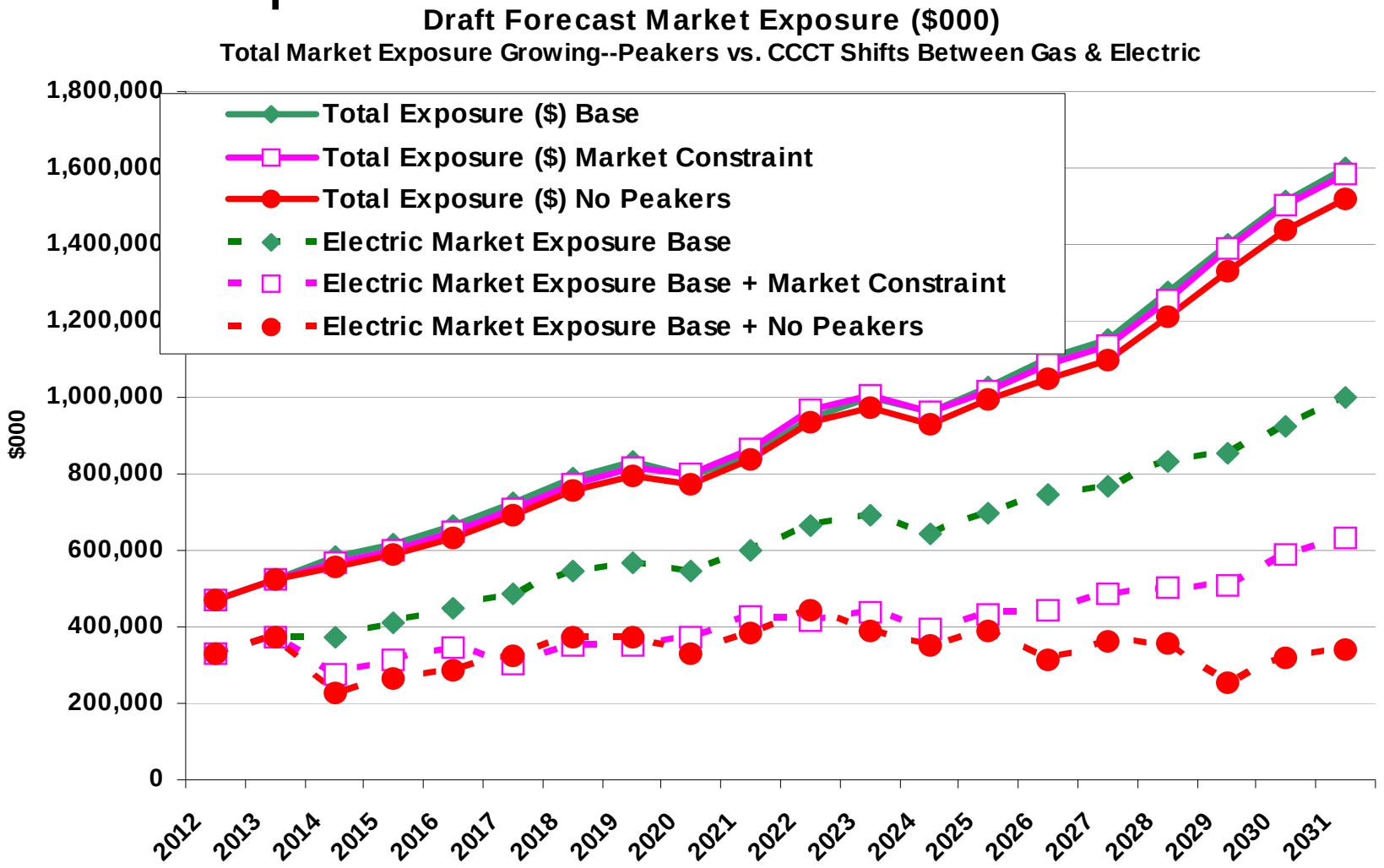
Question:

In 2021…increase expected revenue requirement by $120 million to reduce power cost risk by $40 million?

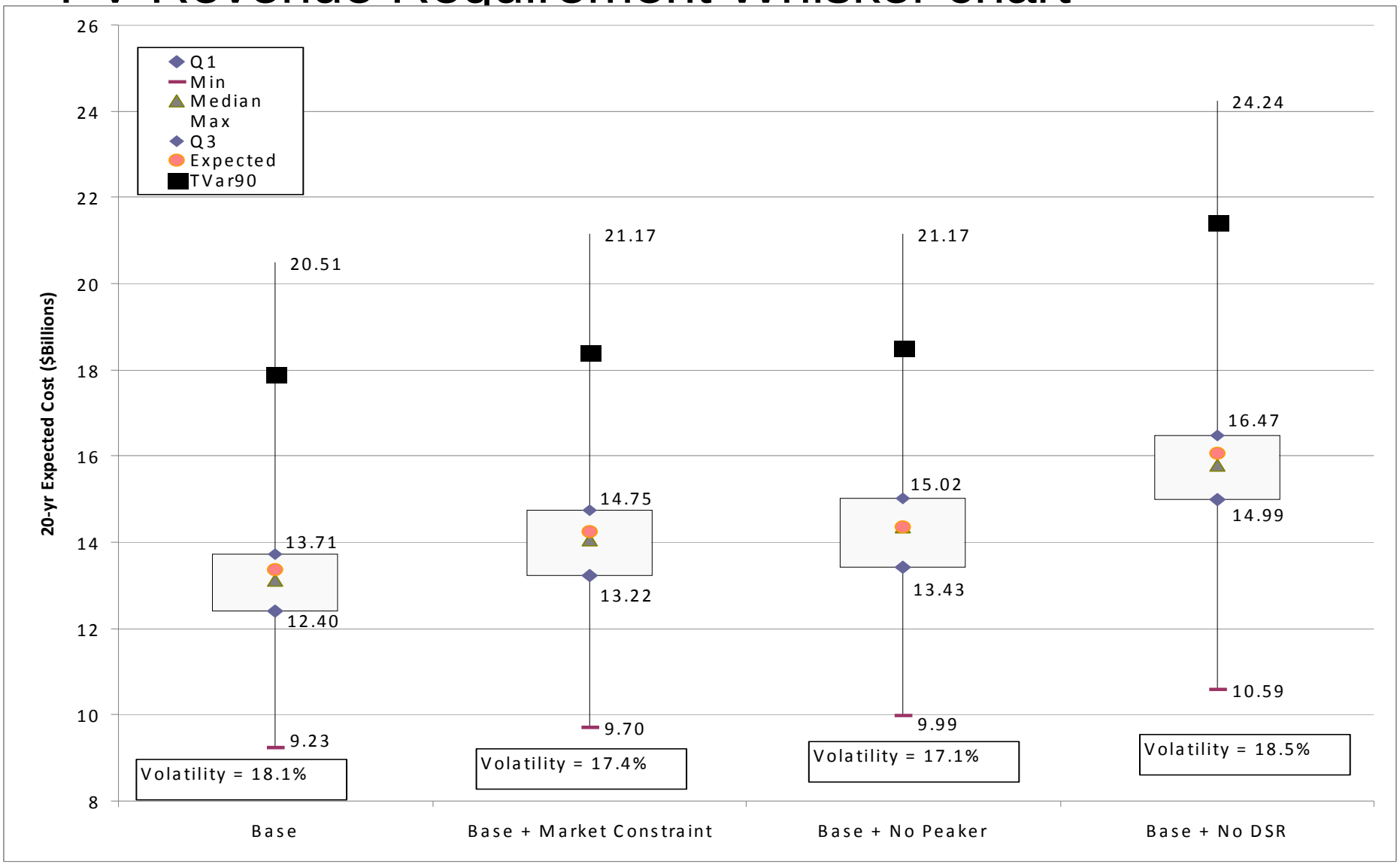
Market Position (Net Purchases MWHs/Load MWHs)



Market Exposure



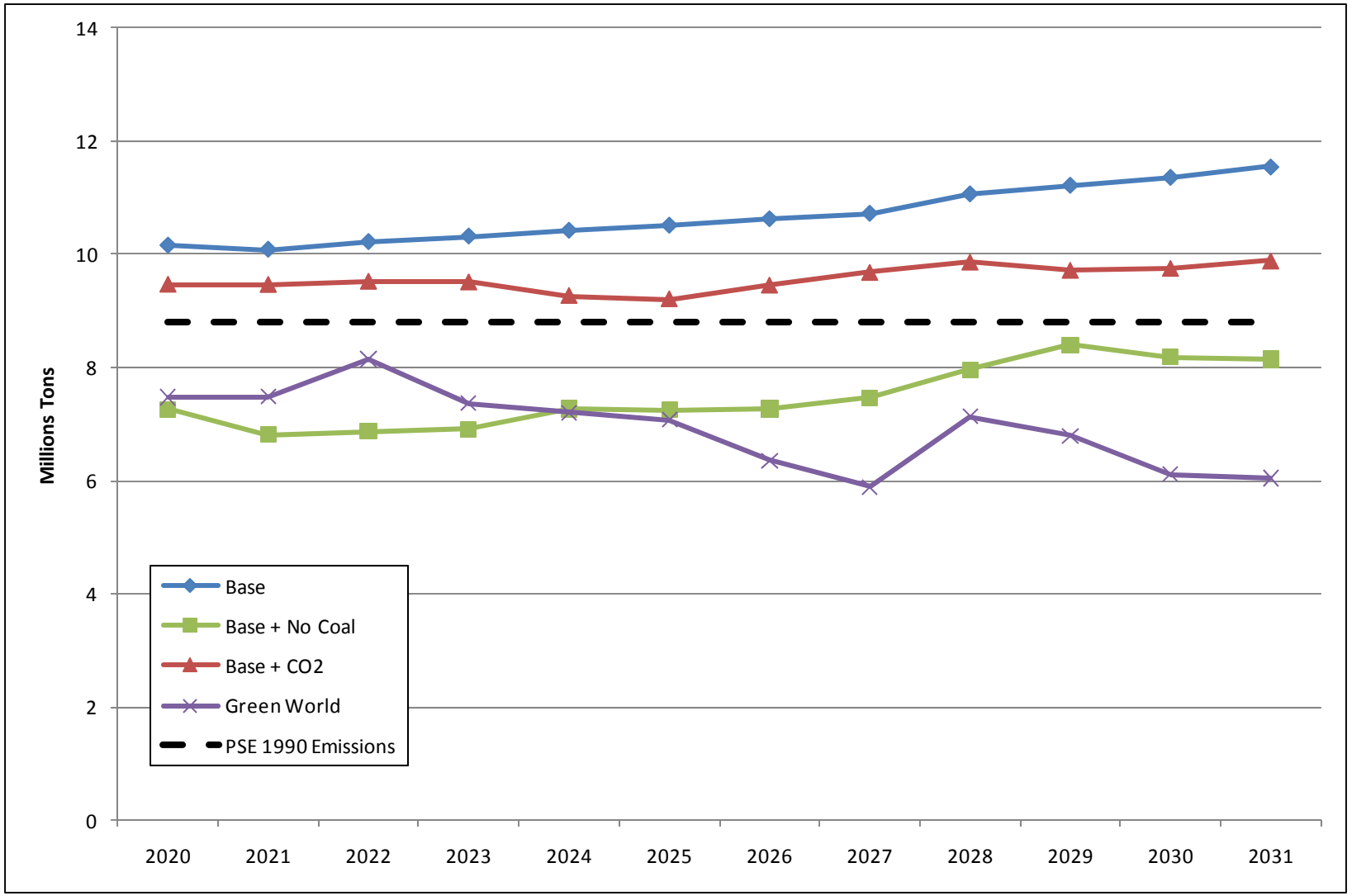
PV Revenue Requirement Whisker chart



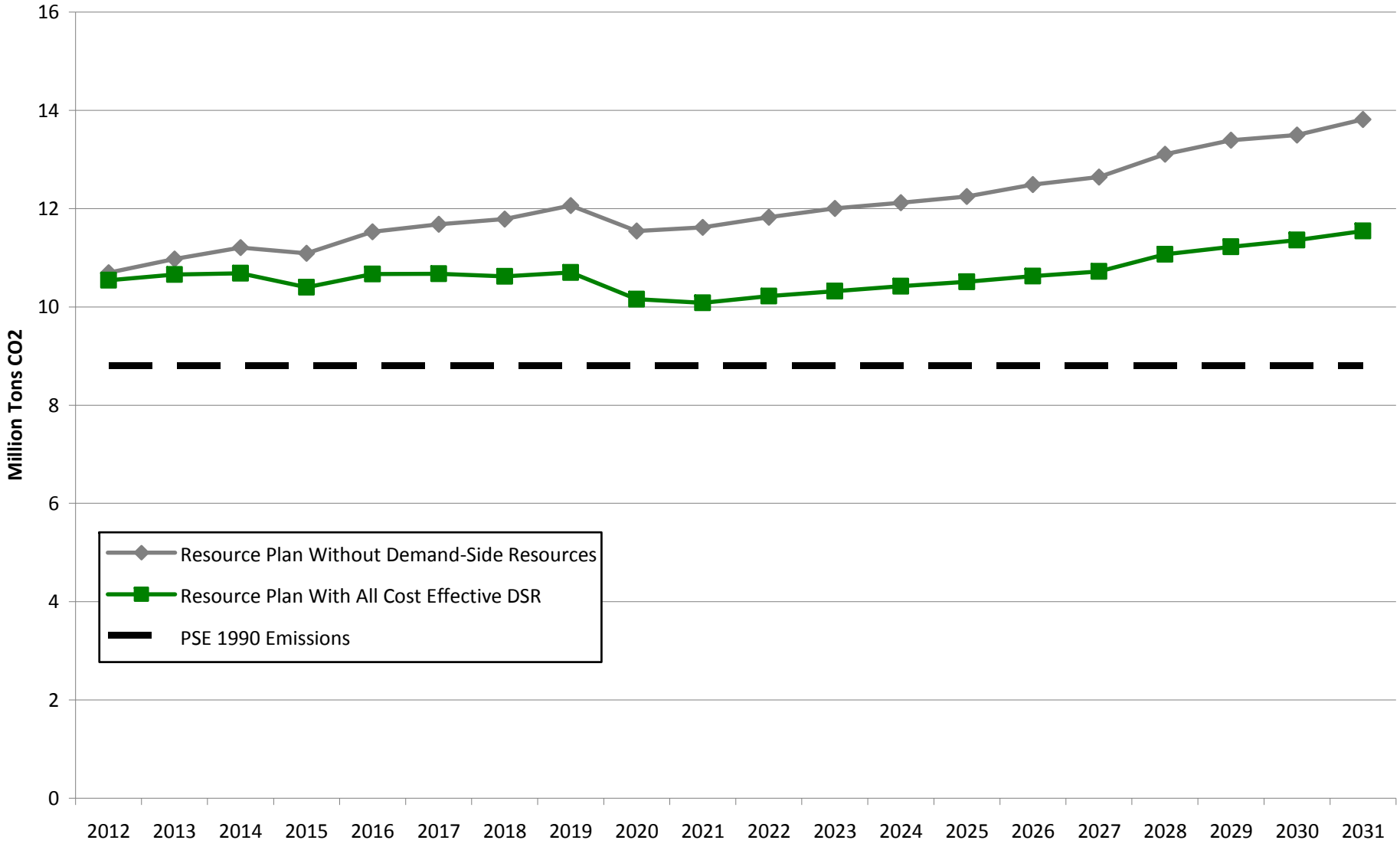
Comparison of Different “Carbon Policies”

- Costs and Emissions
- Base
- Base + CO_2
- Green World…more than just CO_2
- No Northwest Coal by 2020 Sensitivity

Comparison of CO_2 Emissions

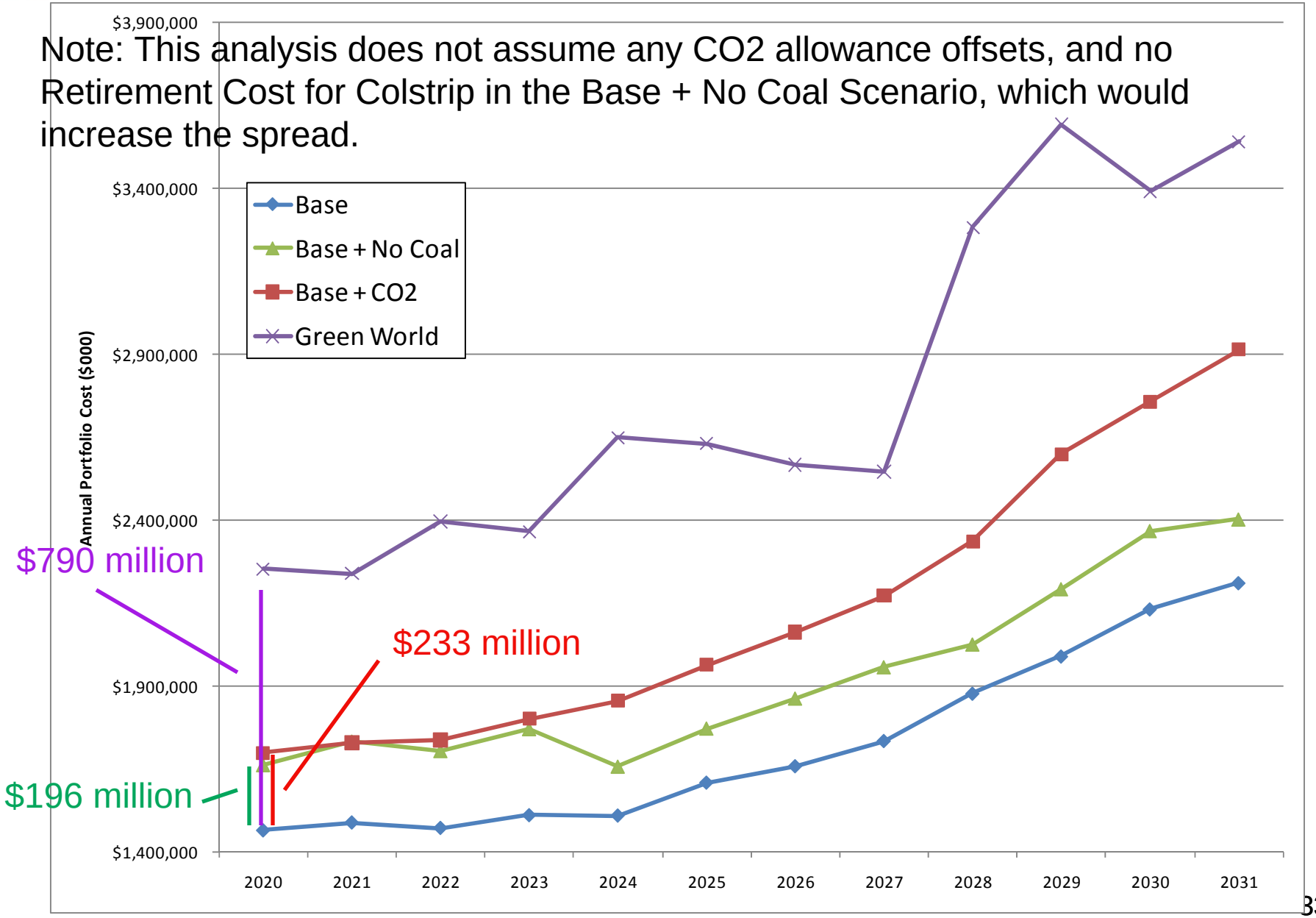


Projected CO2 Emissions and Emission Savings from Cost Effective Demand-Side Resources



Impact on Annual Revenue Requirement

Note: This analysis does not assume any CO2 allowance offsets, and no Retirement Cost for Colstrip in the Base + No Coal Scenario, which would increase the spread.



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Summary of Portfolio Analysis Results

Demand-Side Resources

- Almost same aMW as 2009 IRP
- 10-Year Acceleration modestly more cost effective than Council Ramp Rates

Renewables

- Existing wind plus Baker, Snoqualmie, & LSR Phase I (including 1.2x REC) covers RPS need till 2020
- Extension of federal financial incentives accelerates timing & lowers cost

Market and Thermal Resources Meet Remaining Capacity Needs

- New peakers more cost effective than new CCCT
- New transmission build to market looks cost effective

Results May Vary Depending Upon Executable Alternatives

- IRP analyzes assumptions on new builds
- Additional PPAs not assumed
- Availability of distressed assets not assumed

Key Issues—Plans vs. Planning

Plans vs. Planning

- Next RFP could find delivered PPAs lower cost than self-build
- Impact on capital requirements, fuel supply, & hedging

Physical Reliance on Market to Meet Load

- 1200 – 1400 MW on peak…+500 MW: ~25% Peak Need
- Regional Resource Adequacy Forum: Green light for next 5 years
- Additional 500 MW by 2017: Doable?

Heavy Reliance on Peakers vs CCCT

- Fuel Supply: oil back-up for 1300 MW peakers by 2020?
- Gas Supply Swings: +/- normal winter gas sales day.
- Non-Firm Transmission: market imports when units out of the money.
- Hedging: growing exposure to hedge.

Draft 2011 Electric Resource Plan

Peak Hour Capacity (MW)

	2016	2020	2025	2031
Demand-Side Resources	423	815	1106	1319
Wind	0	300	300	400
Biomass	0	25	25	50
Transmission + Market	0	500	500	500
Peakers	1065	1278	1704	2443

Lunch Break

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Gas Planning Analysis

Gas Sales

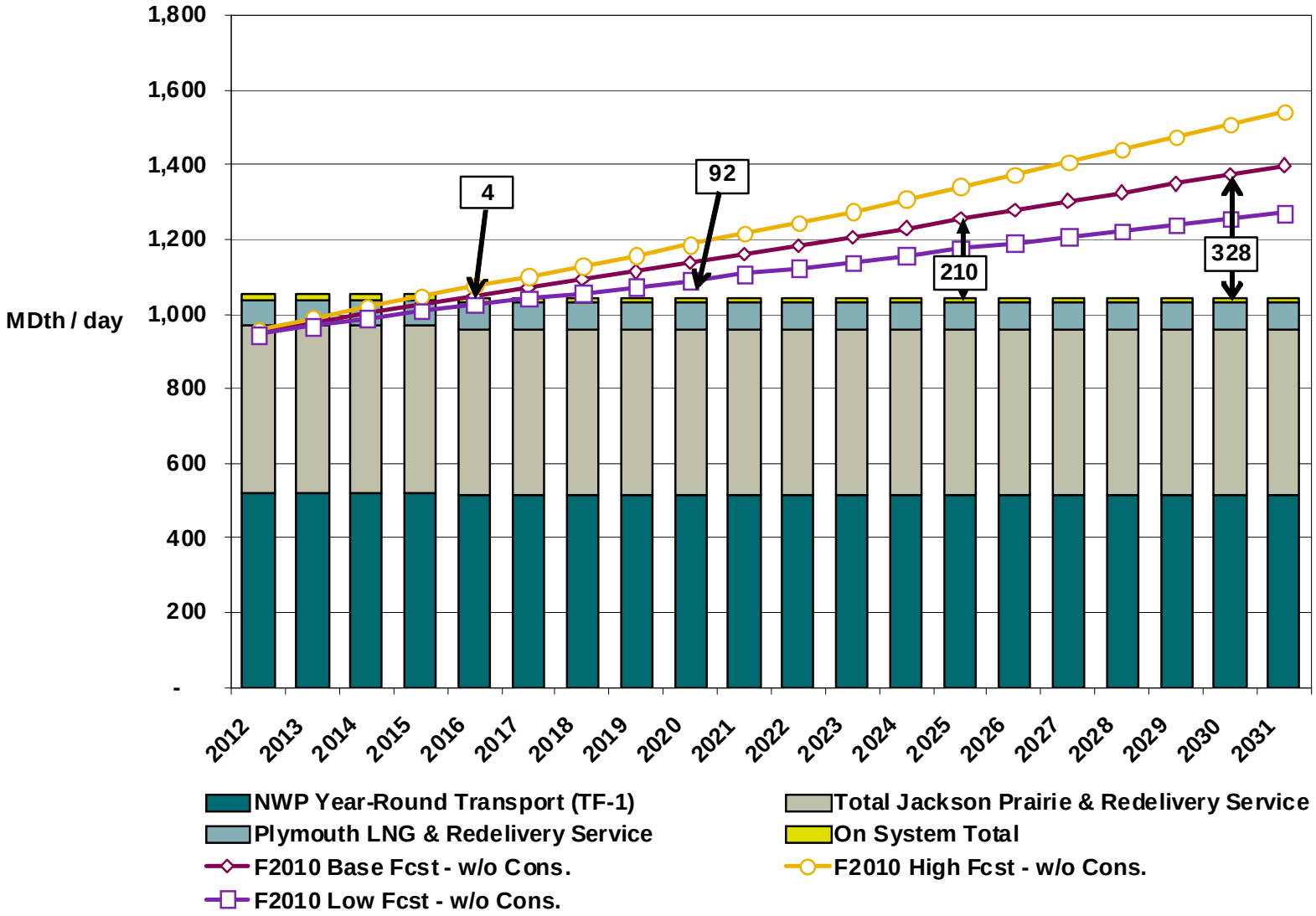
- Scenarios & Resource Alternatives Review
- Model Results: Demand Side
- Model Results: Supply Side

Generation Fuel

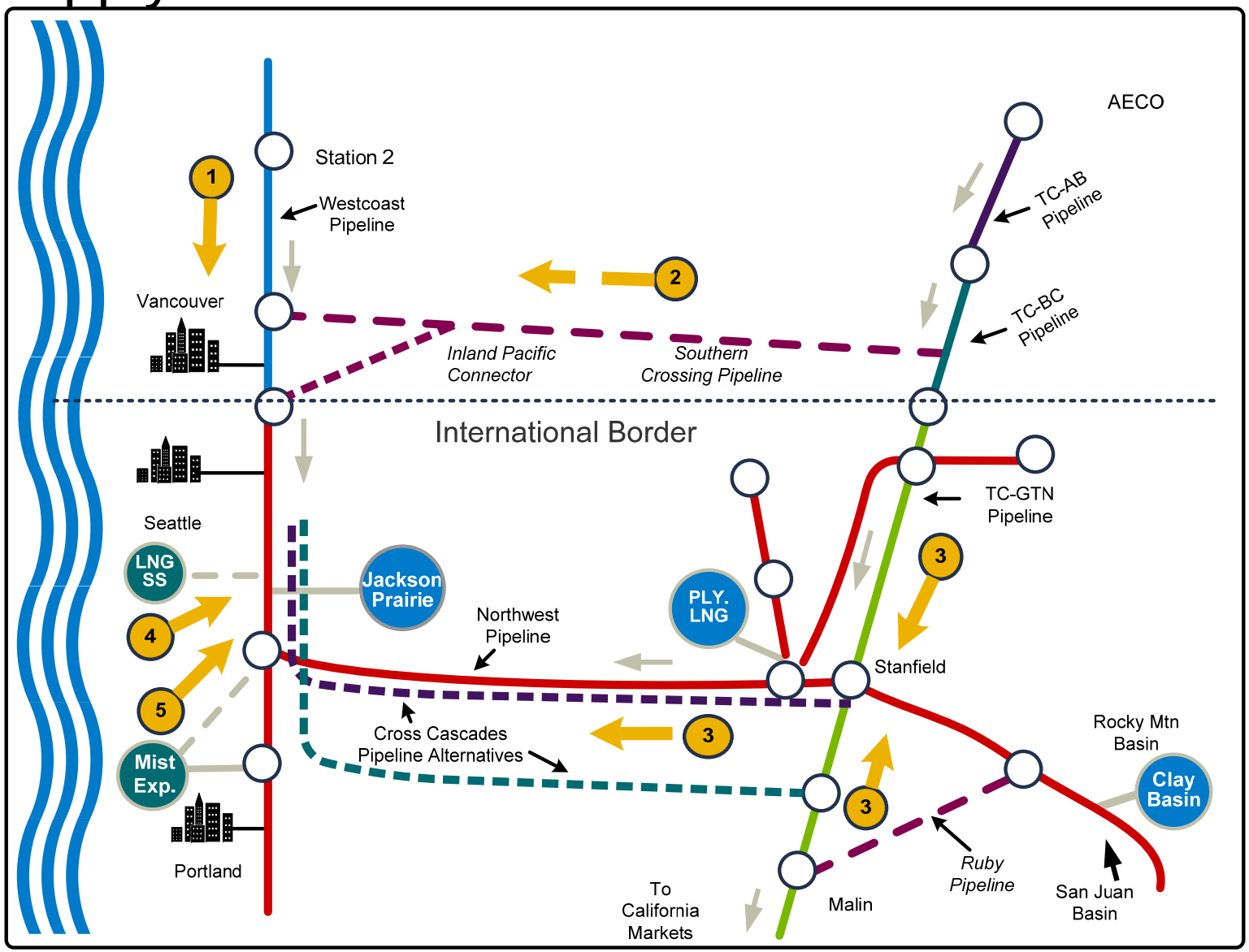
- Range of Resource Need
- Issues with Relative Swings
- Model Results

Next Steps

Gas Sales Peak Capacity Resource Need



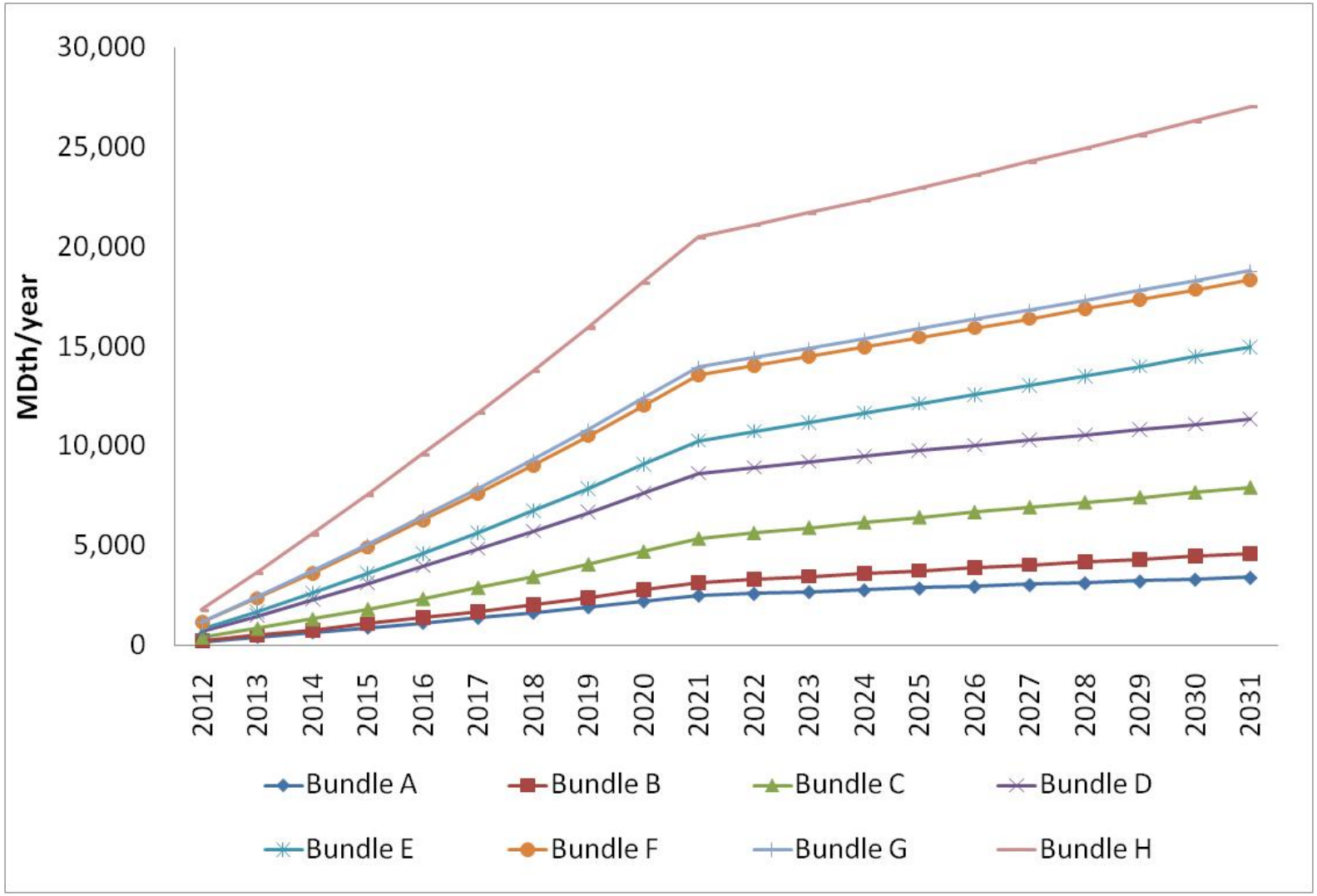
Gas Supply Alternatives



DSR: Incremental Bundles

Bundle	Price Cut-Offs for Bundles
A	< $0.45/therm
B	Bundle A + ($0.45 to $0.70)
C	Bundle B + ($0.70 to $0.95)
D	Bundle C + ($0.95 to $1.20)
E	Bundle D + ($1.20 to $1.50)
F	Bundle E + ($1.50 to $2.0)
G	Bundle F + ($2.0 to $2.5)
H	Bundle G + (>=$2.5)

DSR: Achievable Technical Potential - 10-Year Ramp



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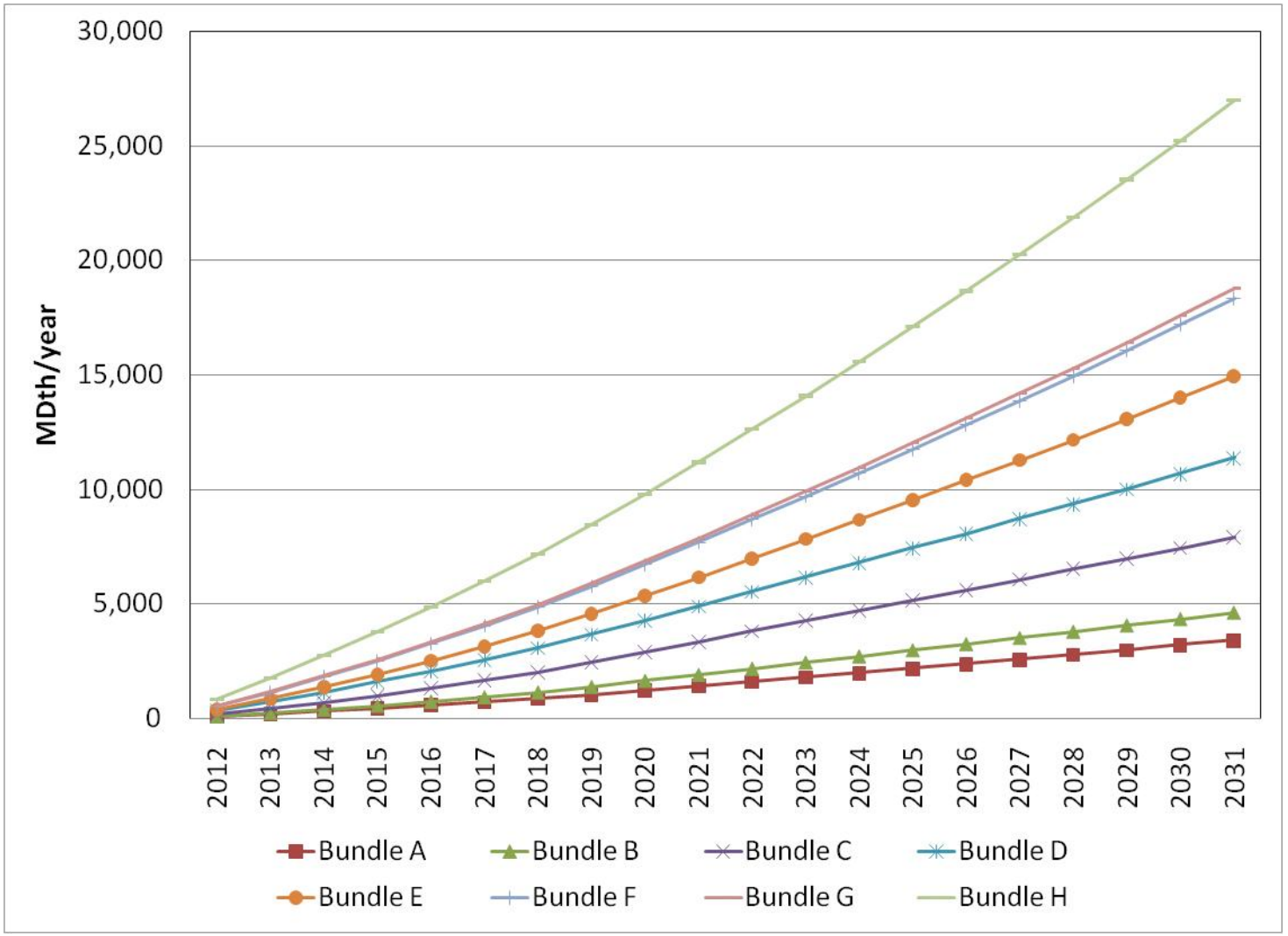
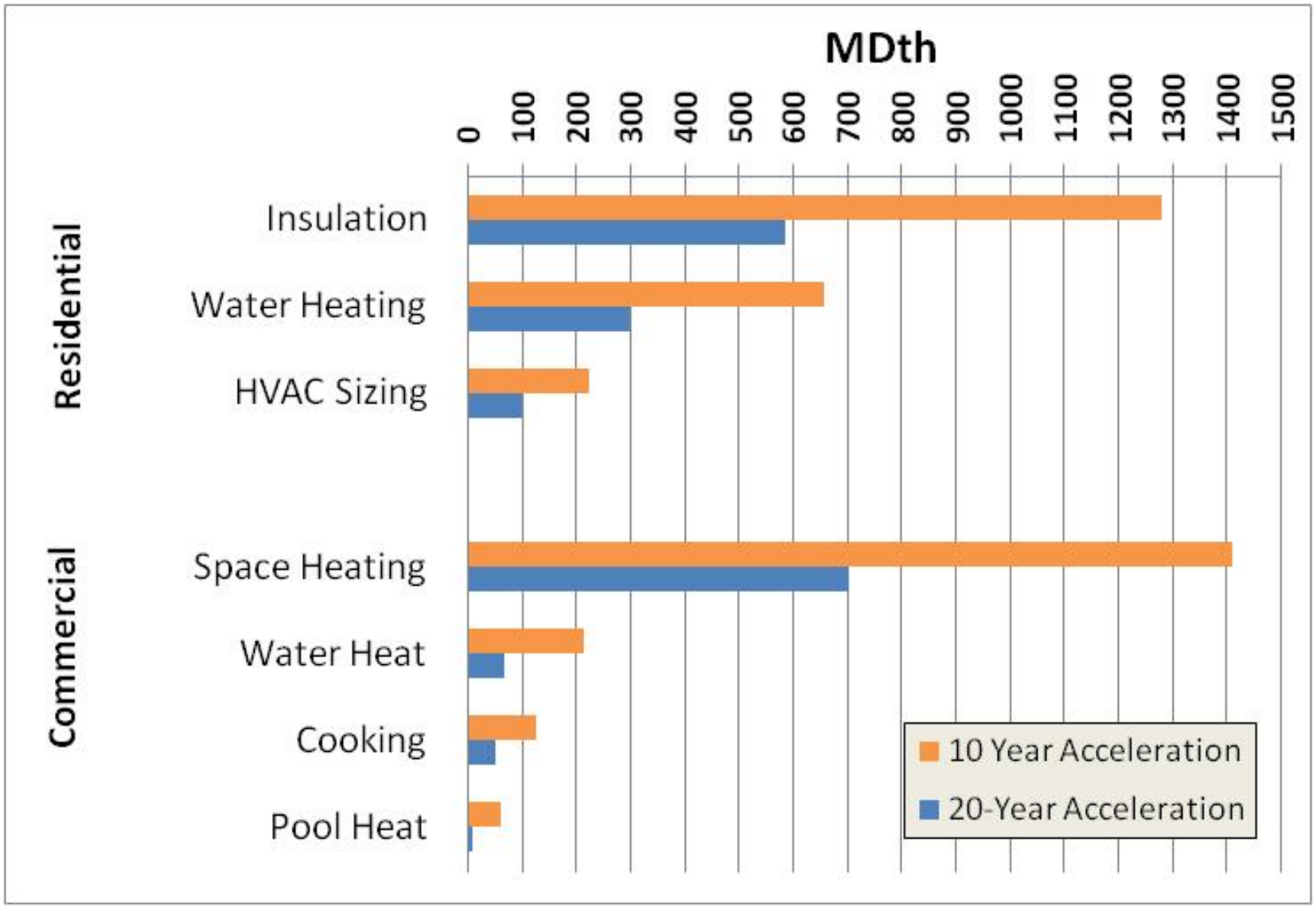


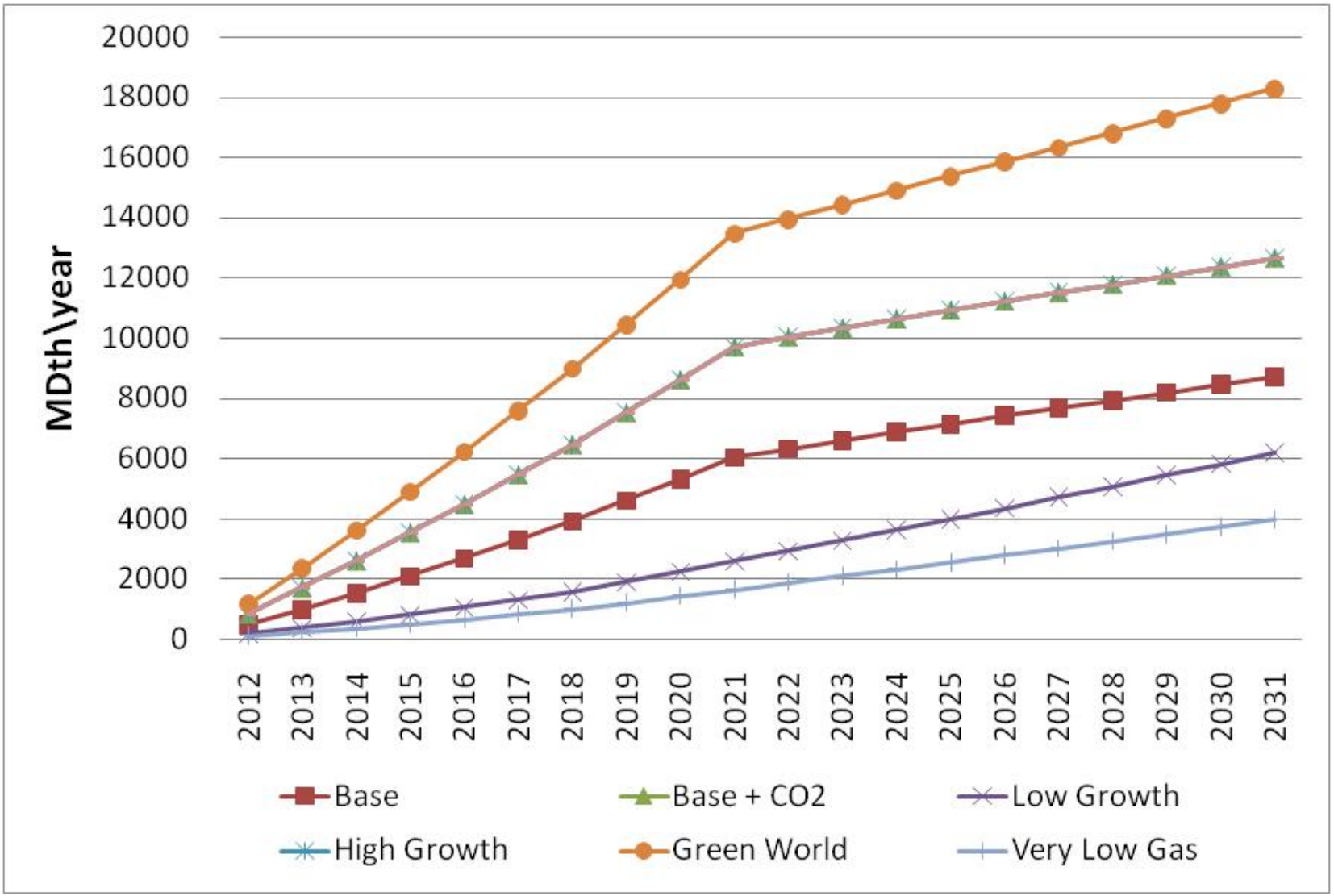
DSR: Comparison of Discretionary Measures 2021



DSR: NPV of Portfolio Costs - ($-Billions)

	20-year Ramp Rate	10-year Ramp Rate
Base	10.18	10.16
Base + CO2	12.05	11.98
Low Growth	7.47	7.50
High Growth	13.15	13.06
Green World	15.81	15.64
Very Low Gas Prices	6.09	6.13
Very High Gas Prices	14.12	14.00

DSR: Optimal Ramp by Scenario



Bundle Matrix

	Base	Base + CO2	Low Growth	High Growth	Green World	Very Low Gas	Very High Gas
Residential Firm	C	D	B	D	G	A	D
Commercial Firm	D	F	D	F	F	B	F
Commercial Interruptible	B	D	A	D	D	A	D
Industrial Firm	C	E	C	E	E	C	E
Industrial Interruptible	C	E	C	E	E	C	E

Resource Builds for 2021

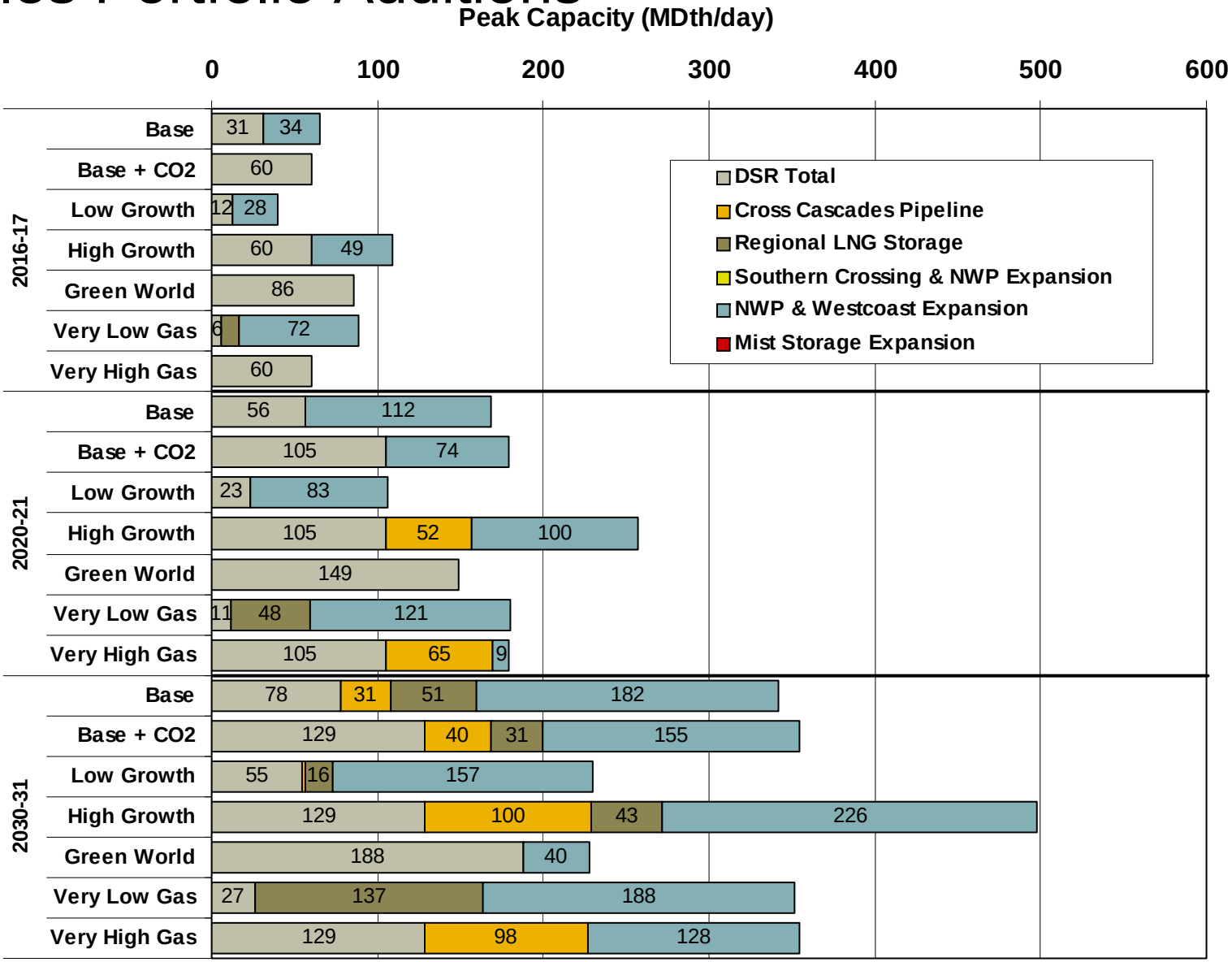
20-year DSR Ramping

	DSR Total	Cross Cascades Pipeline	Regional LNG Storage	NWP Sumas to PSE Expansion
Base	34	0	20	121
Base + CO2	50	0	0	113
Low Growth	23	0	0	83
High Growth	60	74	22	93
Green World	84	0	0	0
Very Low Gas	11	0	48	121
Very High Gas	60	65	0	45

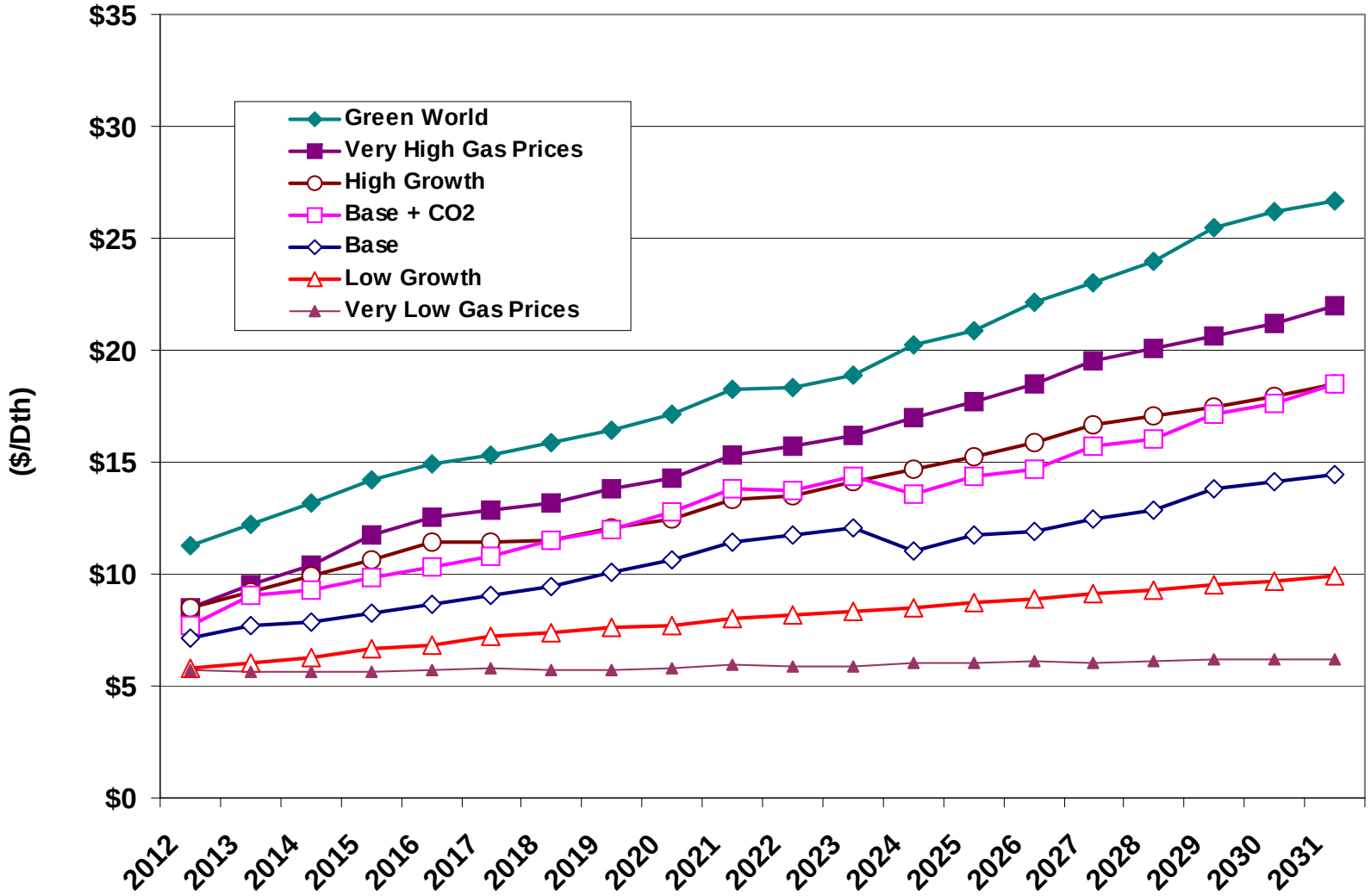
10-year DSR Ramping

	DSR Total	Cross Cascades Pipeline	Regional LNG Storage	NWP Sumas to PSE Expansion
Base	56	0	0	112
Base + CO2	105	0	0	74
Low Growth	38	0	0	71
High Growth	105	52	0	100
Green World	149	0	0	0
Very Low Gas	21	0	38	121
Very High Gas	105	65	0	9

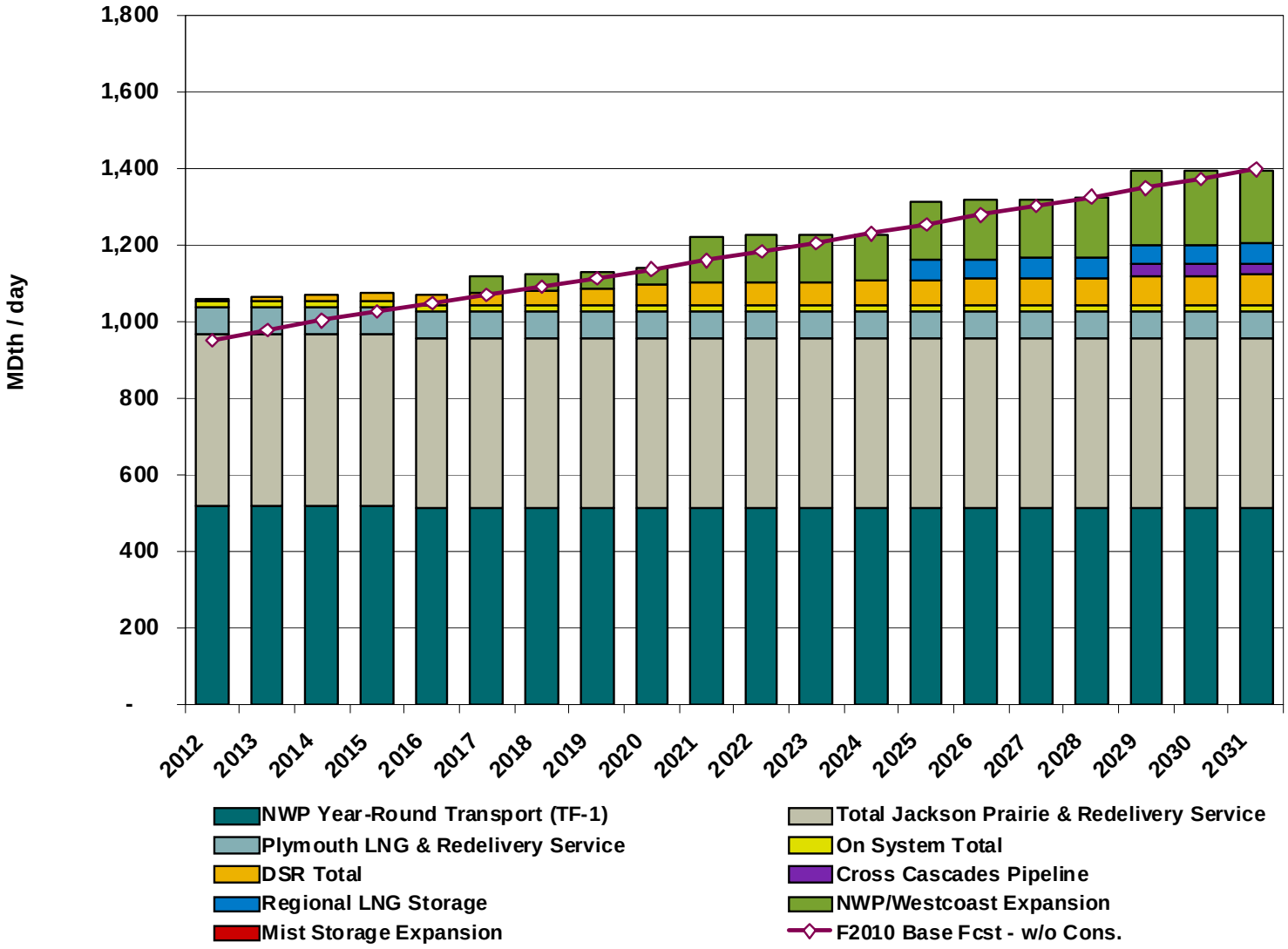
Gas Sales Portfolio Additions



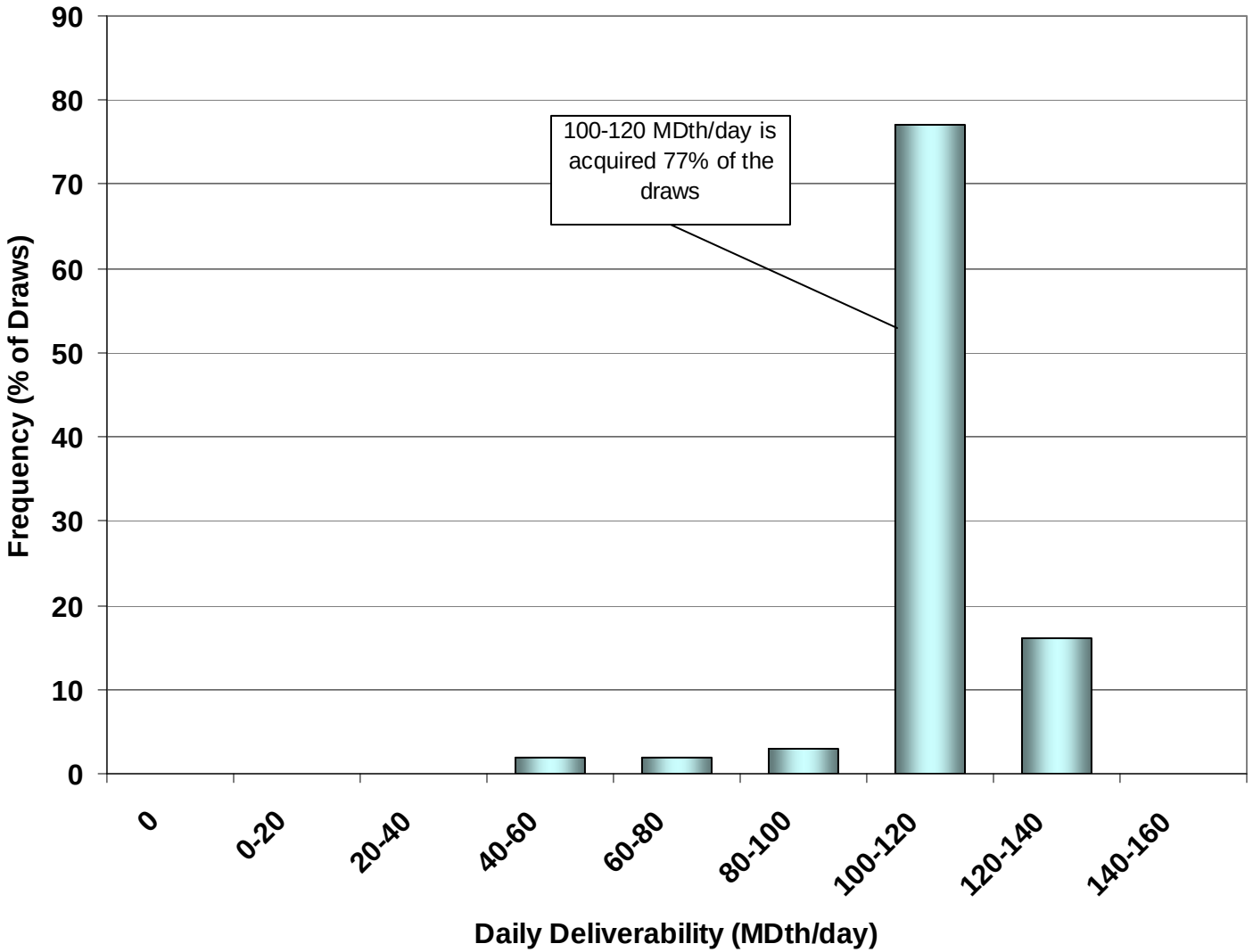
Average Portfolio Cost of Gas



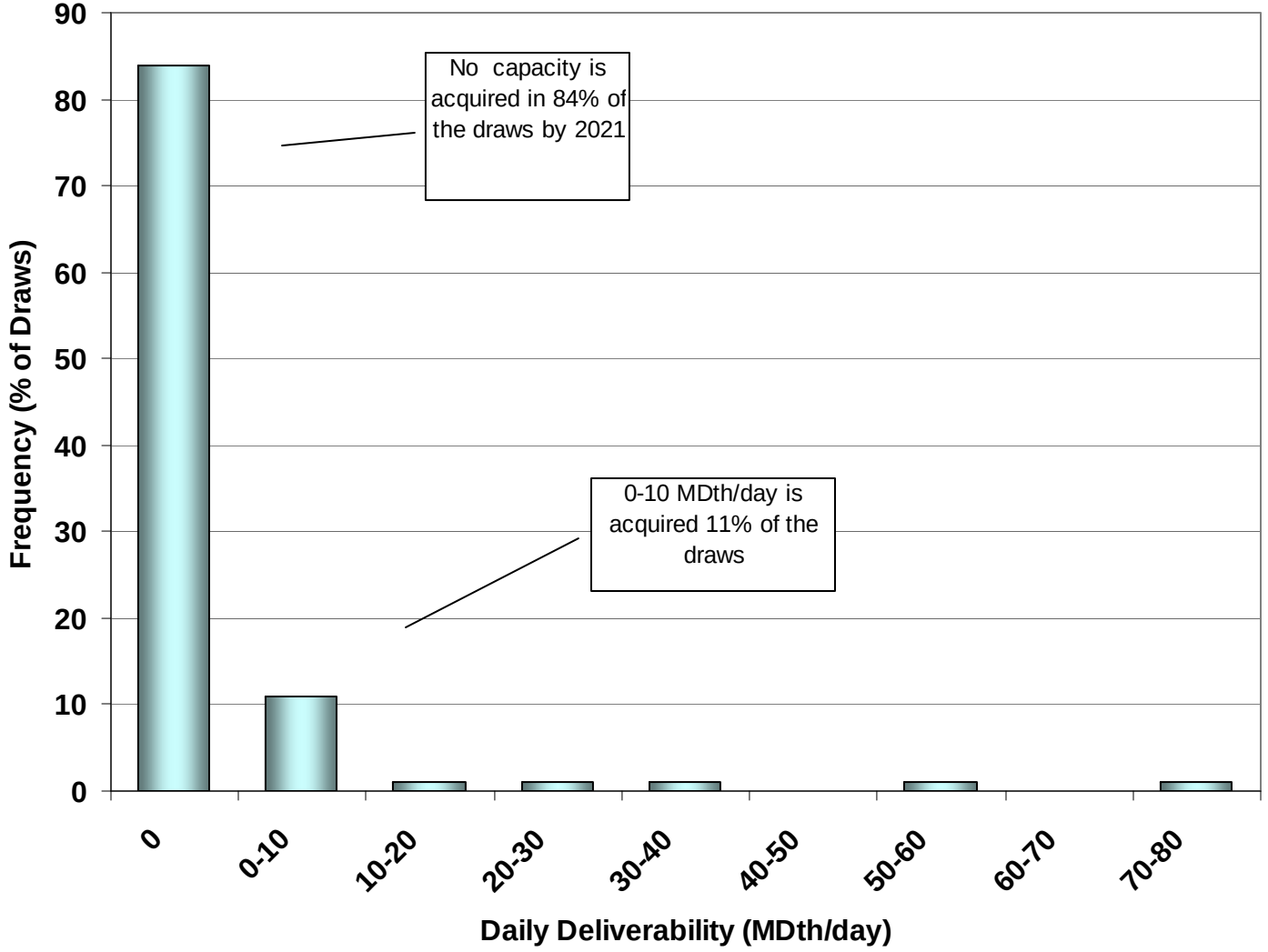
Base Scenario Gas Sales Portfolio Results



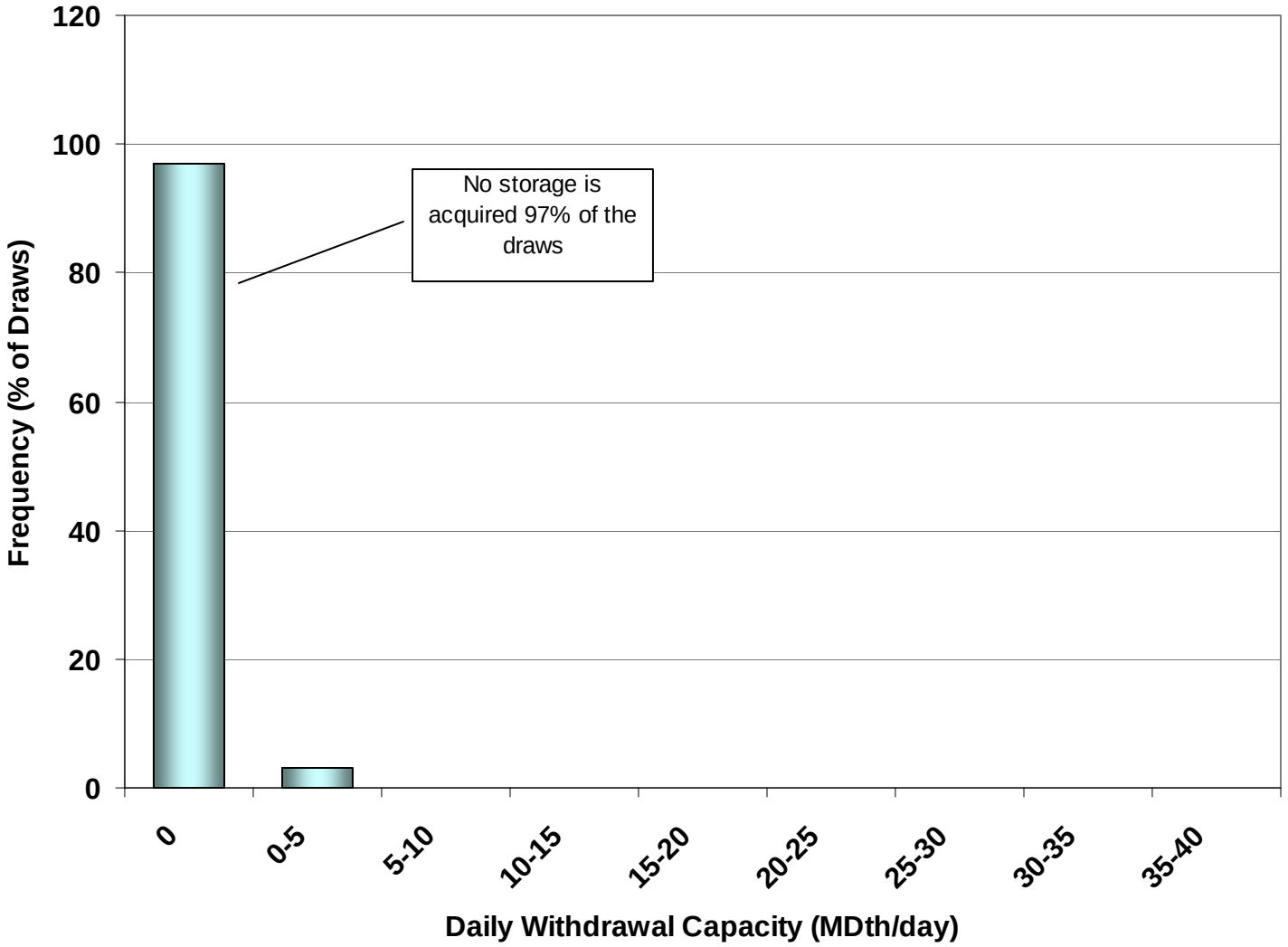
Monte Carlo Results – NWP Sumas to PSE: 2021



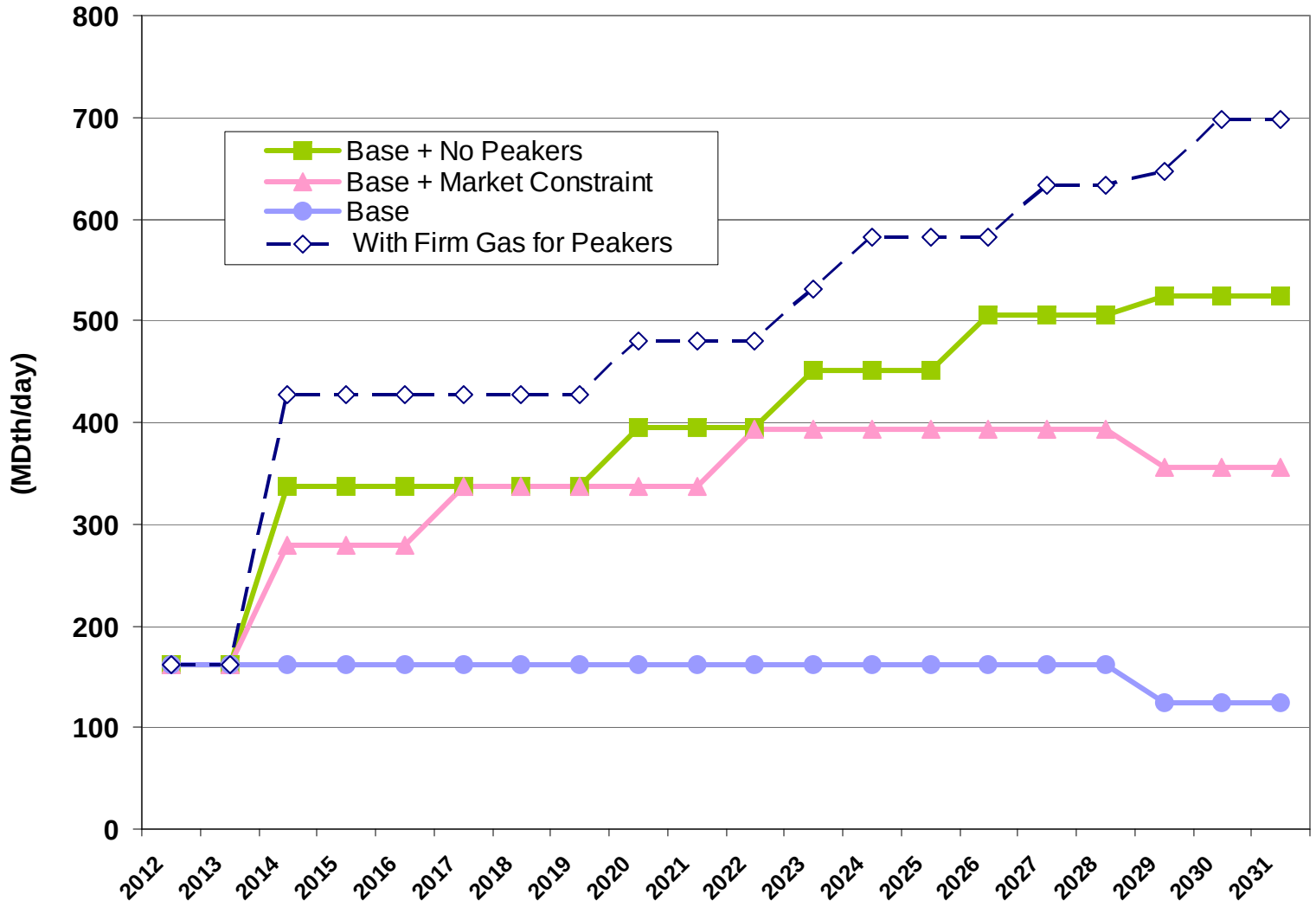
Monte Carlo Results – Cross Cascades Pipeline: 2021



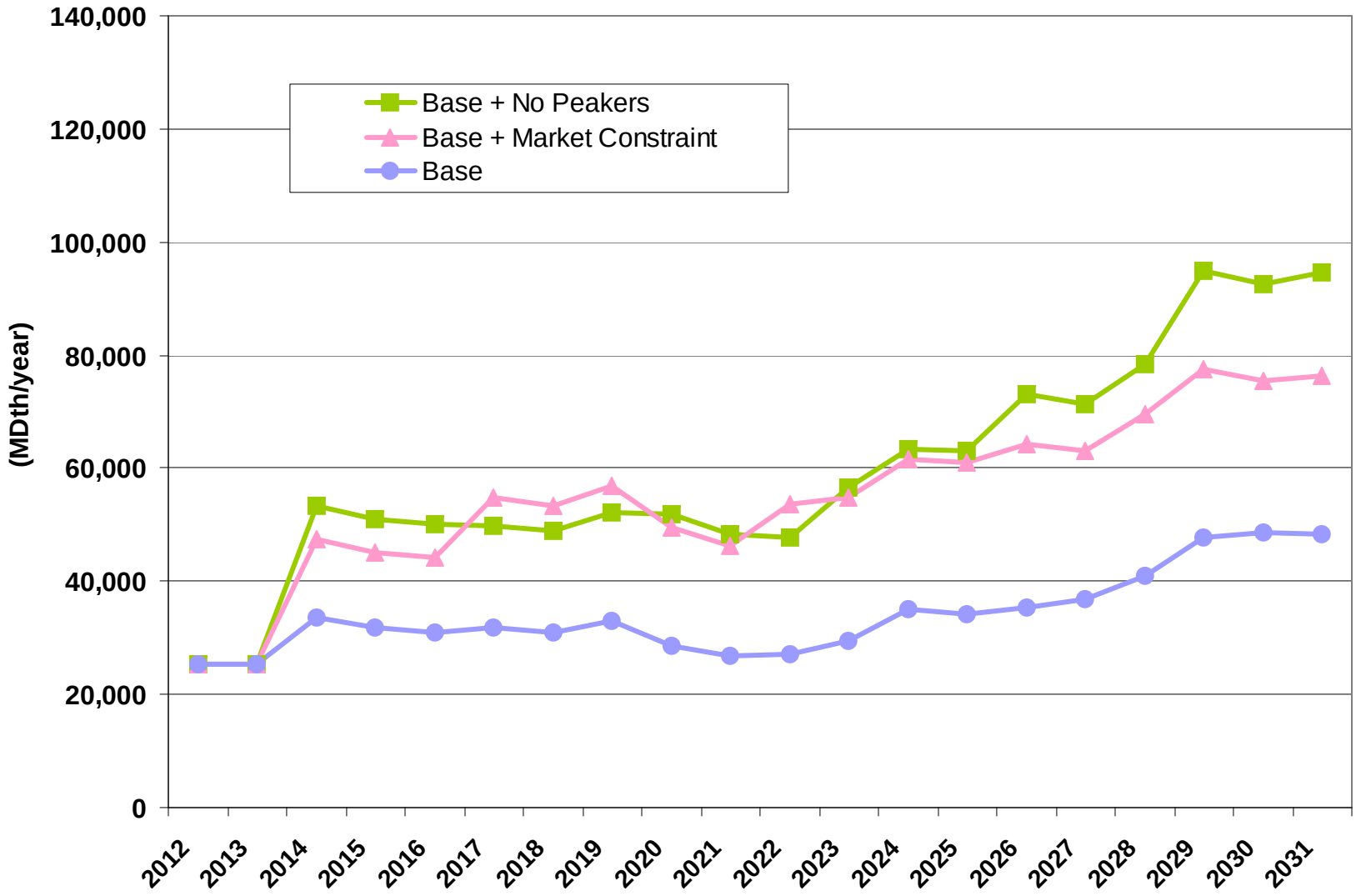
Monte Carlo Results – Regional LNG Storage: 2021



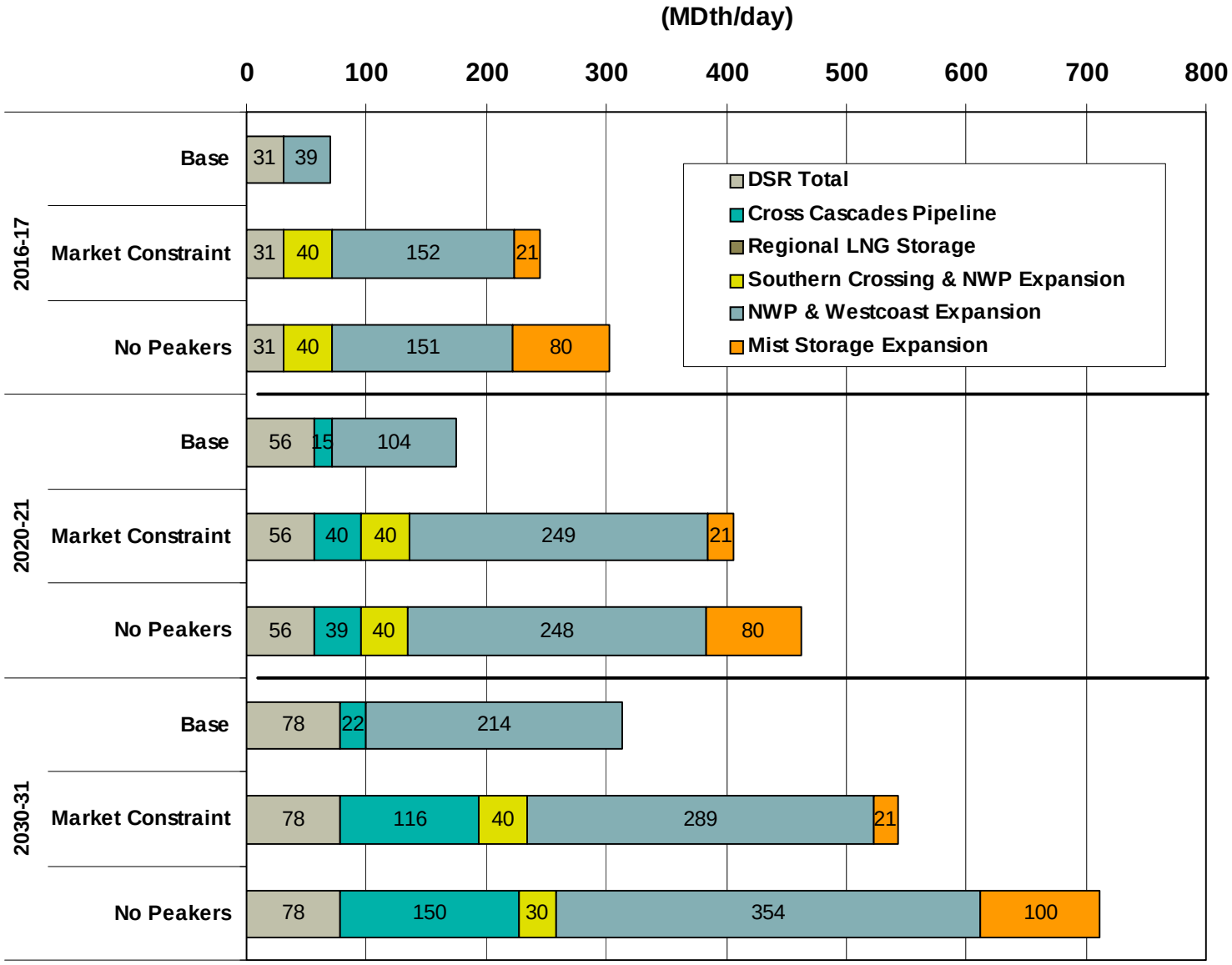
Gas for Power Portfolio Peak Day Load



Annual Gas for Power Portfolio Gas Load



Combined Portfolio Resource Additions



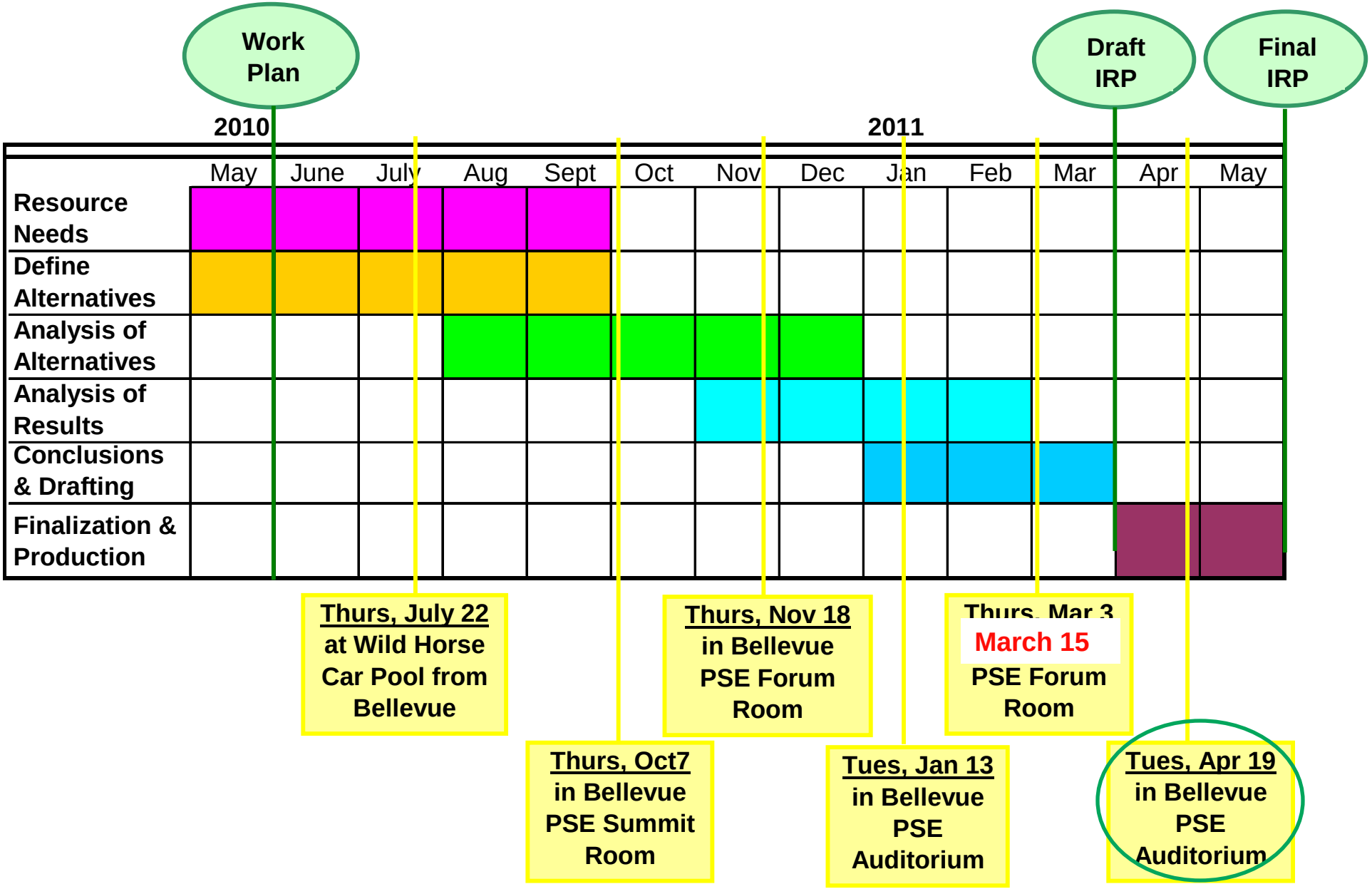
Draft 2011 Gas Sales Resource Plan

Peak Day Capacity (MDth/day)

	2016-17	2020-21	2024-25	2030-31
Demand Side Resources	**31**	**56**	**65**	**78**
Cross Cascades Pipeline				**31**
Regional LNG Storage			**51**	**51**
NWP/Westcoast Expansion	**44**	**112**	**145**	**182**

Anticipated 2011 IRP Work Plan Schedule for Public Participation

Updated August 27, 2010



Appendix

DSR Annual Energy Savings Comparison

Bundle	Price Cut-Offs for Bundles	2011 IRP Annual aMW PSE Ramp	
		2012	2031
A	< $55	27	327
B	Bundle A + ($55 to $85)	33	438
C	Bundle B + ($85 to $115)	36	502
D	Bundle C + ($115 to $130)	38	528
E	Bundle D + ($130 to $150)	39	563
F	Bundle E + ($150 to $170)	41	587
G	Bundle F + ($170 to $190)	42	597
H	Bundle G + (>= $190)	50	737
EISA		4	186
DE		1	37