Northwest Power and Conservation Council

July 2, 2013

MEMORANDUM

TO: Council Members

FROM: Charlie Black

SUBJECT: Briefing on Puget Sound Energy's Integrated Resource Plan

On May 31, 2013, Puget Sound Energy (PSE) filed its latest Integrated Resource Plan (IRP) with the Washington Utilities and Transportation Commission (WUTC). Under WUTC regulations, PSE updates its IRP every two years. The IRP forecasts PSE retail electric customers' requirement 20 years into the future and identifies resource options that are most likely to meet those needs at the lowest cost and risk. PSE prepares its IRPs with active participation by a broad range of interested parties.

At the Council meeting in Seattle on July 10, 2013, Philip Popoff, PSE's Manager, Integrated Resource Planning will provide a briefing on his utility's 2013 IRP.

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PSE's 2013 IRP Overview
NWPCC

Phillip Popoff

Manager, Integrated Resource Planning

July 10, 2013

IRP Overview

PSE Overview

2013 IRP Key Findings

Analysis and Scenarios Considered

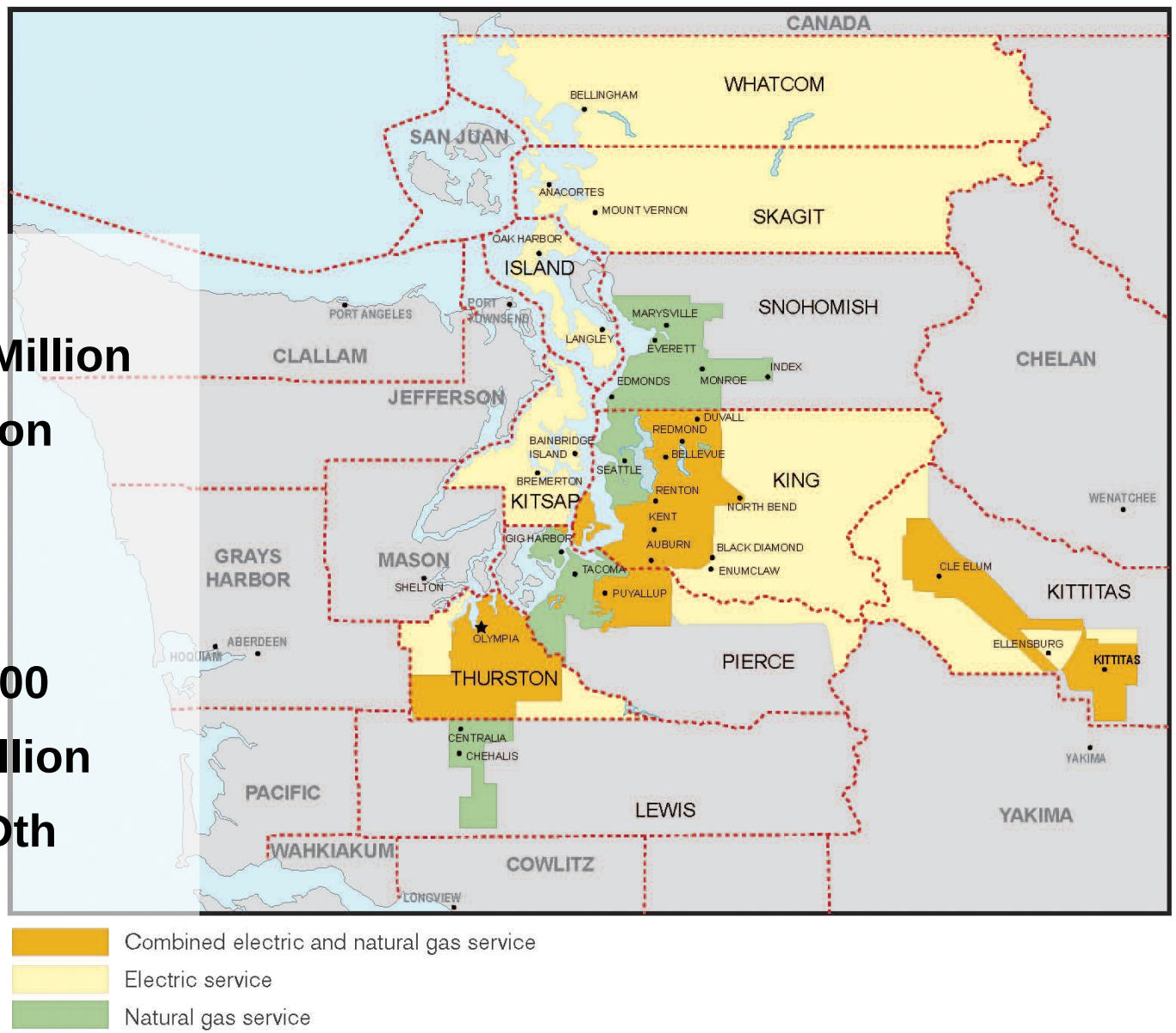
Next Steps

Electric

- Customers: 1.1 + Million
- Revenue: $2+ Billion
- Sales: 24 Mil MWh

Gas

- Customers: 760 ,000
- Revenue: $1.2+ Billion
- Sales: 108,000 MDth



PSE's Current Resource Stack in MW

Wind
823 MW

Hydro
1000 MW

Nat Gas
Base Load
& Peaker
1868 MW

Coal
677 MW

Long-Term
Contracts
800 MW

Shorter-Term Import Capability
1400 MW

Great Regional Map:
http://www.nwcouncil.org/maps/power/Default.asp

2013 IRP – Key Findings

Continued Reliance on Market for Peak Capacity

- Shorter Term—Looks Reliable
- Longer-Term—Concerns

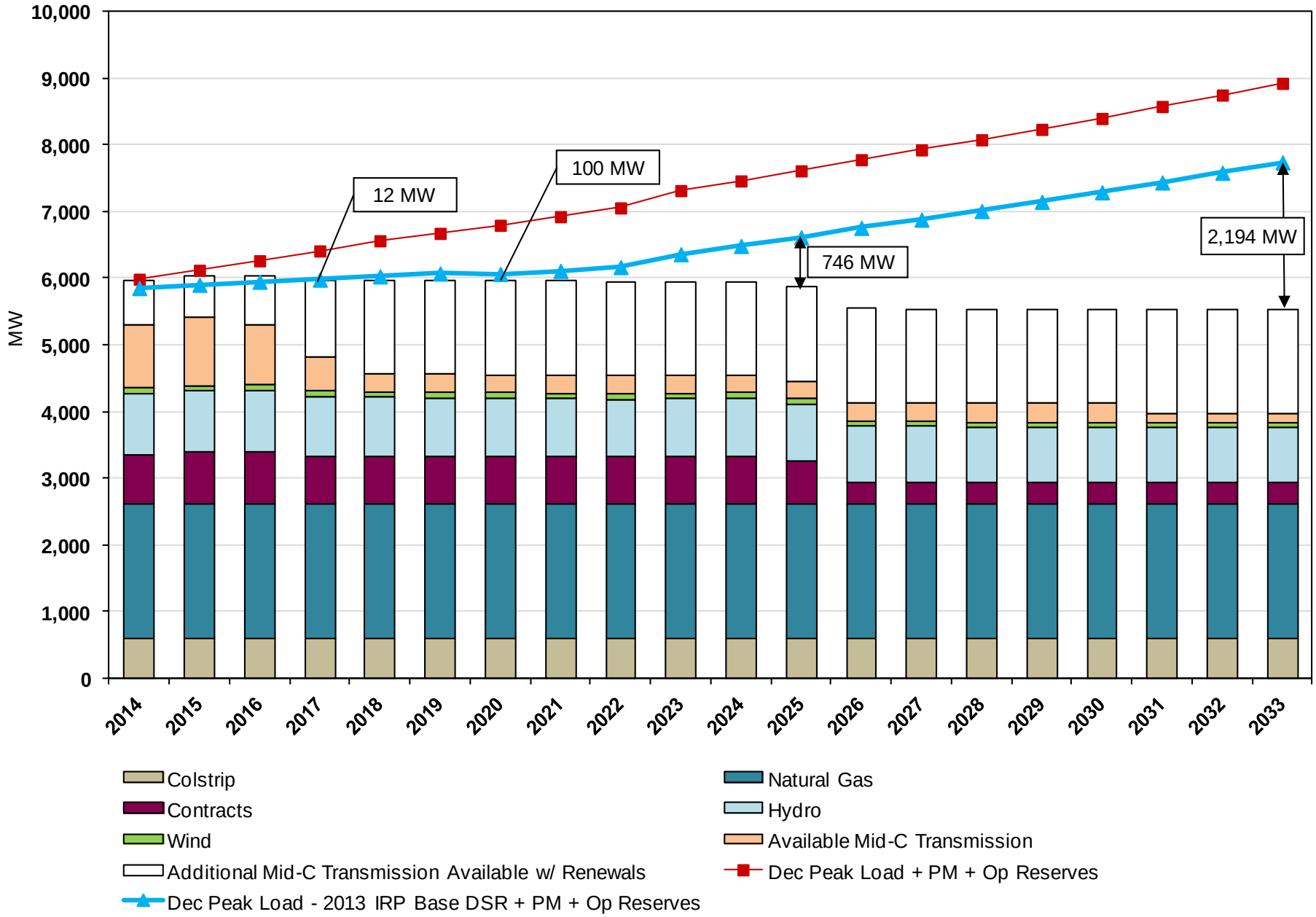
Challenges for Existing Coal-Fired Generation

- A Number of Issues for Coal Generally in U.S.
- Focused on Understanding Factors that Could Affect Economic Viability of Colstrip
- Big Picture: No Major Near-Term Investment Decisions to Make at Colstrip

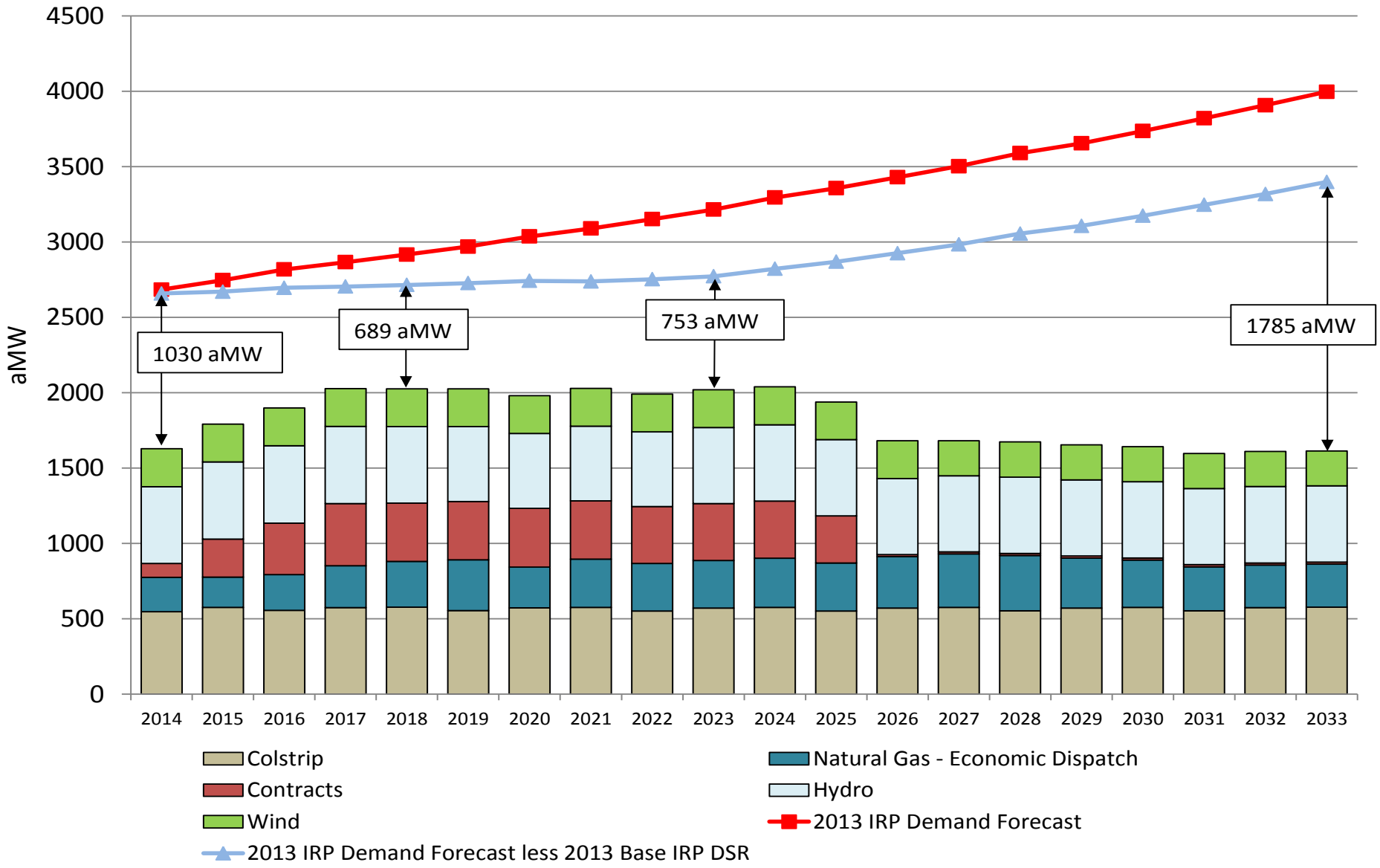
Infrastructure Challenges

- Electric IRP Calls for Gas Storage
- As Regional Capacity Tightens, Need to Plan Further Out to Facilitate Infrastructure

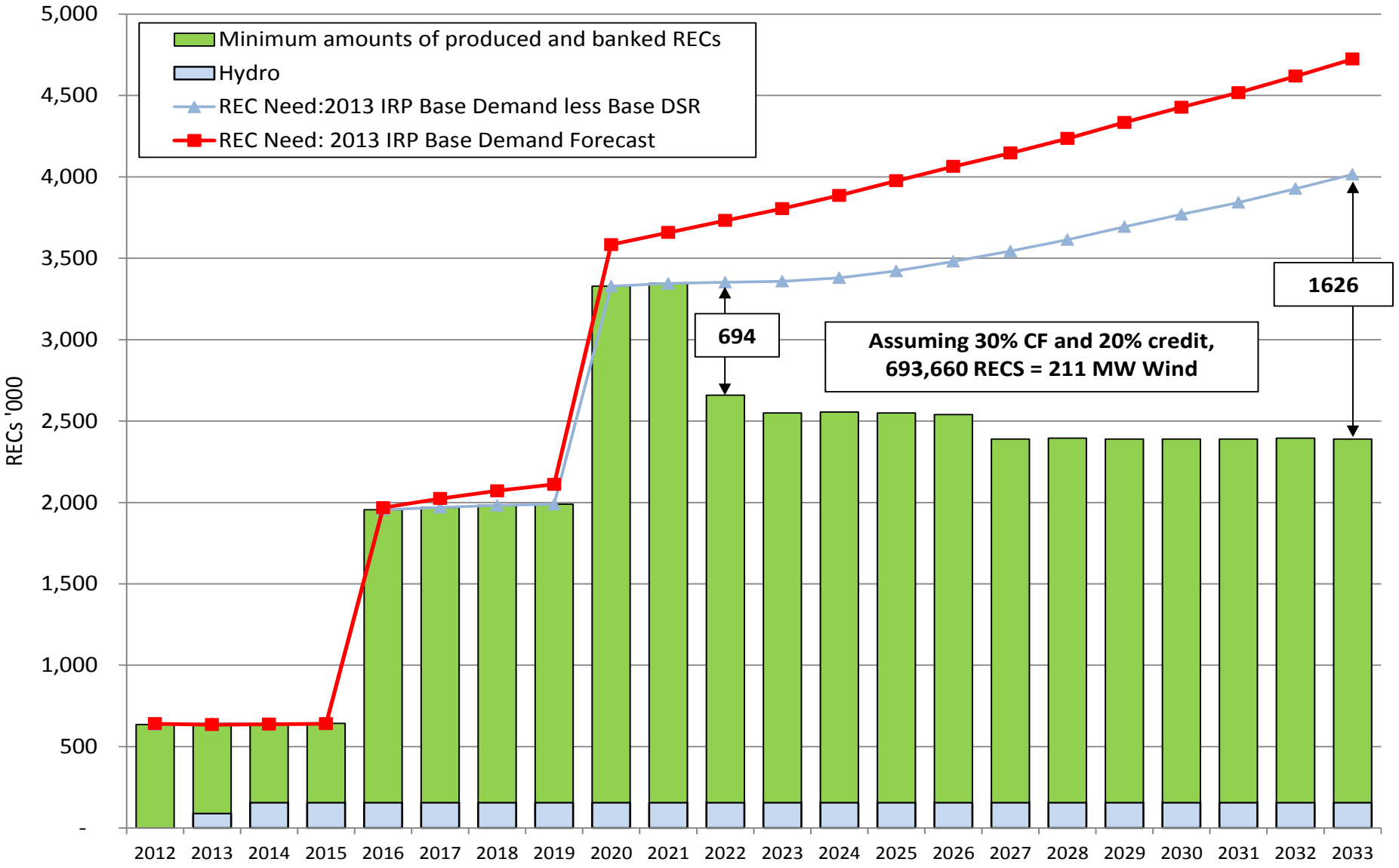
Winter Peak Capacity Need



Annual Energy Position



Renewable “Energy” Need



Resource Plan - Cumulative Capacity Additions

	2017	2023	2027	2033
Demand-Side Resources (MW)	327	800	887	1,007
Wind (MW)	0	300	500	600
Peakers (CT in MW)	221	442	1,327	2,212
Transmission Renewals (MW)	1,141	1,407	1,407	1,567
Gas Storage (MDth/day Gas)	100	100	100	150

Integrated Resource Planning

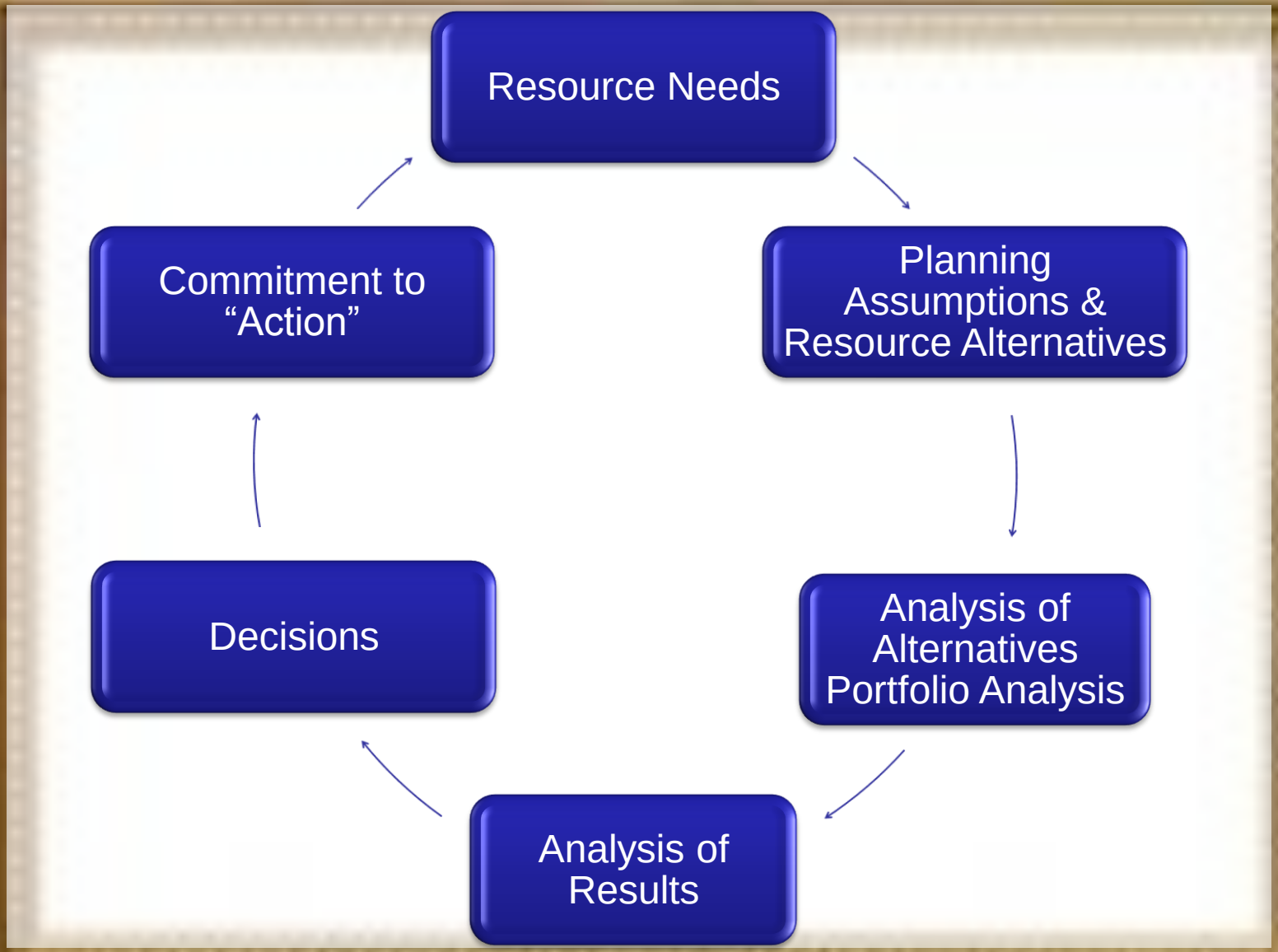
WAC 480-100-238 Integrated resource planning.

(1)Purpose. Each electric utility… has the responsibility to meet its system demand with a least cost mix of energy supply resources and conservation.

"Least Cost": "Lowest Reasonable Cost" Includes Consideration of Risks

Risk Focus: What Factors Can Affect The Least Cost Mix?

Regulatory Compliance



Stakeholders

Market Outlook

Customer Needs

Analyzing Uncertainty

Deterministic Analysis: Scenarios/Sensitivities

- Factors that Might Create Different Long-Term Market Equilibriums and/or Specific Policy Analysis
- Examples: Gas Price Trends, PTC Extension, Load Growth

Stochastic Analysis: All Futures Bumpy!

- Live in Series of Short-Runs…Not Long-Run Equilibriums
- Stochastic Variables in Portfolio Analysis: Gas Prices, Power Prices, Load (weather), Wind, Hydro, CO_2 Price (Cap & Trade Only)

Why Not One, Grand Stochastic Analysis?

- Too Complicated to Intuit
- Difficult to Discern What is Important
- Hard to Explain What is Important
- Use to Learn: Inform Decisions

2013 IRP: Scenarios/Sensitivities/Cases

Market Scenarios

- Base: Mid Growth, Mid Gas Price
- Base + Low Gas
- Base + Very Low Gas Price
- Base + Very High Gas Price
- Base + Low CO_2 Cost
- Base + High CO_2 Price
- Base + Very High CO_2 Cost
- Low: Low Growth, Low Gas Price
- High: High Growth, High Gas Price
- High + High CO_2 Price

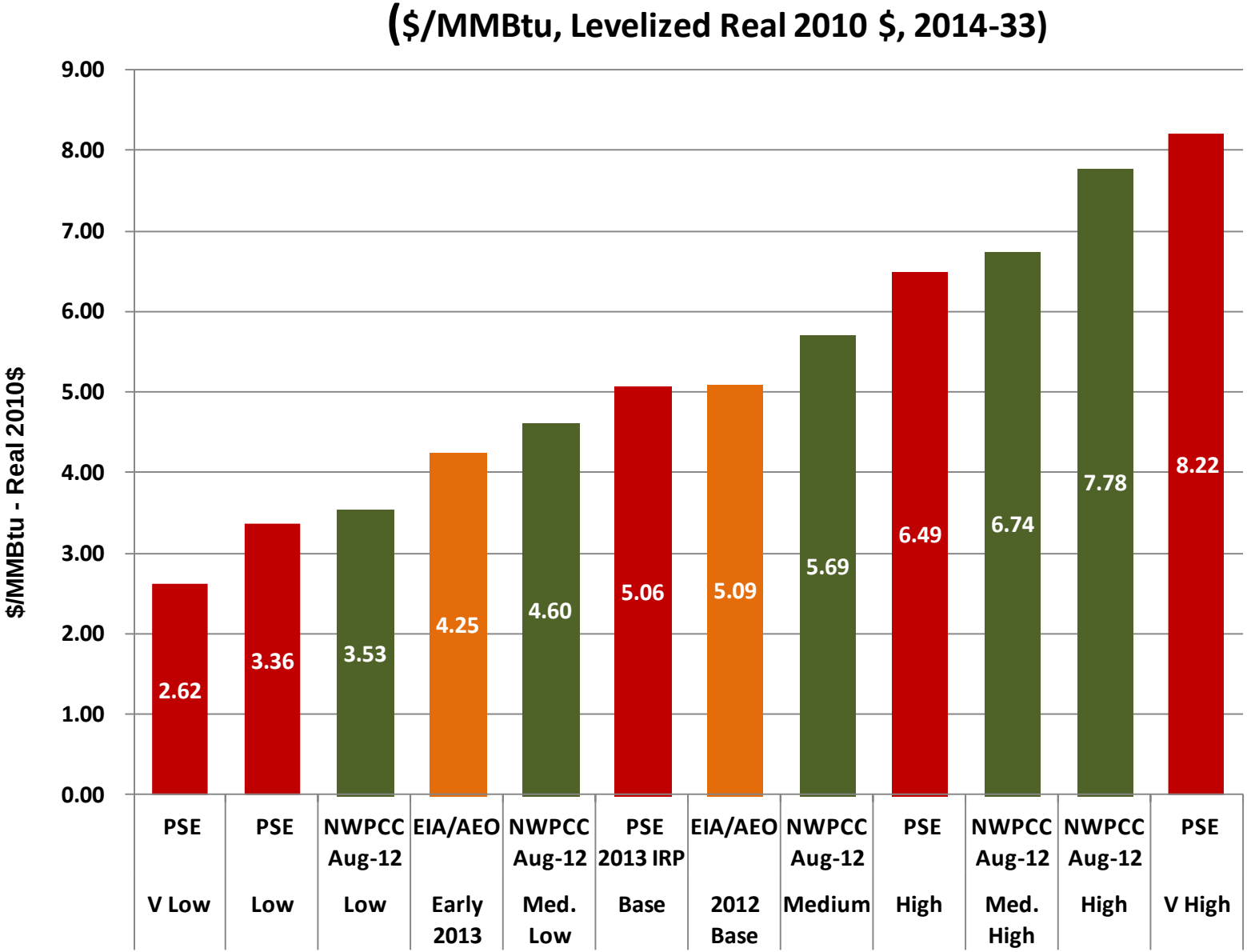
Portfolio Sensitivites

- Peaker Type – CT vs Recip
- CT With and Without Oil Back-up
- Location: East/West Cascades
- DSR Acquisition /Ramp Rates
- Colstrip Least Cost Replacement
- Replace Colstrip with MT Wind
- RPS + 300MW Wind

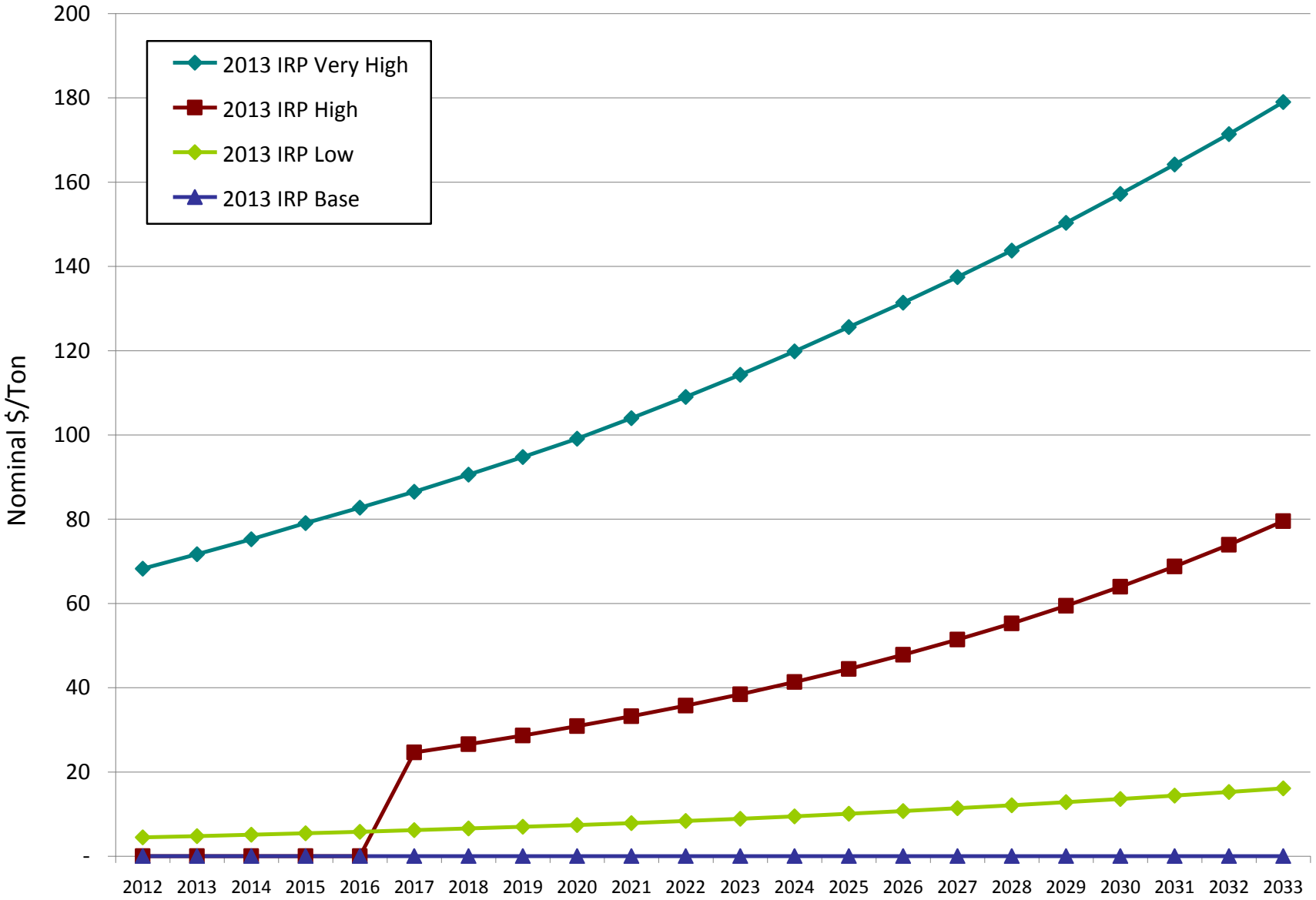
Colstrip Environmental Compliance Cases

- Case 1–Low Cost: Regional Haze Less Costly Technology Solution
- Case 2–Mid Cost: Regional Haze Realistic Estimate of EPA Technologies
- Case 3–High Cost: Case 2 + CCR Hazardous w/Offsite Disposal @ $8/ton
- Case 4—Very High Cost: Case 2 + CCR w/Offsite Disposal at $24/ton

Henry Hub Gas Price Forecasts



CO2 Cost/Price Assumptions: Deterministic



Two Ways of "Internalizing" Externalities

Reflected in Economic Dispatch: Tax/Cap & Trade

Cost = F(Fixed Costs, Variable Costs (gas prices, CO_2 prices,etc.))

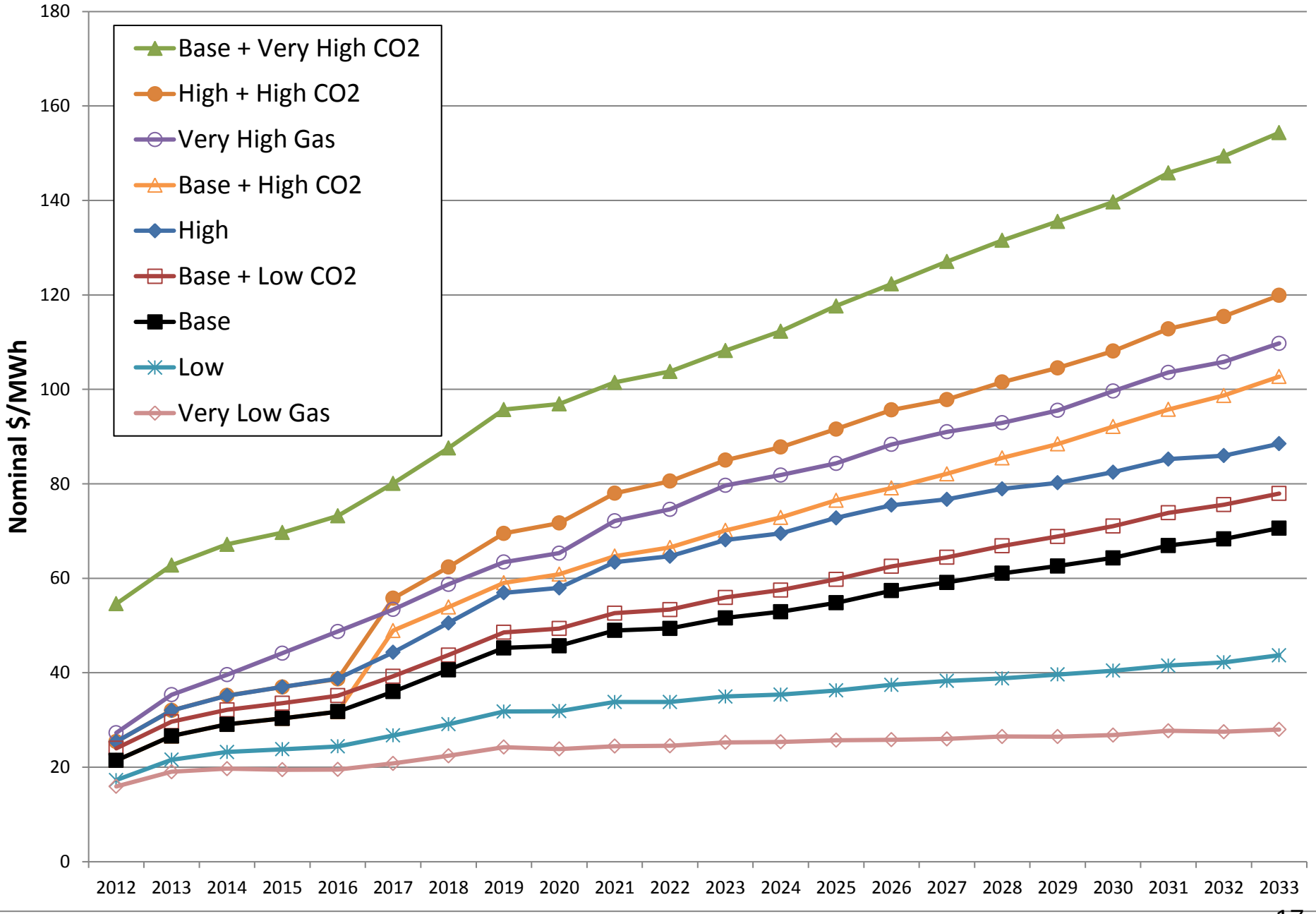
- CO_2 cost in portfolio costs—Part of Economic Dispatch
- Appropriate for CO_2 Tax or Cap & Trade Price
- Key Points:
  - Cost of CO_2 Properly Reflected in Market Price
  - CO_2 Prices Will Affect Quantity via Economic Dispatch AND Resource Portfolios

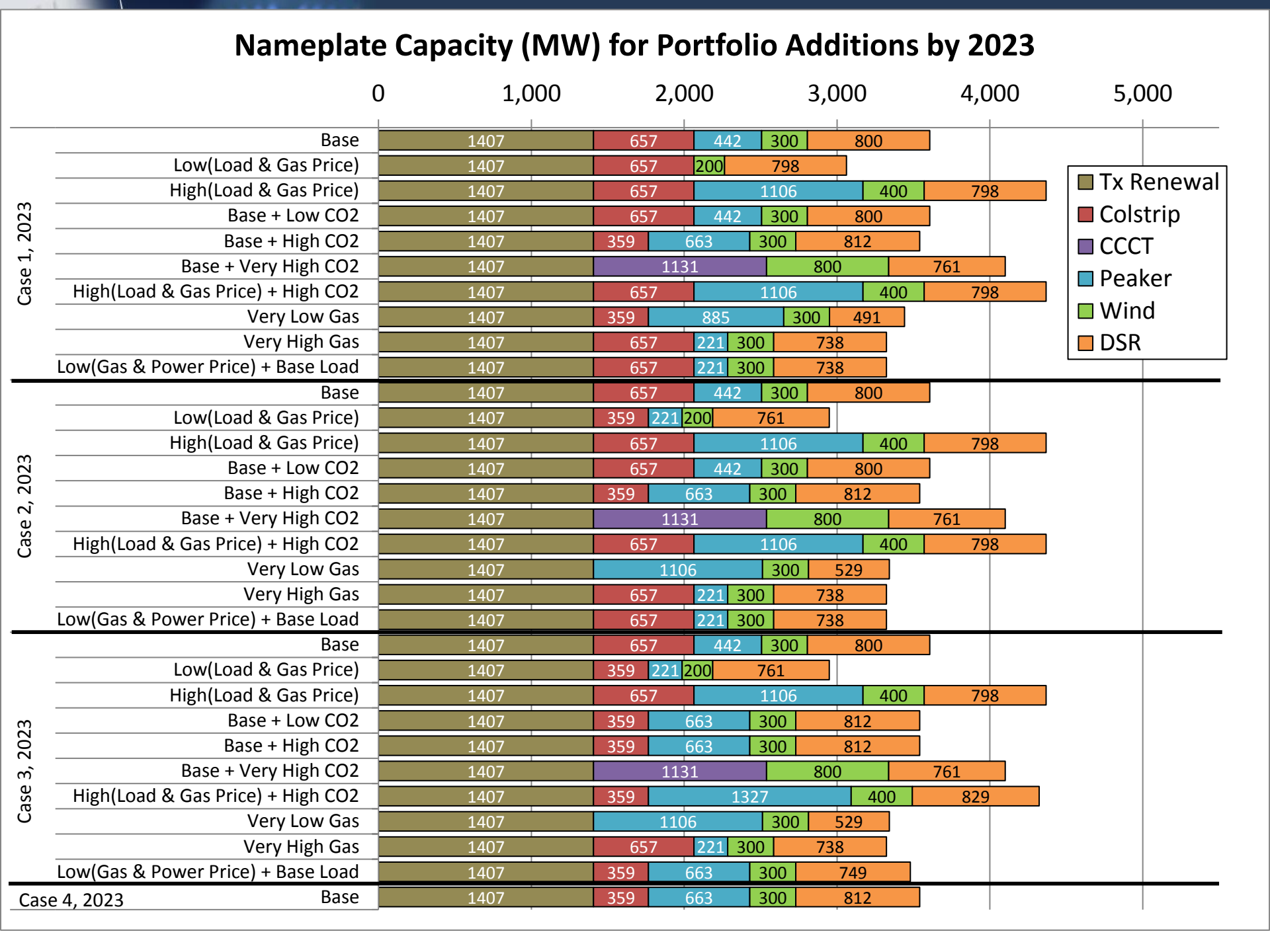
External to Economic Dispatch: As Externality

Cost= F(FC + VC) + (Cost of CO_2 * Tons)

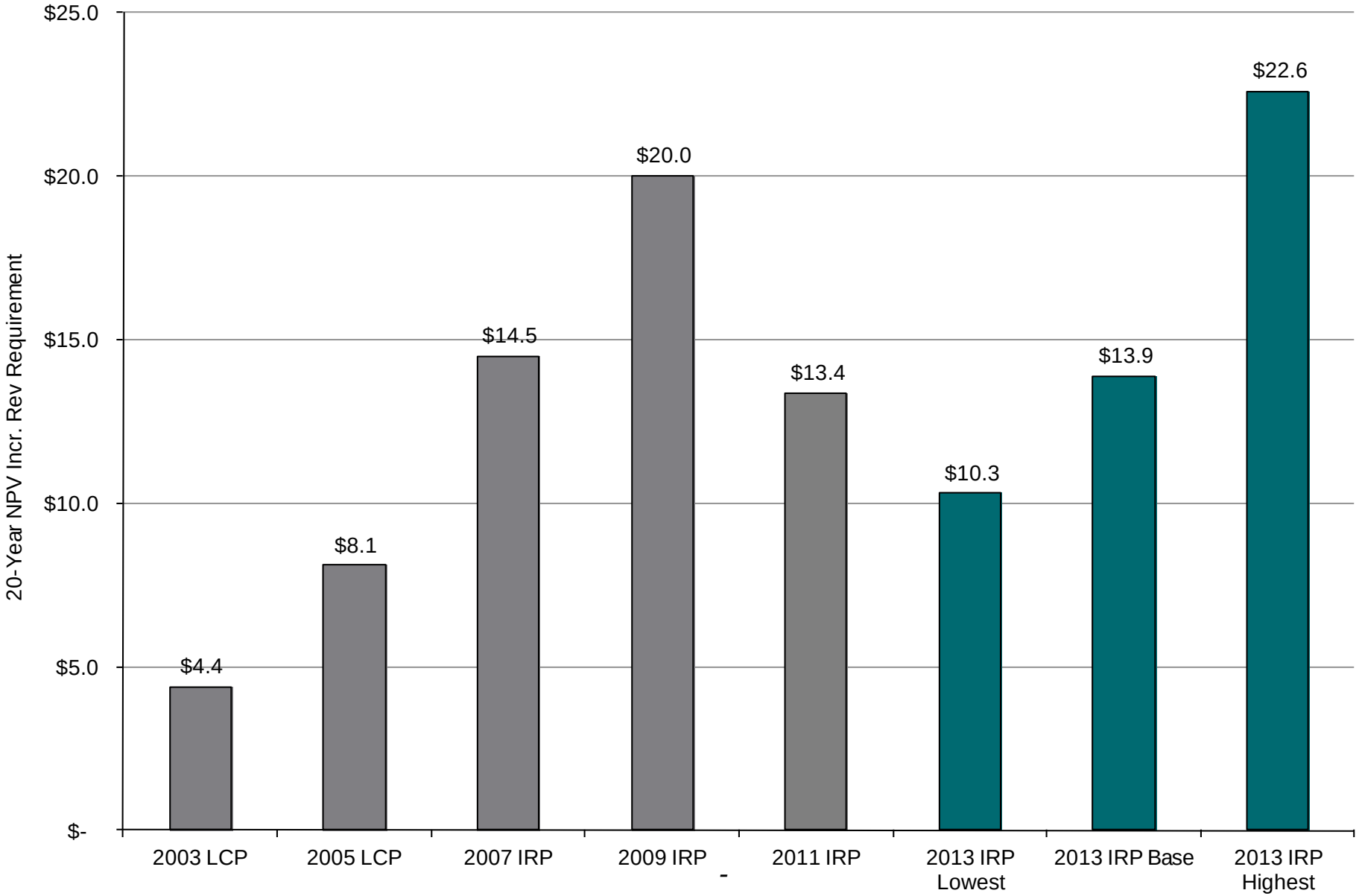
- CO_2 cost Incorporated Outside Economic Dispatch
- Appropriate for Analyzing CO_2 as a Societal Cost
- Key Points:
  - Cost of CO_2 Will Properly <u>Not</u> be Reflect in Market Price
  - CO_2 Costs Affect Quantity Only via Resource Portfolios

Annual Average Mid-C Power Price (Nominal $/MWh)

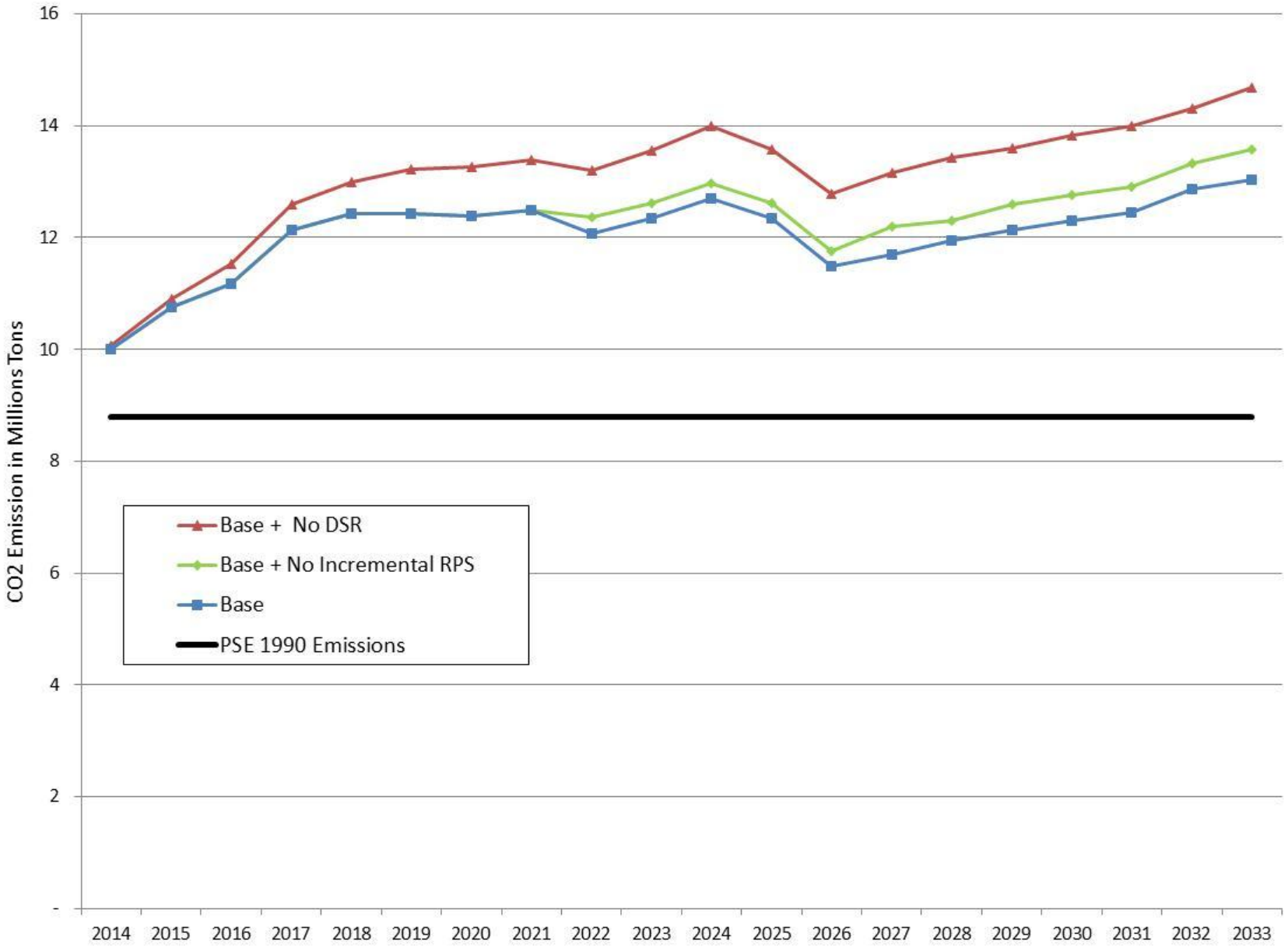



Nameplate Capacity (MW) for Portfolio Additions by 2023
0
1,000
2,000
3,000
4,000
5,000
Tx Renewal
Colstrip
CCCT
Peaker
Wind
DSR
Case 1, 2023
Base 1407 657 442 300 800
Low(Load & Gas Price) 1407 657 200 798
High(Load & Gas Price) 1407 657 1106 400 798
Base + Low CO2 1407 657 442 300 800
Base + High CO2 1407 359 663 300 812
Base + Very High CO2 1407 1131 800 761
High(Load & Gas Price) + High CO2 1407 657 1106 400 798
Very Low Gas 1407 359 885 300 491
Very High Gas 1407 657 221 300 738
Low(Gas & Power Price) + Base Load 1407 657 221 300 738
Case 2, 2023
Base 1407 657 442 300 800
Low(Load & Gas Price) 1407 359 221 200 761
High(Load & Gas Price) 1407 657 1106 400 798
Base + Low CO2 1407 657 442 300 800
Base + High CO2 1407 359 663 300 812
Base + Very High CO2 1407 1131 800 761
High(Load & Gas Price) + High CO2 1407 657 1106 400 798
Very Low Gas 1407 1106 300 529
Very High Gas 1407 657 221 300 738
Low(Gas & Power Price) + Base Load 1407 657 221 300 738
Case 3, 2023
Base 1407 657 442 300 800
Low(Load & Gas Price) 1407 359 221 200 761
High(Load & Gas Price) 1407 657 1106 400 798
Base + Low CO2 1407 359 663 300 812
Base + High CO2 1407 359 663 300 812
Base + Very High CO2 1407 1131 800 761
High(Load & Gas Price) + High CO2 1407 359 1327 400 829
Very Low Gas 1407 1106 300 529
Very High Gas 1407 657 221 300 738
Low(Gas & Power Price) + Base Load 1407 359 663 300 749
Case 4, 2023
Base 1407 359 663 300 812

Significant Range of Cost Uncertainty

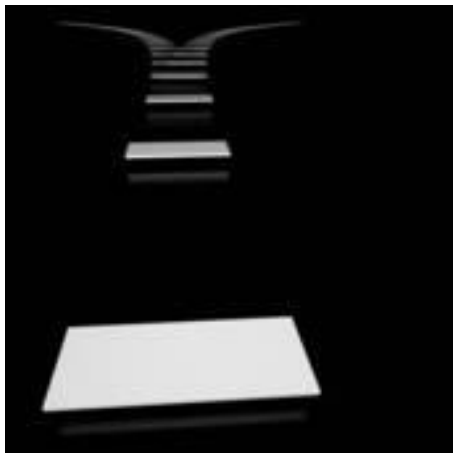


CO_2 Emissions Trending Up



Electric Action Plan

- Pursue Cost Effective Demand-Side Resources
- Develop Strategy to Address Reliance on Market for Capacity in the Intermediate to Long-Term
  - Update to IRP in 4th Quarter 2013
- Pursue Prudent Gas Storage Acquisitions for Generation
- Revise Stakeholder Process to Clarify Roles and Expectations & Provide Greater Transparency



2013 IRP – Key Findings

Concerns About Long-Term Reliance on Market for Capacity

Challenges for Existing Coal-Fired Generation

Infrastructure Challenges

Thank You!

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