Training on Integrated Resource Planning for South Carolina Office of Regulatory Staff

Overview of the major components of an IRP and its development process

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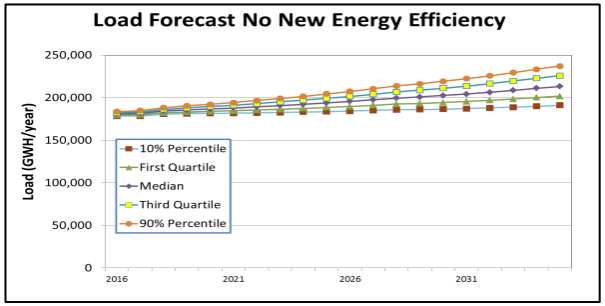
March 1, 2021

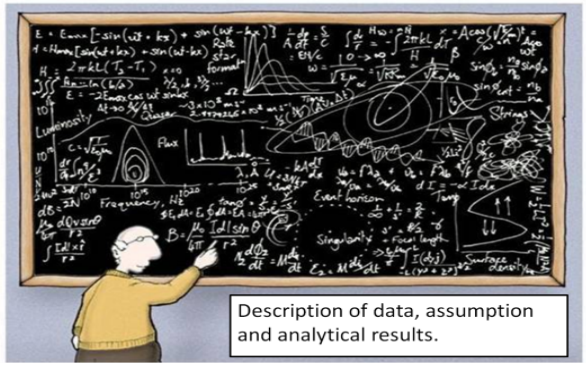
This work was funded by the U.S. Department of Energy's Office of Electricity, Energy Resilience Division, under Contract No. DE-AC02-05CH11231

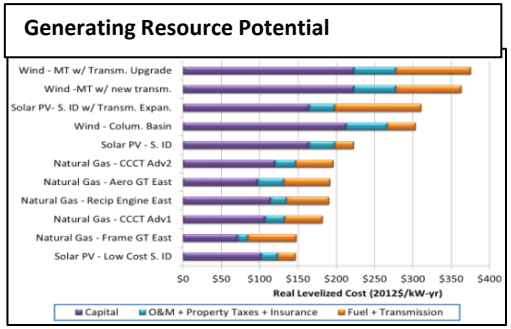
Overview of an Integrated Resource Plans and Planning

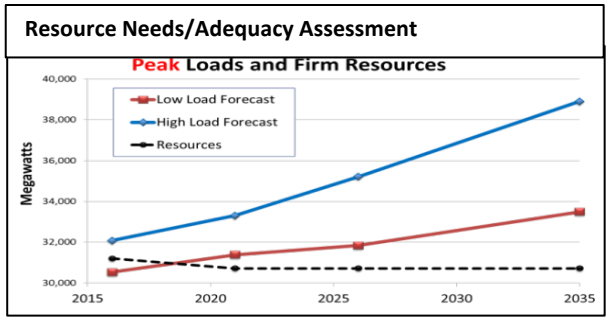
- What are the major components of an IRP?
  - How are these components “integrated”?
- What are the major analytical steps in the IRP development process?
- What types of models are used?
  - What role does each model type play in IRP development?
  - What are the critical inputs/assumptions?
- How can energy efficiency and demand response be treated as resource options?
- How are alternative resource portfolio evaluated?
  - How are uncertainty and risk considered?

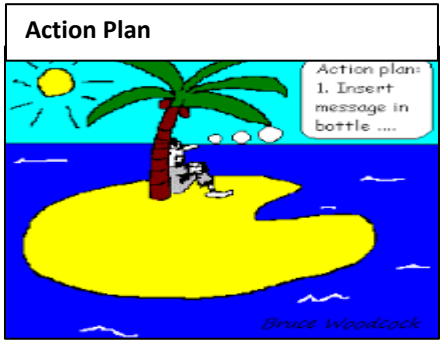
Key Components of IRPs

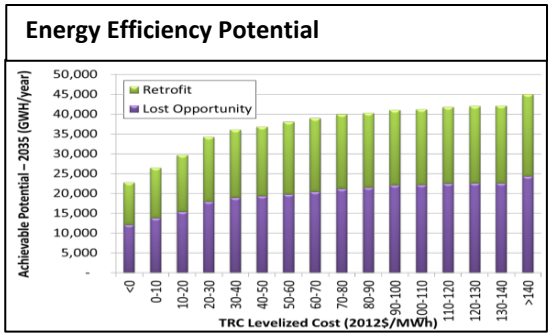


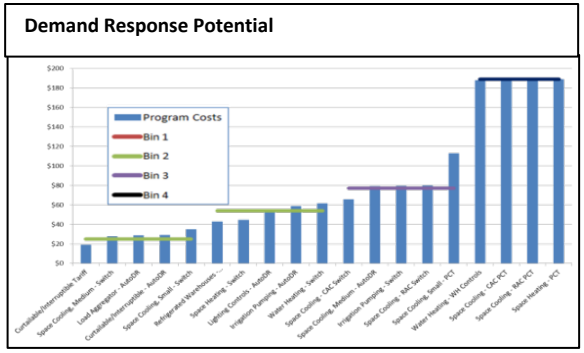


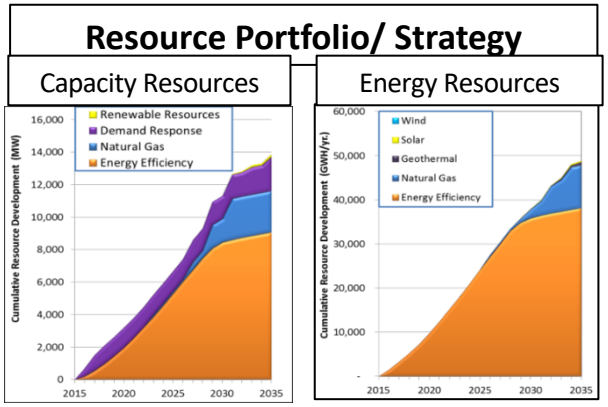


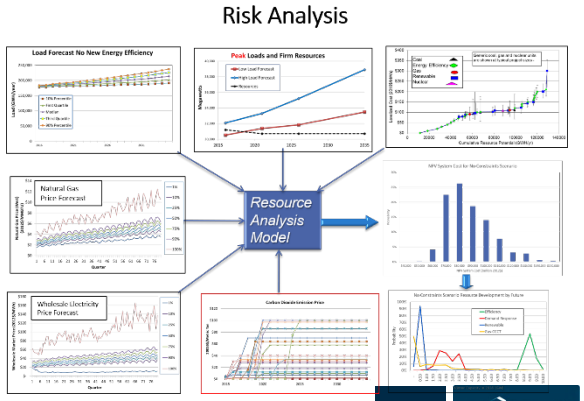






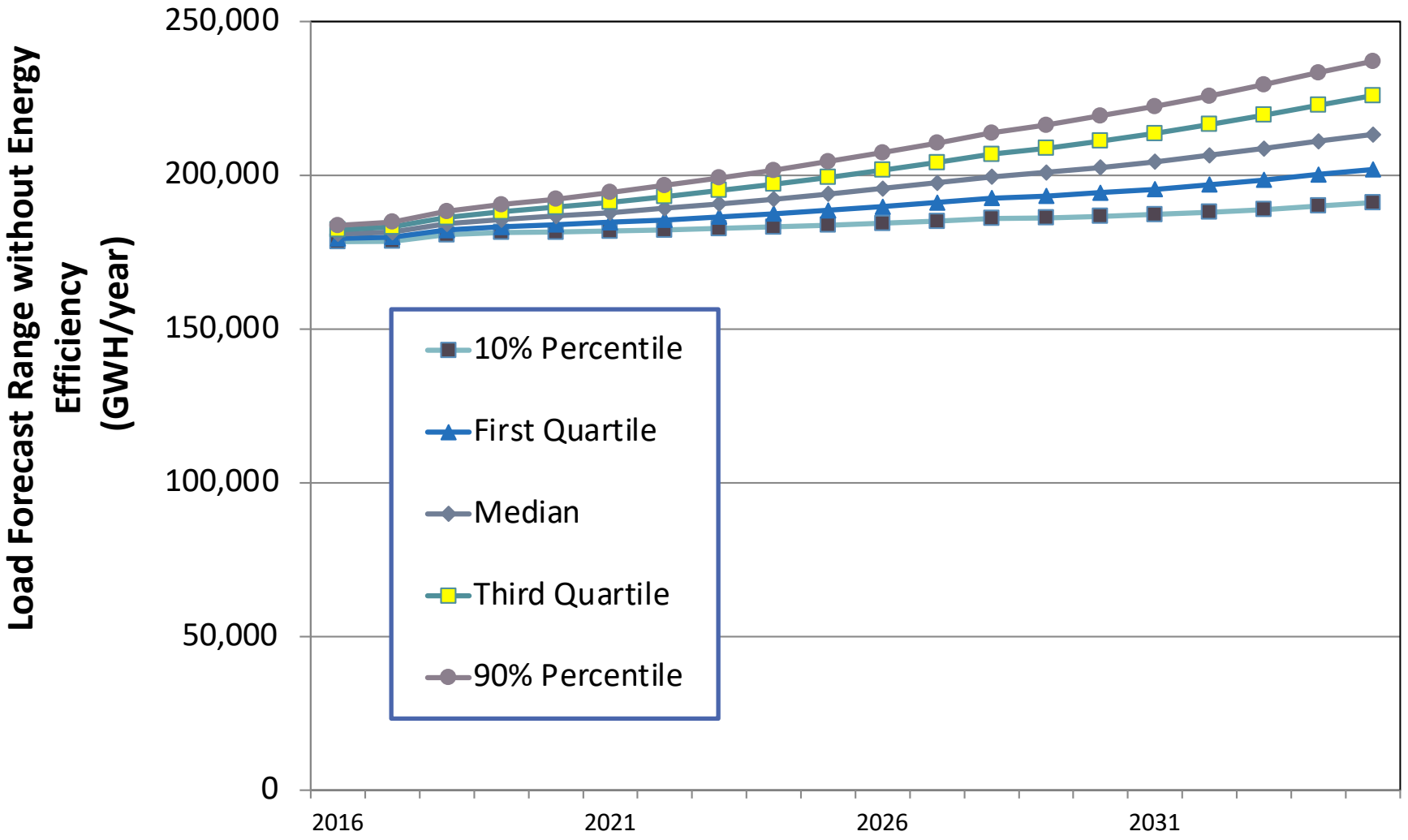






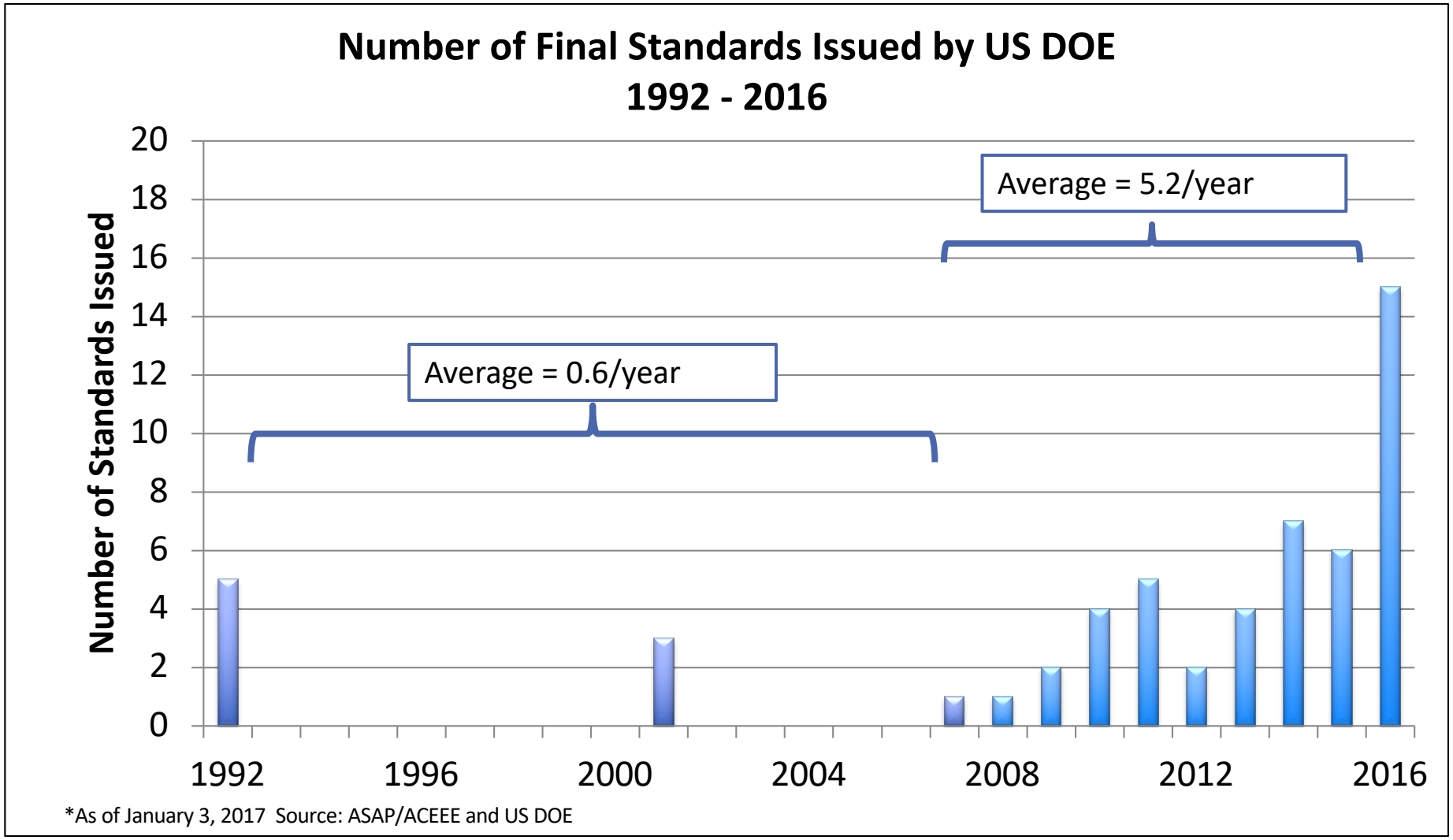
Load Forecast for Energy and Capacity –

Typically provided as a range and *without* additional energy efficiency or demand response



Sidebar Comment on Load Forecasting Methods:

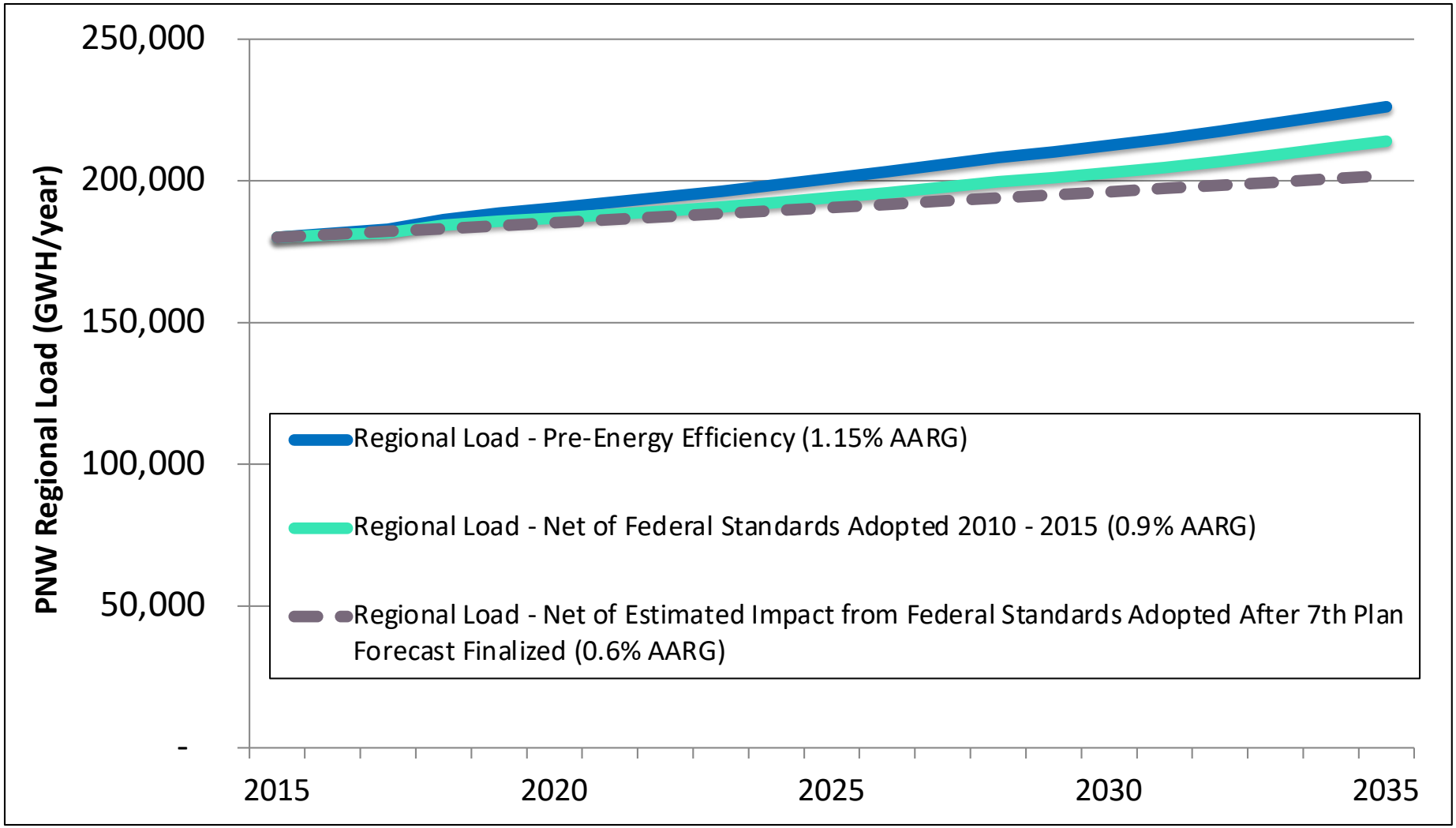
Econometric Load forecasting models generally fail to fully reflect the impact of recently adopted/updated codes and standards – this can lead to systematically over forecasting growth



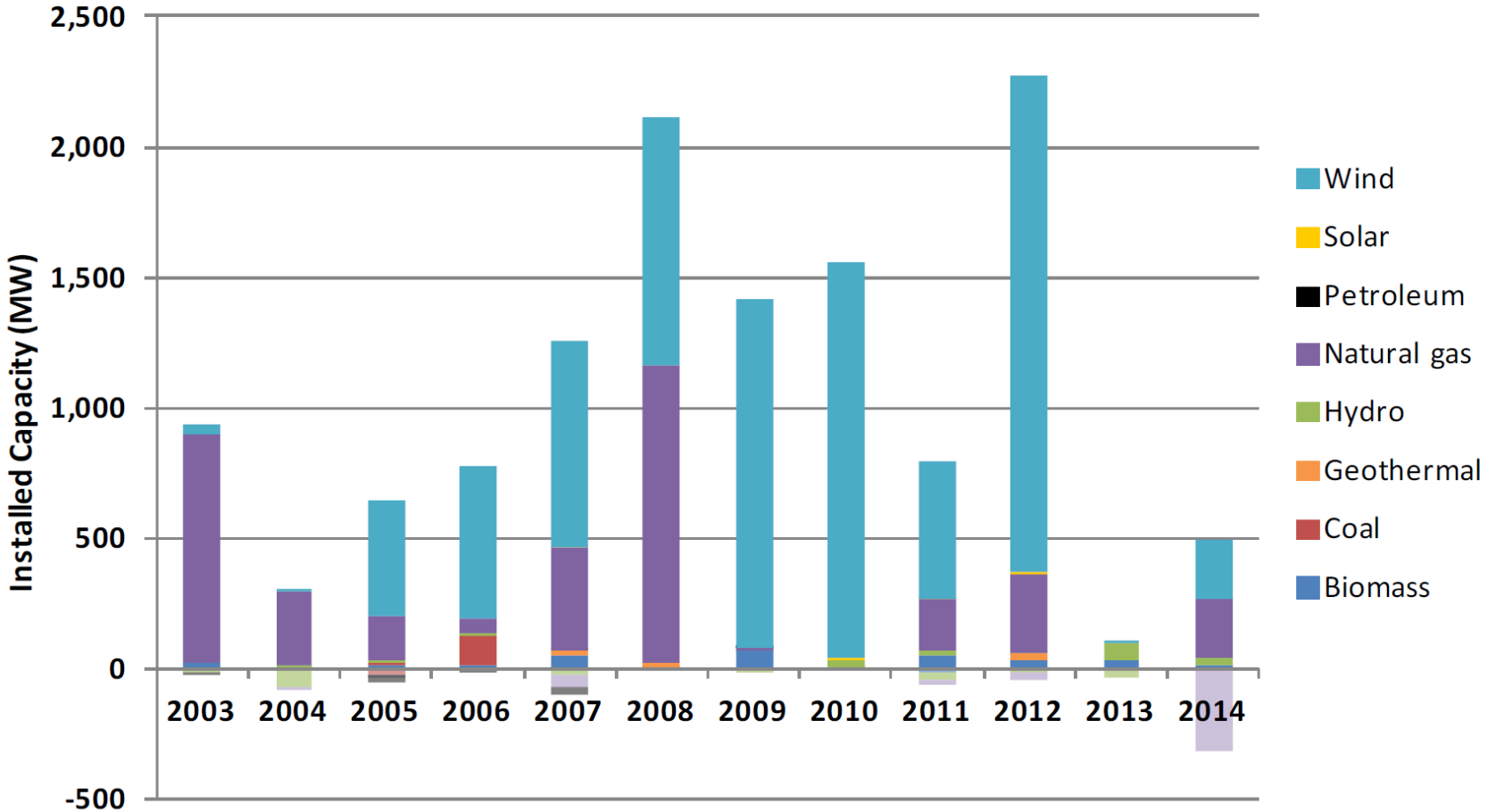
*As of January 3, 2017 Source: ASAP/ACEEE and US DOE

Accurately Accounting for Such Impacts Matters:

Potential Impact on Load Forecast of Known Codes and Federal Standards Seventh Northwest Power and Conservation Plan

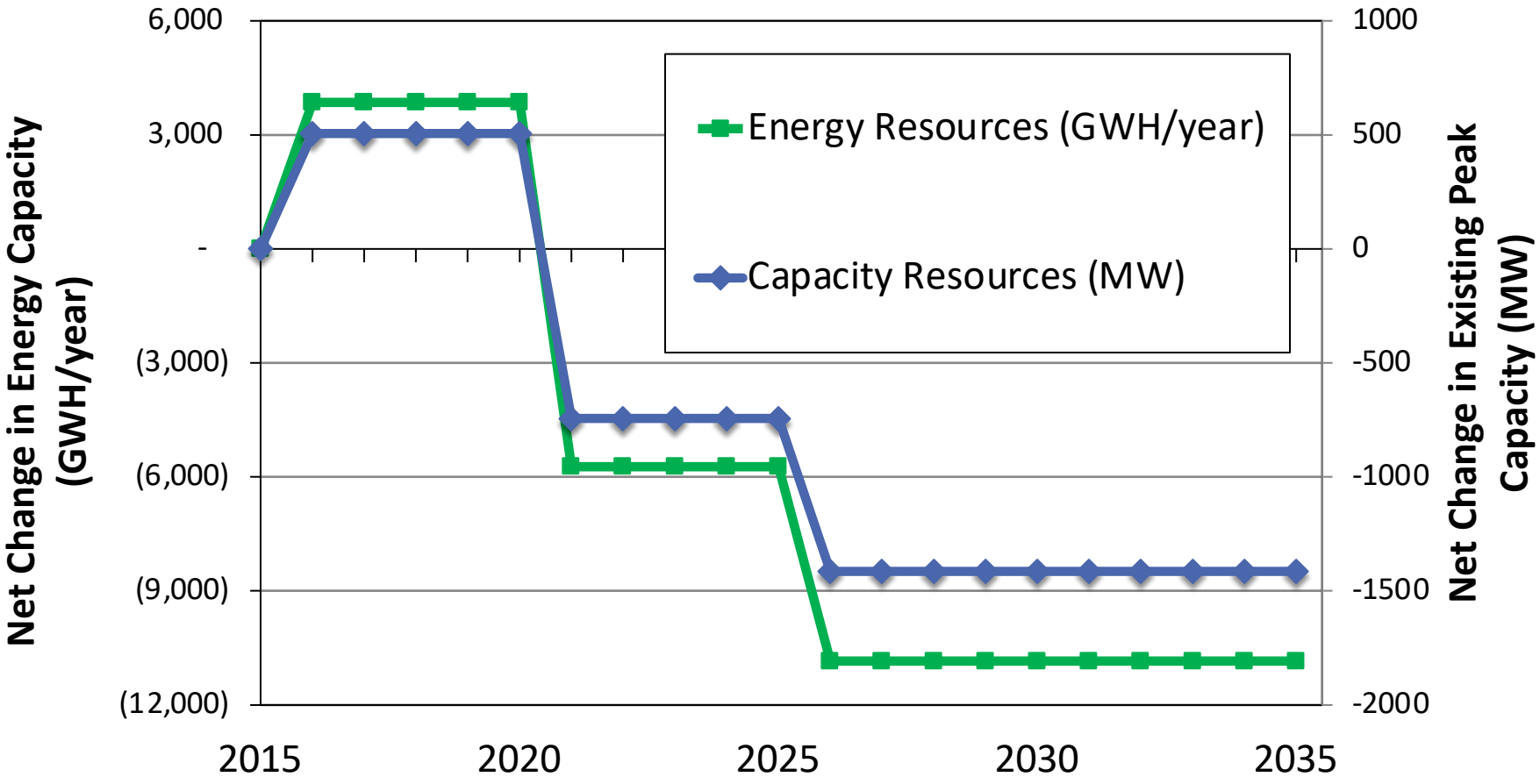


Generating Resource Additions and Retirements



* Projects considered additions if in service or construction is near complete.
Retirements do not include plants that have been idled for potential future use.

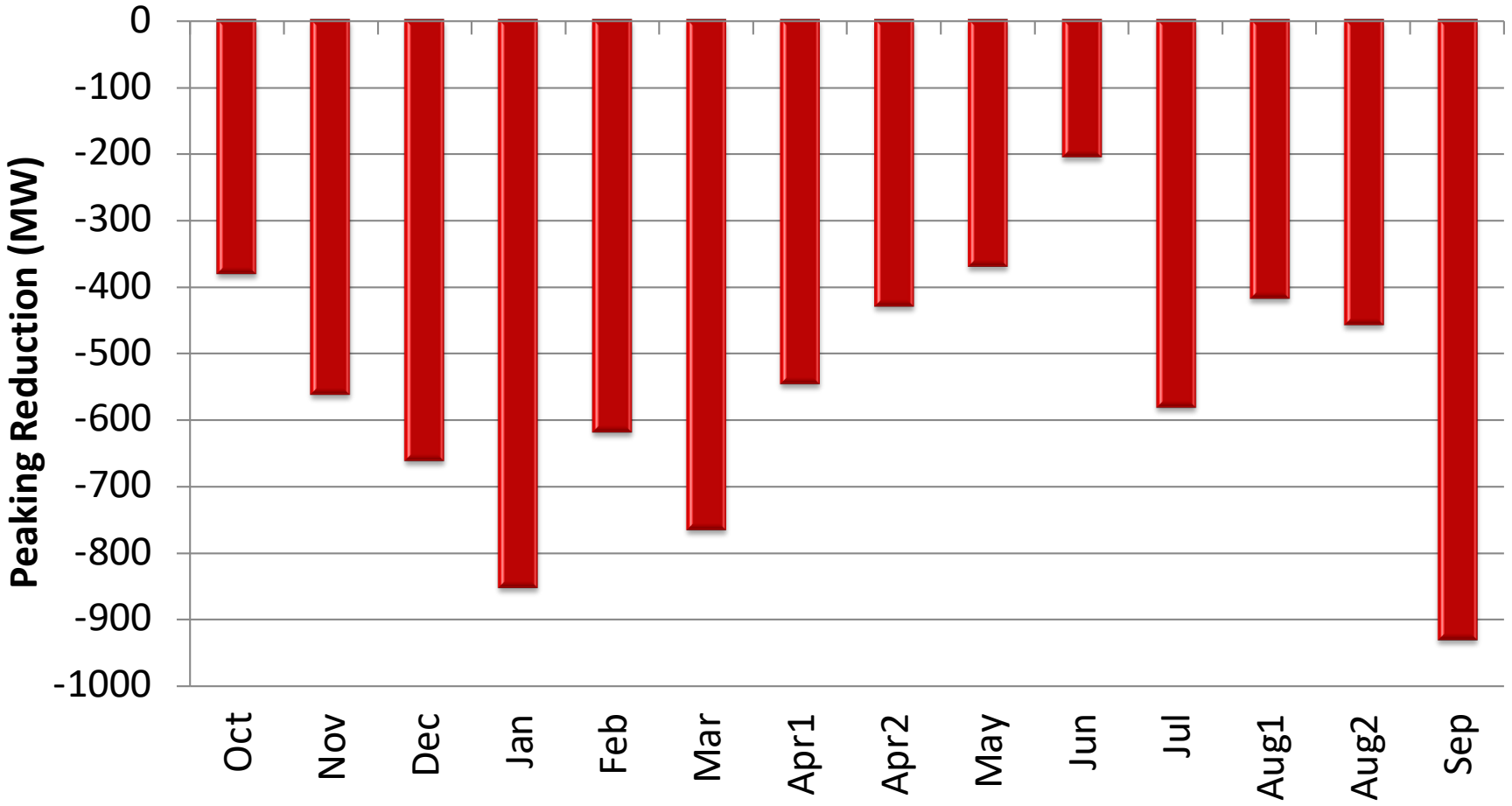
Forecast Changes in Existing Resources



Resource Adjustments for Reserves/Ancillary Services

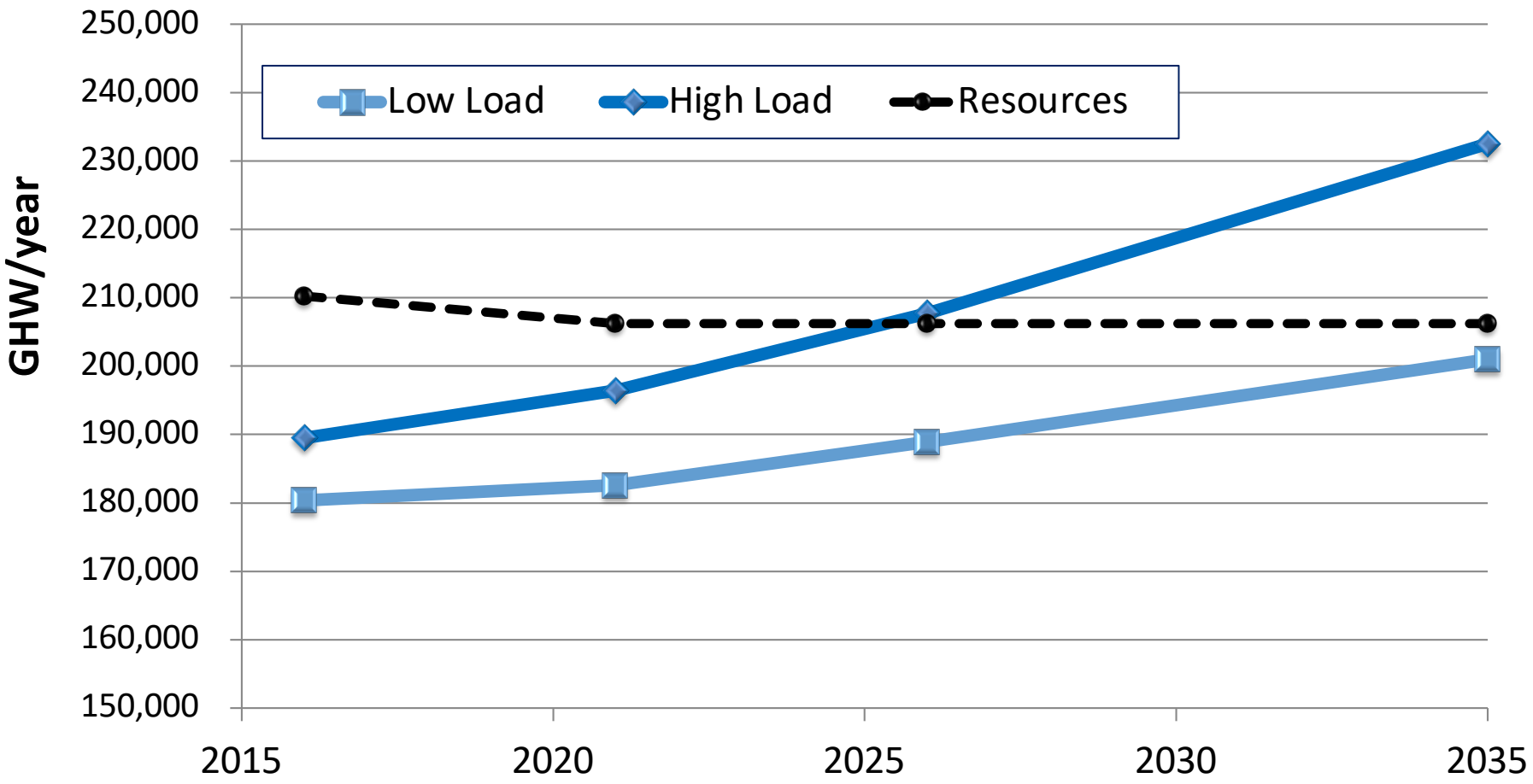
(e.g., Balancing and Flexibility Reserves)

Reduction in 10-Hour Sustained-Peaking Capability for "INC" and "DEC"

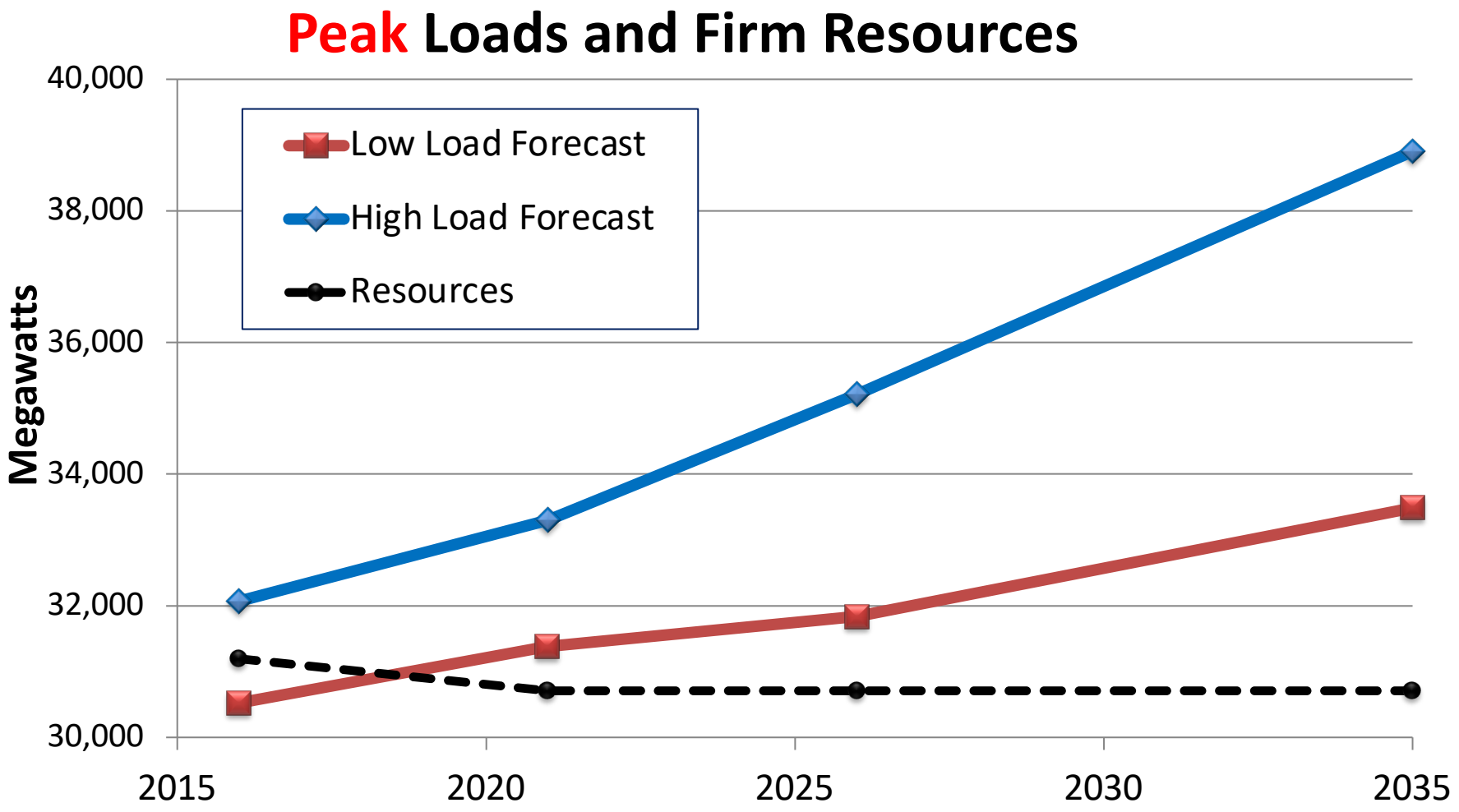


Resource Needs Assessment - Energy

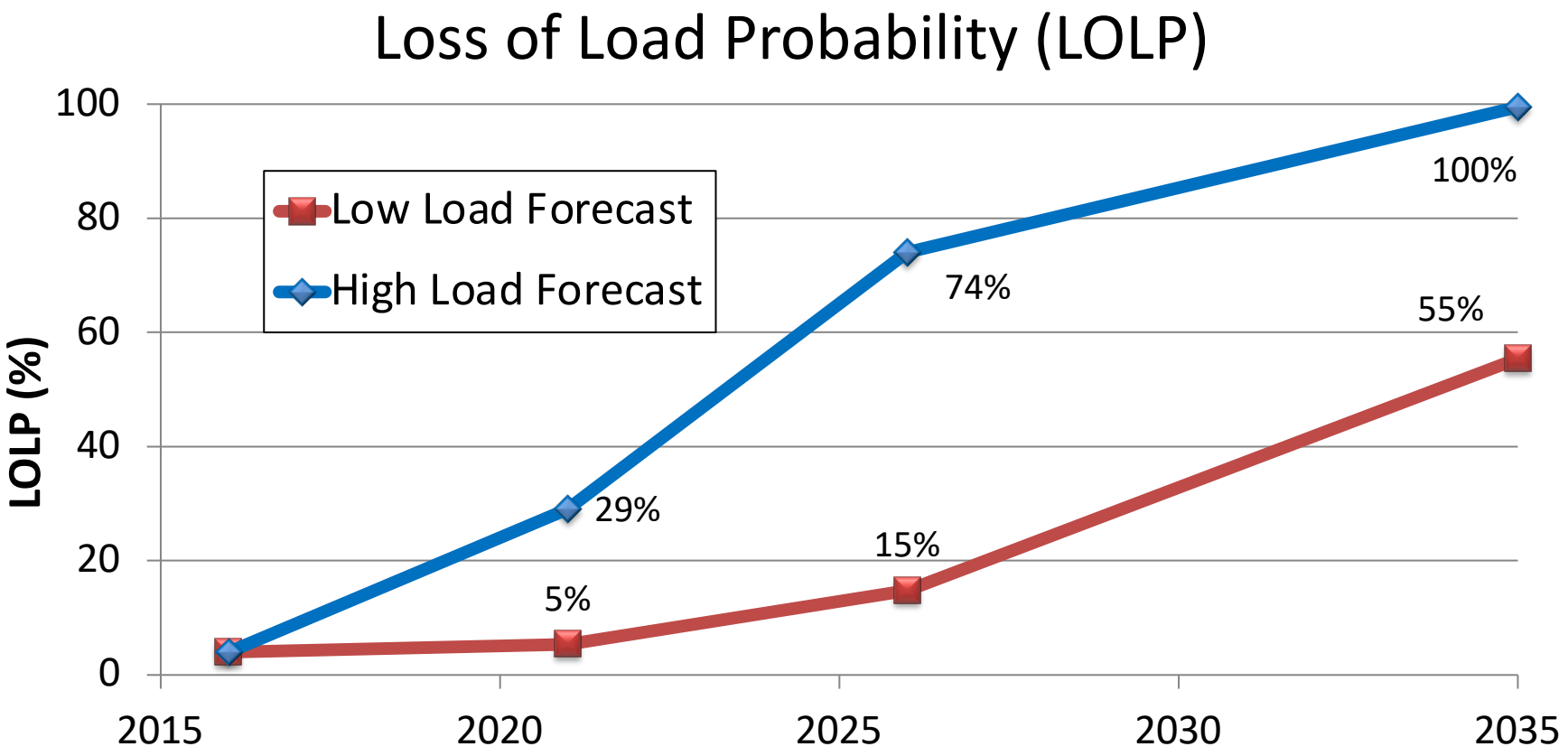
Annual Energy Loads and Firm Resources



Resource Needs Assessment - Capacity

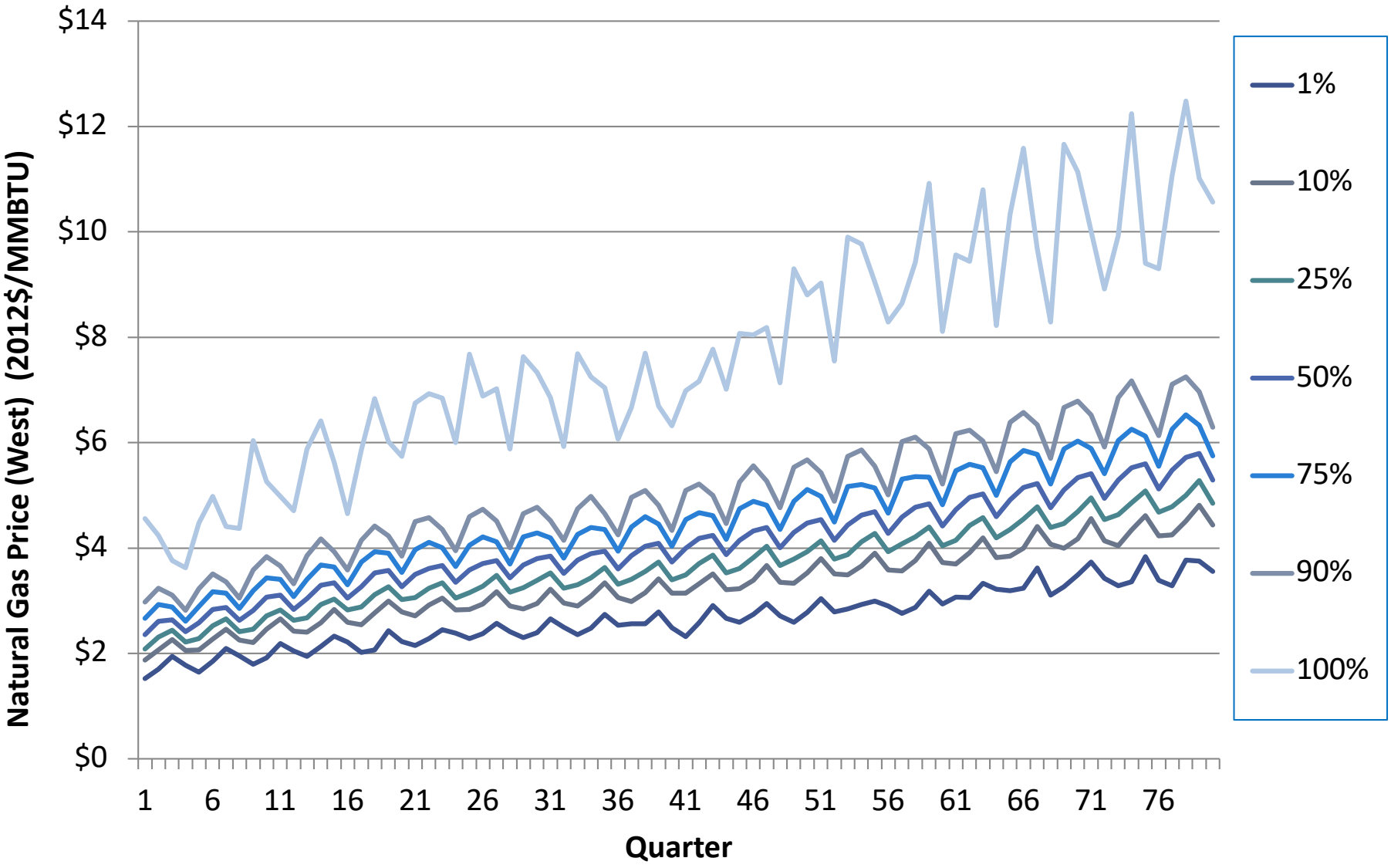


More Sophisticated Needs Assessments Employ Probabilistic Resource Adequacy Analysis*

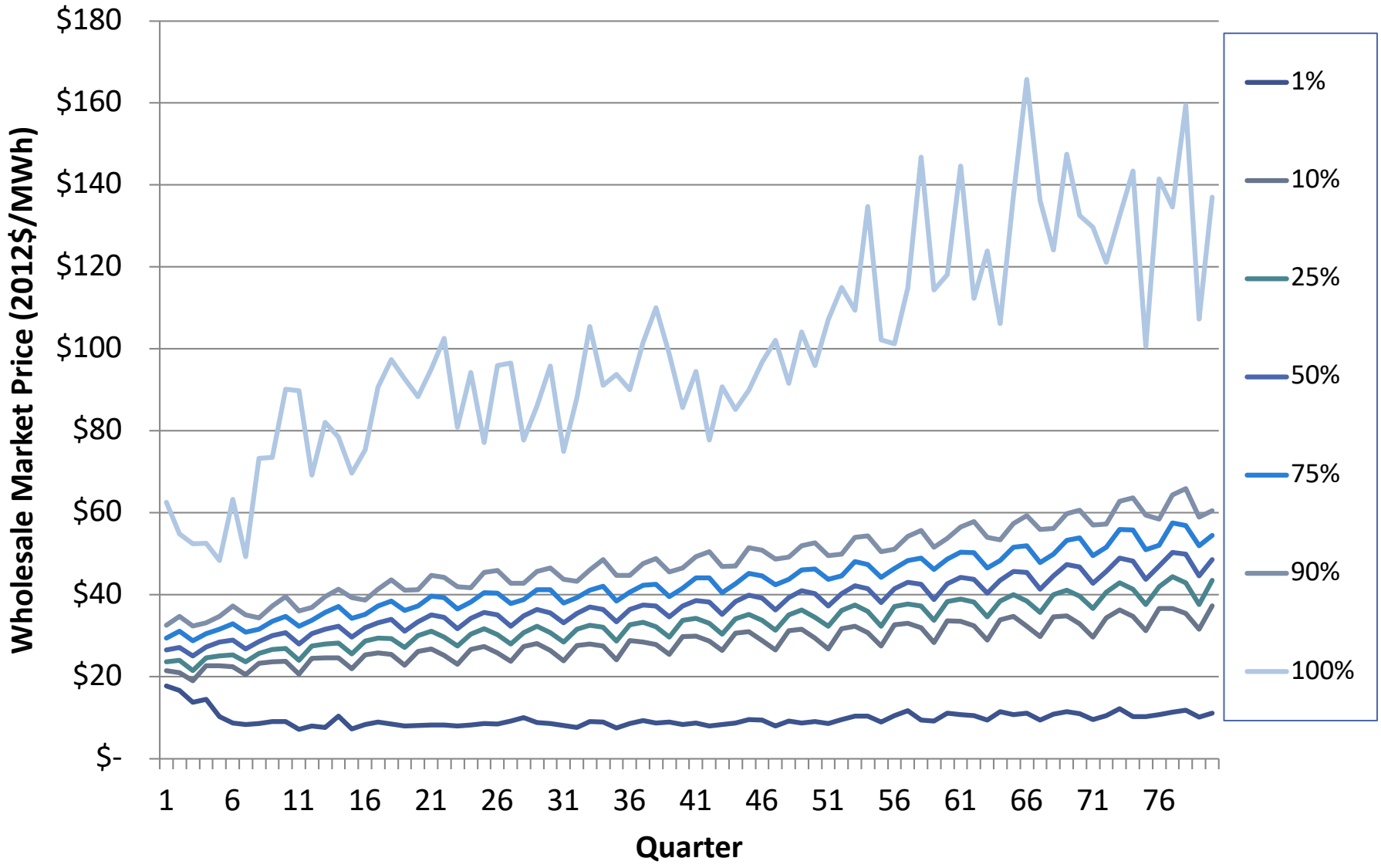


*Note: Resource Adequacy Assessments may be done independently of IRPs, but their results are used in an IRP, so data and assumptions used in both analysis should be internally consistent.

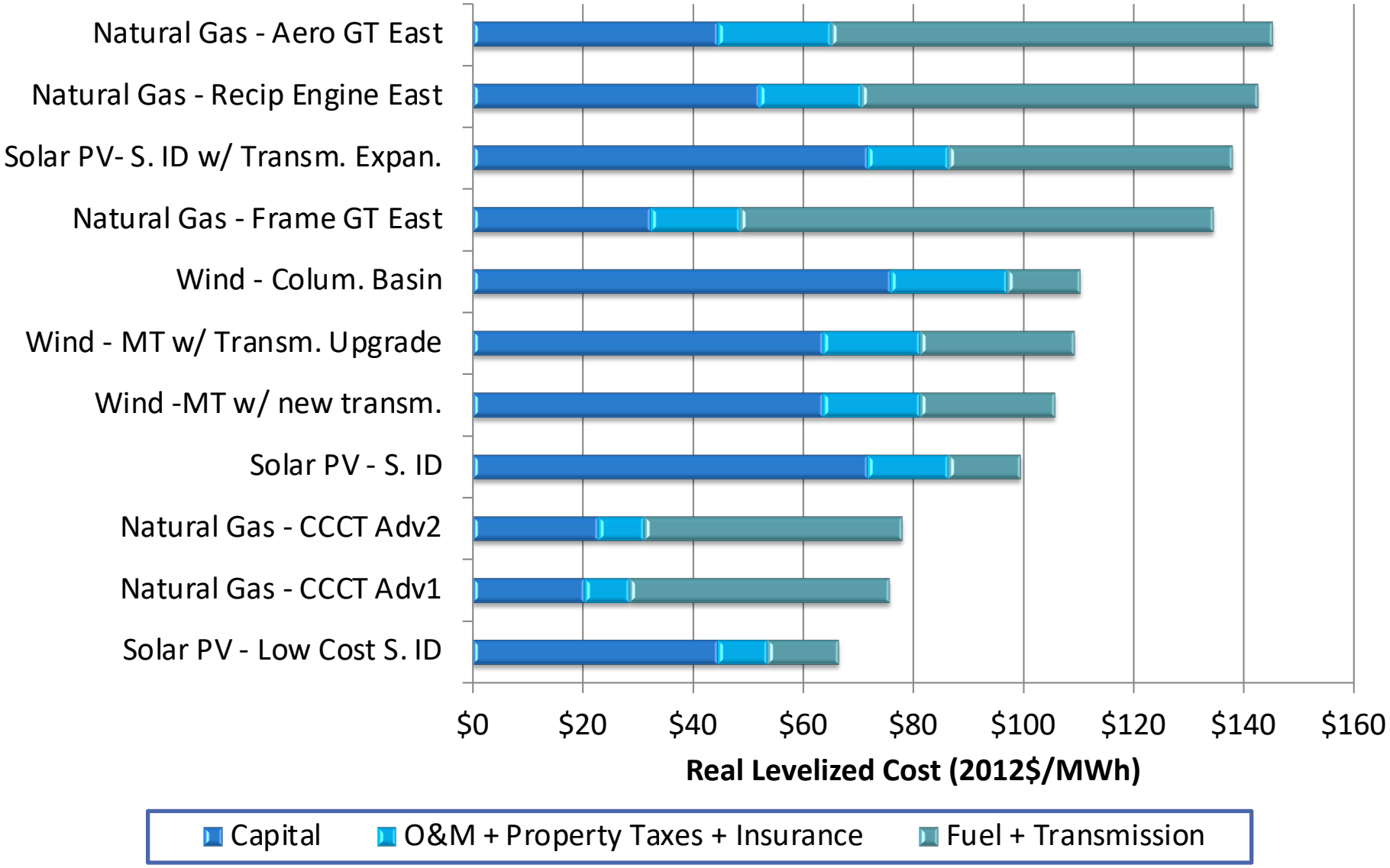
Natural Gas (and other fuel) Price Forecast Range



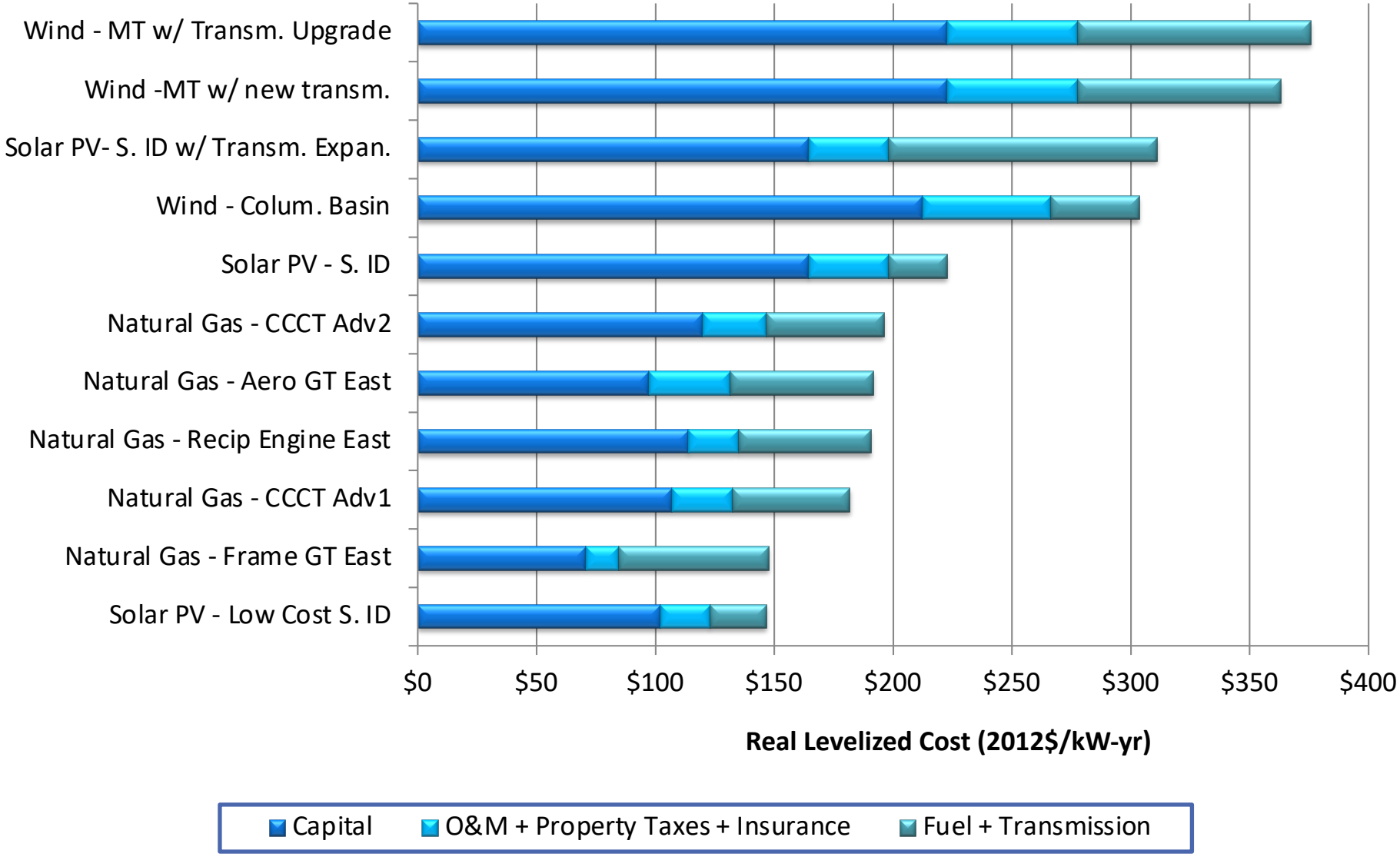
Wholesale Electricity Price Forecast Range



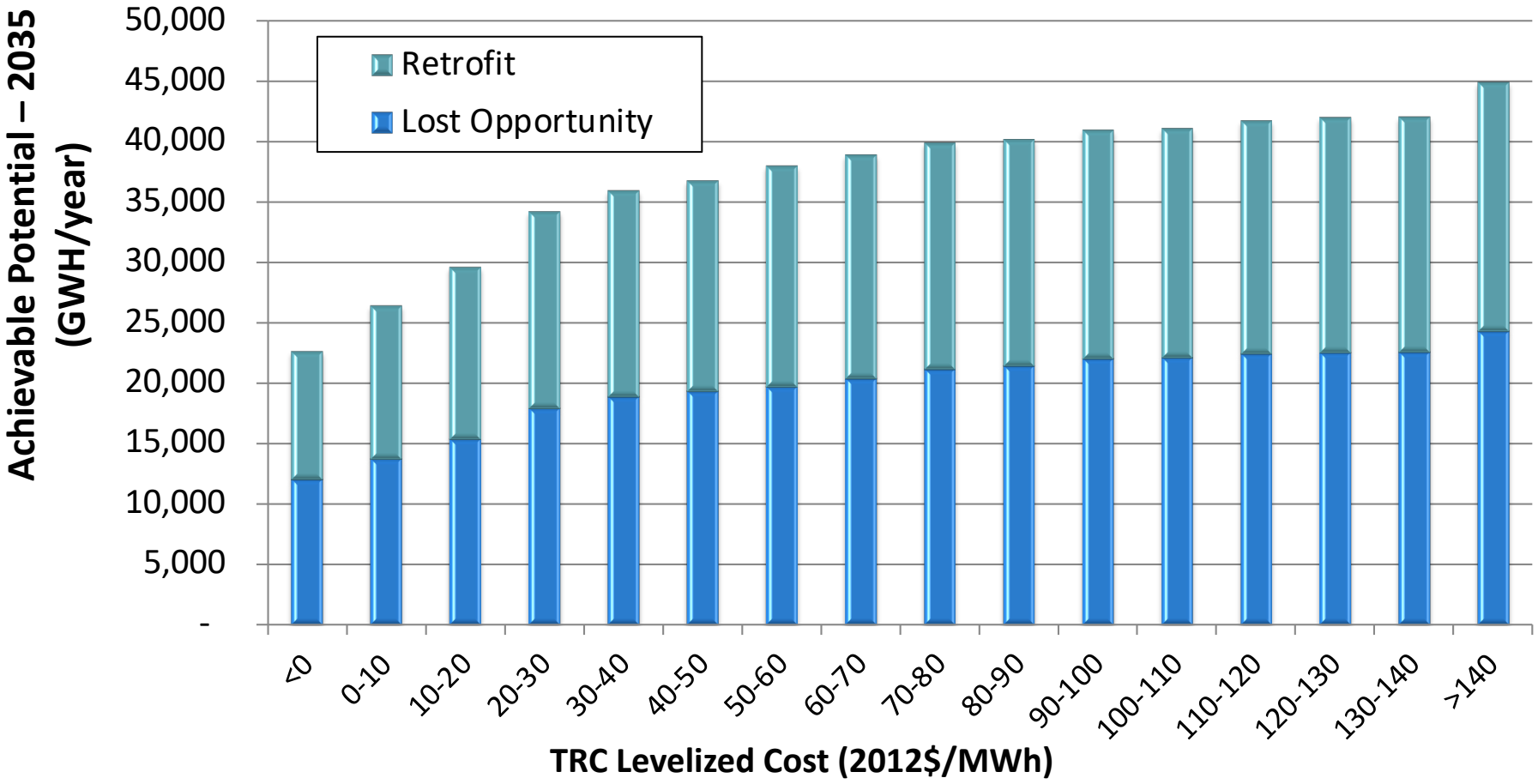
Generating Resource Cost Estimates –
Energy Capability, Operating Characteristics and Cost



Generating Resource Cost Estimates –
Peak Capacity, Operating Characteristics and Cost

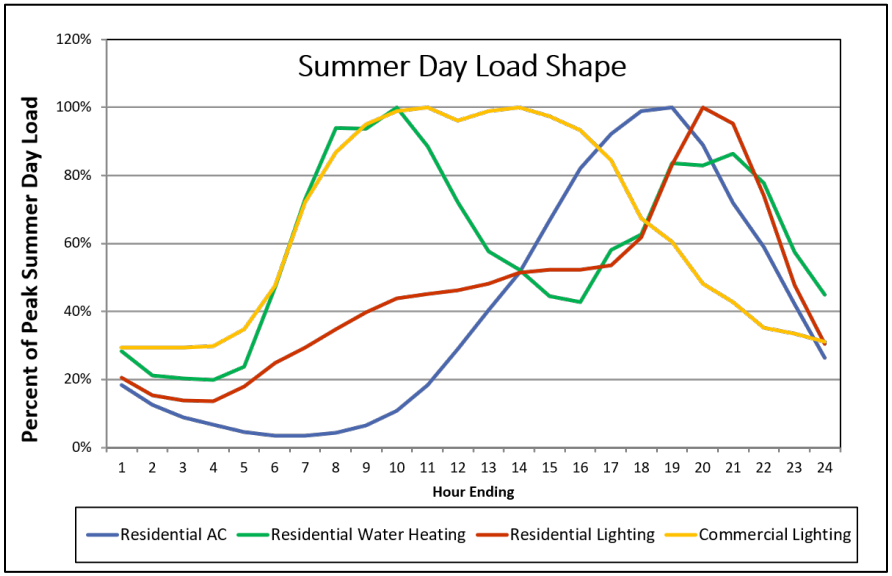


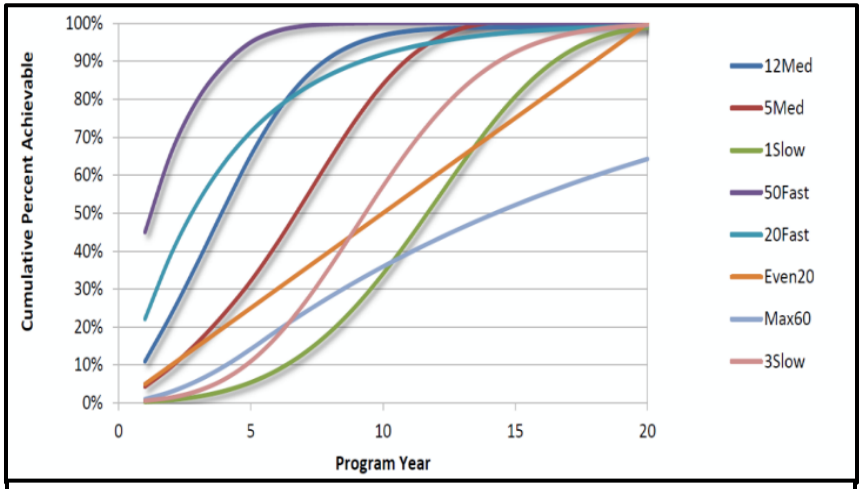
Energy Efficiency Resource Assessment:
Technical and Achievable Potential*



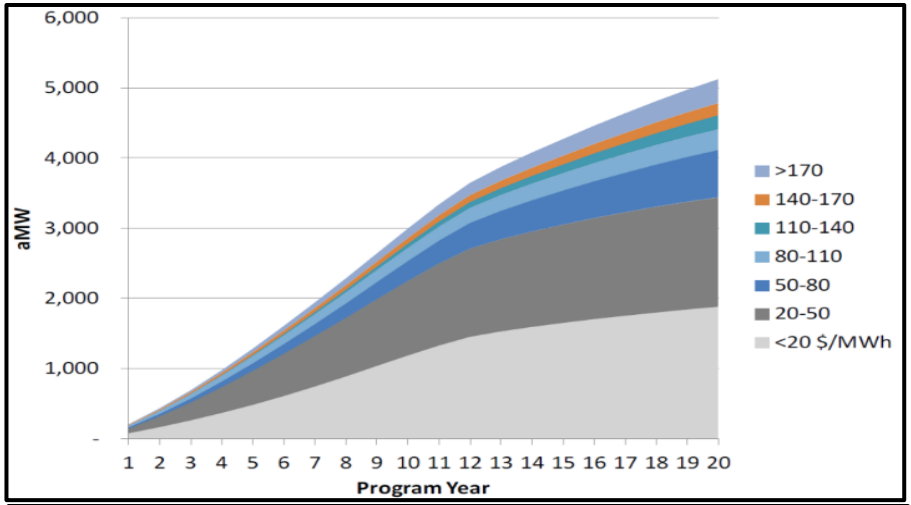
*Economically achievable potential is best derived through modeling efficiency as a resource in capacity expansion models.

Energy Efficiency Resource Assessment: Load Shape and Deployment limits



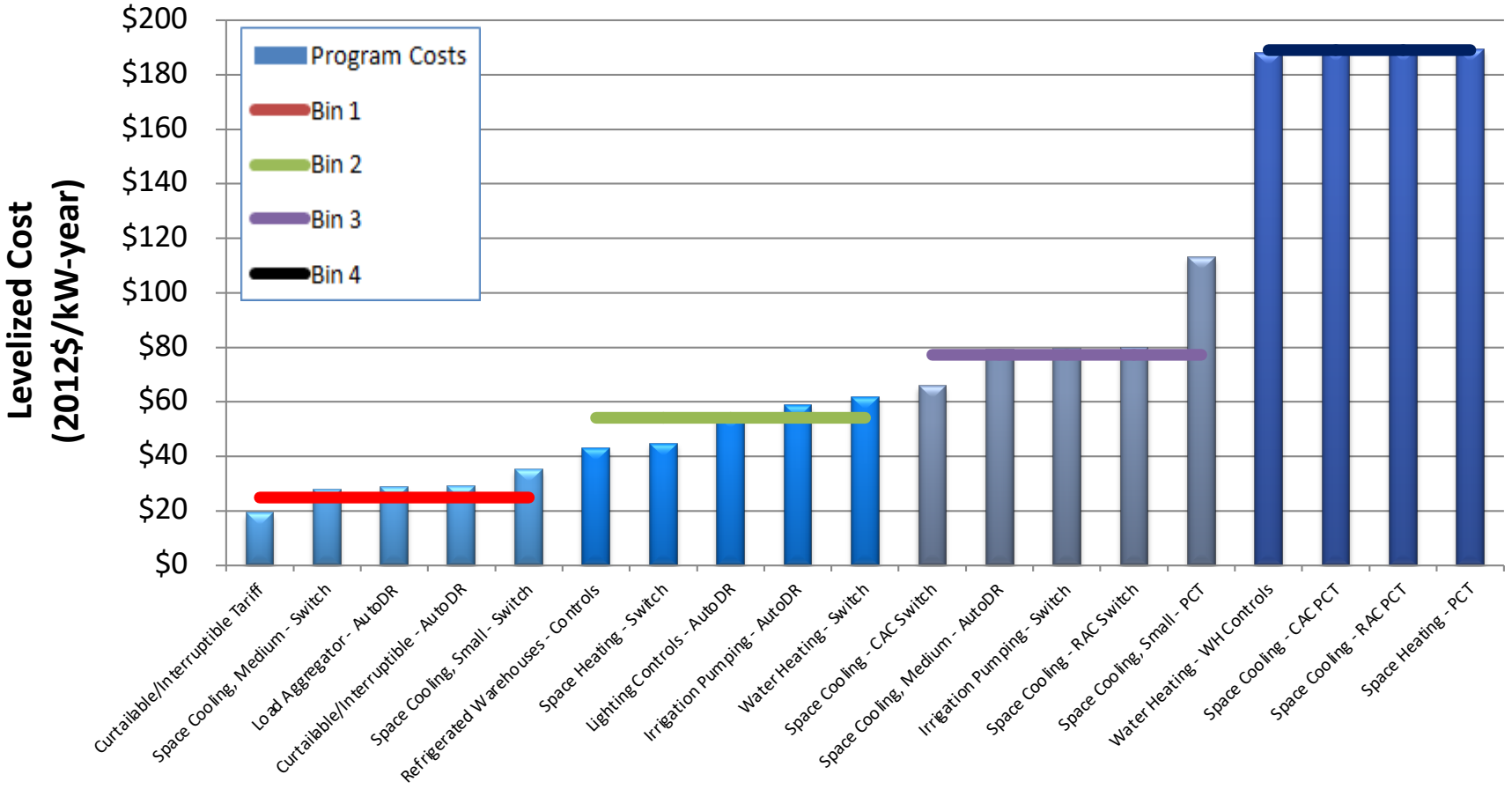


Maximum Ramp Rates



Maximum Annual and Cumulative Achievable Potential

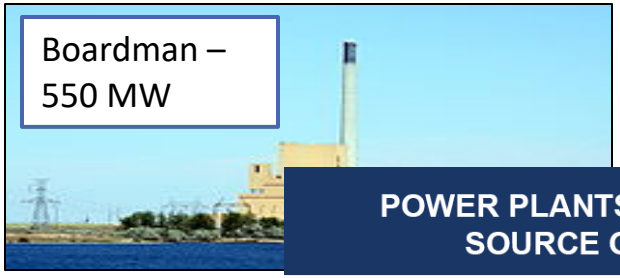
Demand Response Resource Assessment: Technical and Achievable Potential*



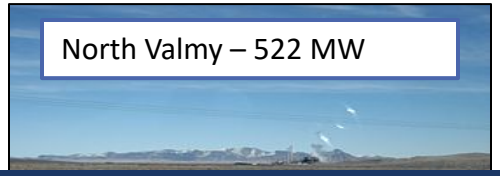
*Economically achievable potential is best derived through modeling demand response as a resource in capacity expansion models.

Description of Major Issues Potentially Impacting Resource Planning Environment

Centralia 1 & 2 – 1340 MW

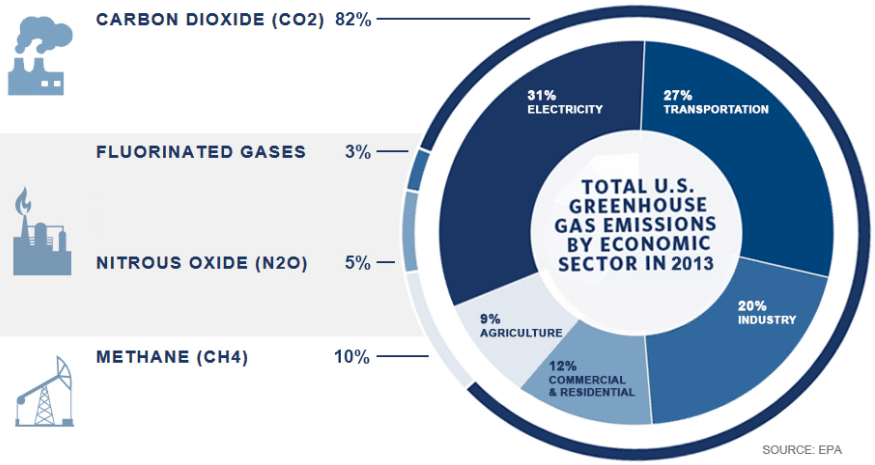


Boardman – 550 MW

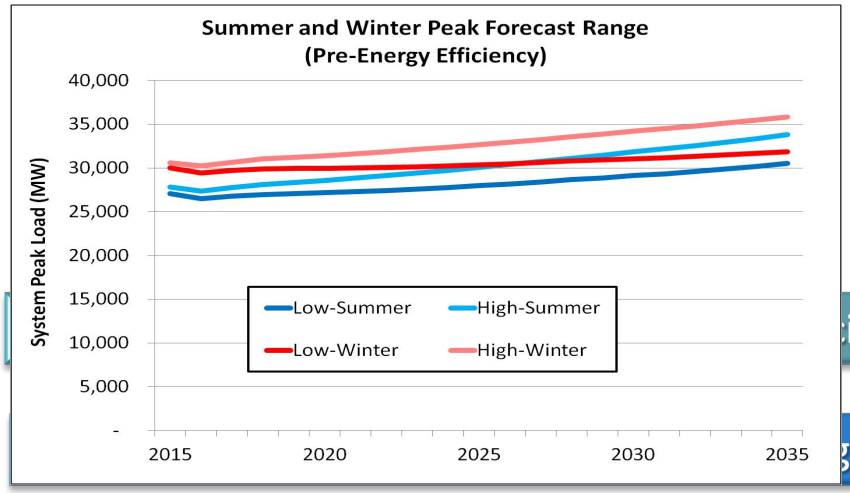


North Valmy – 522 MW

POWER PLANTS ARE THE SINGLE LARGEST SOURCE OF CARBON POLLUTION



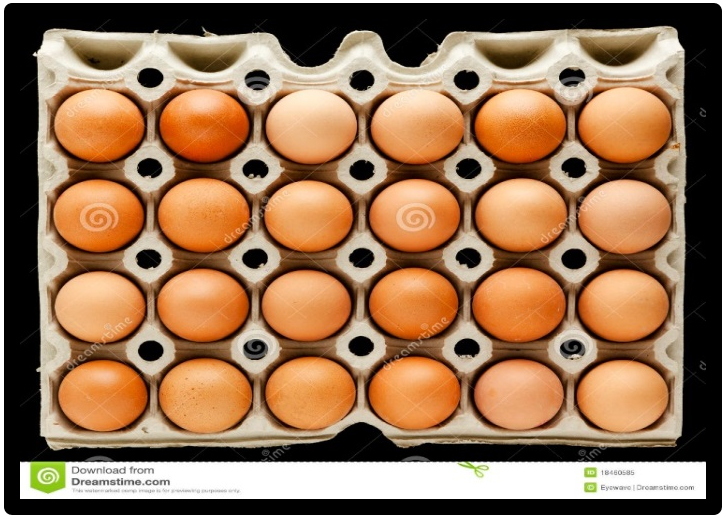
Impact of announced coal-plant retirements



ity (i.e., peaking) resources

g EPA's Clean Power Plan

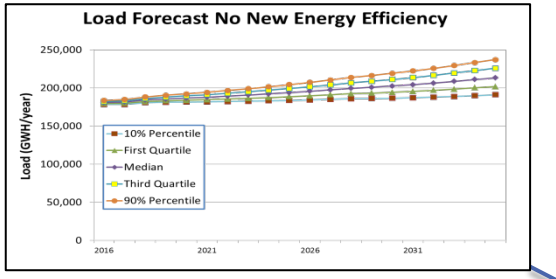
Description of the Scenarios Tested

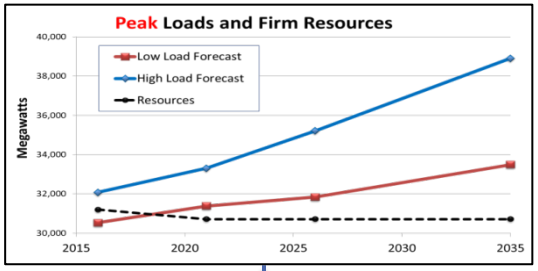


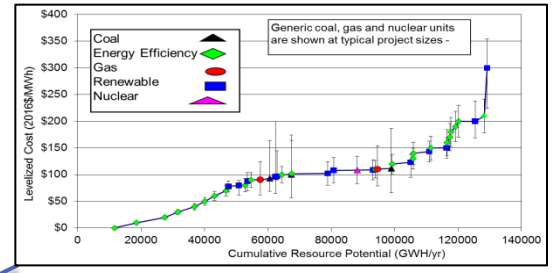
Example: Over Two Dozen Scenarios Were Tested As Part of the Development of the Council's Seventh Power Plan

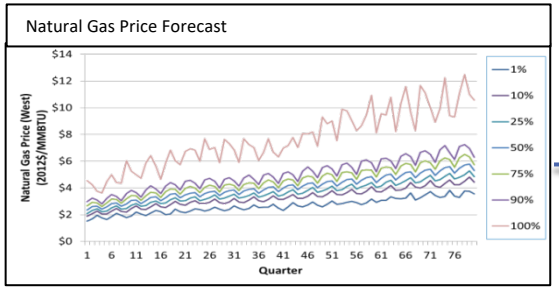
- Existing Policy
- Social Cost of Carbon
- Retire Coal
- Retire Coal and Inefficient Gas
- Retire Coal & Impose Social Cost of Carbon
- Retire Coal & Impose Social Cost of Carbon & No New Gas
- Regional RPS @ 35%
- No Demand Response
- Increase Market Reliance
- Limit Energy Efficiency Acquisitions to Market Price

Description of Resource Analysis Methods and Assumptions

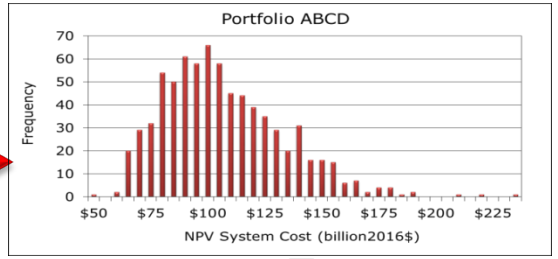


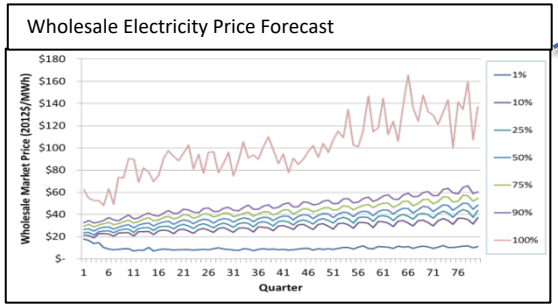


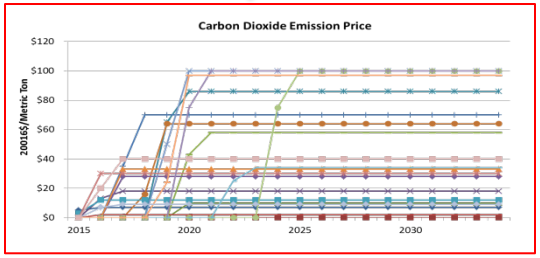


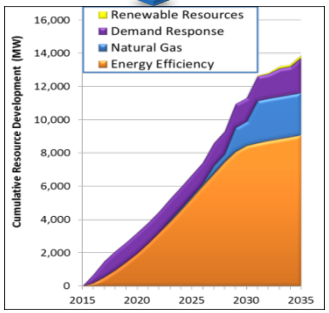


Resource Analysis Model

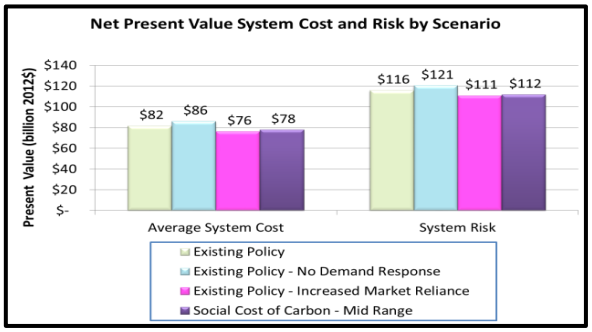


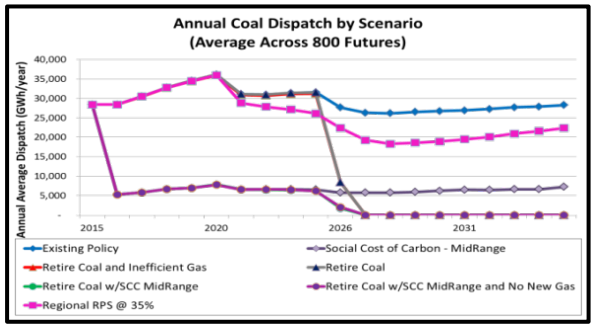


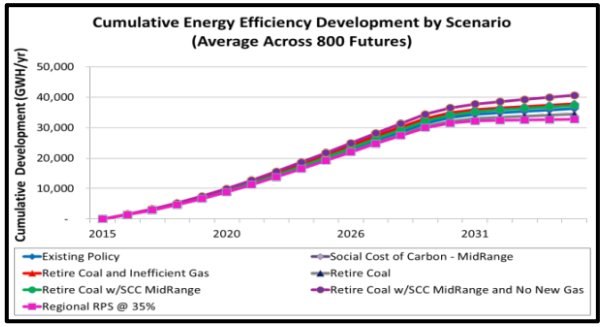


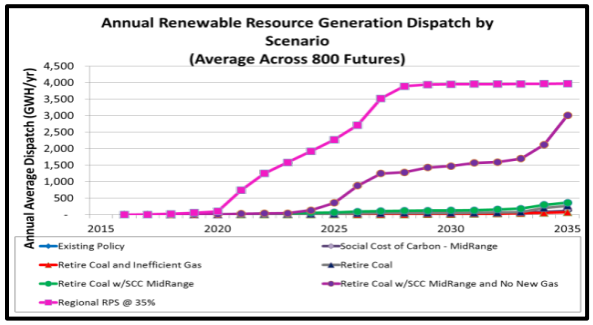


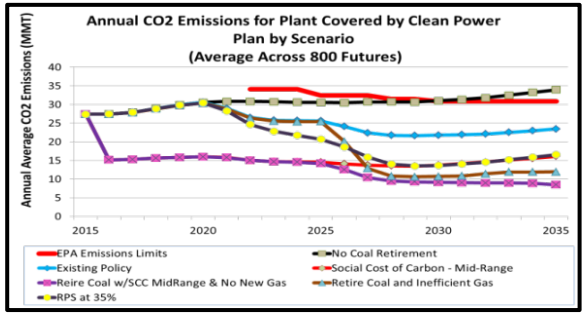
Publicly Available Analytical Findings

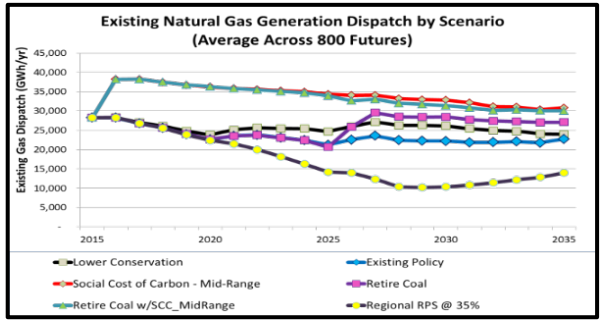


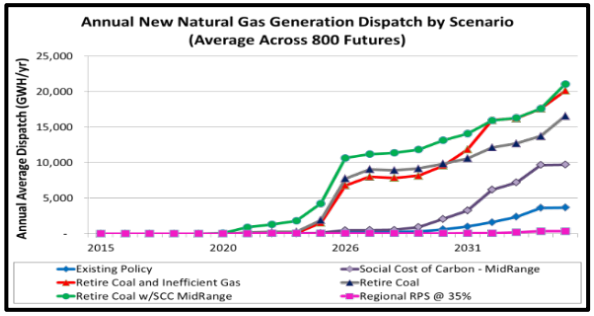


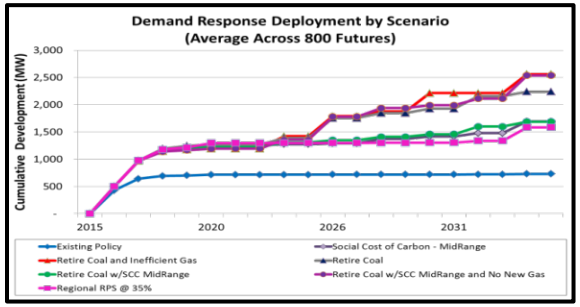


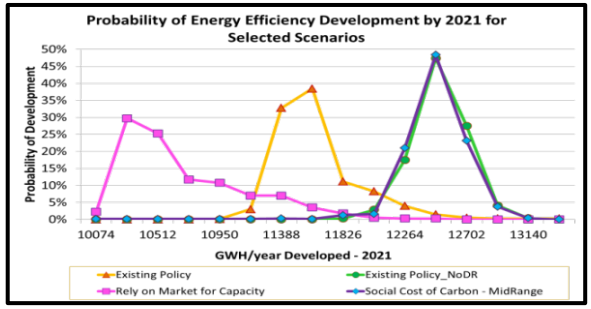






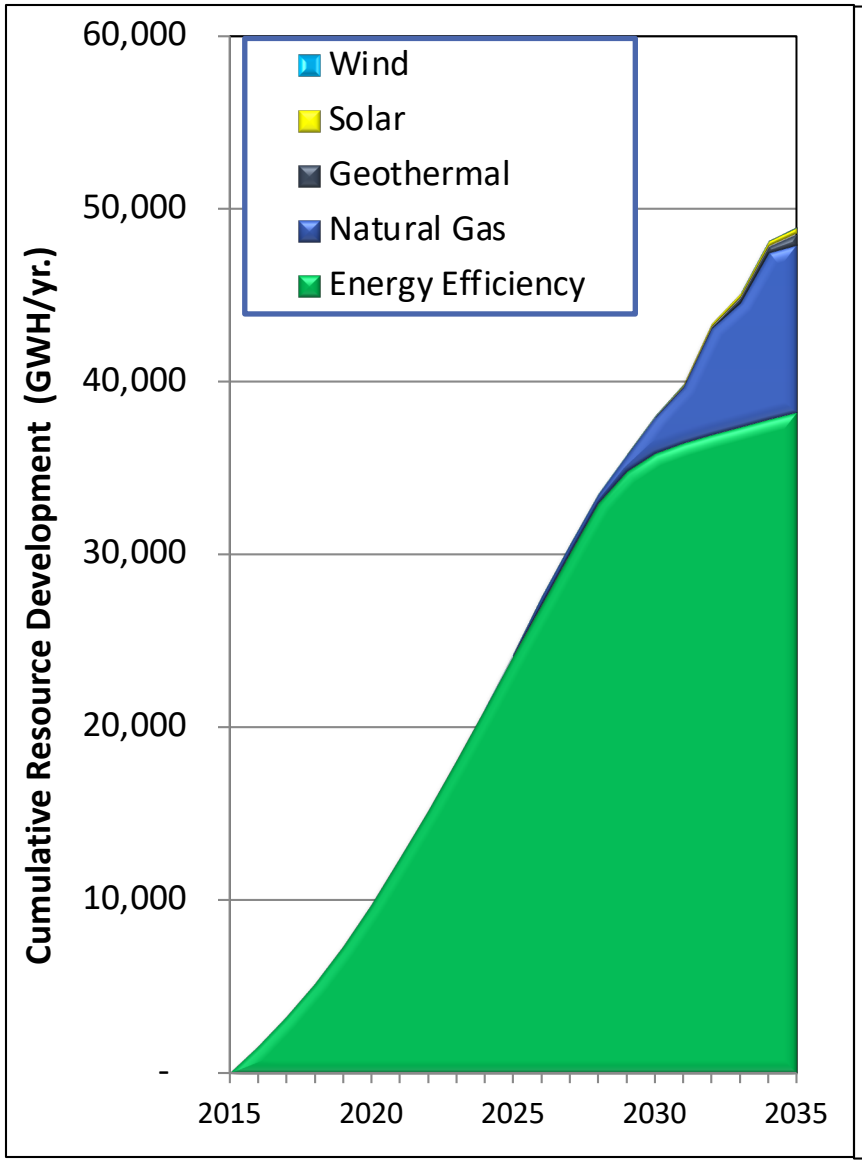


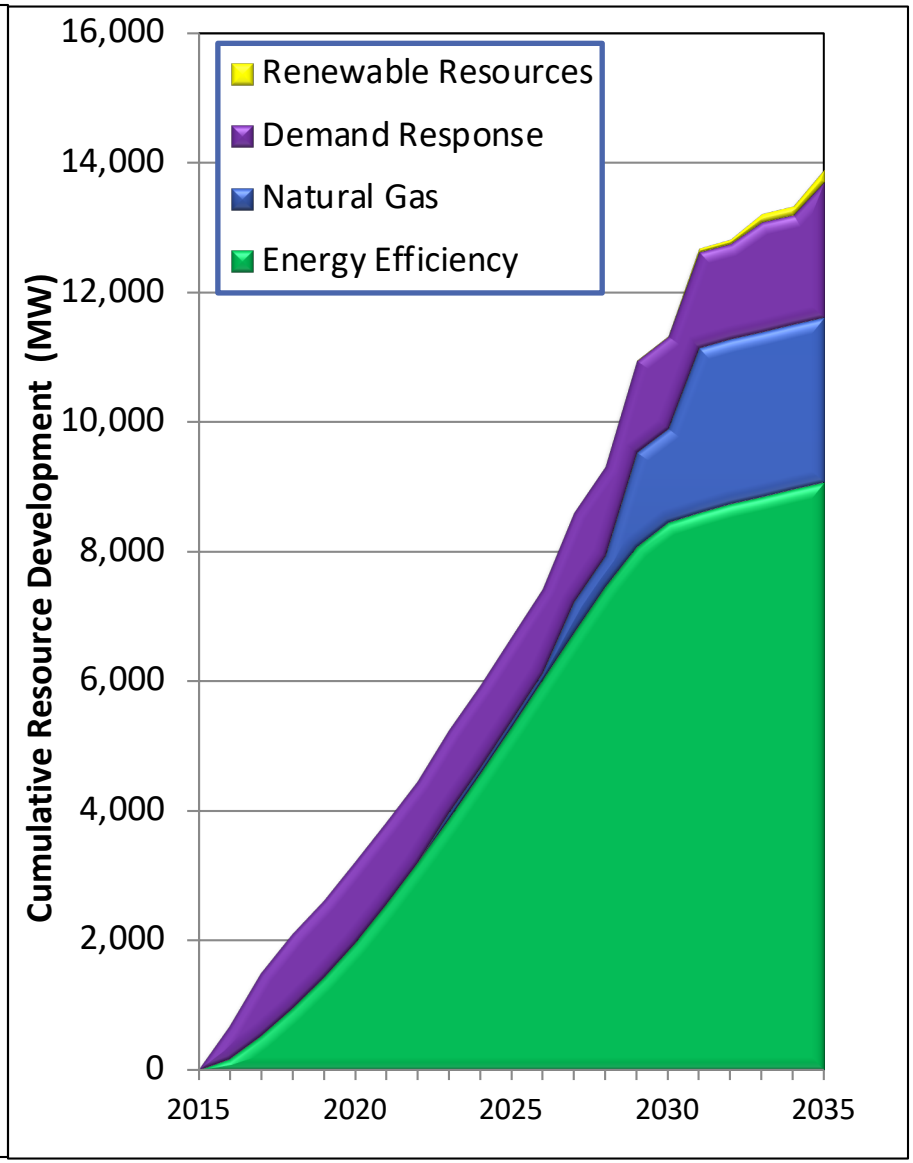




Source: Seventh Northwest Power and Conservation Plan

Preferred Resource Strategies for Meeting Forecast Energy and Capacity Needs Over Planning Period





An Action Plan:

- Preferred Resource development/management actions
  - EE & DR goals
  - Generation, including ancillary services/reserves
  - Transmission and Distribution
  - Risk management
- Non-resource development actions
  - Analytical capability enhancement
  - Data development
  - Research on emerging technologies