Northwest **Power** and **Conservation** Council

May 1, 2018

MEMORANDUM

TO: **Power Committee**

FROM: **Ben Kujala**

SUBJECT: **Report on the Bonneville Resource Program**

BACKGROUND:

Presenters: Bonneville Staff: Rob Petty and Danielle Walker

Summary: Bonneville will present to the Council results from the Bonneville portfolio analysis in the AURORA model. In the last Council meeting, the inputs into the analysis were extensively discussed. This will be an opportunity for Bonneville to share on the methods and results of the portfolio analysis.

Relevance: The Resource Program is an inquiry by Bonneville into needs and resource possibilities at a level of detail and specificity the Council has not gone into in the power plan. The Council's ultimate interest under the Act is in seeing Bonneville make resource decisions that are as consistent as can be with the Council's power plan, even as Bonneville takes that inquiry into more specificity

Workplan: Monitor and Report to Council on BPA Resource Program. Action items BPA-2, BPA-4, ANLYS-11.

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BPA Resource Program Draft Results

May 8, 2018

Agenda

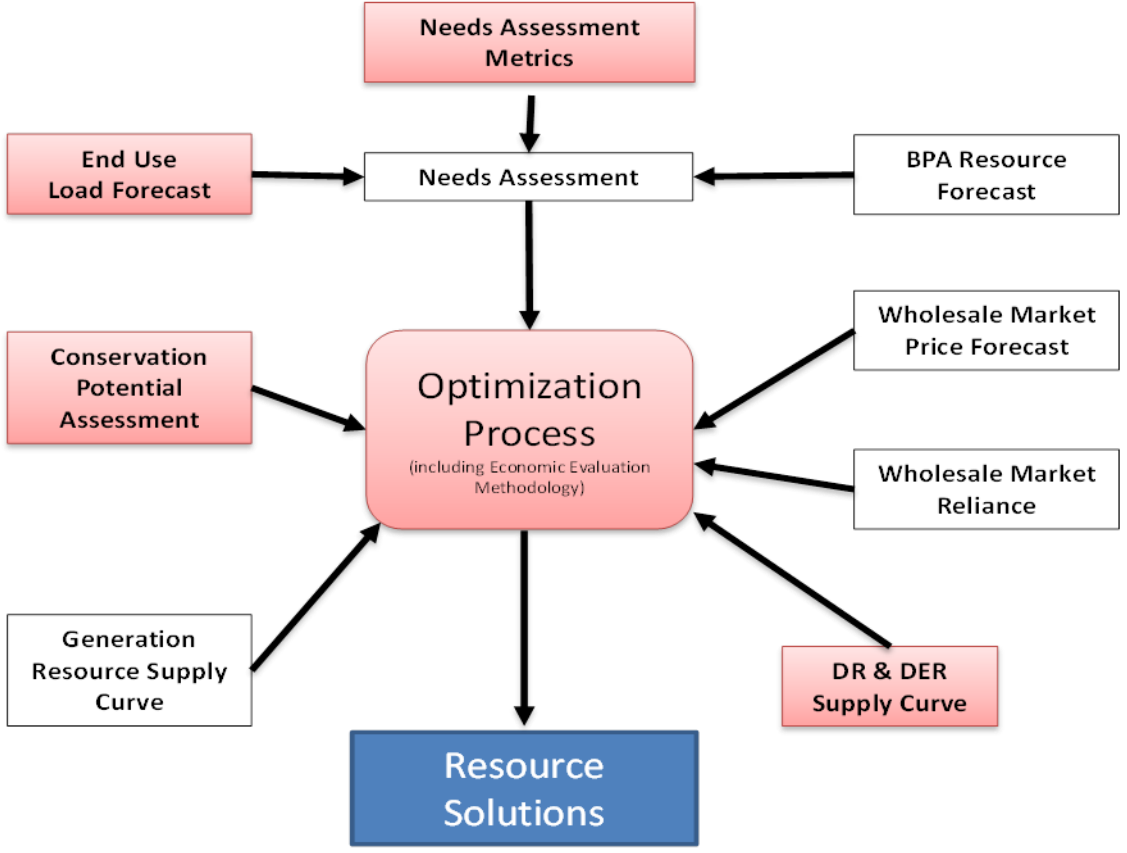
- Resource Program Overview and April Meeting Recap
- Inputs and Metrics
- Optimization Model
- Draft Results
- Next Steps

BPA Resource Program

- The BPA Resource Program
  - Begins with a forecast of BPA load obligations and existing resources and then determines needs
  - Identifies and evaluates potential solutions to meeting those needs
    - Energy efficiency, demand response, market purchases, wind, solar, gas plants, etc.
  - Outlines potential strategies for meeting those needs

- The Resource Program is not
  - A decision or policy document such as an Administrator's Record of Decision
  - A requirement of law or a regulating body such as FERC or NERC

Resource Program Overview



Recap of April Presentation

Needs Assessment Overview

- The Needs Assessment provides forecasts of Federal system energy, capacity, and balancing reserve needs
  - Considers federal system resources and load obligations
  - Looks at needs in terms of annual energy, monthly P10 energy, superpeak energy, 18-hour capacity and balancing reserves

- The Needs Assessment methodology is largely unchanged from previous Resource Programs
  - Expanded to a 20 year continuous forecast
  - Updated to a frozen efficiency load forecast

Results Summary – Energy

- **Annual Energy** deficits begin in fiscal year (FY) 2021 and grow to 850 aMW by 2039

- The largest **P10 Heavy Load Hour** deficits occur in winter, the first half of April, and late summer
  - January has the largest deficits (650 aMW in FY 2020 and 1,850 aMW in FY 2039)

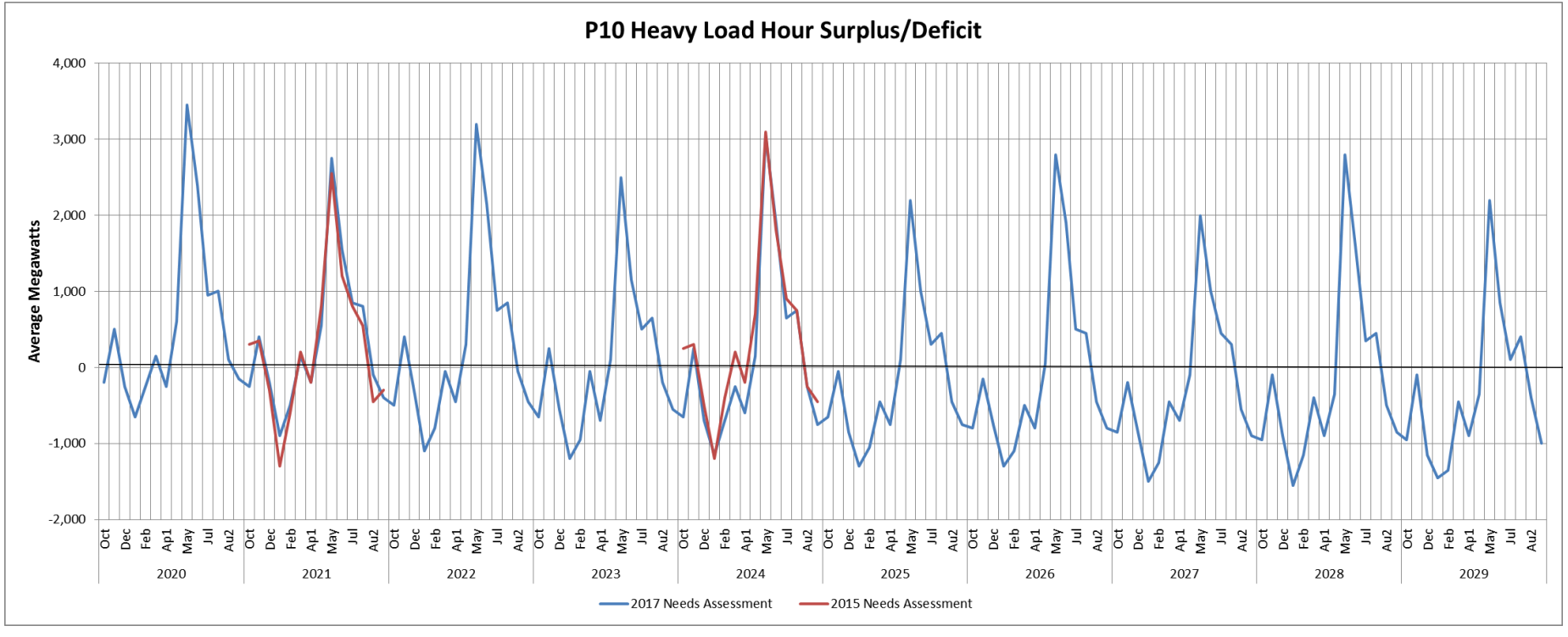
- The largest **P10 Superpeak** deficits occur in winter, the first half of April, and late summer/fall
  - Near load-resource balance in FY 2020 and deficits grow to 1,000 aMW by FY 2039
  - The P10 Superpeak deficits are smaller than the P10 Heavy Load Hour deficits in most months, with the second halves of April and August being the exceptions

Results Summary – Capacity & Reserves

- Winter is **18-Hour Capacity** surplus over the study horizon, while summer is surplus in FY 2020 and deficit thereafter (550 MW in FY 2039)
  - The summer 18-Hour Capacity deficits are smaller than the P10 and Superpeak energy deficits

- **Demand for balancing reserves** in the BPA balancing authority area is not expected to reach 900 MW of incremental reserve over the study horizon

P10 Heavy Load Hour Results



- Key assumptions:
  - Variability in hydro generation, loads, and Columbia Generating Station output

CPA Findings

- BPA identified 1,812 aMW of energy efficiency from 2020-2039
- Significant EE exists below market prices (over 50% of total potential below $25/MWh)
- Compared to share of total load, BPA has:
  - Fewer single family homes, but more electric heating load
  - Less commercial square footage
  - More industrial sales
  - Fewer agricultural acres

Demand Response - Base Case Achievable Potential

Area	Winter Achievable Potential (MW)	Percent of Area System Peak—Winter	Summer Achievable Potential (MW)	Percent of Area System Peak—Summer
West	1,061	9.9%	807	10.8%
East	490	9.6%	795	13.5%
Total	1,551	9.8%	1,602	12.0%

The base case was developed by benchmarking participation rates and kW impacts of common DR programs. The participation rates used were generally a median value and intended to depict participation in a healthy, established DR program. Most of the DR products reach a **full ramp within 7 years**, and after that grow with anticipated load rate changes.

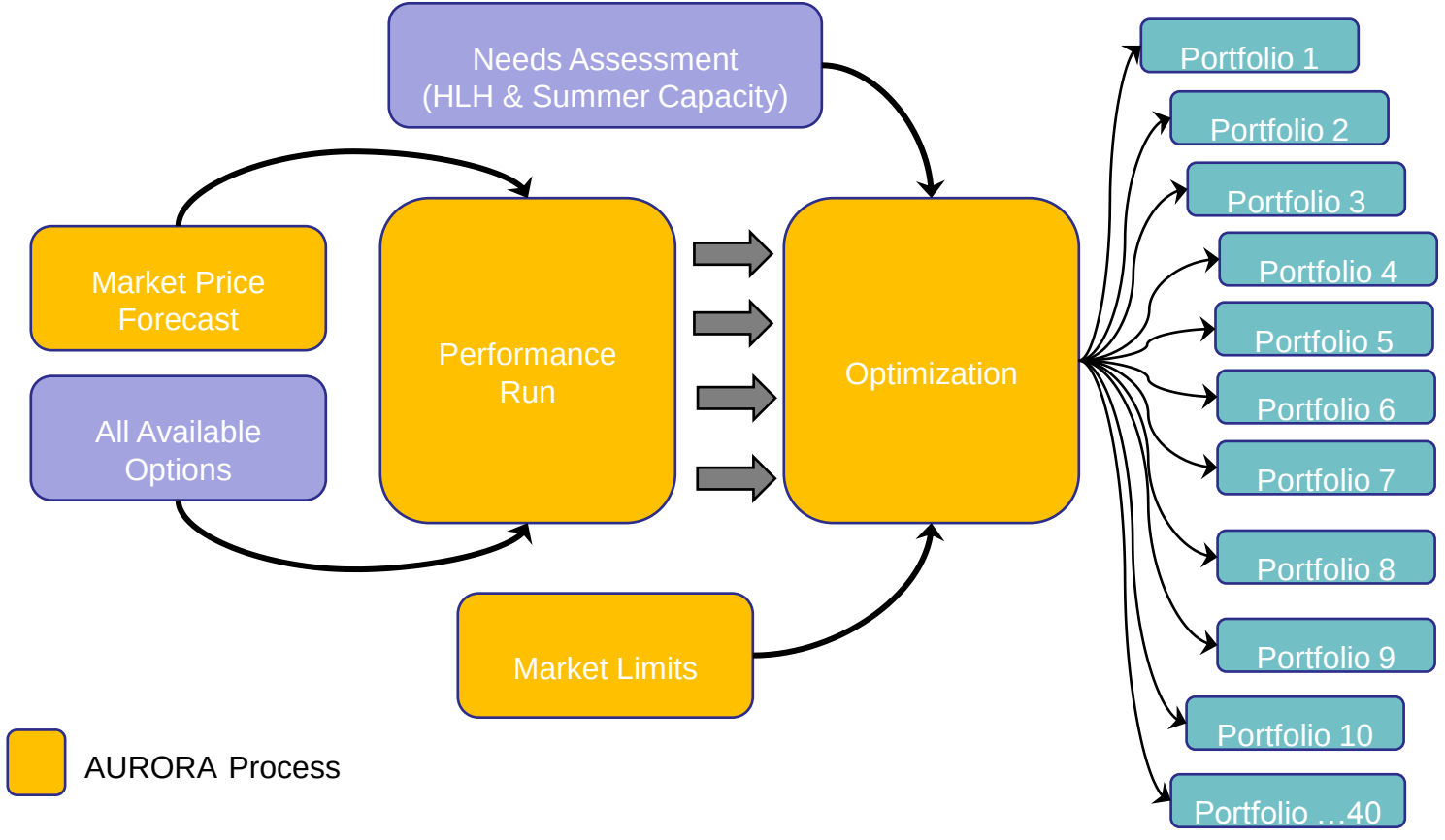
The base case values represent the **mean of a range of potential MW's**.

Optimization Model

Overview

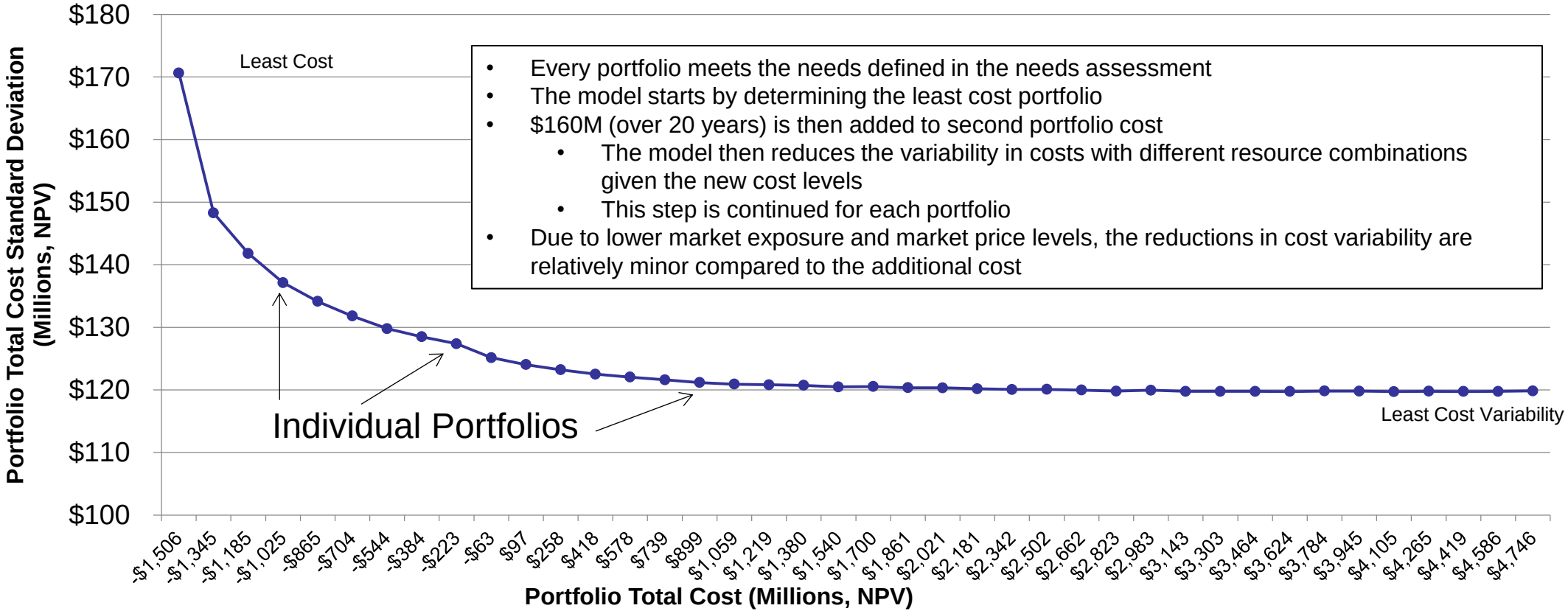
- BPA is using AURORA for the portfolio optimization
- AURORA
  - Is a production cost model that BPA has been using for Rate Cases and other purpose for many years
  - Has the additional capability to perform evaluations and optimizations
  - Was simulated at an hourly level
  - Models the entire WECC area

Optimization Model Overview



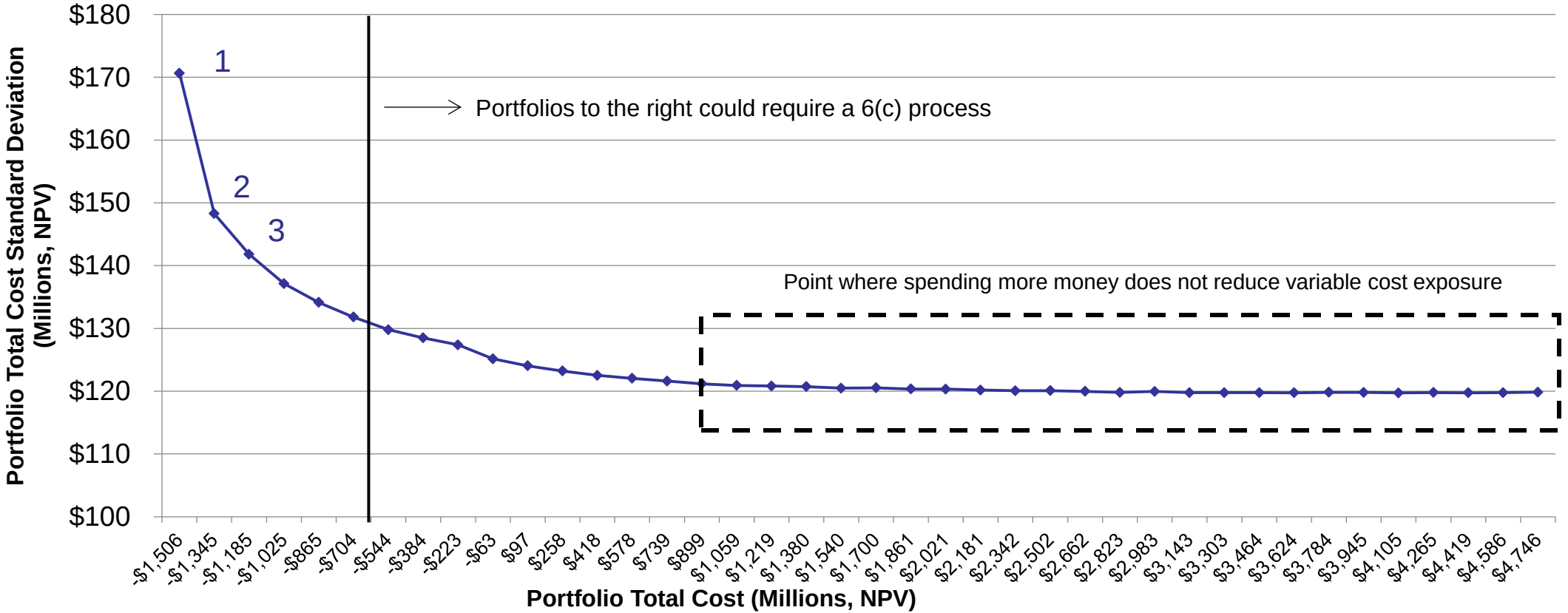
Draft Results

Solutions - Efficiency Frontier



- Every portfolio meets the needs defined in the needs assessment
- The model starts by determining the least cost portfolio
- $160M (over 20 years) is then added to second portfolio cost
  - The model then reduces the variability in costs with different resource combinations given the new cost levels
  - This step is continued for each portfolio
- Due to lower market exposure and market price levels, the reductions in cost variability are relatively minor compared to the additional cost

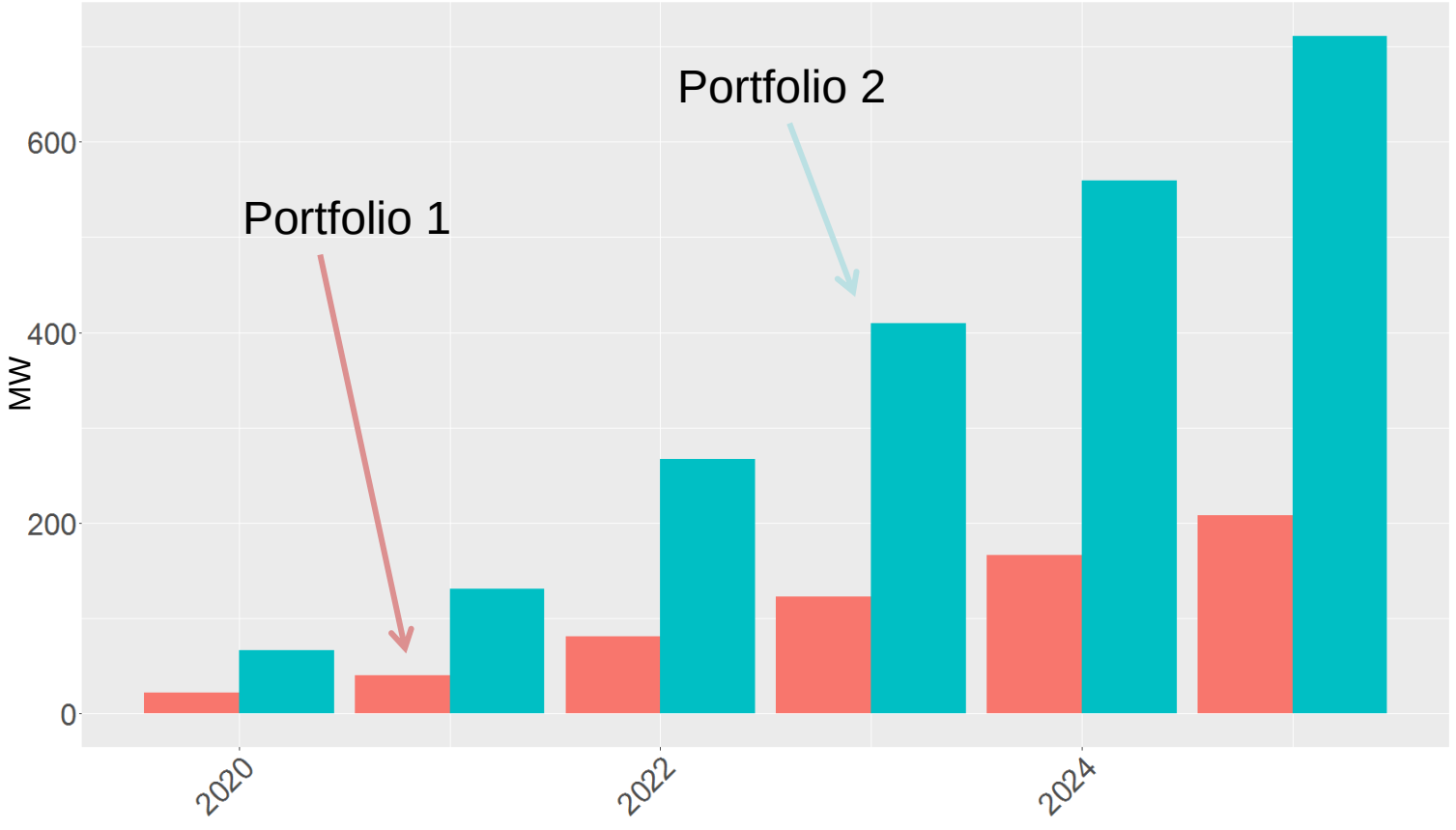
Solutions - Efficiency Frontier



Resource Program Outputs – Portfolios 1, 2 & 3

Portfolio	Max Monthly Market Purchase (aMW)			Energy Efficiency Aquired (aMW)			Highest EE Cost Bundle ($/MWh)	Demand Response Adquired (MW)		
	2021	2025	2039	2021	2025	2039	All Years	2021	2025	2039
1	775	963	1037	121	409	910	$25/MWh	40	208	255
2	737	895	887	154	516	1141	$40/MWh	131	711	705
3	729	882	875	161	542	1258	$40/MWh	131	711	705

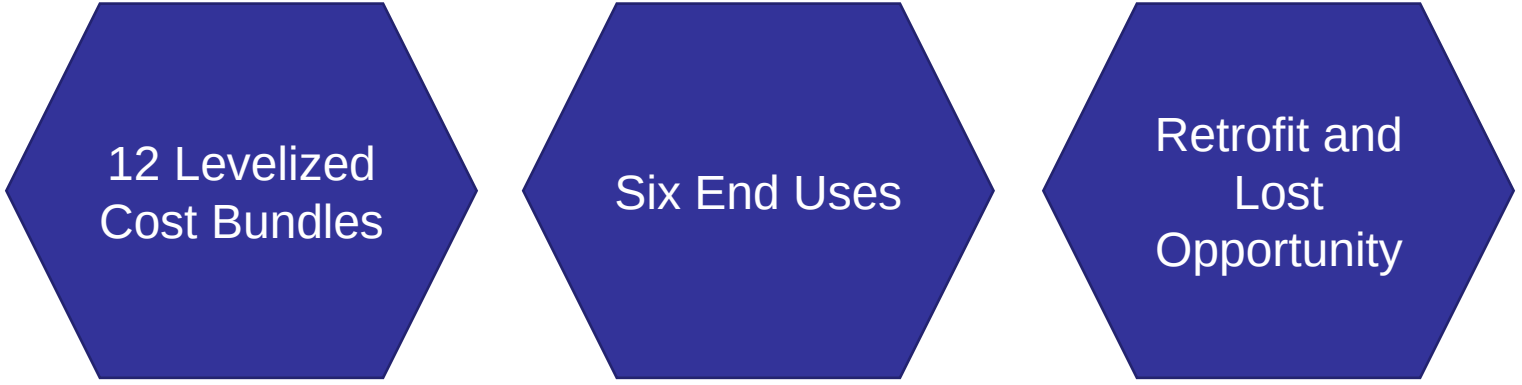
Demand Response



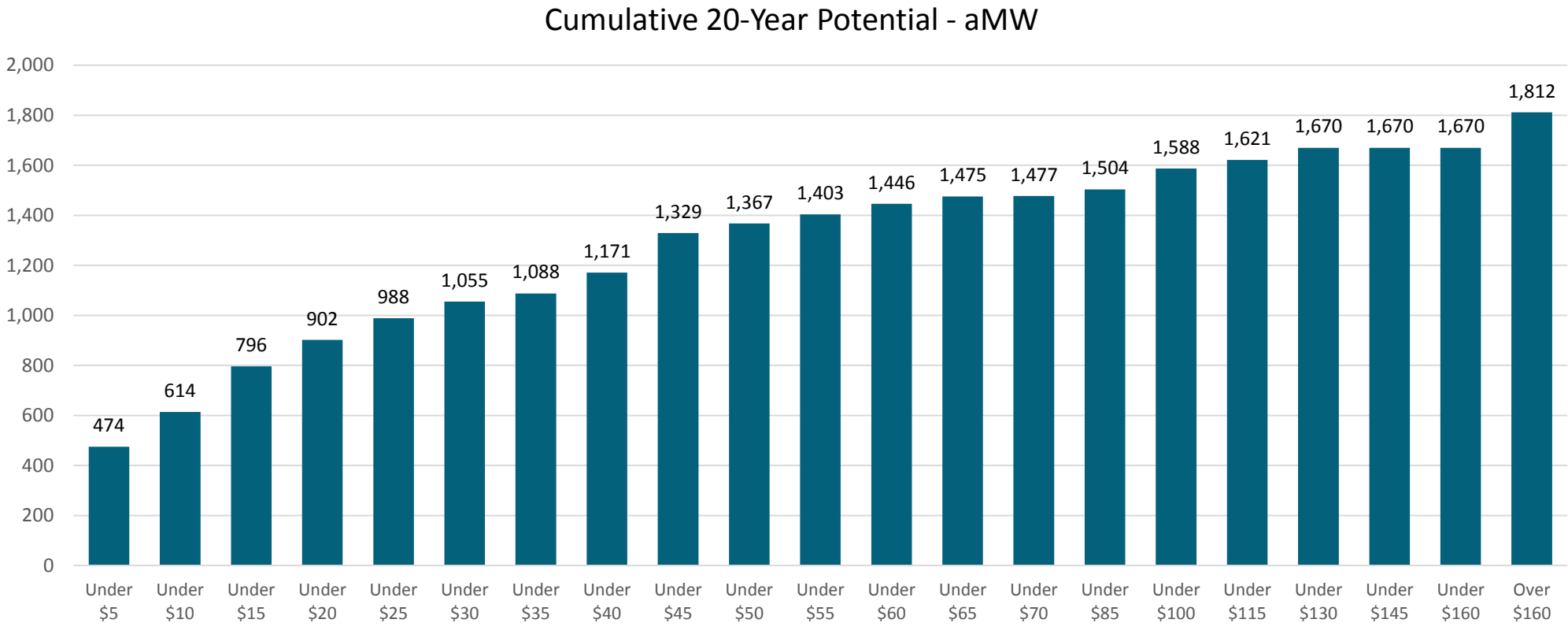
- Portfolio 1
  - 40 MW by 2021
  - 208 MW by 2025
  - Is added due to contribution to meeting summer capacity needs in the least cost portfolio
- Portfolios 2-3
  - Additional DR is added to reduce cost variance

Energy Efficiency - Inputs

Conservation potential provided to optimization model in 90 bundles

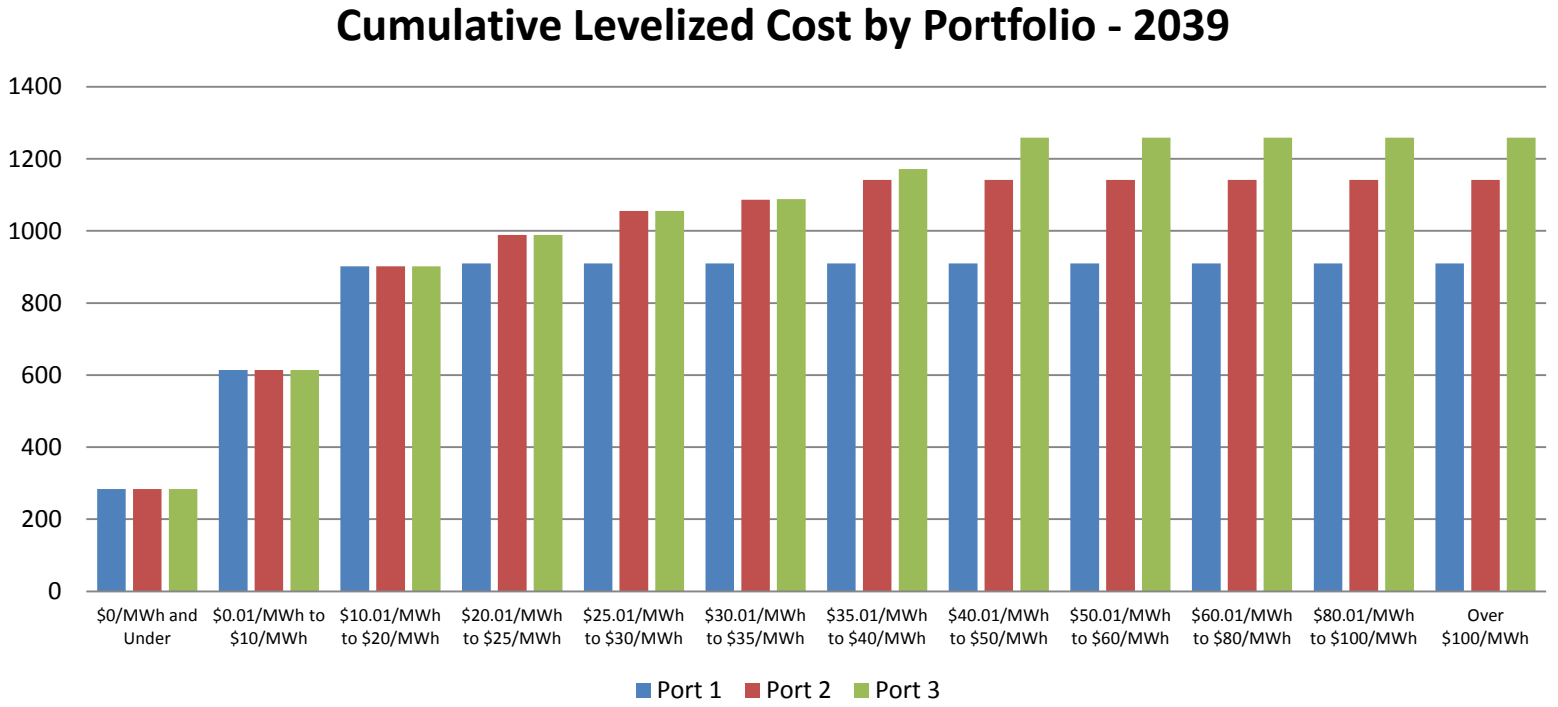


Energy Efficiency Supply Curve - Inputs

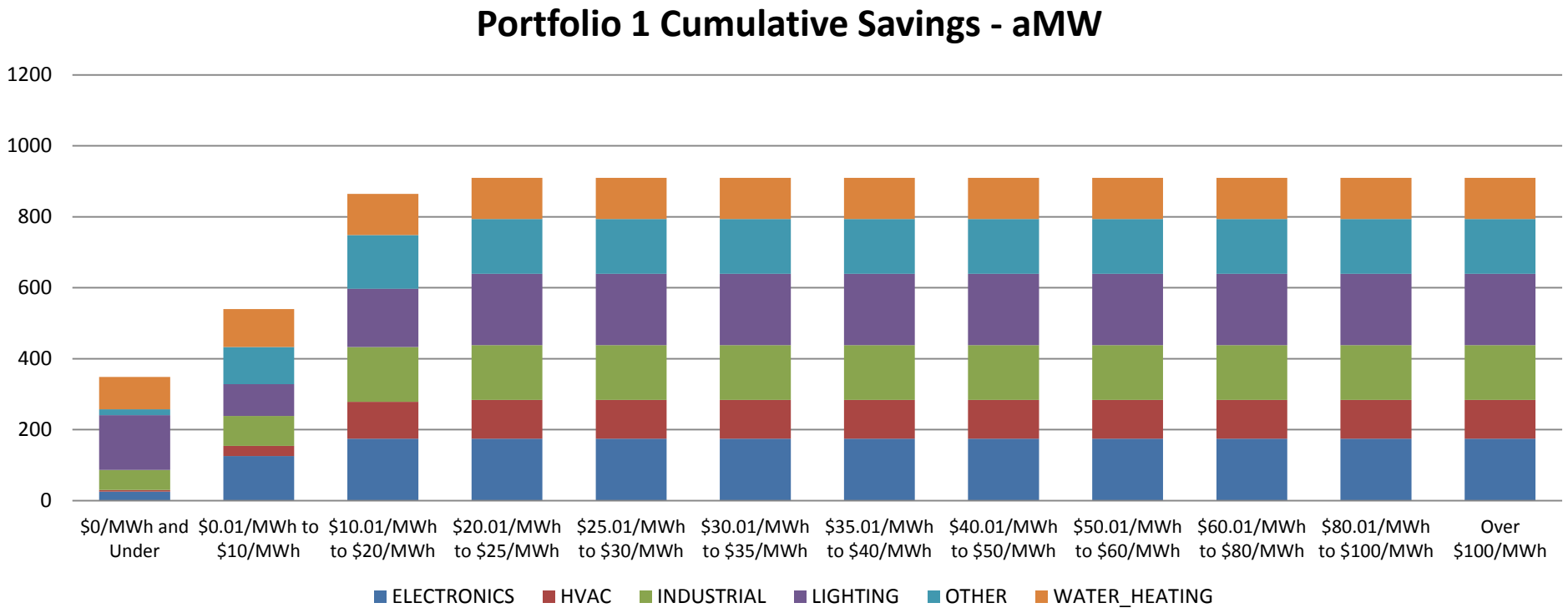


Energy Efficiency - Outputs

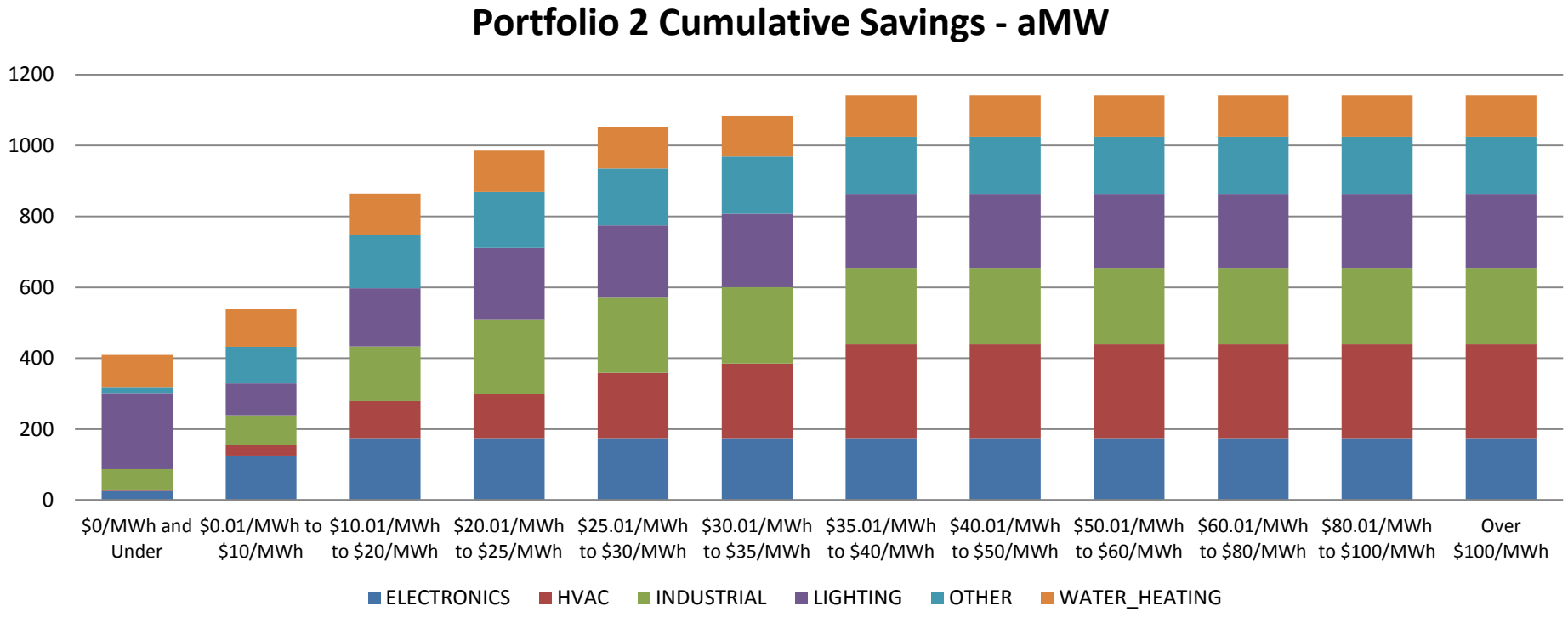
- Model takes all savings up to $20 in every portfolio
- To reduce variance, model begins to move up EE supply curve, finding EE that meets energy needs
- Portfolio 1: 909 aMW
- Portfolio 2: 1141 aMW
- Portfolio 3: 1258 aMW



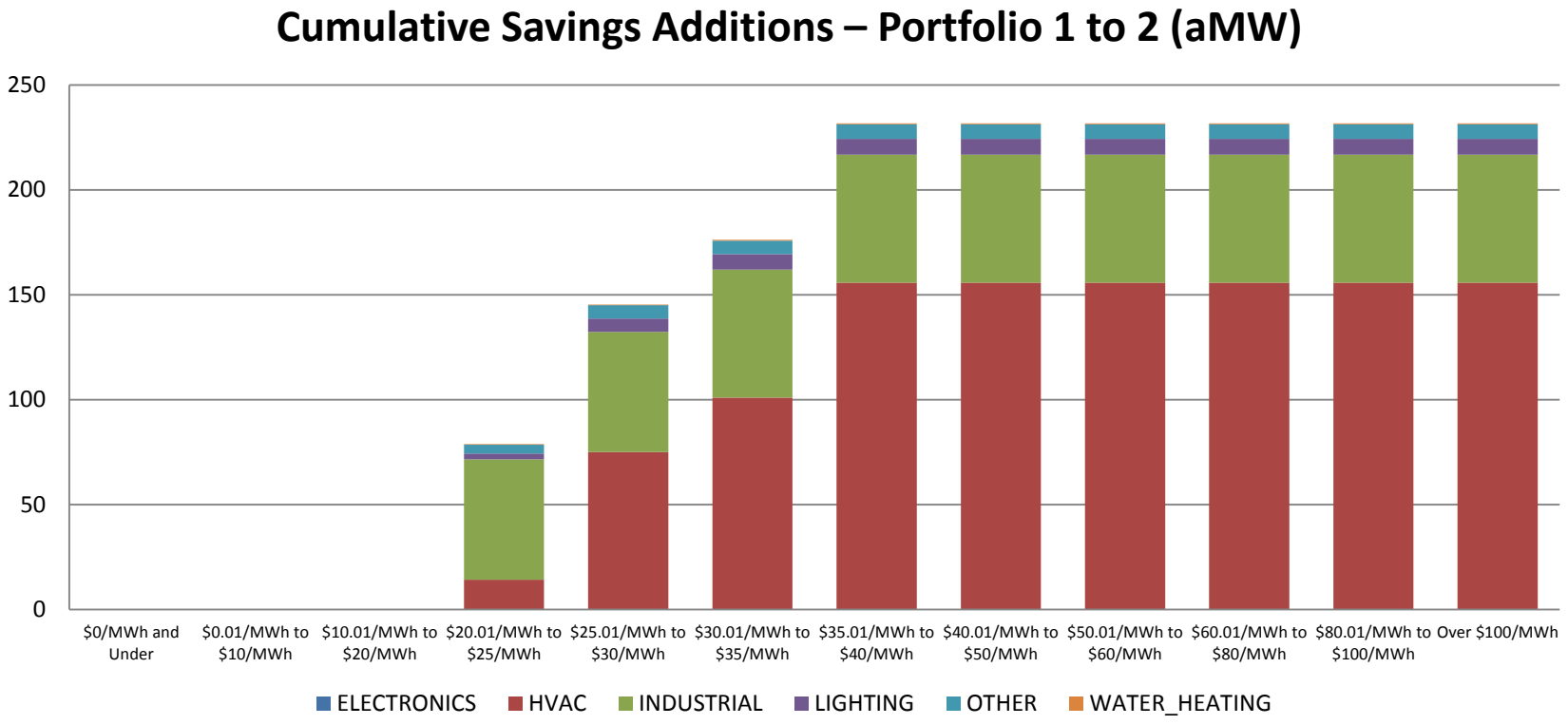
Portfolio 1 Acquisitions by End Use



Portfolio 2 Acquisitions by End Use



Which measures reduce cost variance?



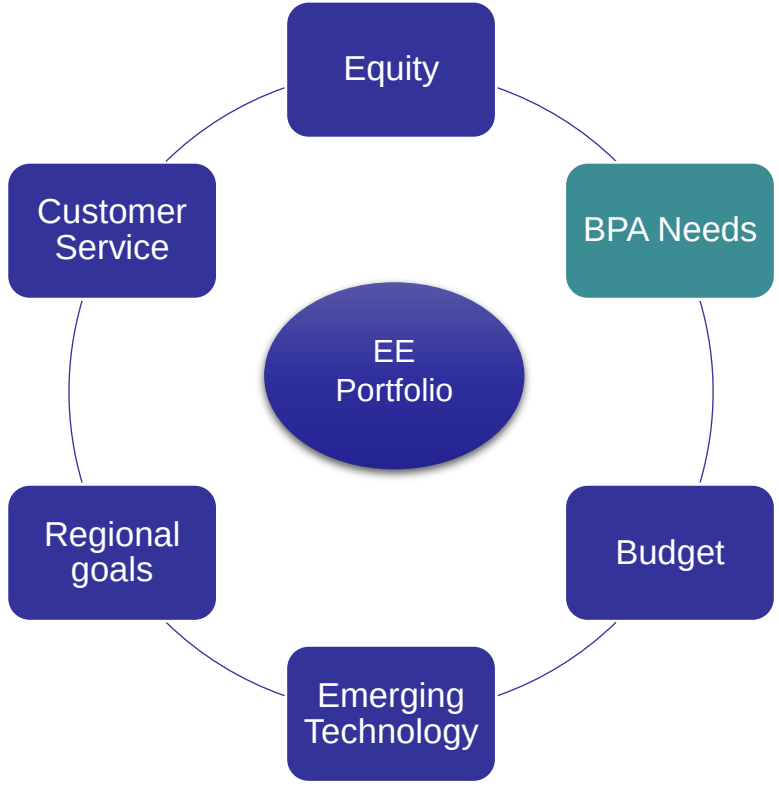
- Green: industrial energy management
- Red: residential ductless heat pumps, windows and insulation

What We Learned

- BPA can continue to meet its needs with a combination of energy efficiency and market purchases – no need for a major resource
- Demand Response appears to be an economically feasible option to meet summer capacity needs
- All energy efficiency below market prices contribute to a least cost portfolio
- Not all savings are equal, measures shaped to meet Bonneville needs are preferred over other savings
- The portfolio of savings selected differs from the current portfolio of savings achievements

Next Steps for EE

- BPA's EE portfolio is a balance of many objectives
- The results of the Resource Program have provided Bonneville with new information to consider in program development
- Currently developing a proposal for how to best address these objectives for the 2020/21 rate period
  - June Council Meeting
  - June IPR workshop



Next Steps

- May 10th
  - Resource Program Public Workshop
- June 12th
  - Council discussion on Energy Efficiency
- June/July
  - Finalize Resource Program