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

December 8, 2020

MEMORANDUM

TO: **Power Committee**

FROM: **Ben Kujala**

SUBJECT: **First Look at Baseline Conditions RPM Results**

BACKGROUND:

Presenter: Ben Kujala and John Ollis

Summary: The Regional Portfolio Model looks at resource strategies for the region and evaluates the cost and risk of those strategies. This presentation will share with the committee some early results from the model when looking at the baseline conditions for the 2021 Power Plan.

While the model has been updated with information from the electricity price forecast, staff is still evaluating the adequacy information to see if there is a need to update the assumptions currently used in the RPM which are based on runs in the classic GENSYS model. Though these results are preliminary, staff believes that they are indicative of what we will see even if updates are needed based on results from the redeveloped GENESYS model.

Relevance: The Regional Portfolio Model is used to test regional resource strategies and evaluate the cost and risk of those strategies to the region.

Workplan: A.6.5. Model-based Analysis

More Info: Substantial portions of this presentation are being shared and vetted with the System Analysis Advisory Committee (SAAC) on December 9th, one

day after the packet is posted. To allow for feedback from the SAAC to be incorporated into this presentation, the PowerPoint slides will be posted and sent to the Power Committee members before the Power Committee meeting but are not included in this packet.

First Look at Baseline Conditions RPM Results

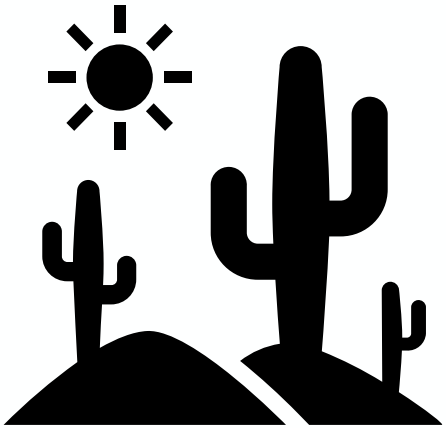
Draft Results based on classic GENESYS adequacy information

THE 2021
NORTHWEST
POWER PLAN
FOR A SECURE & AFFORDABLE
ENERGY FUTURE

What are baseline conditions?

- Baseline conditions are a basis for comparison when developing scenarios
- Baseline conditions are assumptions that are common between 2 or more scenarios
- Baseline conditions are **not**:
  - Business as usual
  - Most likely scenario
  - Default forecast
  - Recommended regional resource strategy

What is a scenario in the Council's Power Plan?



High-level questions help build a future landscape which we examine and compare to alternative outlooks to learn and create a narrative that informs the audience for the Power Plan

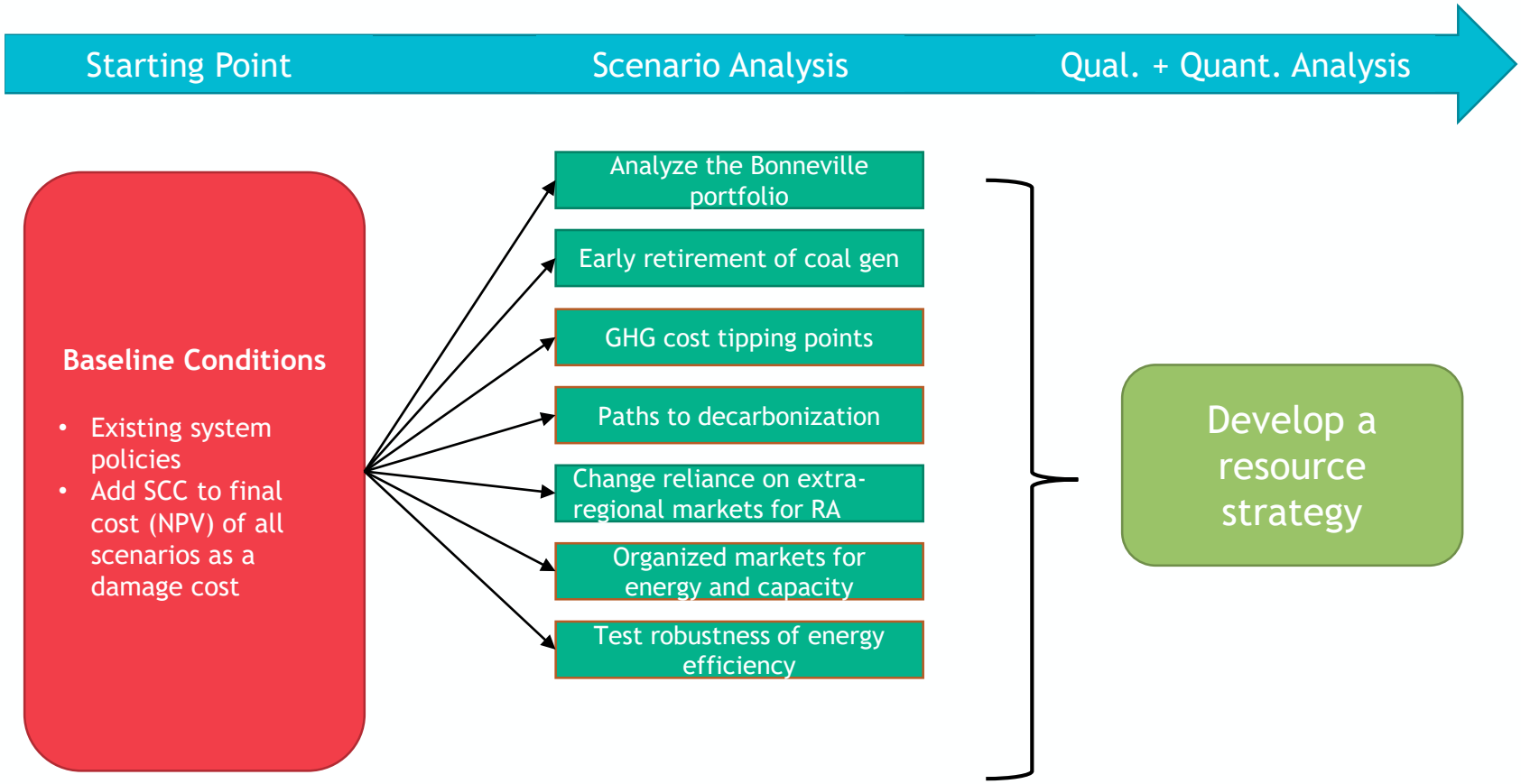
How do we create a scenario?

1. Ask what conditions and processes would change
2. Alter inputs and logic in the models and analyses to consistently implement those changes
3. Look at downstream processes and determine if those changes have material impacts
4. Compare the outcome to alternative outlooks

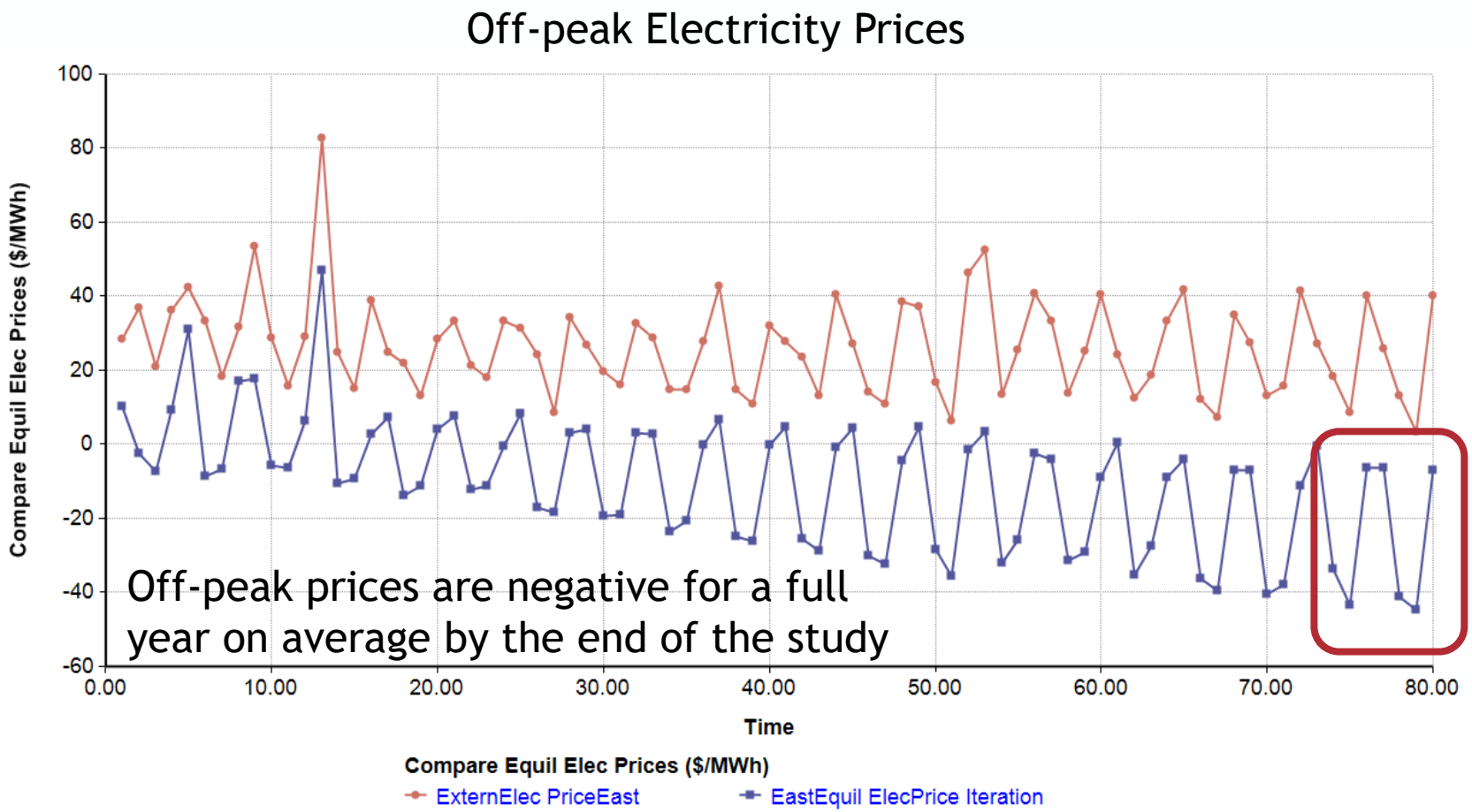
How do scenarios get used?

Scenarios provide the Council with analysis to inform decision-making when developing a final resource strategy for the region and Bonneville

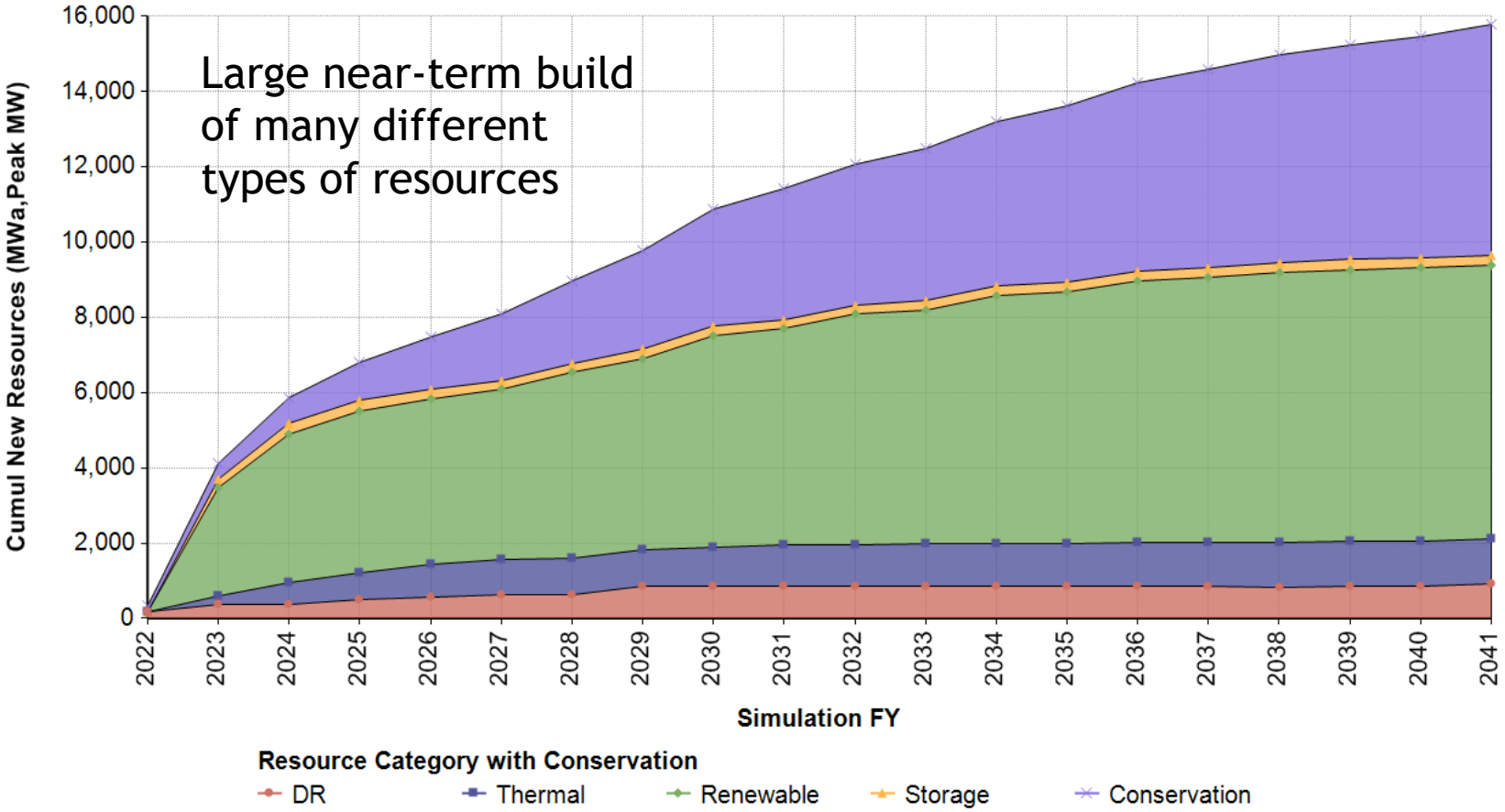
Building the 2021 Power Plan



Impact of Electricity Price Forecast

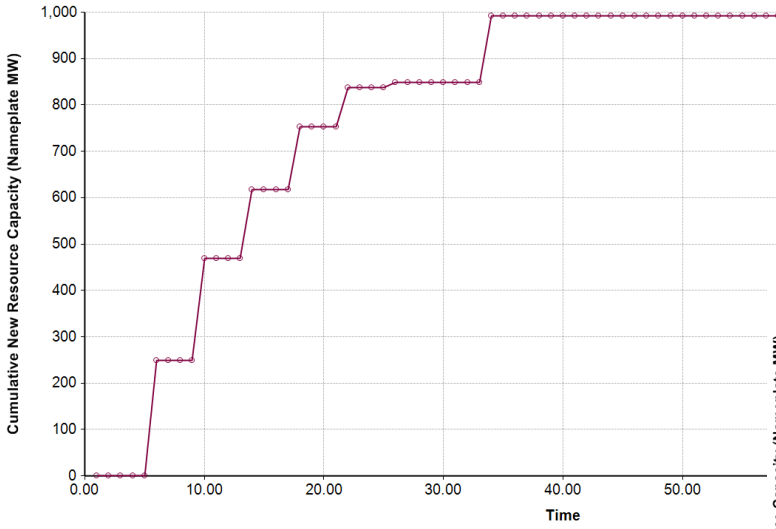


Resource Build

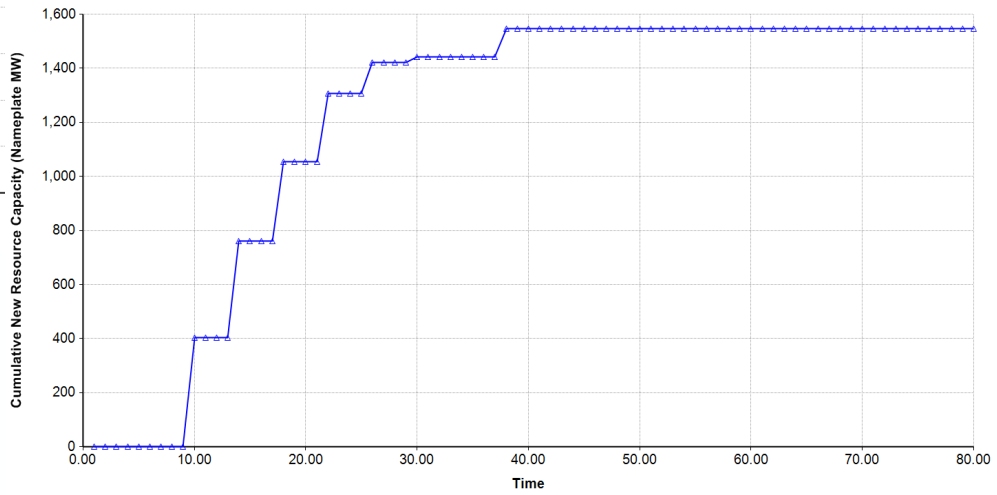


Natural Gas Generation Build

Gas Peakers – 753 MW Nameplate by 2026

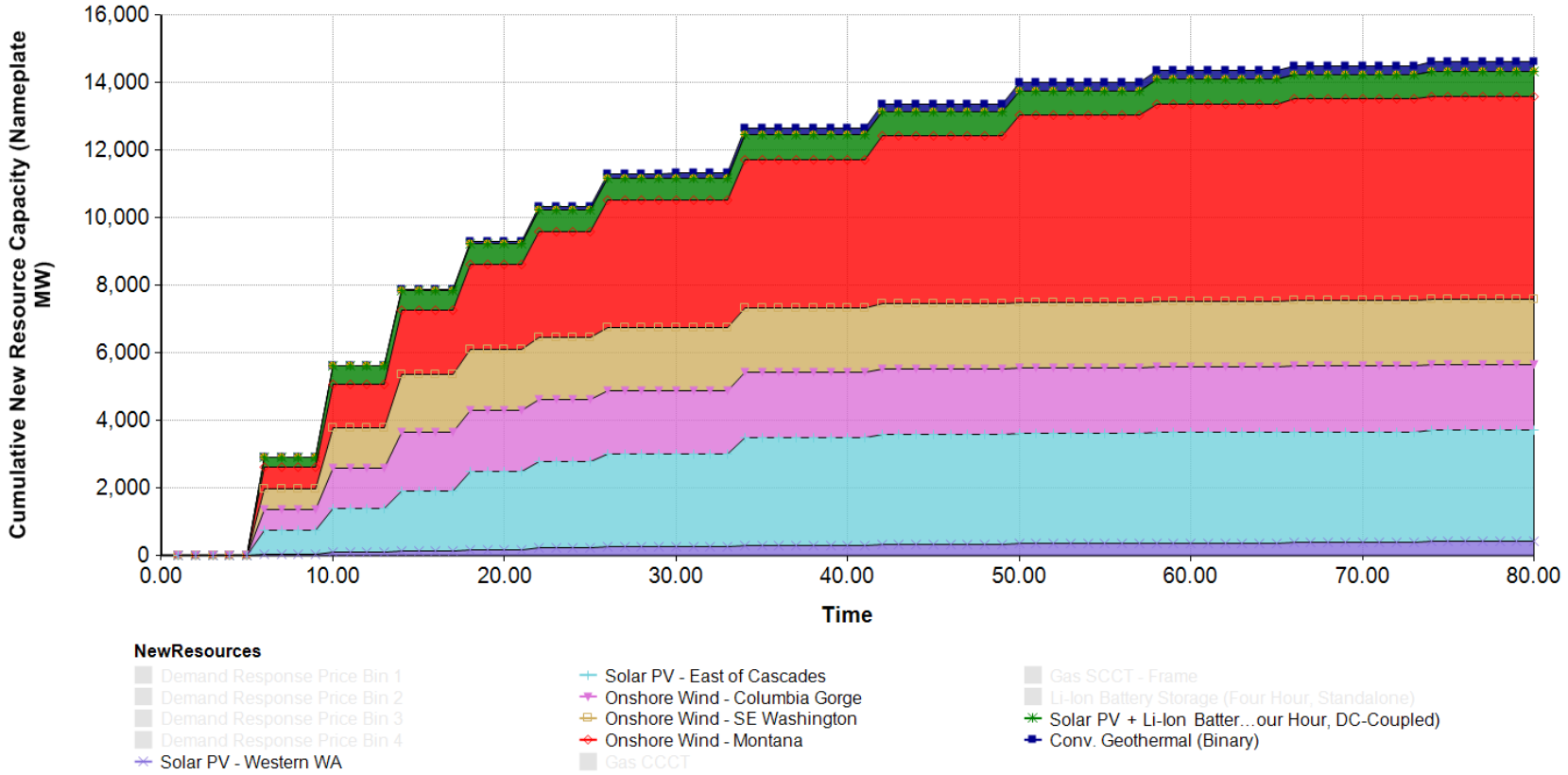


Gas CCCT – 1054 MW Nameplate by 2026

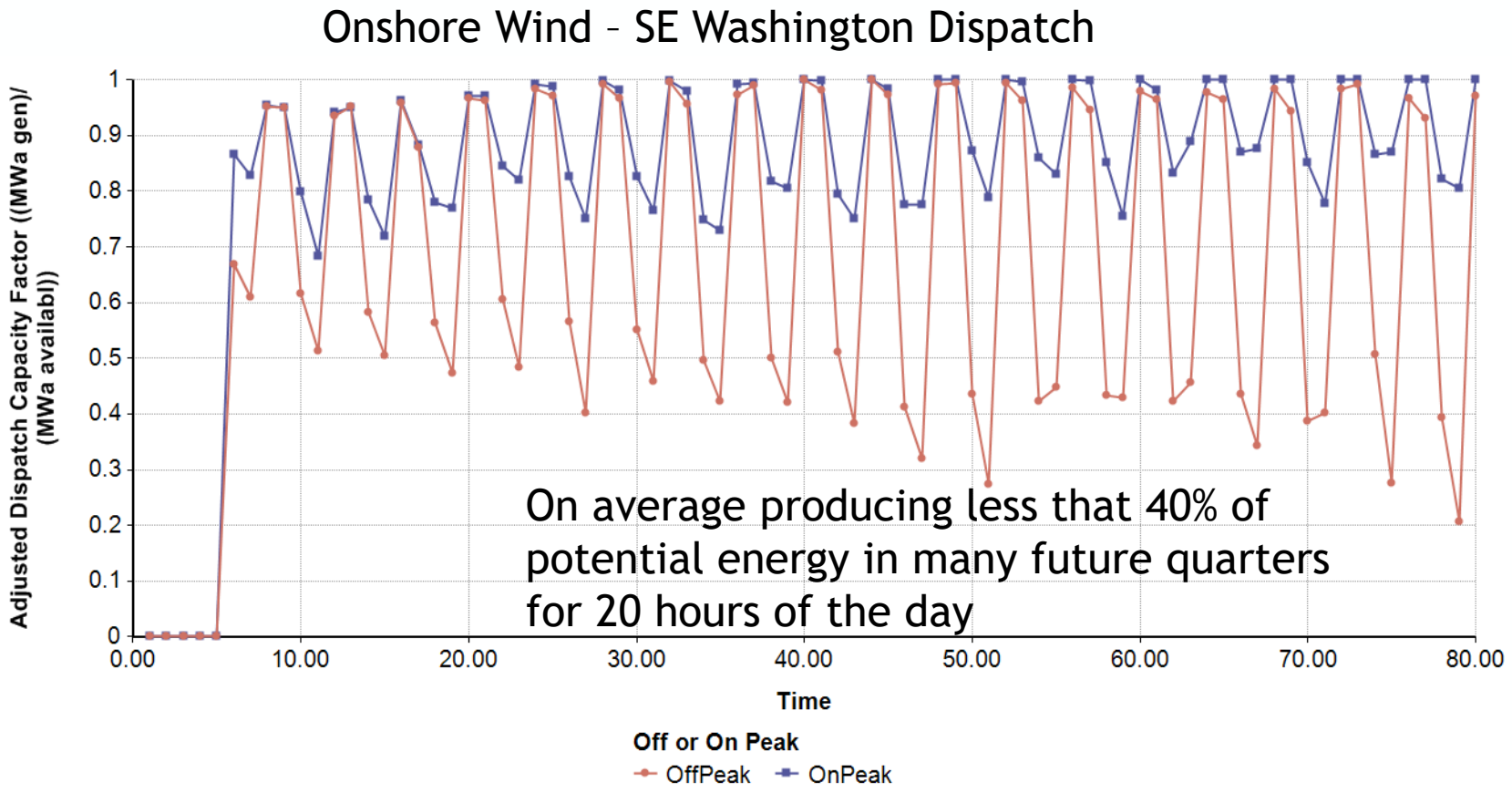


Renewable Build

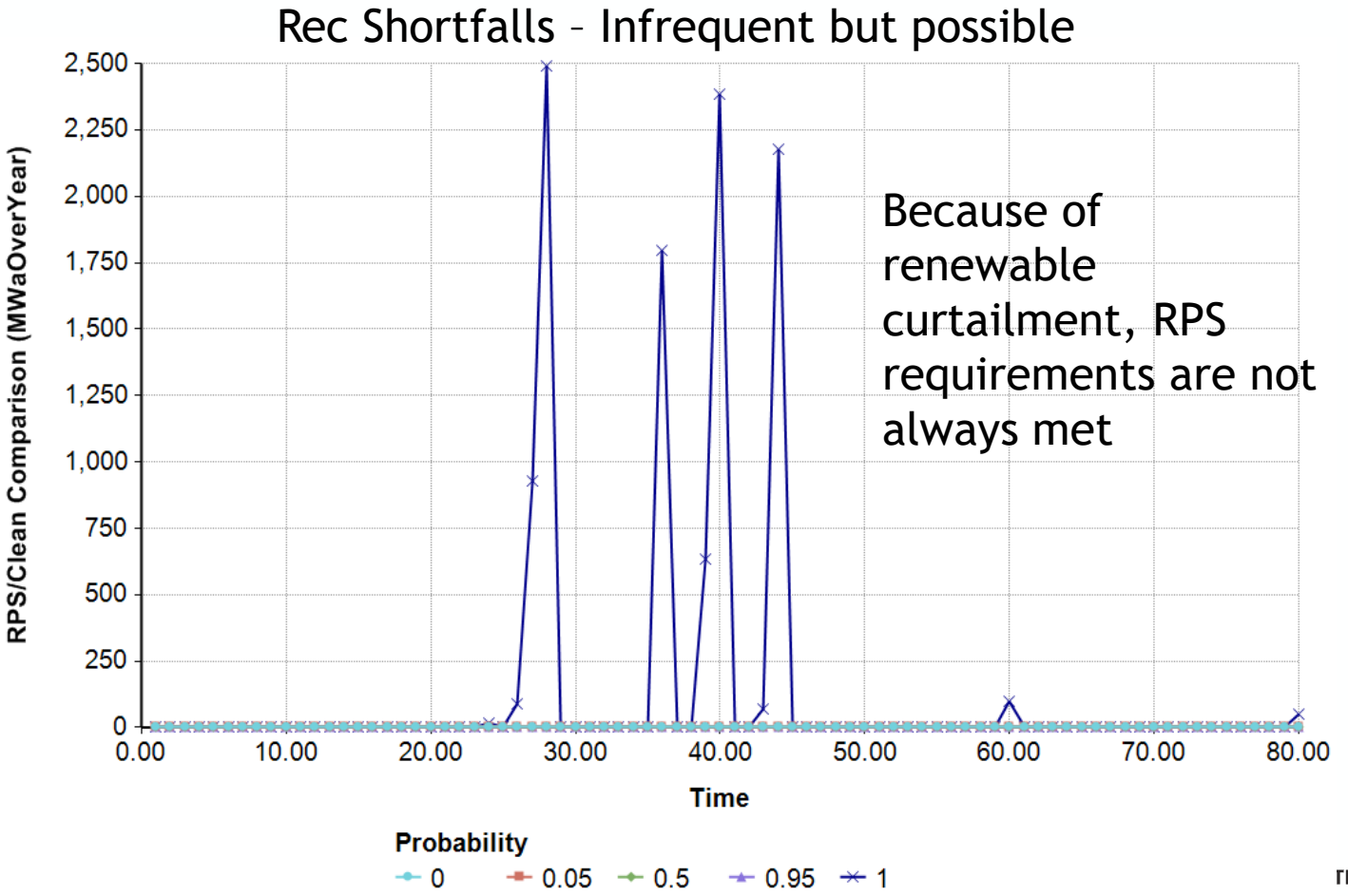
Over 9 GW by 2026

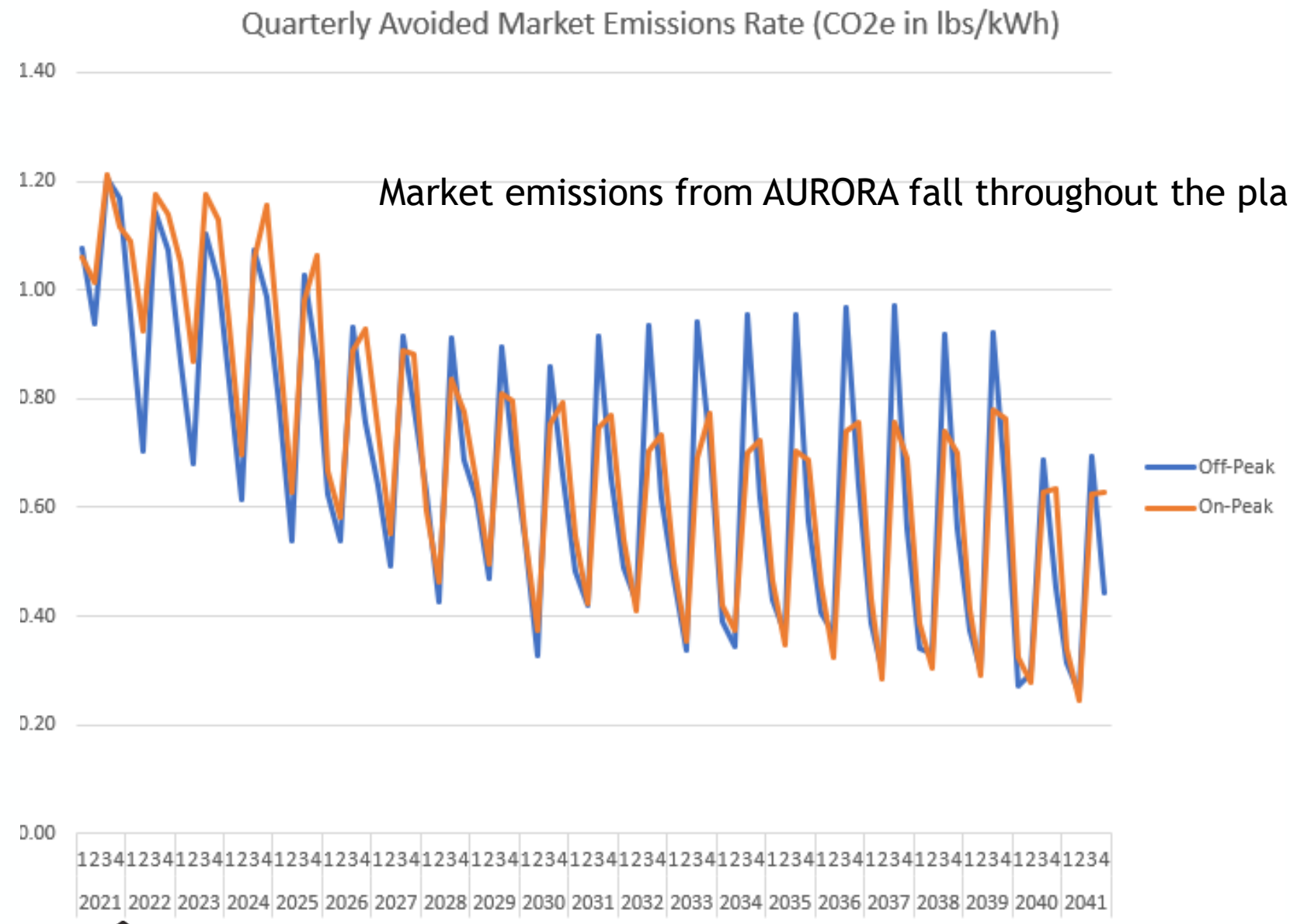


Renewable Curtailment



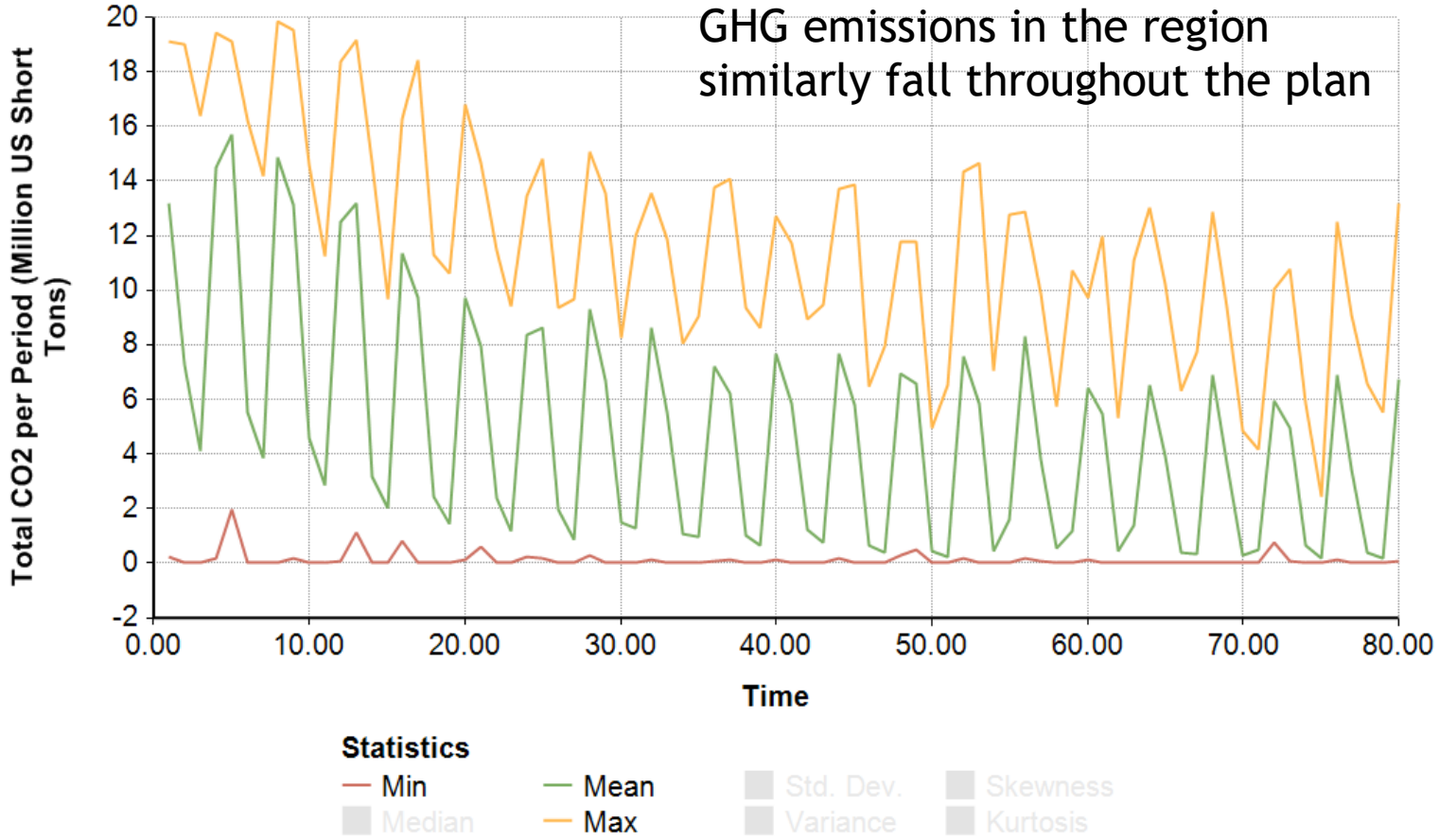
RPS Requirements





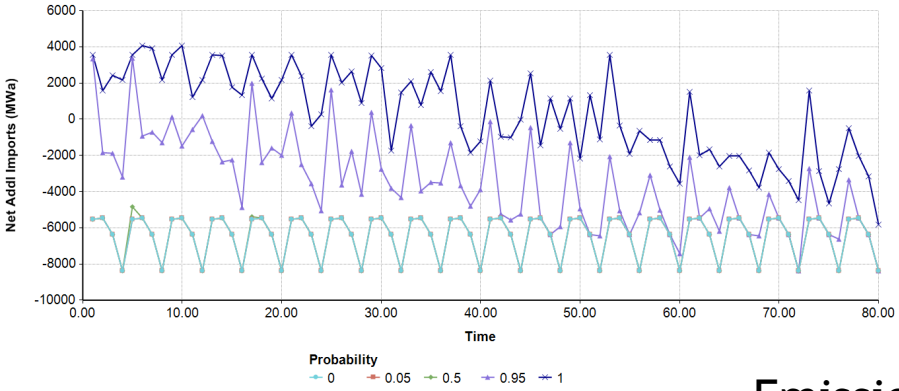
Market emissions from AURORA fall throughout the plan

GHG Emissions

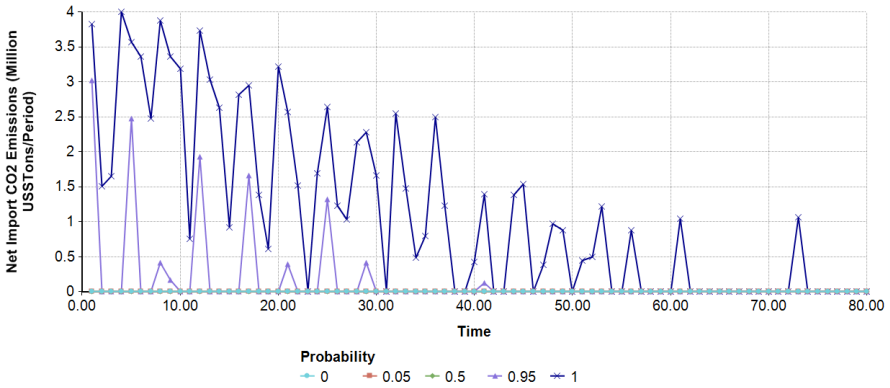


Imports Are Infrequent

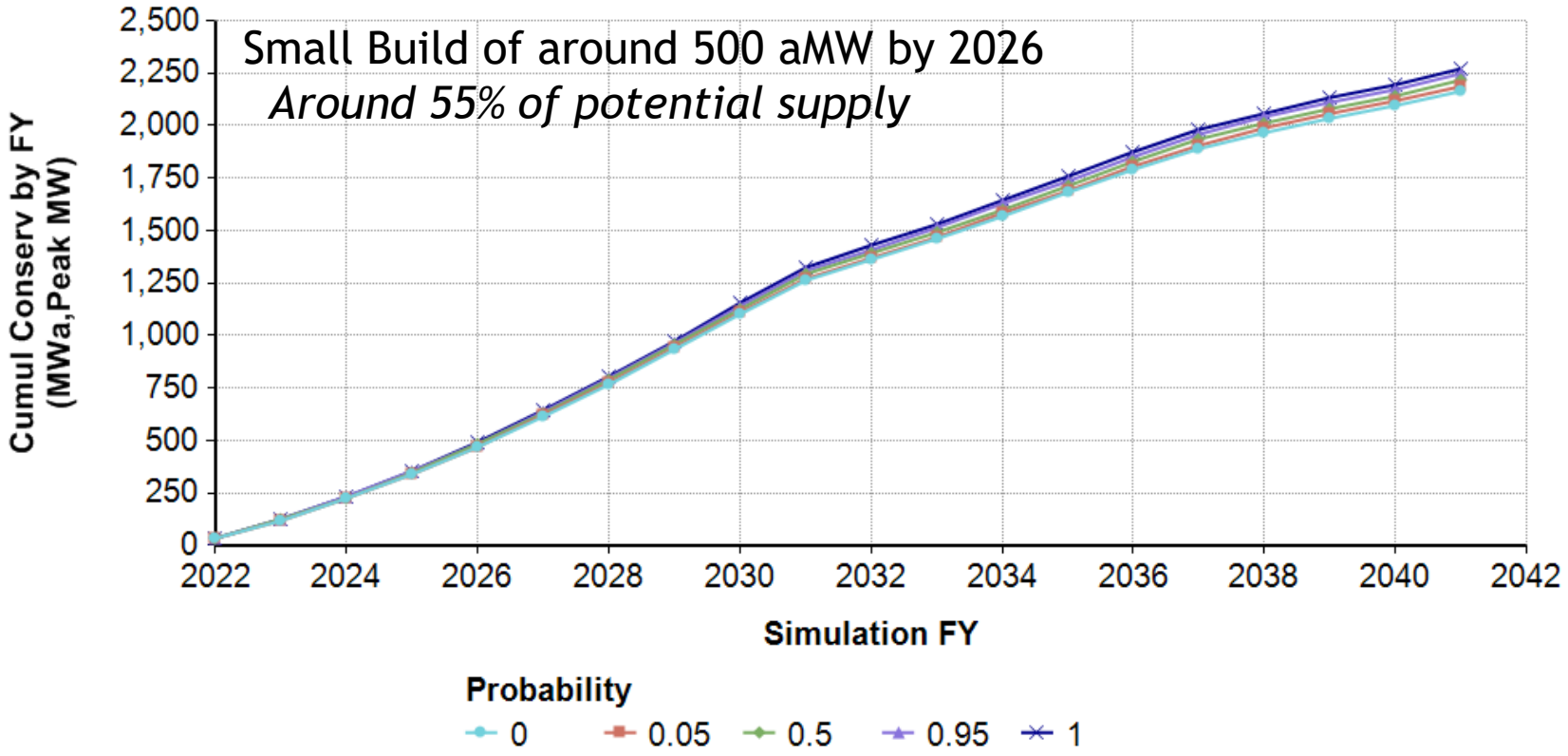
Probability of Imports / Exports



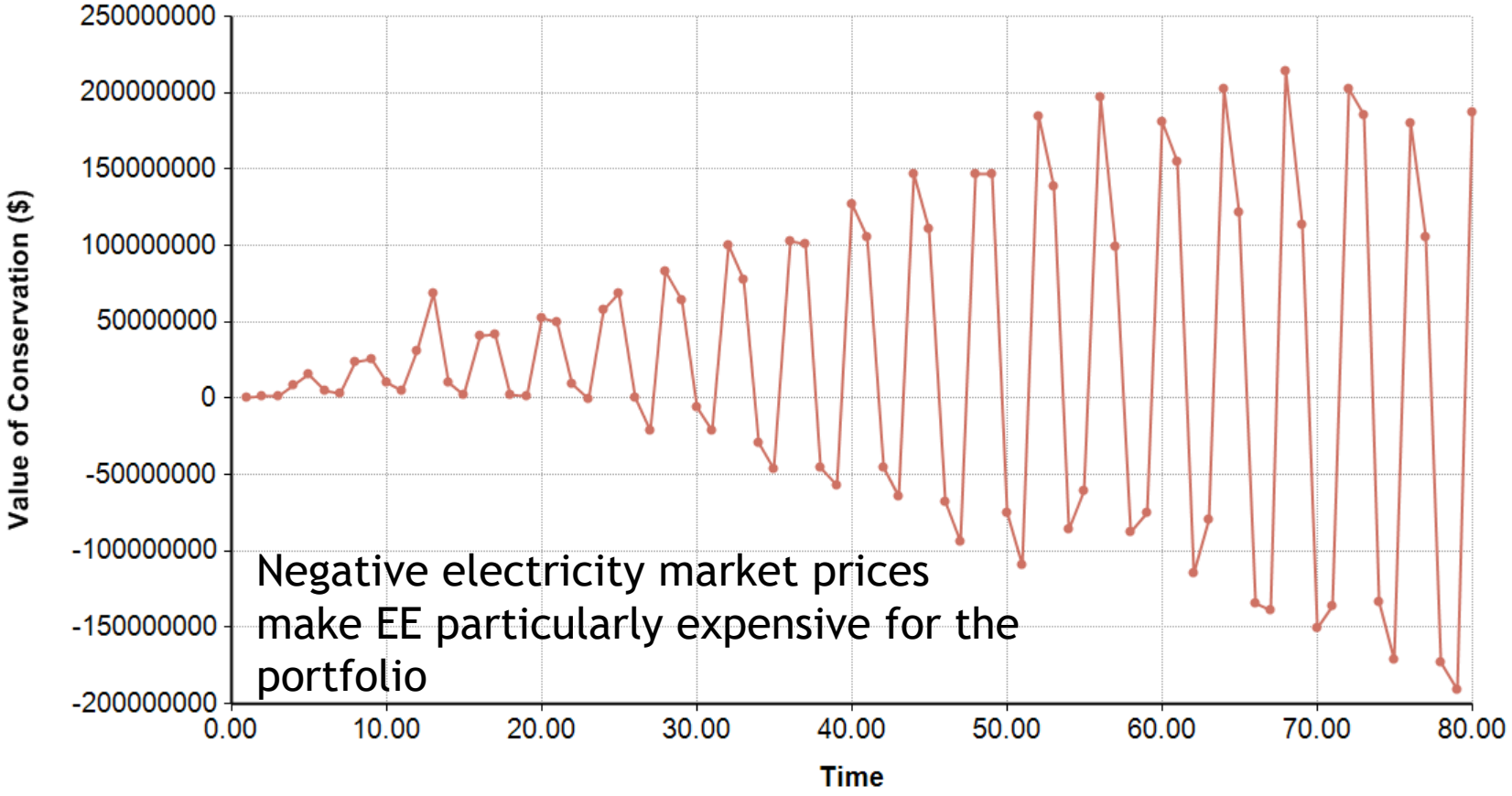
Emissions Associated with Imports



EE Build


Small Build of around 500 aMW by 2026
Around 55% of potential supply
Cumul Conserv by FY (MWa,Peak MW)
2,500
2,250
2,000
1,750
1,500
1,250
1,000
750
500
250
0
2022
2024
2026
2028
2030
2032
2034
2036
2038
2040
2042
Simulation FY
Probability
0
0.05
0.5
0.95
1

Negative Value of EE



Feedback from the SAAC

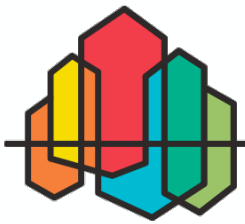
This was presented to the SAAC on December 9th. So far they have raised the following concerns:

1. Market prices are driven down by limited exports, in the environment we're forecasting should we allow for more exports
2. The amount of gas generation built is inconsistent with the limits implemented in AURORA for the electricity price forecast
3. Hydro does not have the ability to curtail which may also drive down market prices

Import / Export Limits

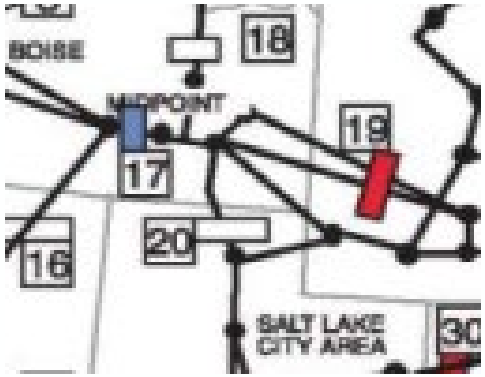
First look import and export limits are based on what was in the 7th plan:

Quarter	Import (MW)	Export (MW)
1	3,732	5,795
2	3,472	6,835
3	3,456	7,062
4	3,266	5,829



Potential Basis for Change

- Limits were previously based on fifth percentile of available transmission capacity on the COI and DC Intertie – this was a proxy for the market seen as predominantly California
- Staff tested adding in the ability to export on the BC Intertie and adding export capability for Path 20 (Southern Idaho to Utah)
- Updated data based on 15 minute ratings from BPA on COI + DC Intertie + BC Intertie ratings from 2016 to 2019
- For WECC Path 20, we didn't have 15 minute ratings so added 1000 MW based on WECC document



Potential Update to Import / Export Limits

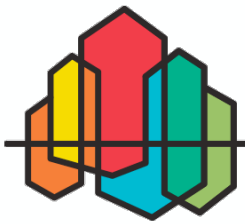
- With this approach the results would be:

Quarter	Import (MW)	Export (MW)
1	7,800	7,800
2	8,210	6,850
3	9,750	7,097
4	5,100	5,850

Potential Change in Import / Export Limits

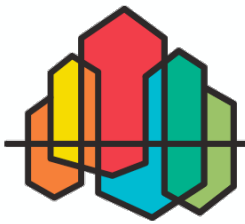
- For a difference of

Quarter	Import (MW)	Export (MW)
1	4,068	2,005
2	4,738	15
3	6,294	35
4	1,834	21



What's with the imports?

- These imports are for economics only, the imports for adequacy are determined by GENESYS and the Adequacy Reserve Margin
- Updated data show higher import transmission ratings and adding BC and Path 20 imports results in significant increase to import limits
- In the first look RPM run, import limits were infrequently hit so generally we wouldn't expect increasing them to have much impact in this setup – it may matter for scenarios



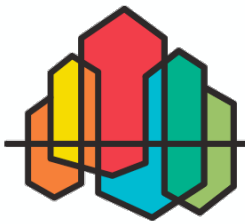
Why didn't that add more to exports?

- Updating to 2016 to 2019 reflects more recent operations which look to have lower ratings for available transmission
- Adding up line ratings misses transmission system dynamics that impact multiple paths
- Fifth-percentile may be conservative but reasonable for imports but not reflect a reasonable assumption for exports
- More to come – we sent details of this analysis to the SAAC and will discuss this at the next meeting

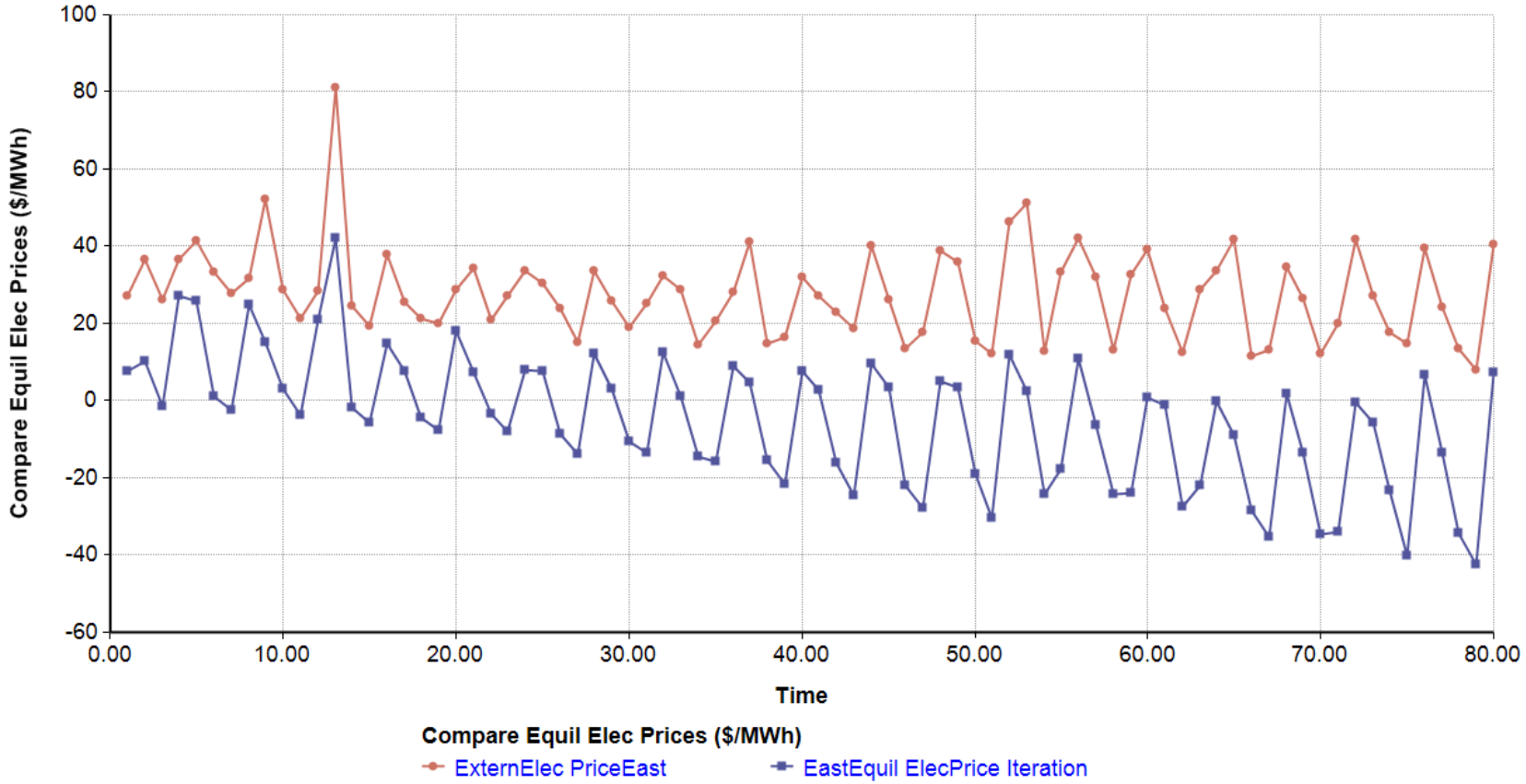
Impact on RPM results?

- Minimal impacts:
  - Prices still negative
  - Reduces resource build in 2030s
  - EE very slightly increases

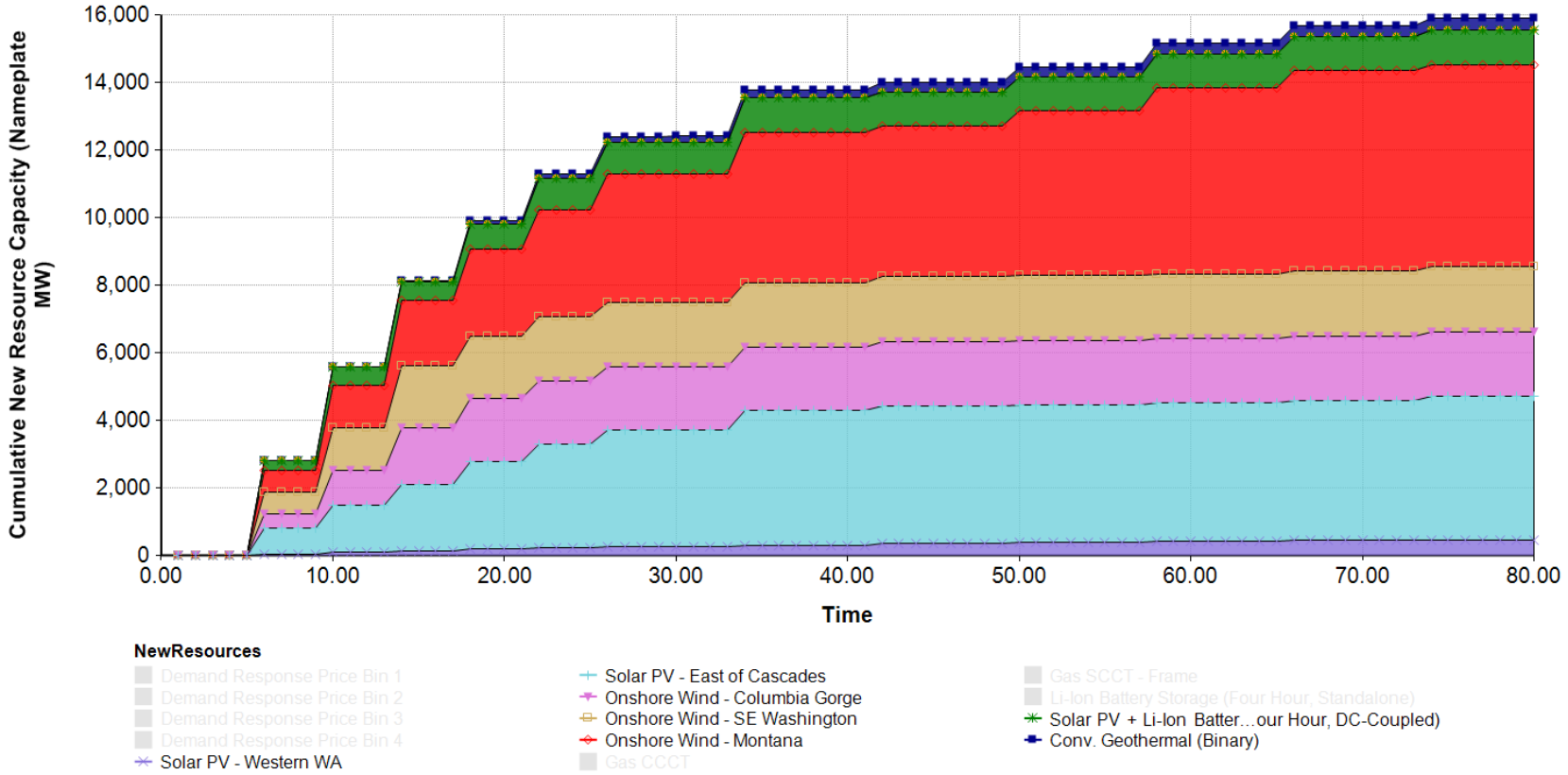
- Hourly shapes still drive renewable curtailment but less curtailment moves infrequent REC shortfalls to later in the study



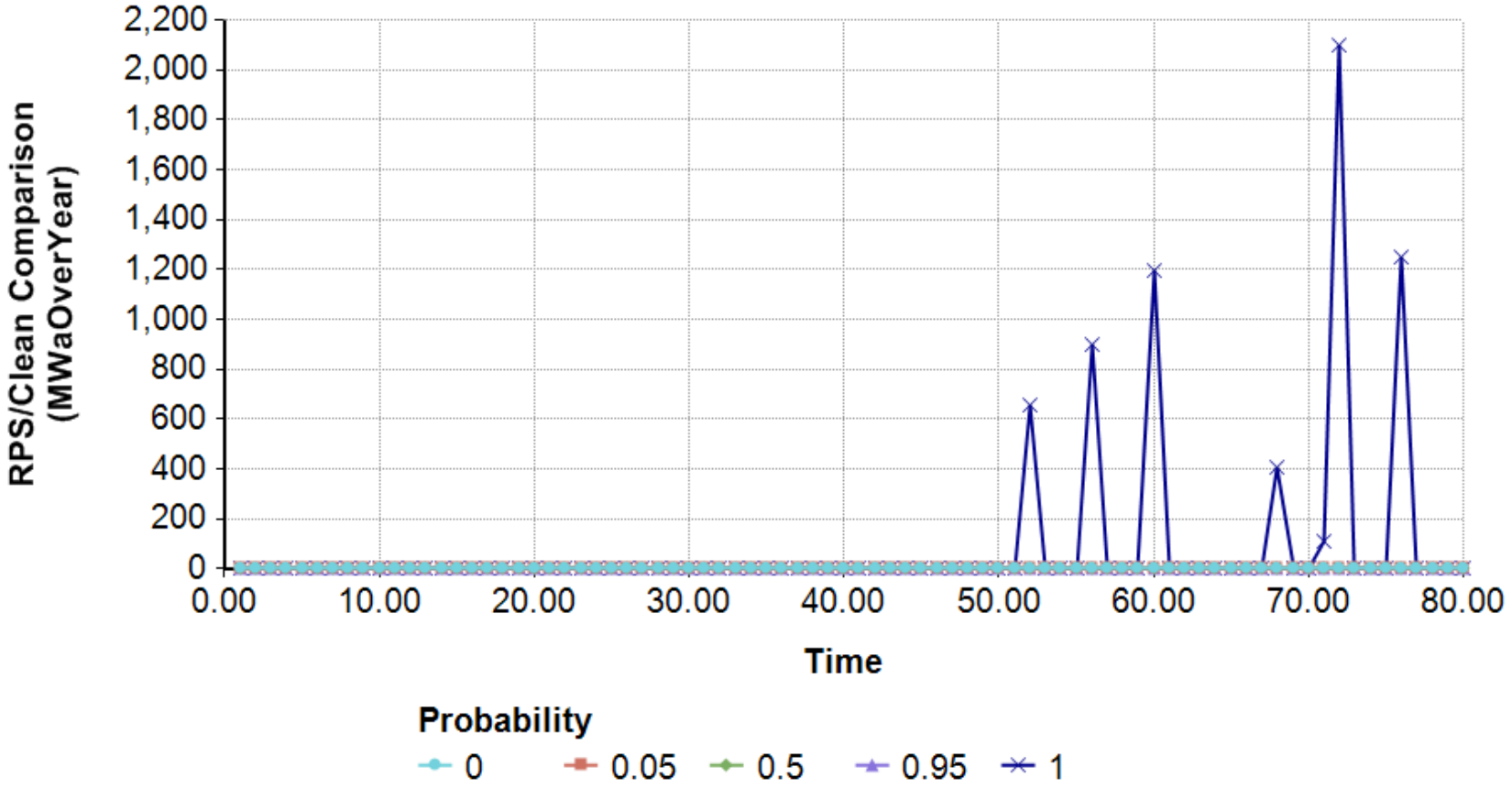
Small Seasonal Increase in Electricity Prices



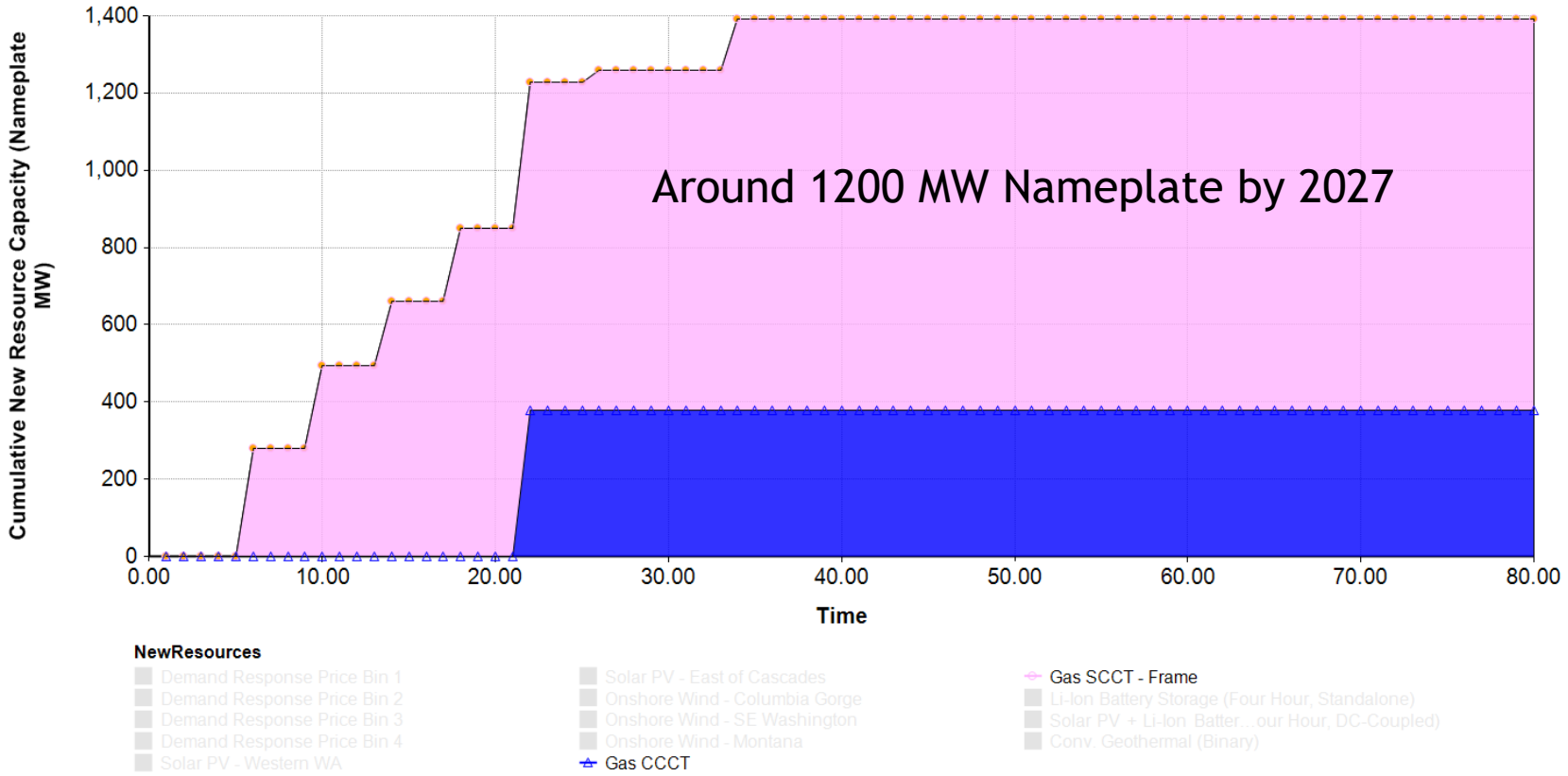
Less Renewables in the 2030s



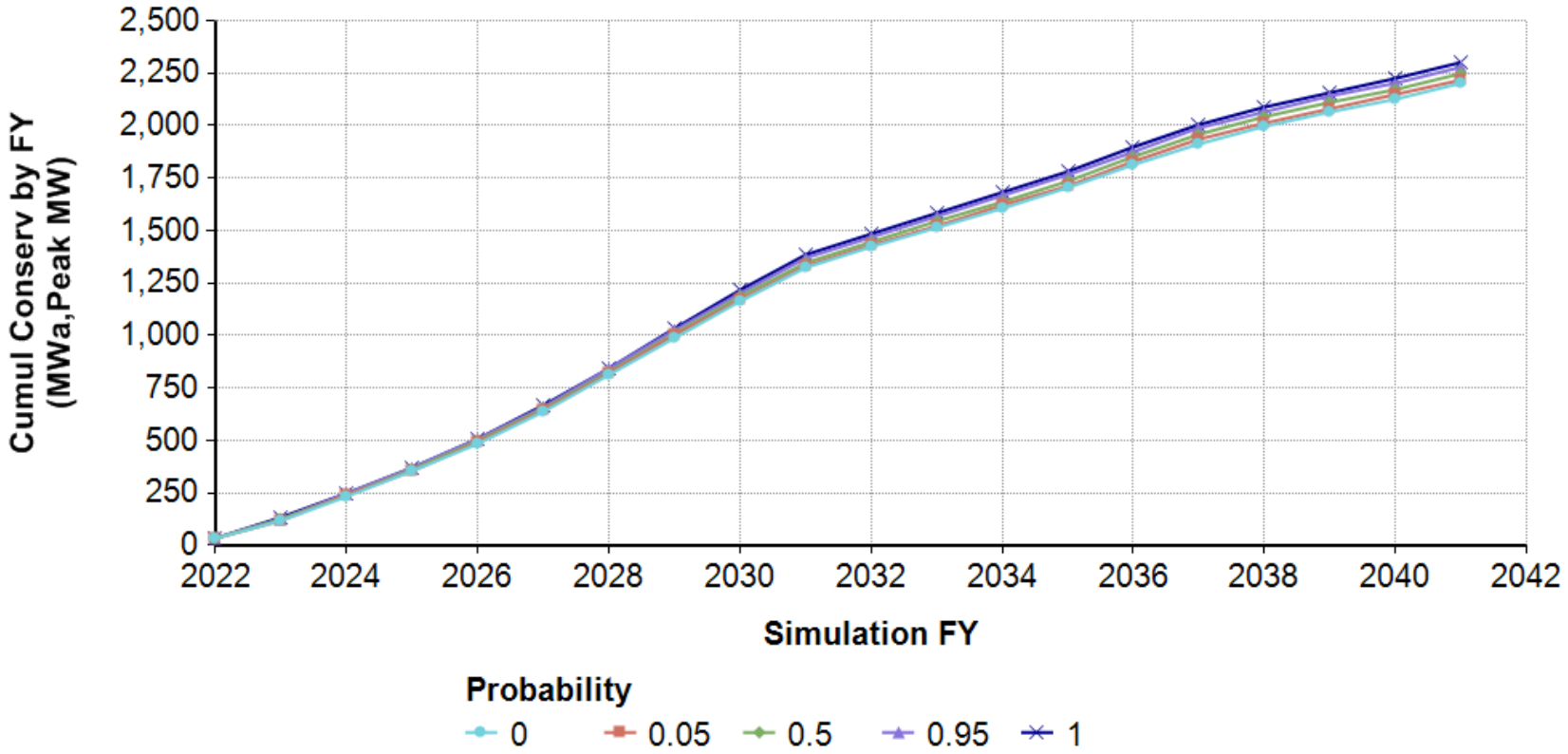
Later Infrequent REC Shortfalls



Decrease in Natural Gas Generation Build



Similar but Slightly Increased EE Build



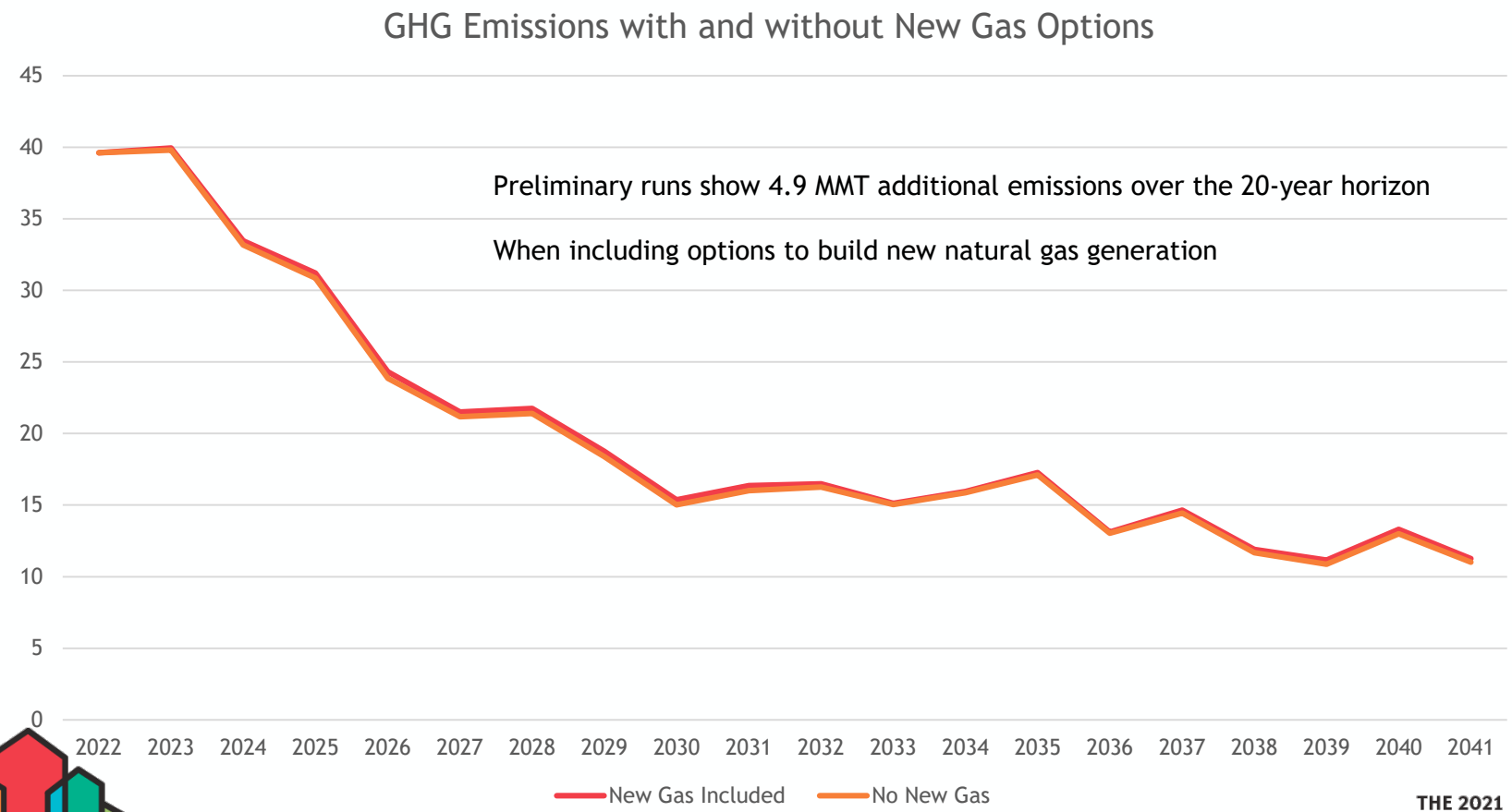
Natural Gas Generation

- RPM builds substantial new natural gas generation in the first look
- Council and advisory committee direction pushed for limited gas in the electricity price forecast
- To test the impacts, we removed the options for new natural gas generation

Impact on RPM results?

- Without alternative resources removes RPM's ability to respond to adequacy signals
- Higher resource adequacy penalties occur later in the run
- Likely to be highly sensitive to updated ASCC and ARM study
- Preliminary runs show a very slight increase in EE – too many outstanding questions to read much into this yet

Minimal Reduction in GHG Emissions (MMT)



Hydro Curtailment

- Still exploring options in RPM
- Likely to require fidelity of GENESYS, with RPM resource build added to understand how much this could impact regional resource strategy


Questions?
Let’s open RPM…

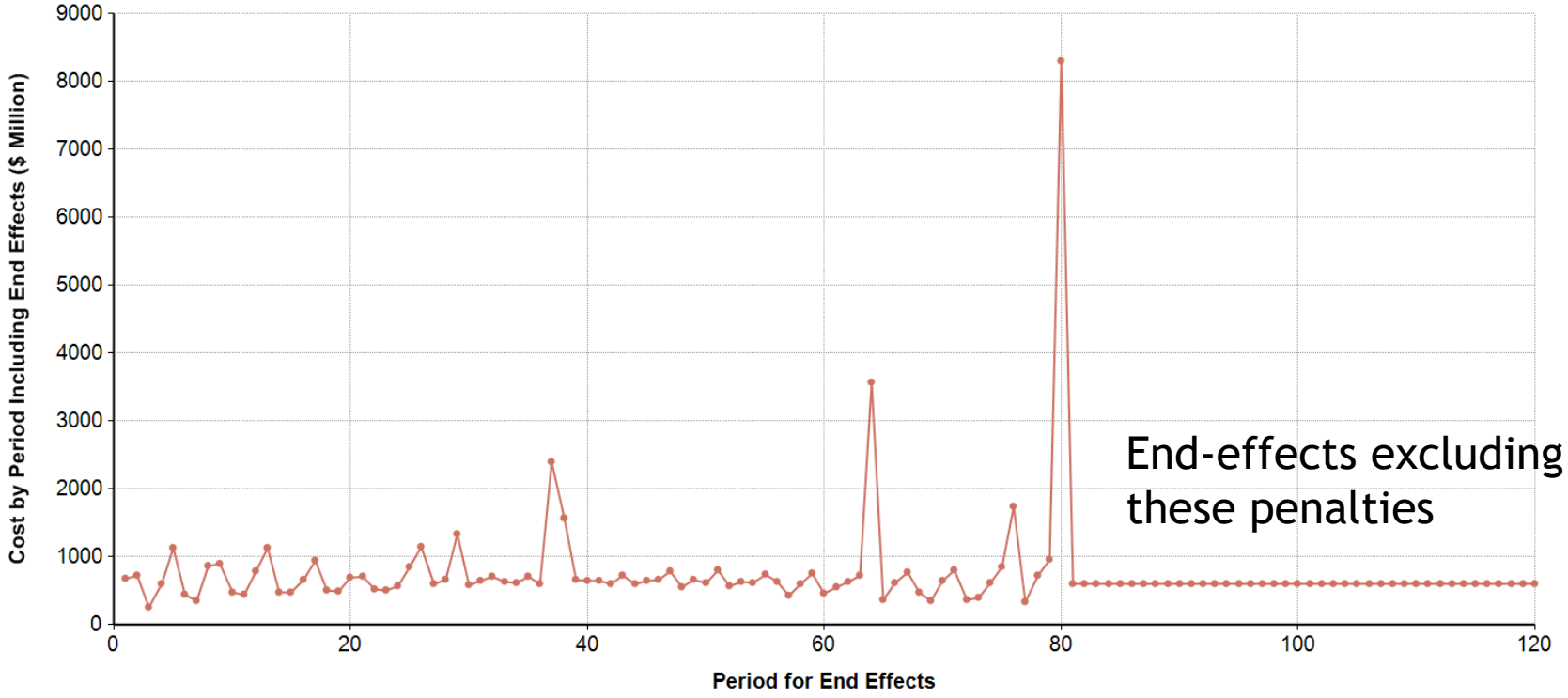
Extra slides for reference

CAVEAT…

While the model has been updated with information from the electricity price forecast, staff is still evaluating the adequacy information to see if there is a need to update the assumptions currently used in the RPM which are based on runs in the classic GENSYS model. Though these results are preliminary, staff believes that they are indicative of what we will see even if updates are needed based on results from the redeveloped GENESYS model.

Penalties and End-Effects

Resource Adequacy penalties cause large cost jumps



Penalties and End-Effects

- Agent-based logic in the model is unable to resolve all Resource Adequacy penalties
- Higher occurrence of penalties toward the end of the study make averaging the tail of the study with penalties overstate end-effects
- Excluding penalties from end-effects misses potential costs and challenges that could occur in the end-effect period
- Including penalties in end effects and/or lengthening the period for end-effects drives larger builds throughout the study including in the action plan period

REC Shortfall Example