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

February 2, 202

MEMORANDUM

TO: **Council Members**

FROM: **Ben Kujala**

SUBJECT: **Summary of Baseline Condition Modeling Results**

BACKGROUND:

Presenters: Ben Kujala and John Ollis

Summary: At the December Power Committee Meeting, we presented a first look at some of the results from the models using baseline conditions. In subsequent meetings we have explored how different assumptions and parameters are impacting the results.

We will update the Council on the results discussed to data and describe some of the factors that substantially influencing those results, including:

- Impacts of projected renewable resource builds outside the region
- Resource selection changes based on including the Social Cost of Carbon
- Natural gas and demand response selection based on adequacy needs
- Energy Efficiency value in an extremely low-priced market

Some of the early results have looked substantially different than previous power plans. We have received feedback for Advisory Committees and Stakeholders and have continuously been testing the models and running

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sensitivities on the different parameters. We are still incorporating much of these results into the baseline conditions and will follow up packet with a presentation to be able to share the most up-to-date results ahead of the Council meeting.

Background:

December Power Committee Presentation:
https://www.nwcouncil.org/sites/default/files/2020_12_p5.pdf

January Power Committee Presentation:
https://www.nwcouncil.org/sites/default/files/2021_01_p4.pdf

January 28th Power Committee Webinar Presentation:
https://nwcouncil.app.box.com/file/769095448780?s=ww73wgczjd4gfuzx7fewr3nl0p7yny9m

Summary of Baseline Condition Modeling Results

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

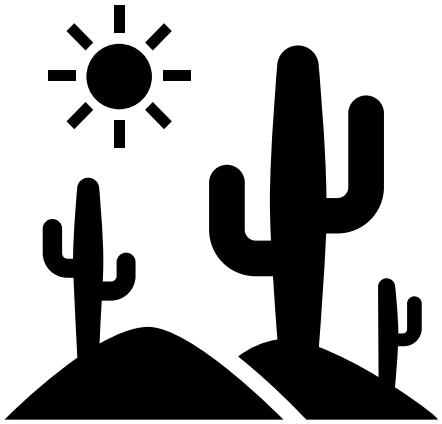
What are the high-level themes?

- GHG Emissions
- Resource Adequacy
- Market Expansion
- Recommendations to Bonneville

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

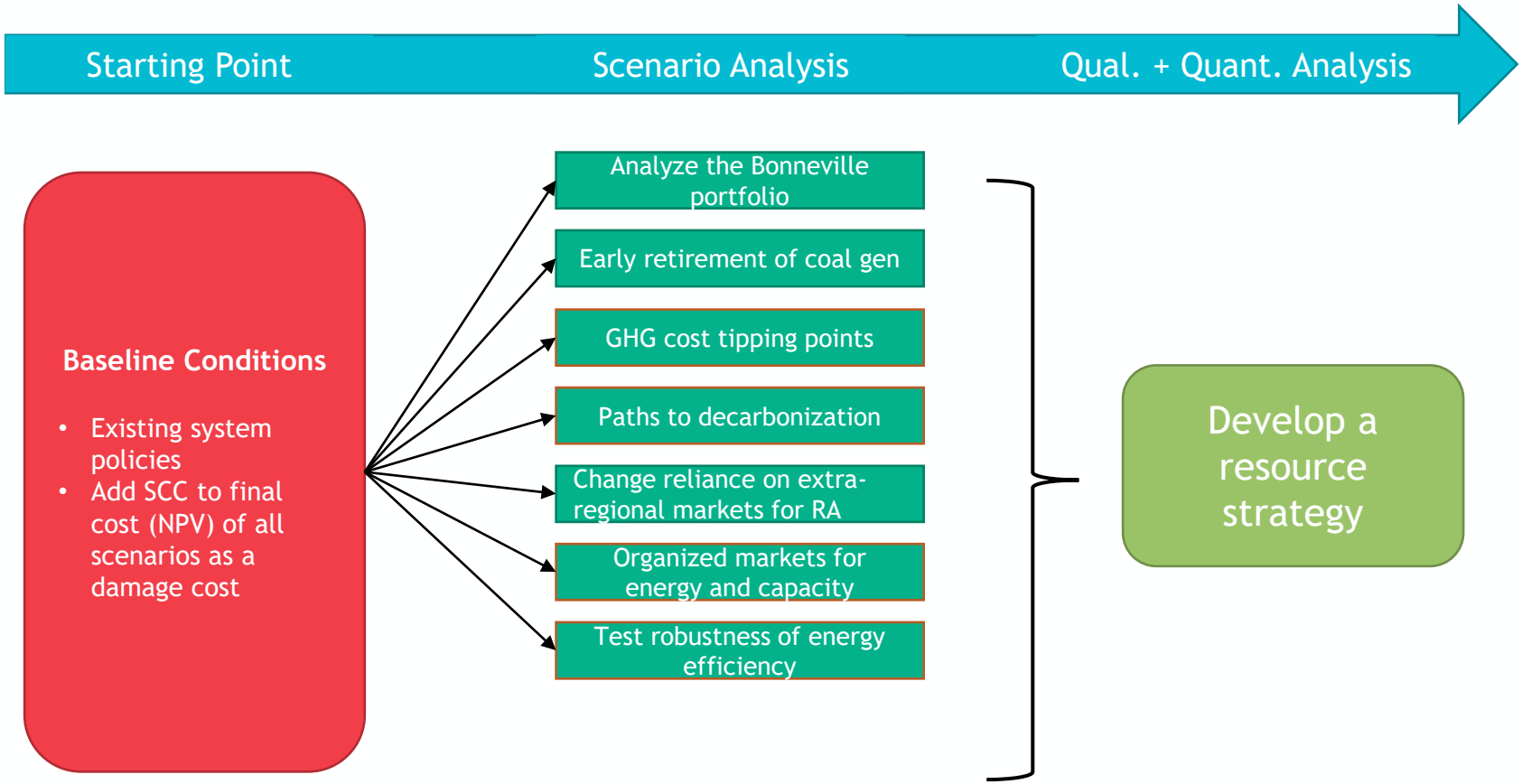
How do we create a scenario?

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

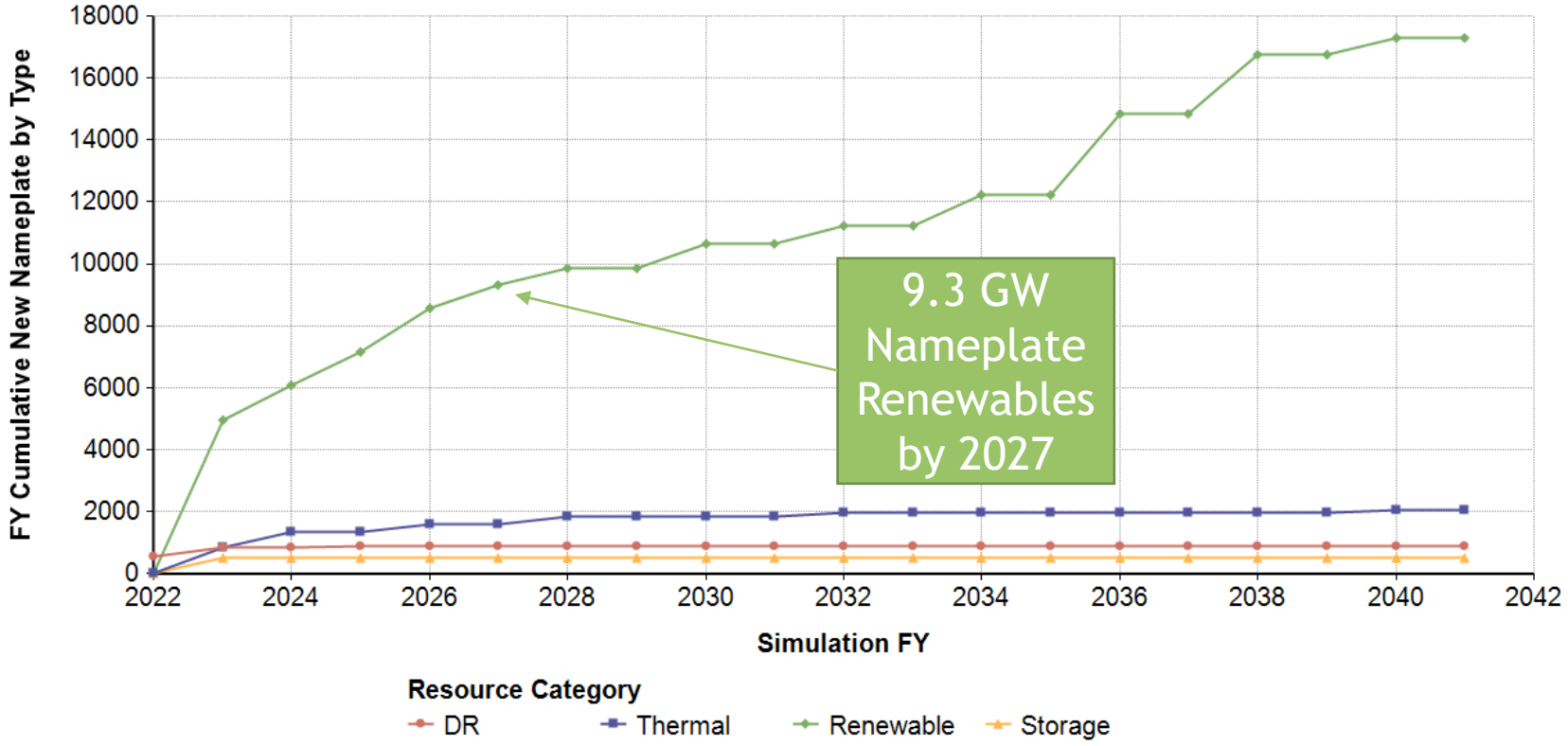
How do scenarios get used?

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

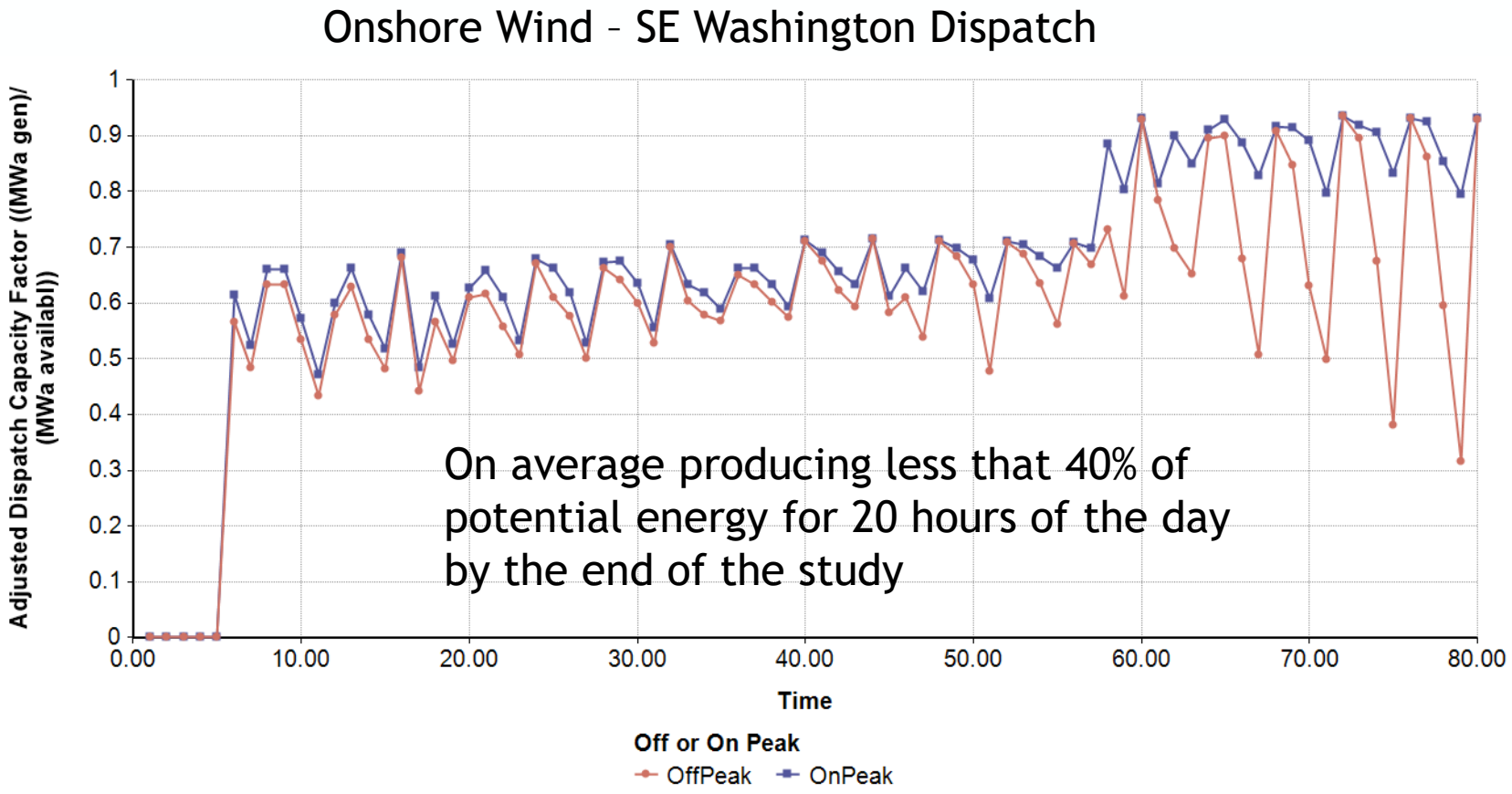
Building the 2021 Power Plan



Large Build of Renewables

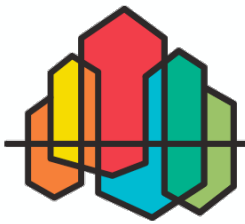


Renewable Curtailment



Integrated Resource Planning

- Rough analysis: Quick review of the region's IOUs near-term resource acquisitions in the latest integrated resource plans (IRPs)
- Many IOUs are actively working on an IRP; some of the IRPs cited here will soon be replaced with the new IRP
  - Some of the IRPs cited were final before clean energy policy wave (WA CETA, utility clean policies) – expect the next IRPs to reflect this (and potentially have higher renewable build-outs)
- IRPs are developed on a roughly two year cycle; continuous evolution
- IRPs typically look out over 20 years, with an action plan period over the next 5 years



Compilation: New Renewable Resource Acquisitions in Preferred Portfolios

	By 2023	By 2025 (cumulative)
Solar PV (utility-scale)	3,120 MW	3,120 MW
Wind (utility-scale)	3,942 MW	4,129 MW
Renewables (utility-scale)		600 MW
Distributed energy resources: renewables and storage		155 MW
Flexible capacity	400 MW	400 MW
Total	7,462 MW	8,404 MW

Notes:
Includes all of PacifiCorp IRP resources
600 MW of the solar by 2023 is co-located with battery
Flexible capacity resource(s) could be renewables, thermals, storage, energy efficiency, and demand response

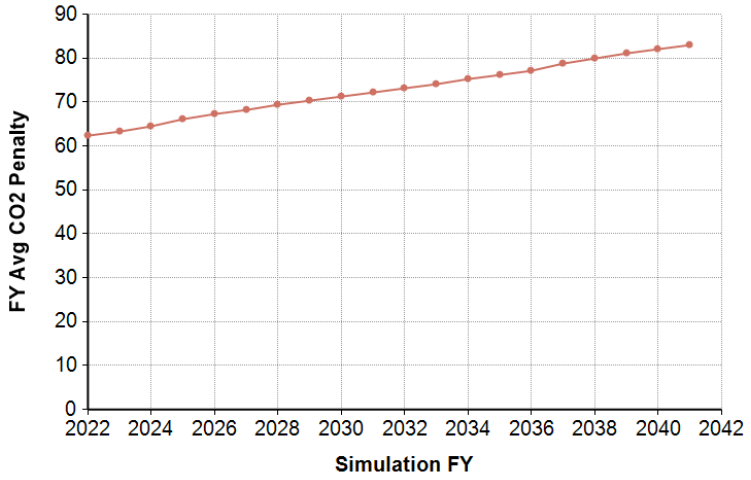
Status of Current IOU* IRP Cycle

Investor Owned Utility	IRP cited *in this rough** analysis*	Current status
Avista	2021 IRP (DRAFT) – January 2021	Plan to file final 2021 IRP in April 2021
Idaho Power	2019 IRP (Second Amendment) – October 2020	2021 IRP in progress
NorthWestern Energy	2019 IRP (August 2019) Supplement to 2019 IRP (Dec 2020)	Finalized supplement to 2019 IRP in Dec 2020
PacifiCorp	2019 IRP – October 18, 2019	2021 IRP in progress, scheduled to be filed April 2021
Portland General Electric	2019 IRP - filed July 19, 2019, acknowledged March 16, 2020	2022 IRP in progress
Puget Sound Energy	2021 IRP (DRAFT) – January 2021	Plan to file final 2021 IRP in April 2021

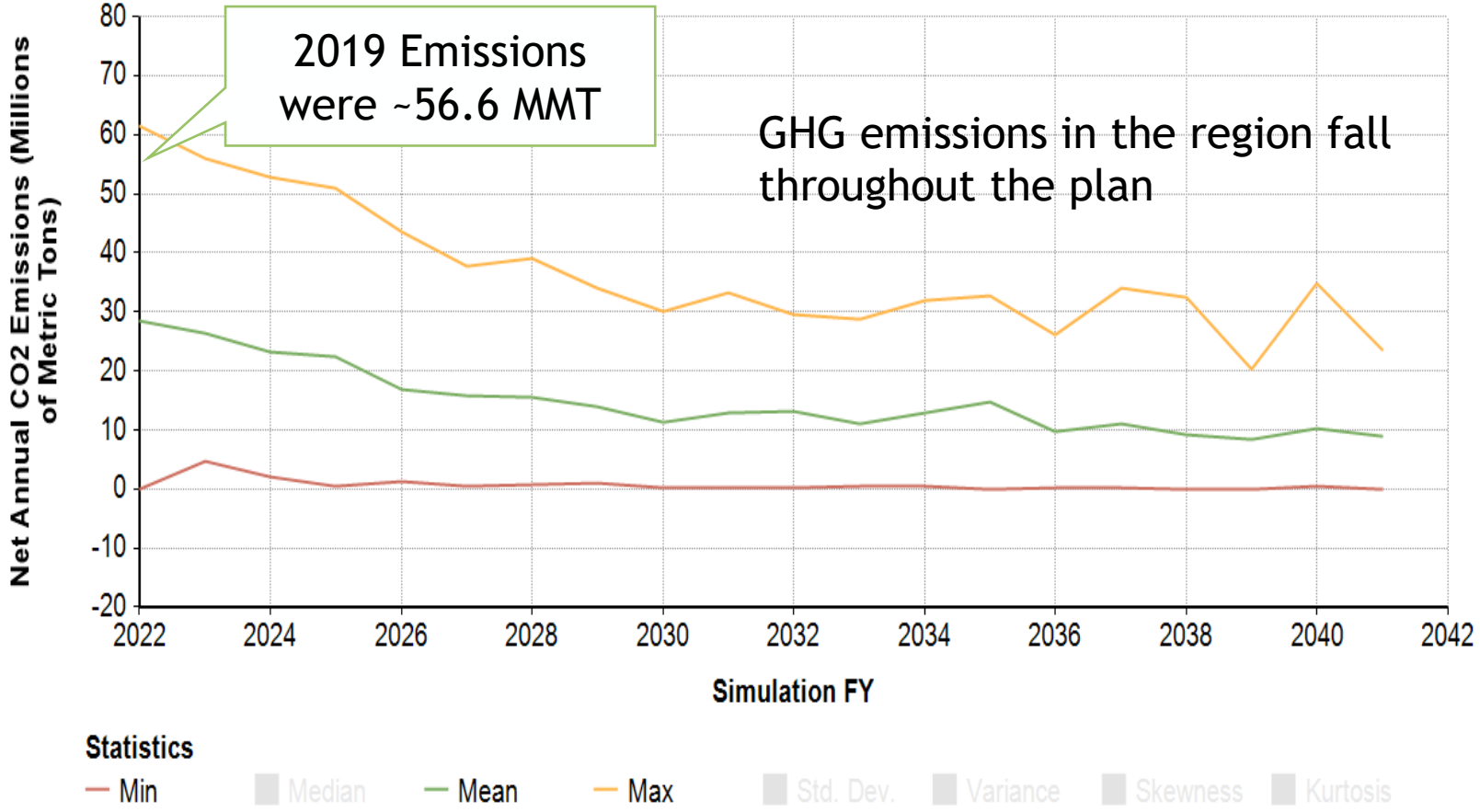
* Many public utilities also develop IRPs; those are not included in this analysis at this time
** The purpose of this "back of the envelope" compilation is to understand the magnitude of IOU expected renewable resource acquisitions in the near-term; it should not be considered an apples-to-apples comparison with the preliminary draft 2021 plan results

Social Cost of Carbon

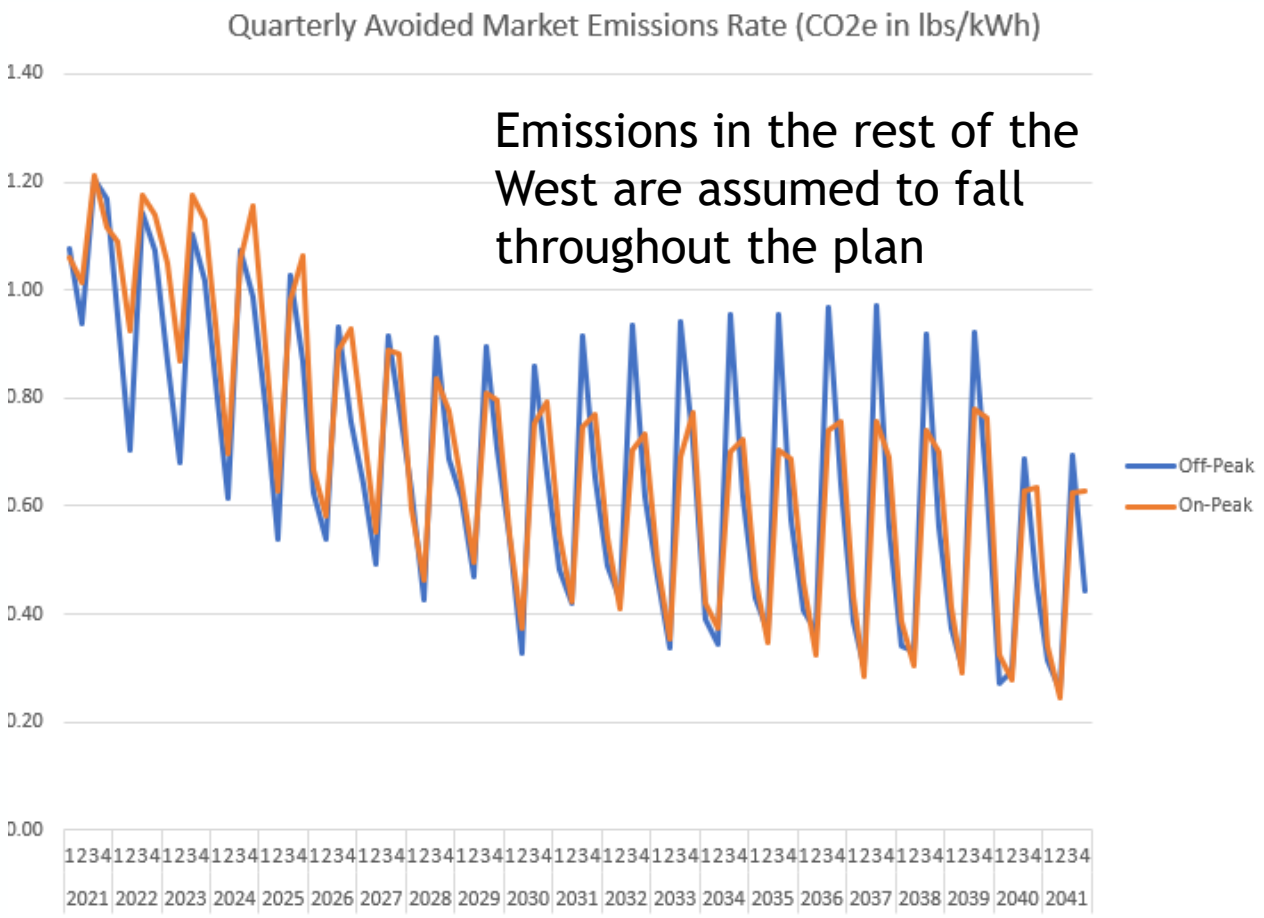
- Starts at $62.41 per metric ton of CO2 equivalent emissions
- Included as part of the cost to serve load
- Averages about $36 Billion for the NPV calculation
  - Just above 75% of the net NPV cost excluding penalties – higher proportionally than the 7th Plan Social Cost of Carbon scenario where around 33% of the net NPV was carbon costs

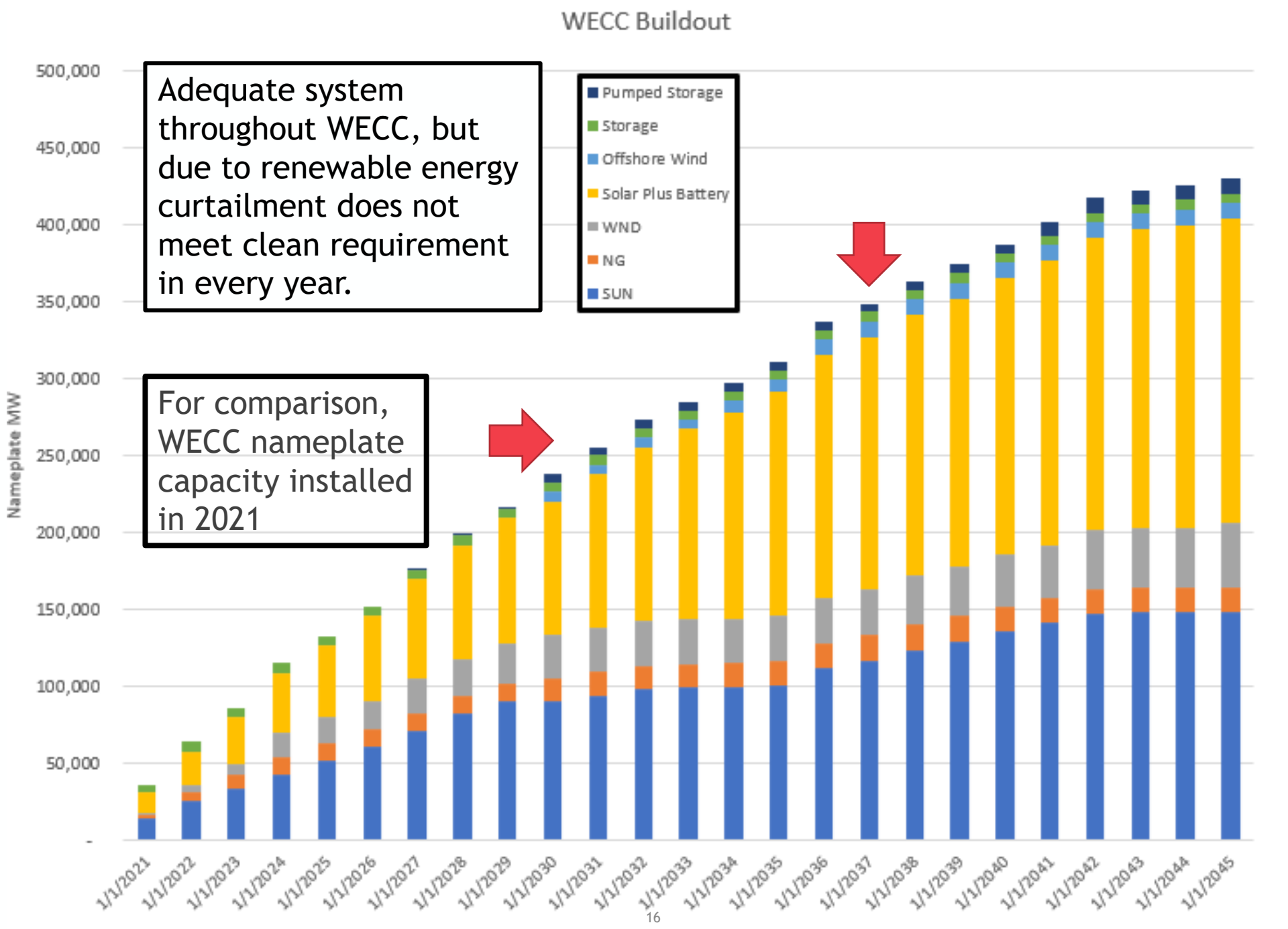


GHG Emissions



Emissions from the External Market




WECC Buildout
Adequate system throughout WECC, but due to renewable energy curtailment does not meet clean requirement in every year.
For comparison, WECC nameplate capacity installed in 2021
Pumped Storage
Storage
Offshore Wind
Solar Plus Battery
WND
NG
SUN
Nameplate MW
500,000
450,000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
-
1/1/2021
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1/1/2041
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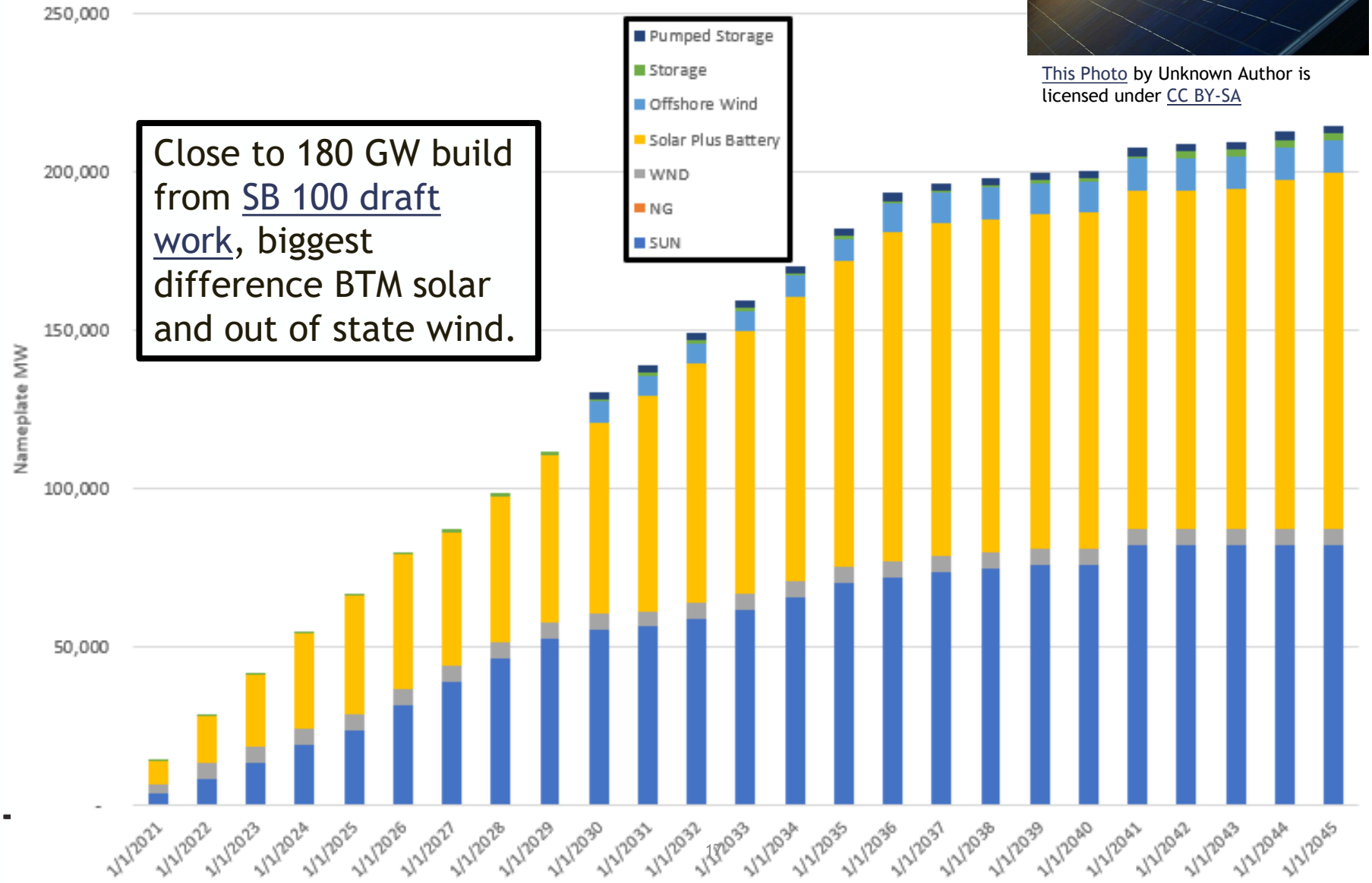
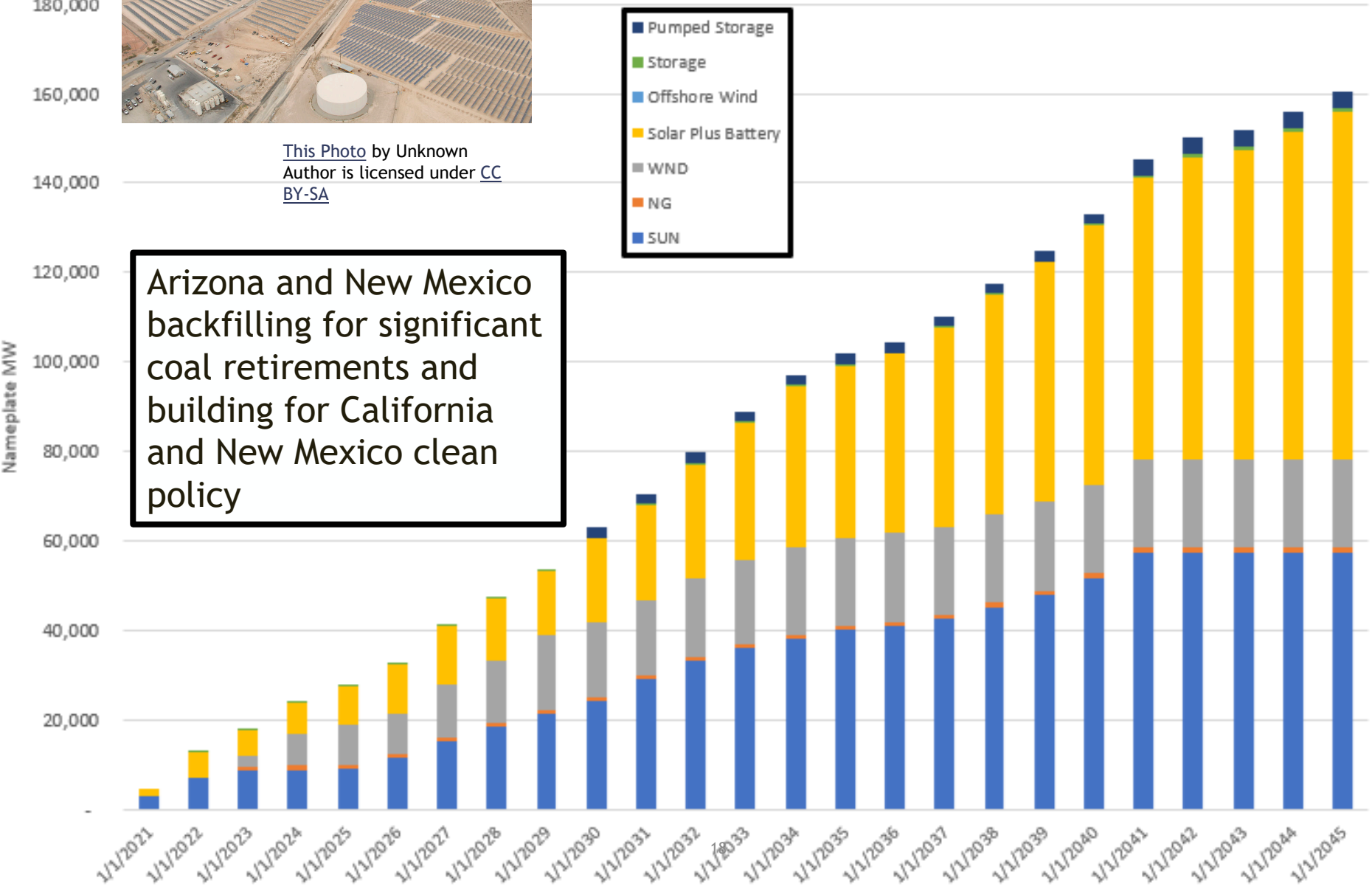
CA Buildout

Close to 180 GW build from SB 100 draft work, biggest difference BTM solar and out of state wind.

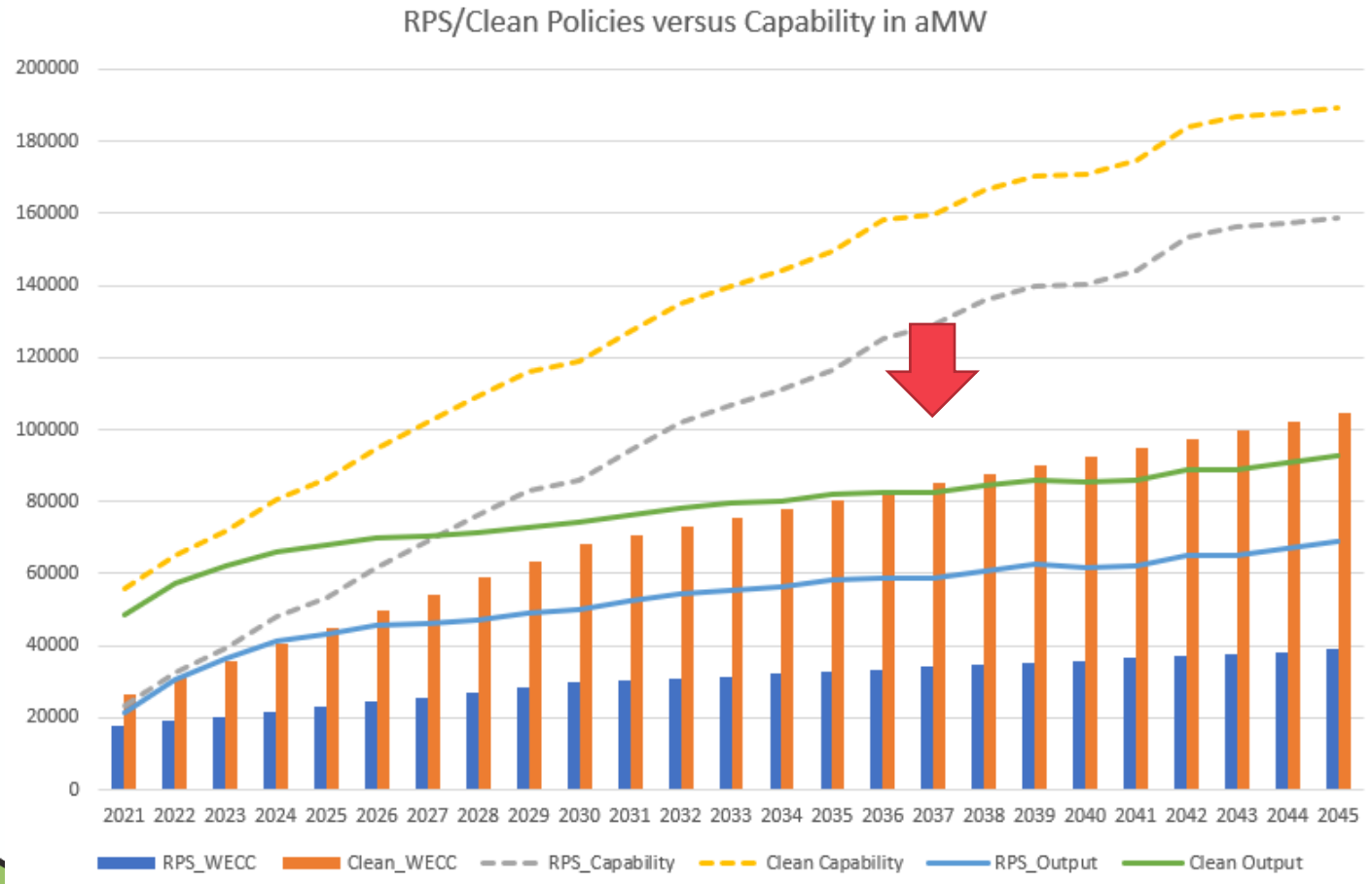


Desert SW Buildout

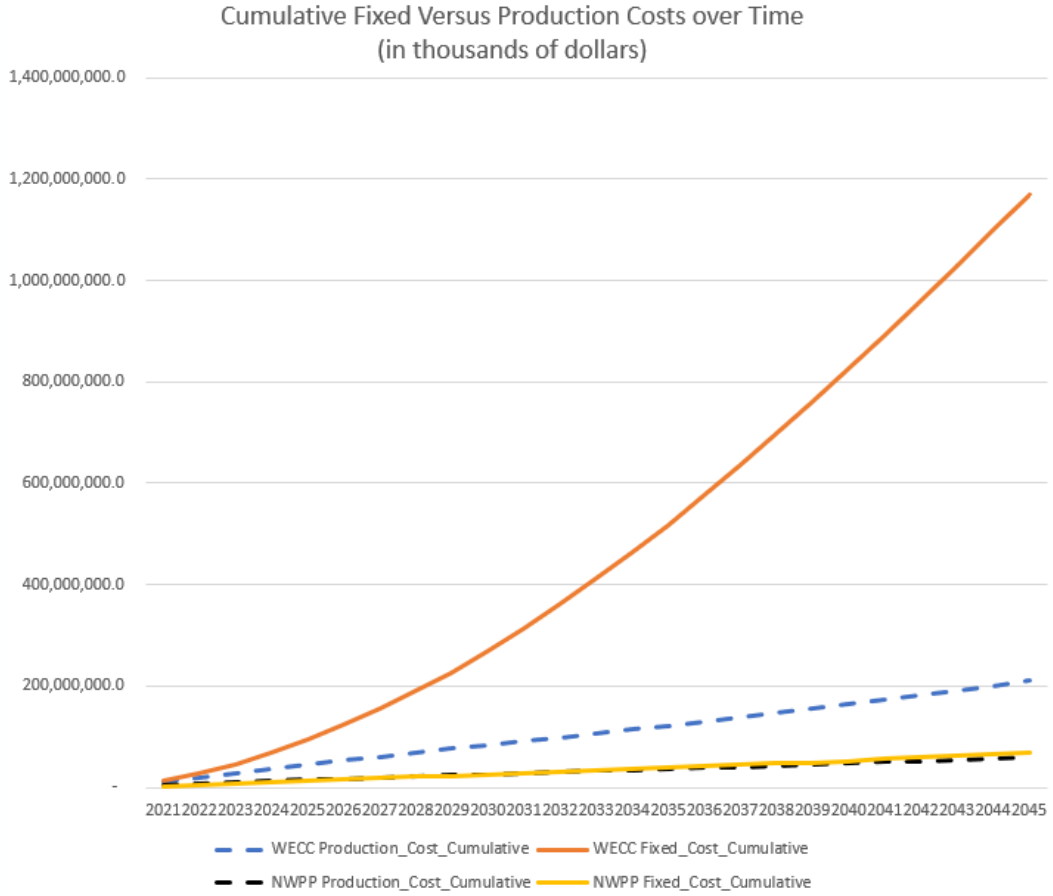


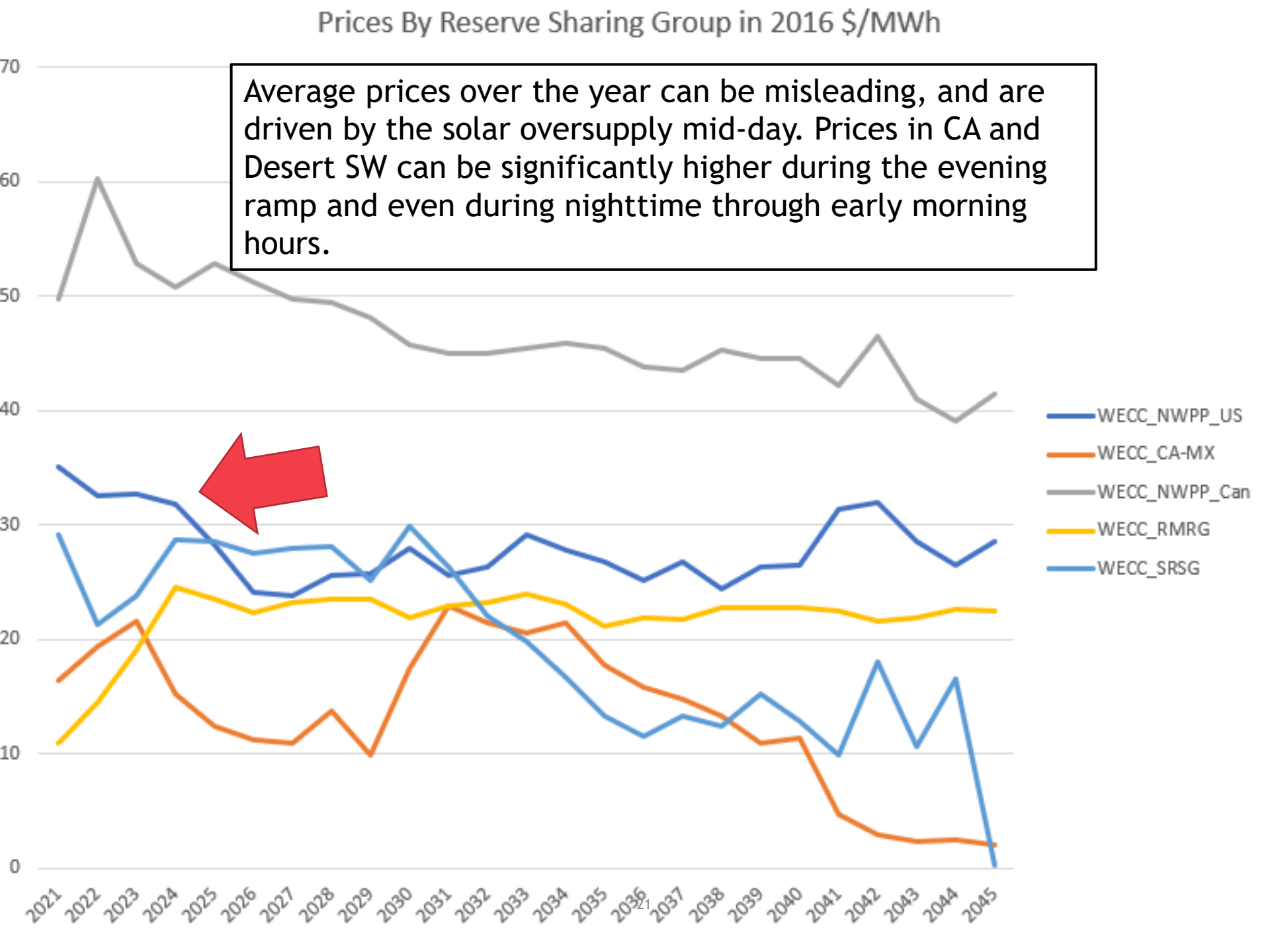
Arizona and New Mexico backfilling for significant coal retirements and building for California and New Mexico clean policy

Meeting Clean Policy Requirements Until Late 2030's



Fixed costs more than **6 times** production costs for WECC, NWPP fixed and production costs stay similar.




Prices By Reserve Sharing Group in 2016 $/MWh
Average prices over the year can be misleading, and are driven by the solar oversupply mid-day. Prices in CA and Desert SW can be significantly higher during the evening ramp and even during nighttime through early morning hours.
70
60
50
40
30
20
10
0
2021
2022
2023
2024
2025
2026
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2028
2029
2030
2031
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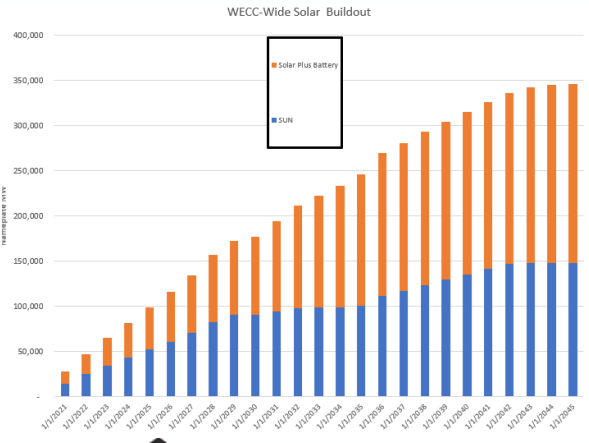
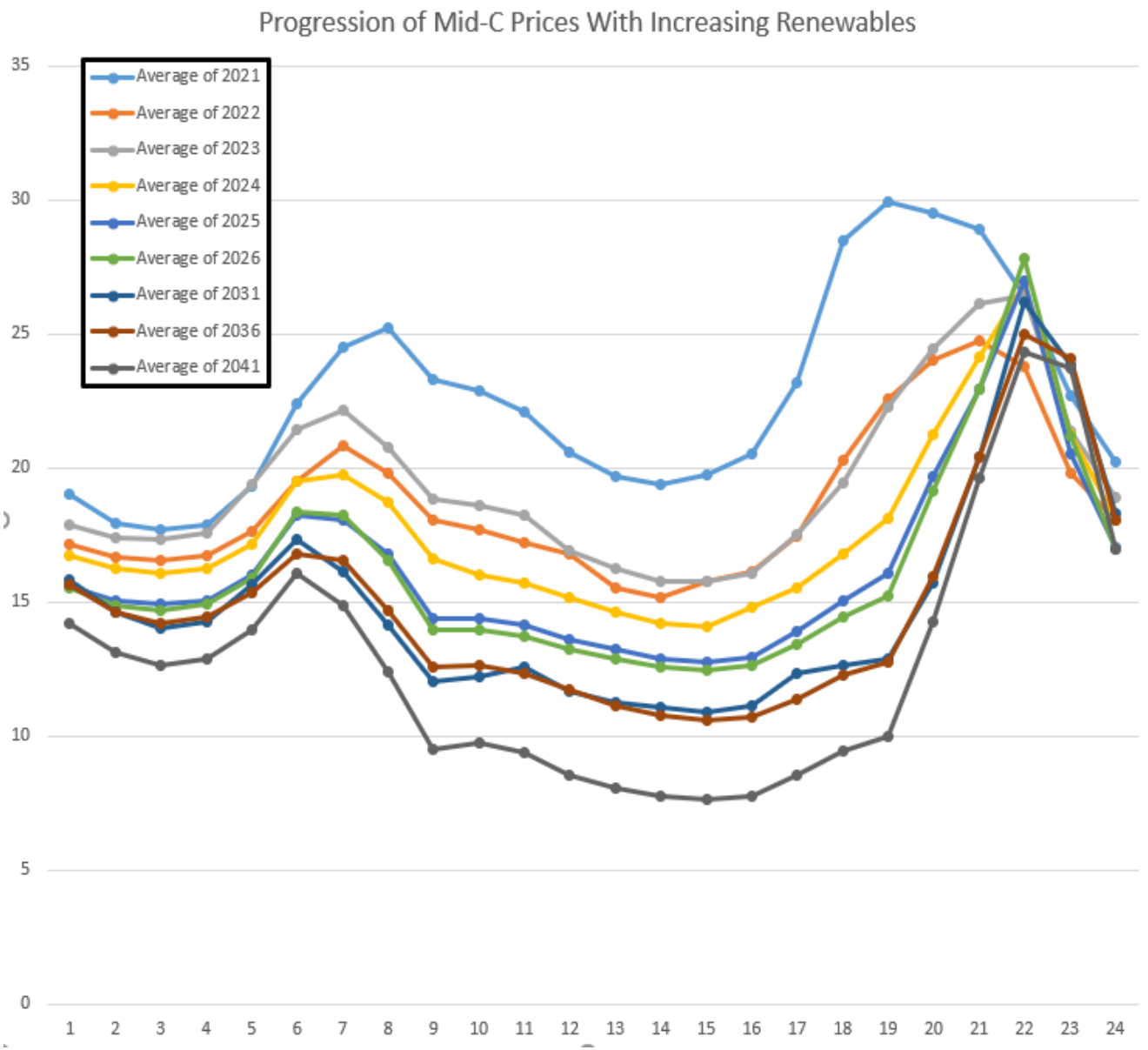
WECC_NWPP_US
WECC_CA-MX
WECC_NWPP_Can
WECC_RMRG
WECC_SRSG

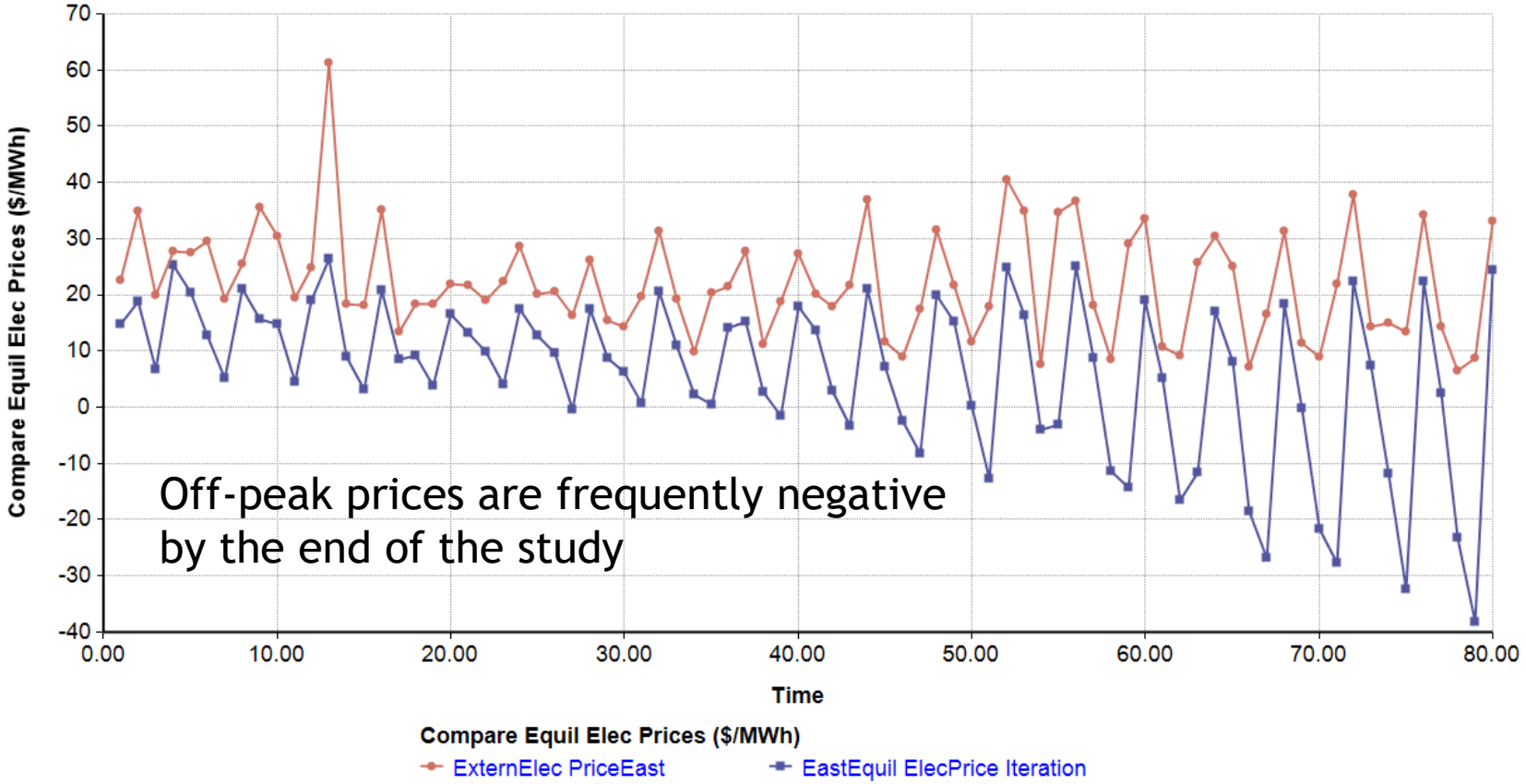
Daily shape changes with more WECC-wide solar





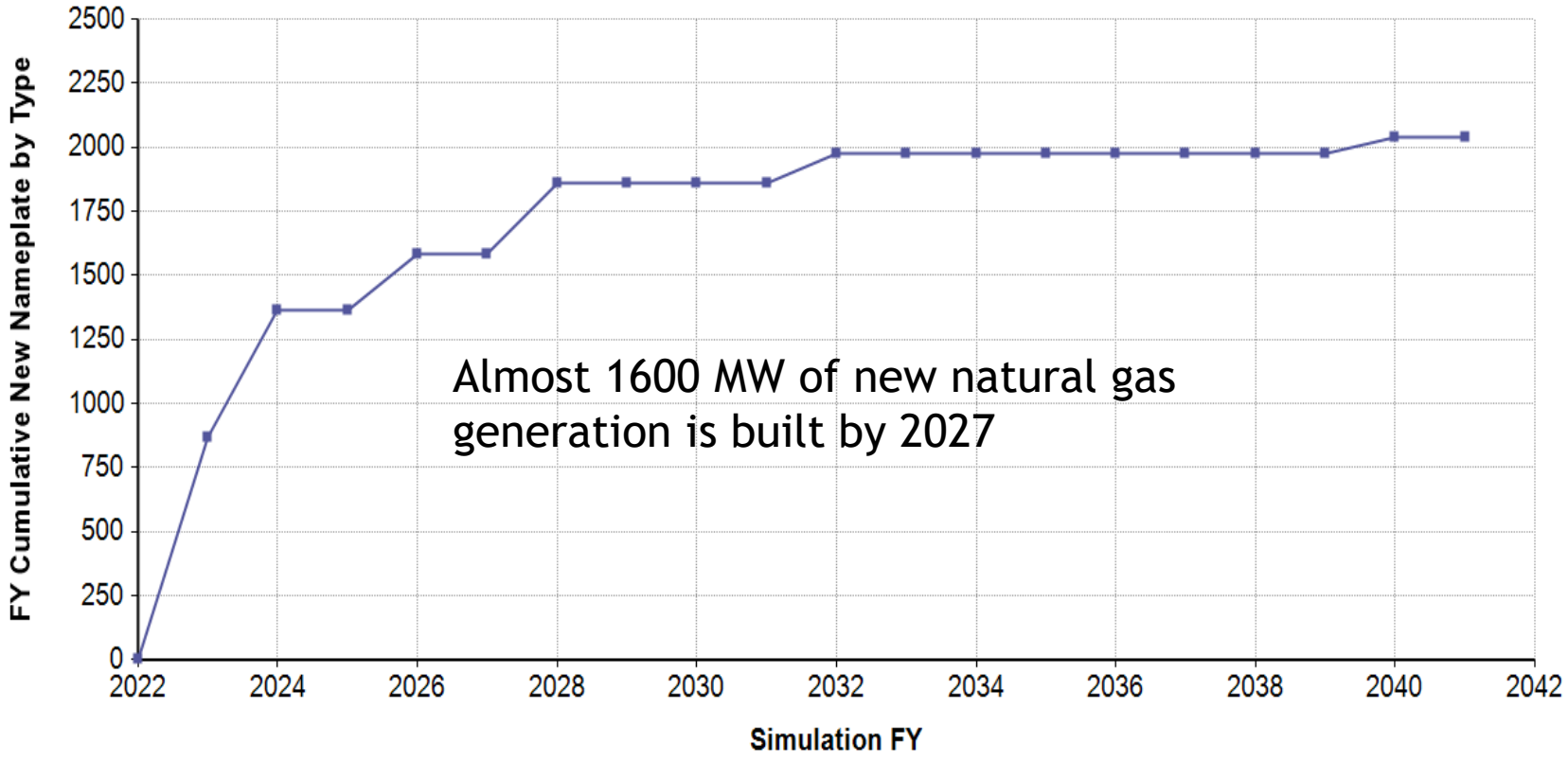
Impact of Electricity Price Forecast

Off-peak Electricity Prices

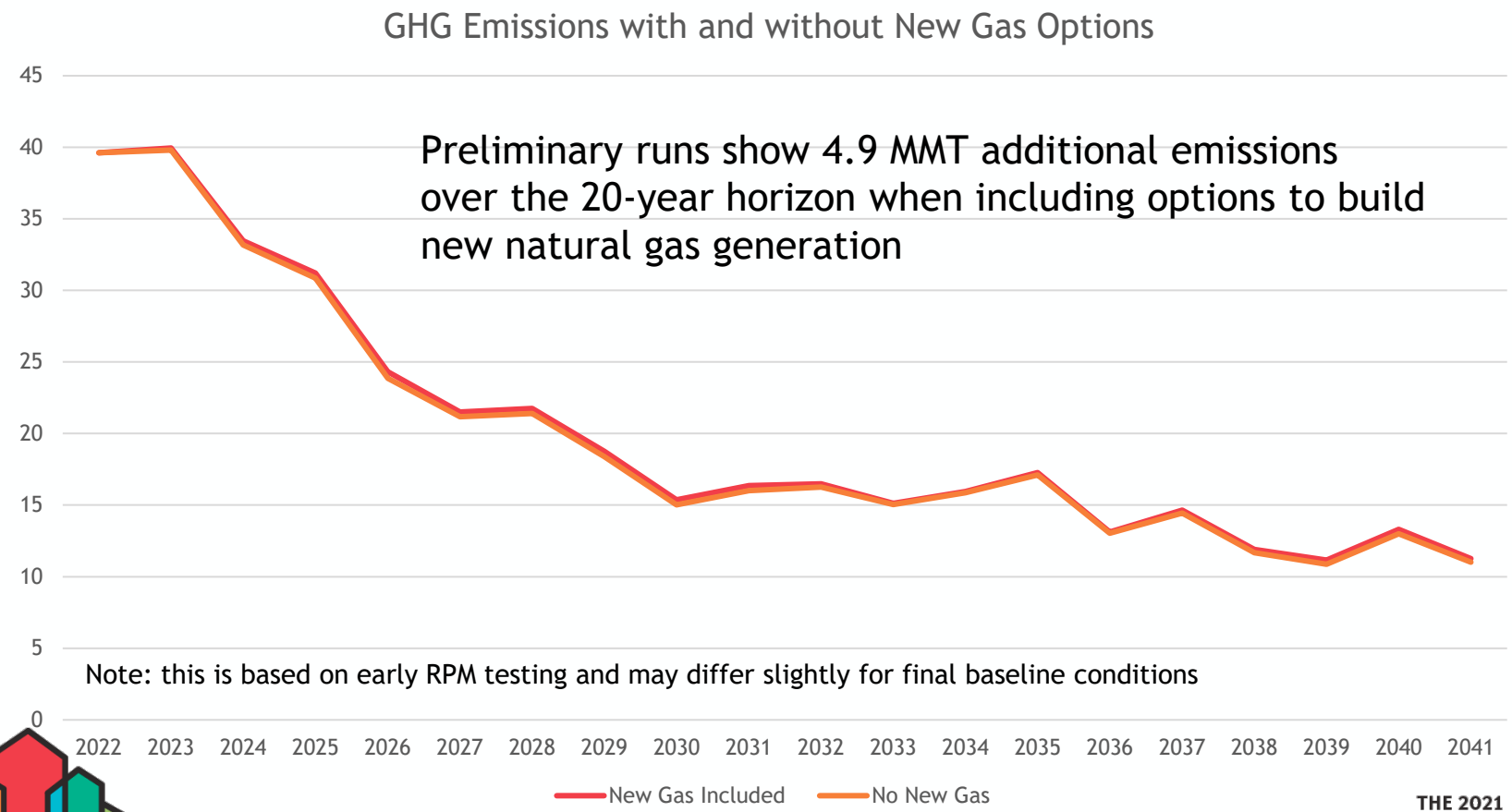


Off-peak prices are frequently negative by the end of the study

Natural Gas Generation Build



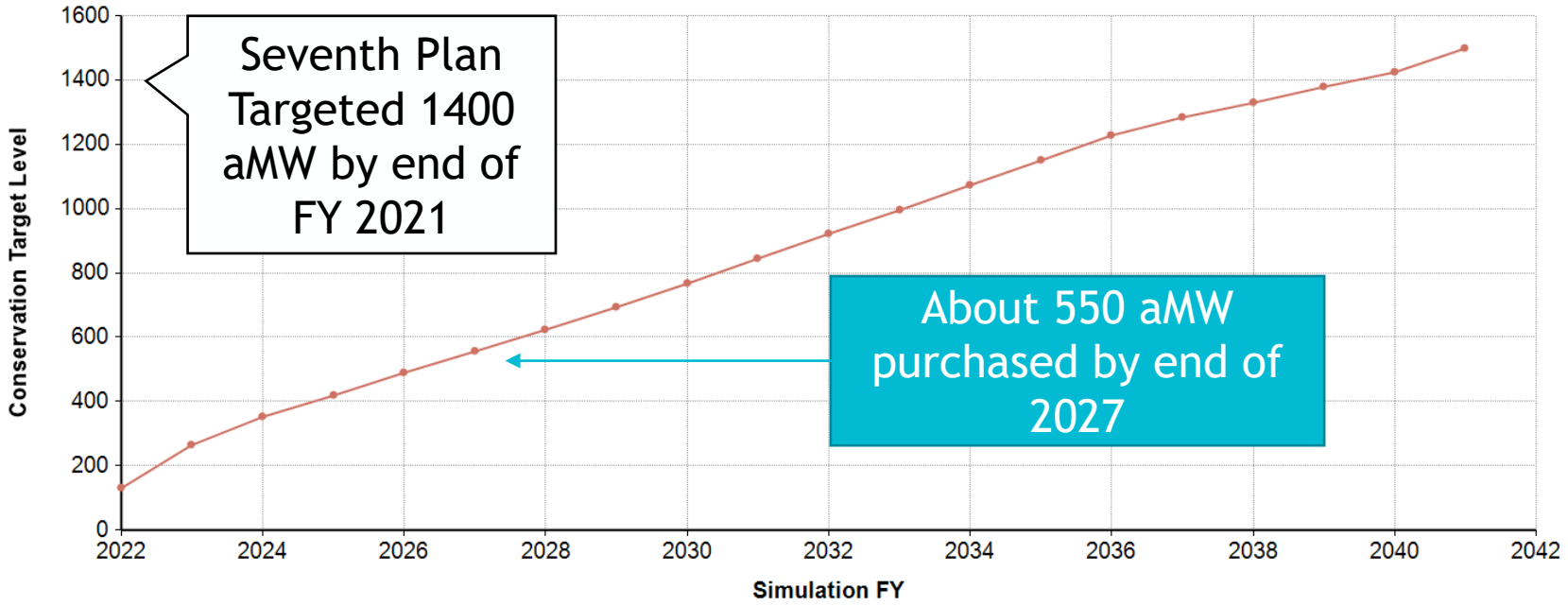
Minimal Reduction in GHG Emissions (MMT)



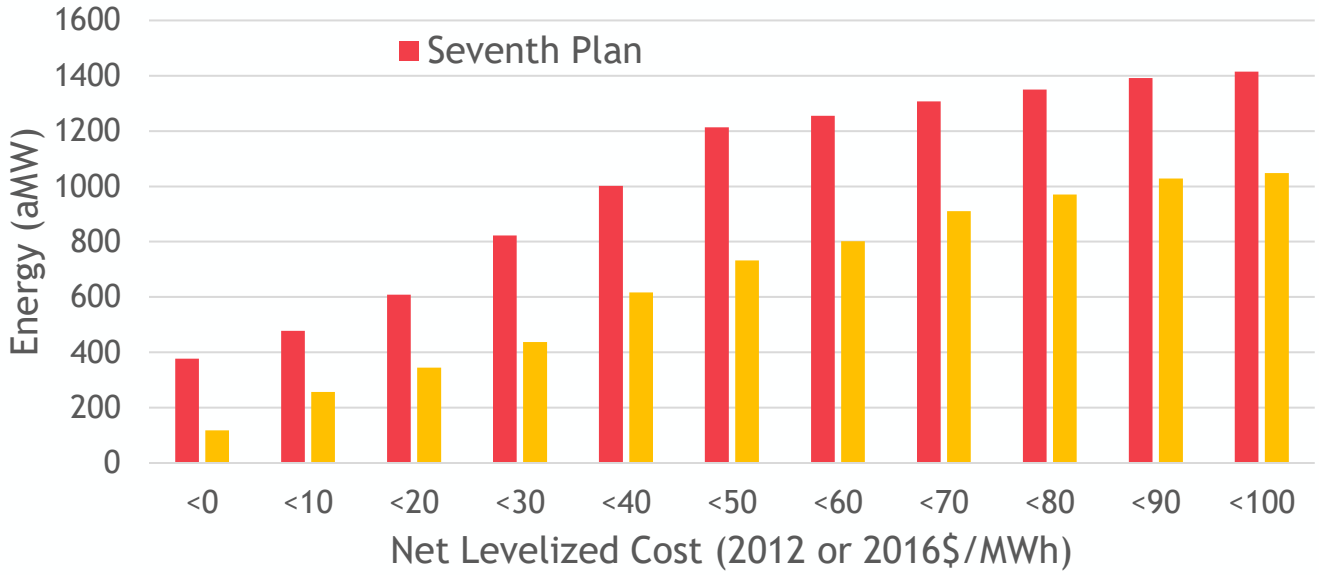
Preliminary runs show 4.9 MMT additional emissions over the 20-year horizon when including options to build new natural gas generation

Note: this is based on early RPM testing and may differ slightly for final baseline conditions

Maximum Amount of Conservation Purchased by FY



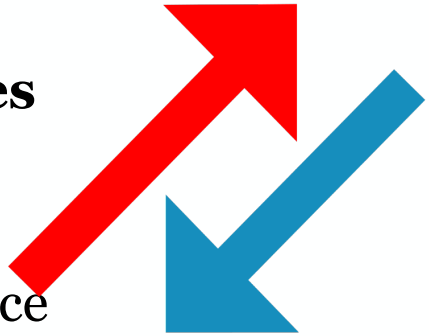
Action Plan Timeframe Impact



6-year EE target would be ~28% lower (around 1,000 aMW) if we were in 7P world!

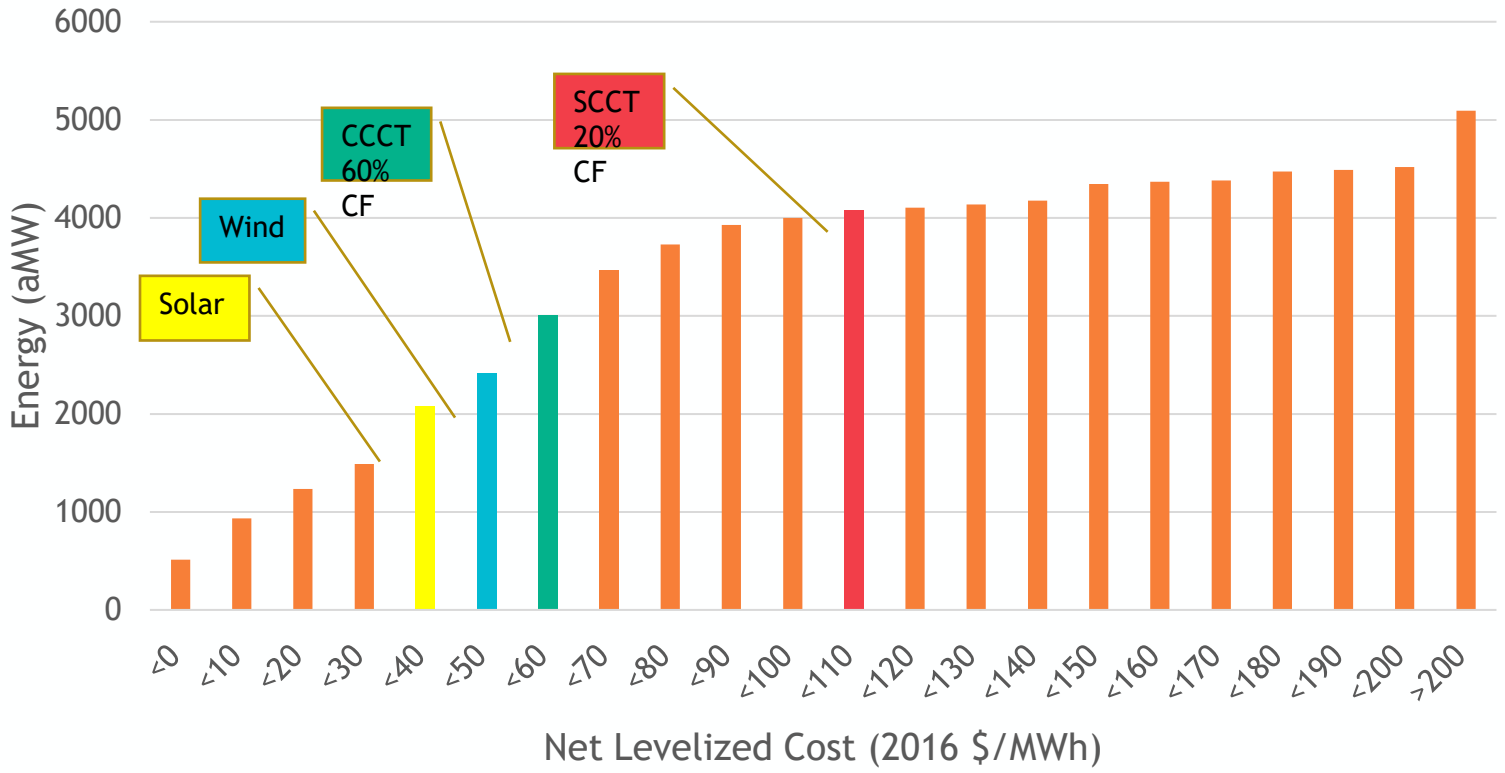
2021 Plan World

- Many changes since 7P release
  - State **clean policies** across WECC
    - Significant **coal retirements**
    - Large **renewable builds**
  - **Market prices** are rapidly decreasing and frequently **negative** by ~2030
  - Dramatic **decrease** in price for **renewables**
  - **Decrease** in **gas** prices
  - **Decrease** in price of combustion **turbines**
  - **Dispatchability** is of paramount importance



  - EE has a lot more competition

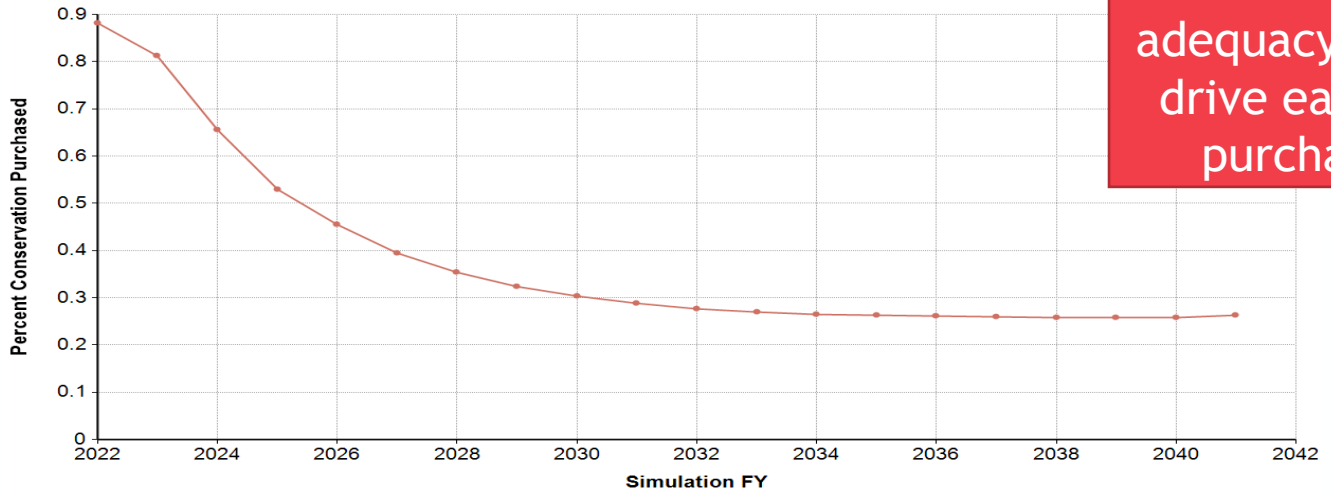
Comparing Energy Efficiency with 2021P Generation Resources Costs (examples)

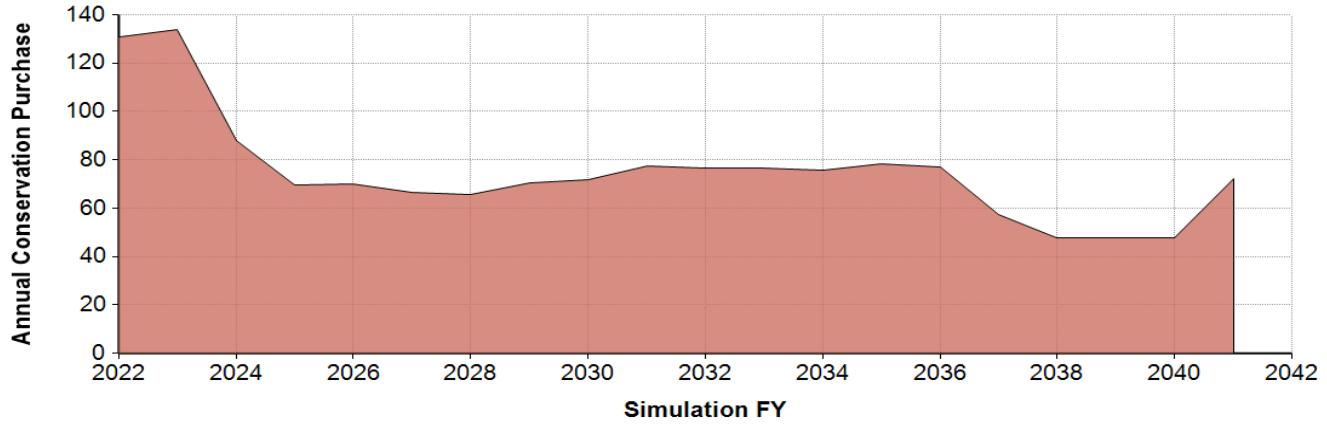


Note: wind and solar prices in this comparison do not include estimated value from RECs

Percent of Conservation Supply Purchased

Near-term adequacy needs drive early EE purchases





EE cost dynamic

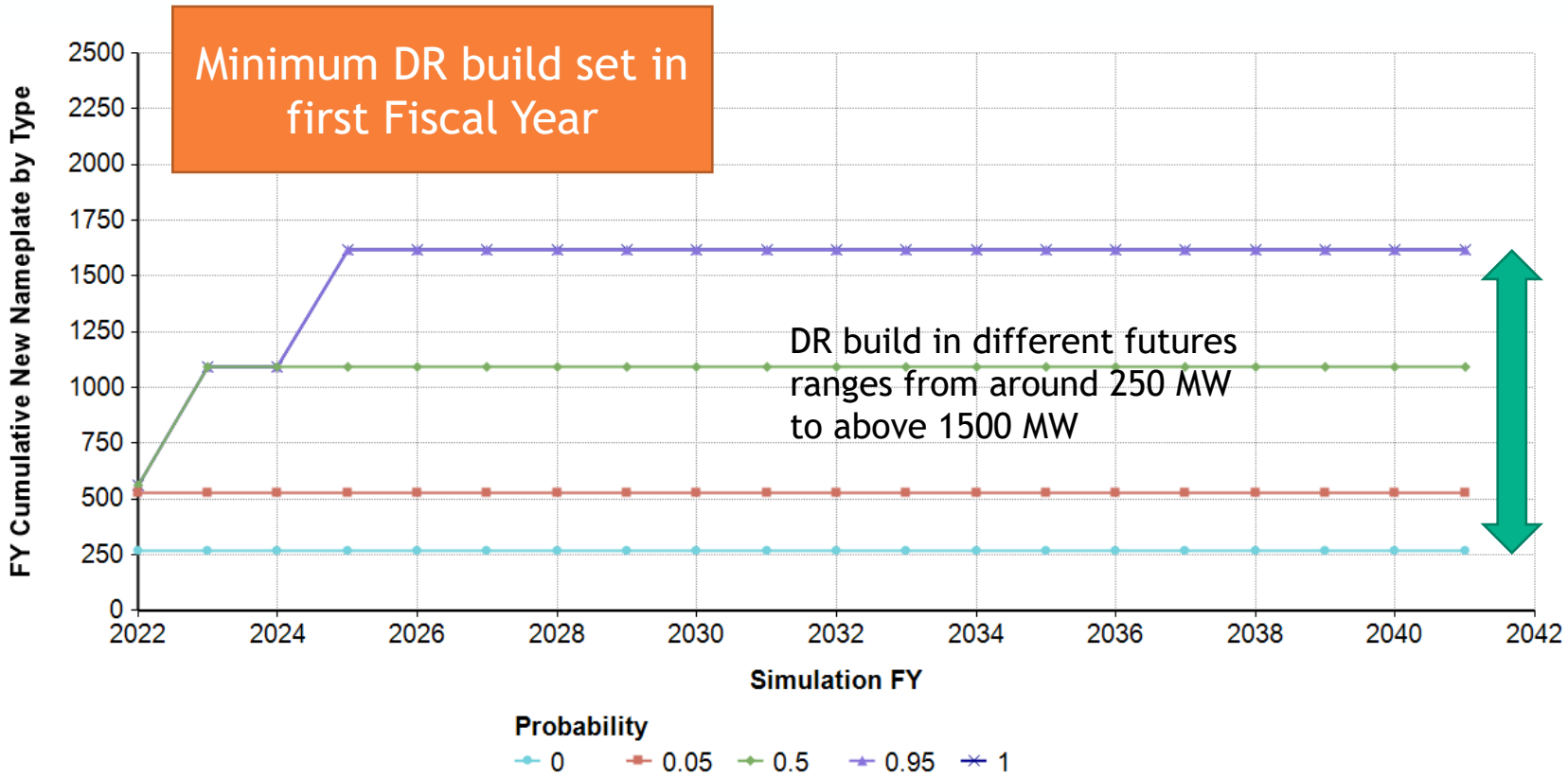
- By action plan period about 120 aMW out of 550 aMW or approximately 22% of EE is purchased at a negative cost

- About 450 aMW are from buckets that have an expected net cost below zero

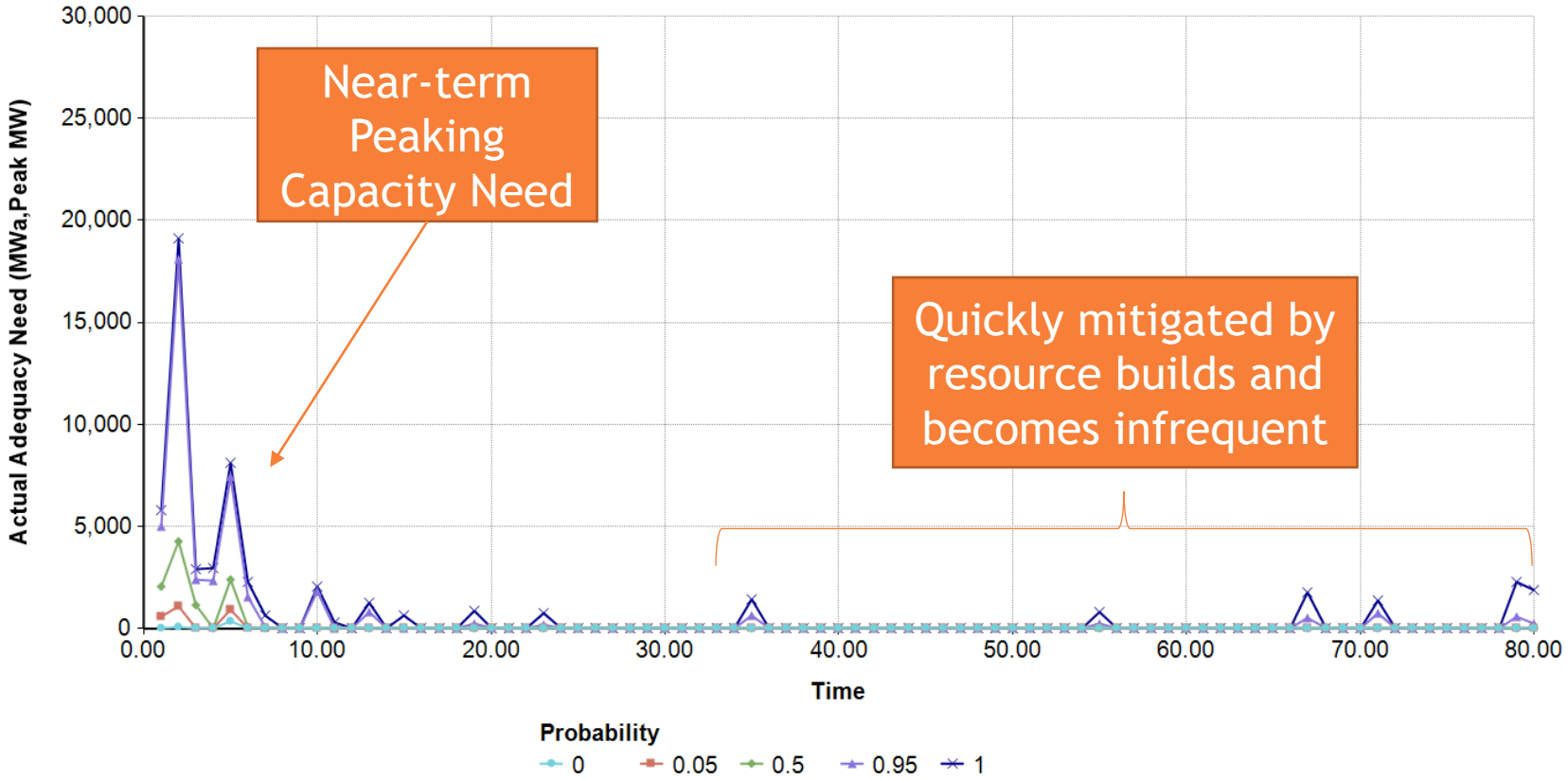
EE in 2021P World

- Renewables are competing directly with EE
  - No carbon emissions
  - Low cost with additional benefits (ITC and RECs)
  - Interruptible
- Low market prices that are *decreasing* over time reduce value of EE as a hedge
  - Only first couple bins of EE show negative long-term energy value (when CO2 prices are included)
- EE as an incremental build resource is less desirable than a immediate build generation resource

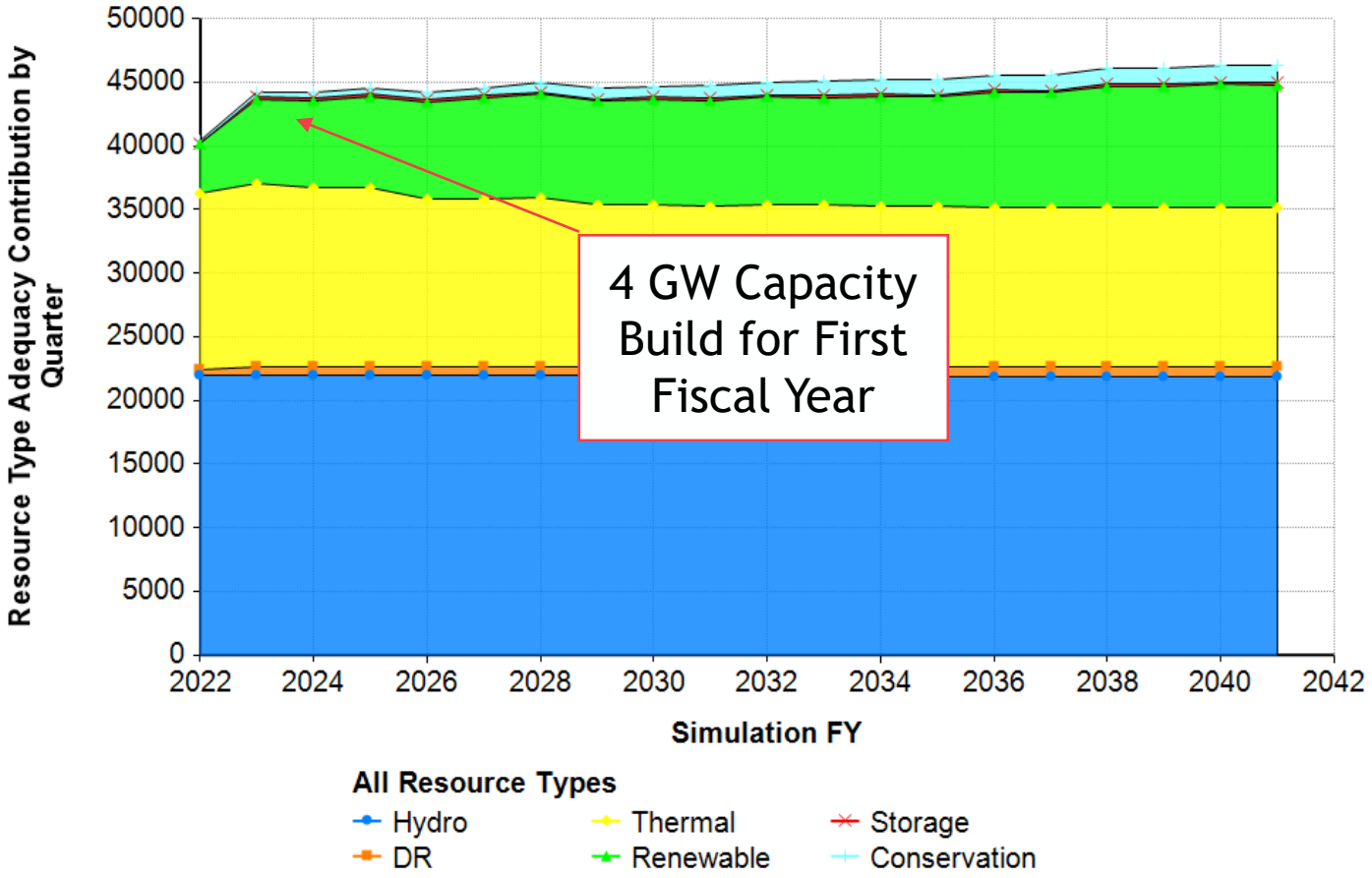
Demand Response Builds for Adequacy Need



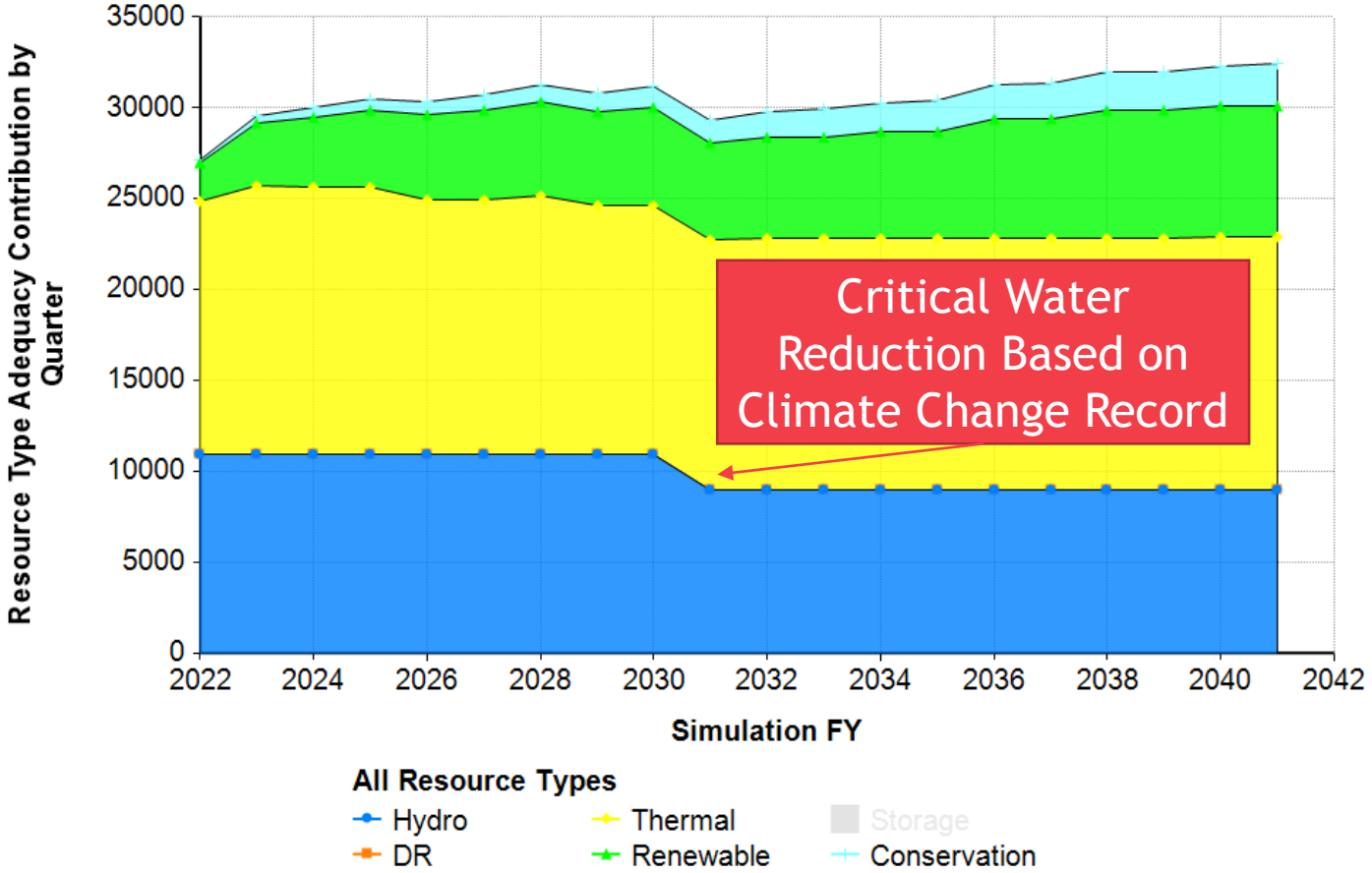
Immediate Adequacy Need



Resource Adequacy Contribution Summer – Capacity



Resource Adequacy Contribution Summer – Energy

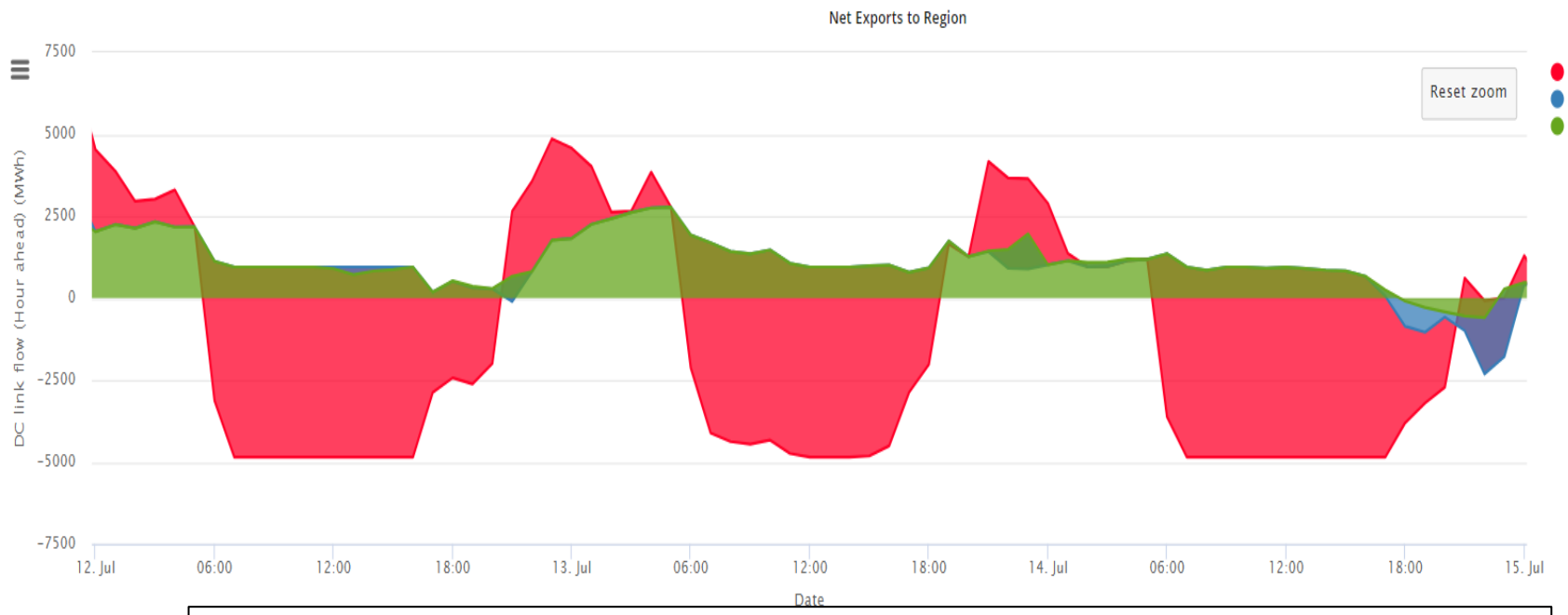



Questions?

Extra slides for reference

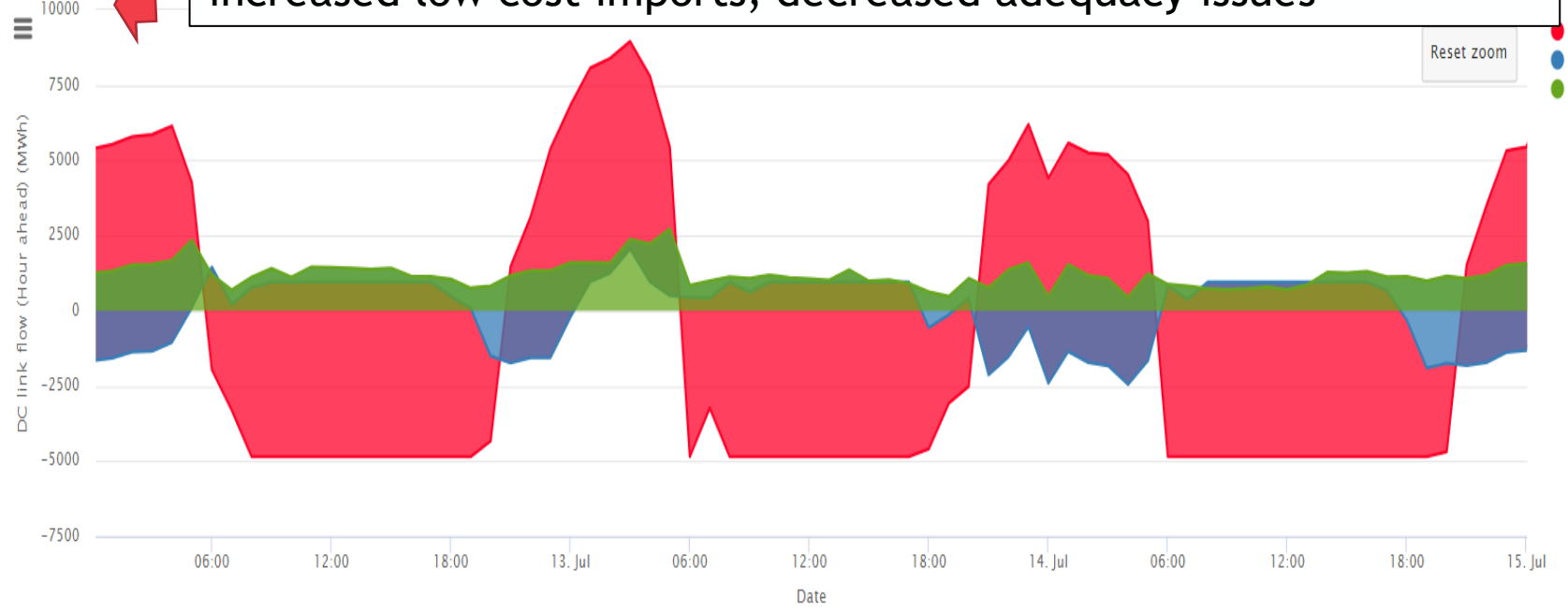
CAVEAT…

While the model has been updated with information from the electricity price forecast from AURORA, and adequacy reserve margin and expected hydro generation from the redeveloped GENESYS, staff is still evaluating the associated system capacity contribution data to see if there is a need to update the assumptions currently used in the RPM which are based on runs in the classic GENESYS 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.



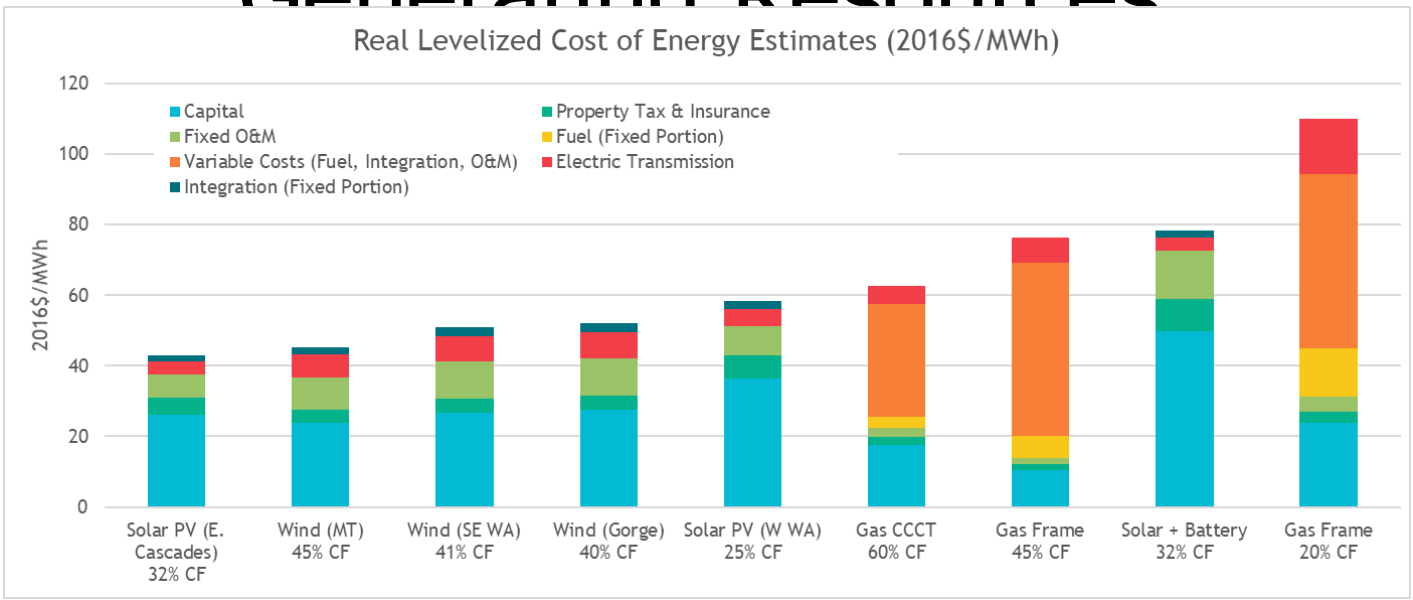
2023

Large WECC-buildout leads to more external market supply, increased low cost imports, decreased adequacy issues



2027

Draft 2021 Plan – LCOE Estimates of Select New Generating Resources*



*Based on draft 2021 plan generating resource reference plants (size, configuration, technology, location, etc.) and financial assumptions in MicroFin