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March 30, 2021

MEMORANDUM

TO: Council Members

FROM: John Ollis, Manager of Planning and Analysis

SUBJECT: Markets for Energy/Capacity

BACKGROUND:

Presenter: John Ollis and Ben Kujala

Summary: The work on this scenario thus far has focused on changes in the structural and fundamental drivers of the market and resources available to the region. Some of the explorations look at implications of a WECC-wide organized market, a market reflecting current policies but not built to reserve margins, and markets where resource build is limited by regulation or current contract structures. We will assess the implied changes in regional needs and analyze strategies to highlight potential risks and benefits or different markets.

Some needs assessment and resource strategy analysis information from this presentation is pending as staff analyzes ongoing simulation results.

Relevance: External market supply changes associated with projected extremely high renewable resource builds have surfaced as a key area of stakeholder concern in this plan per the advent of significant statewide/ municipal policies and utility goals. In the process of developing the WECC buildout for the baseline, the council and its advisory committees have discussed the effects of limited resources available for builds, insufficient reserve margins, and opportunities to increase regional coordination. This

scenario is to help understand the impact of some of these uncertainties and frame the regional discussion.

Workplan: A.6.1 Complete scenario analysis for the plan

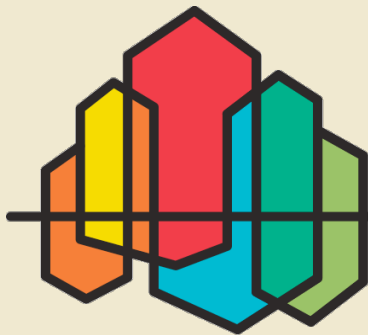
More Info: Simulation results related to this scenario will be discussed at the upcoming March 31st System Analysis Advisory Committee (SAAC).

Preliminary Results: Markets for Energy and Capacity Scenario

Power Committee

April 6th, 2021

John Ollis, Ben Kujala



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ENERGY FUTURE

Summary

- Discuss methodological approaches and setup for markets for energy and capacity scenario
- Share buildouts from AURORA for the following sensitivities:
 1. *Organized Market*
 2. *Limited Market (ignore reserve margins)*
 3. *No Gas Build Limitations*
- Discuss SAAC feedback and additional market tests
- Discuss needs assessment and resource strategy results from the *No Gas Build Limitations* sensitivity



Scenario Description

- Examine the impact on the resource strategy of organized or limited markets under different fundamental, structural and regulatory assumptions.
- We will also estimate changes to adequacy, market and reserve requirements where appropriate.

Organized markets

One planning reserve margin AND zero wheeling costs (or a single wheeling cost)

Limited markets

Examine effects of limits on gas builds

Examine a market built outside the region without considering planning reserve margins

Examine effects of limits/higher costs on renewable builds due to limits on firm transmission rights



AURORA Buildout

Organized Market
Limited Market

Get A Strategy

Long term capital expansion for the WECC ensures that price simulations in AURORA are informed by an *adequate system* that *meets policies*

AURORA Price Runs

Hourly market capability is needed for GENESYS to provide *a good adequacy signal for the NW* informed by changing market fundamentals

Hourly WECC-wide price simulations inform *market prices* and *associated emissions* in the RPM, both can significantly impact *regional resource strategy economics*

GENESYS

RPM

No Gas
Build
Limits

Hourly analysis in GENESYS creates quarterly ARMs and ASCCs, which the RPM uses *to select an adequate resource strategy*

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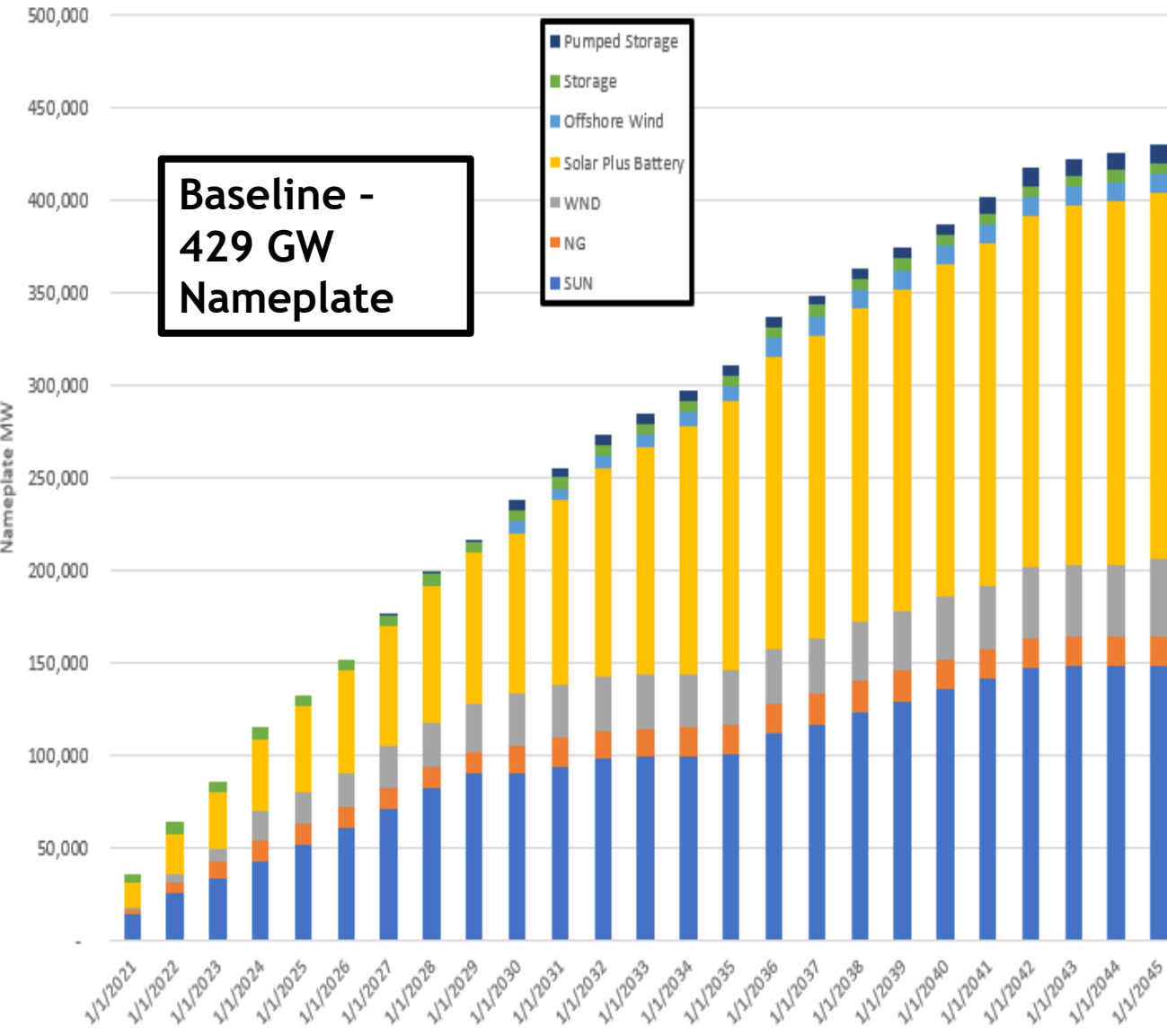
Buildout Summary

- Almost half builds seem to be for economics and state policies when disregarding regional load resource balance concerns
- Removing gas build limitations significantly reduces overall build.
- Organized markets allow for significantly less builds (15% less) and changes economics for stand-alone short duration energy limited resources
- More builds in the PNW region occur in the organized market simulation (51 GW more) and the limited markets or no gas build limits (36 GW more) runs than in the baseline.
 - This usually translates into more needs

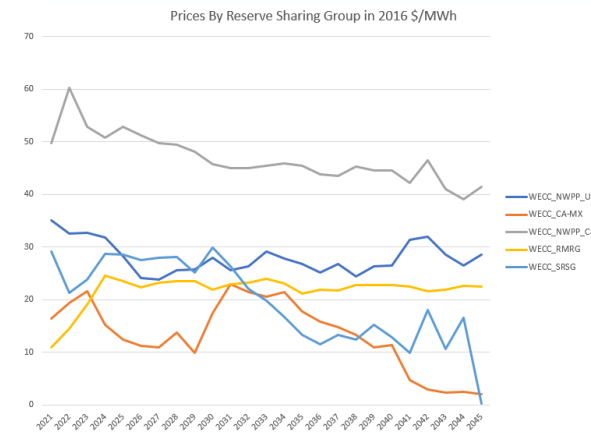


Baseline

Resource Buildout

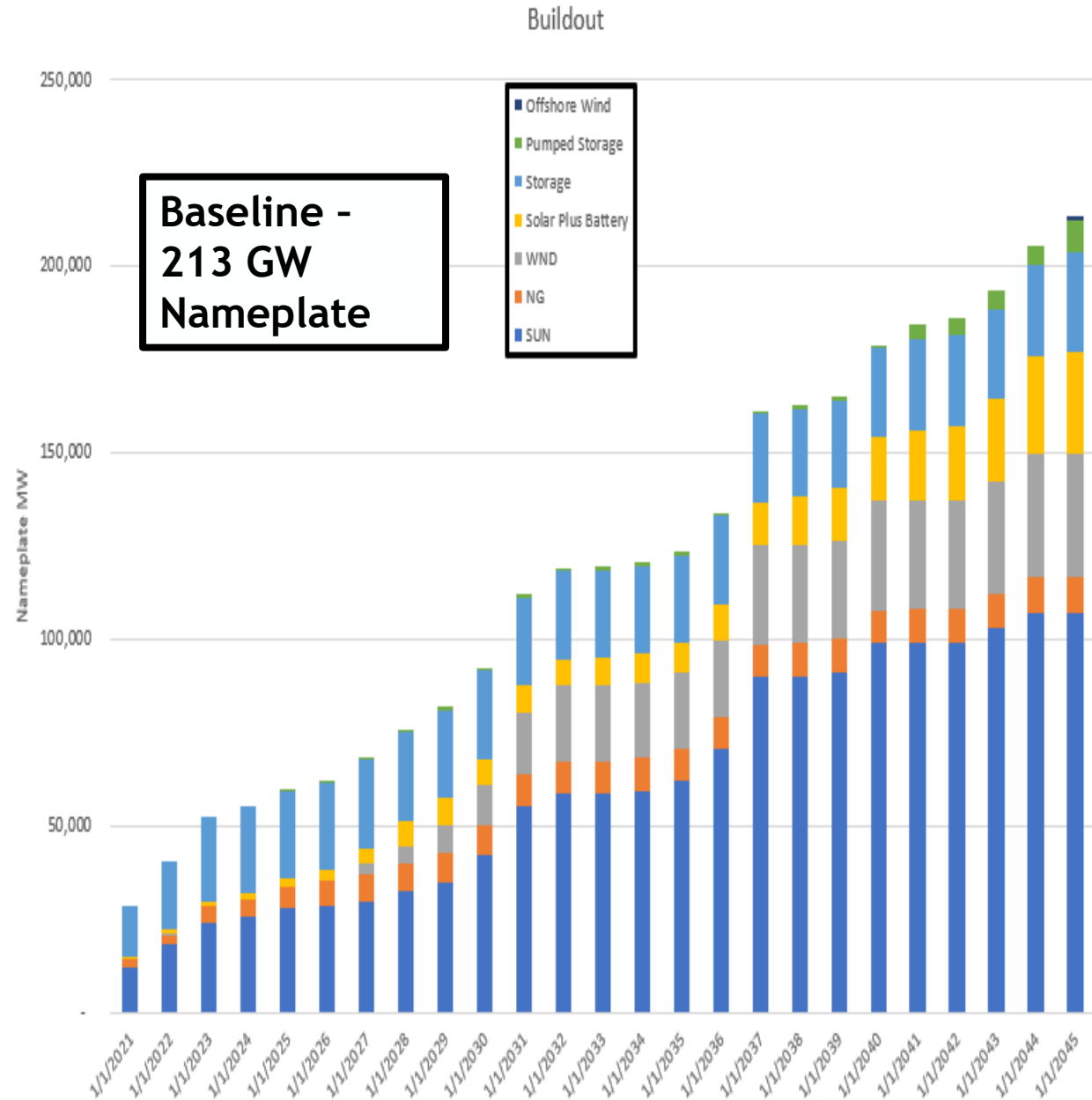
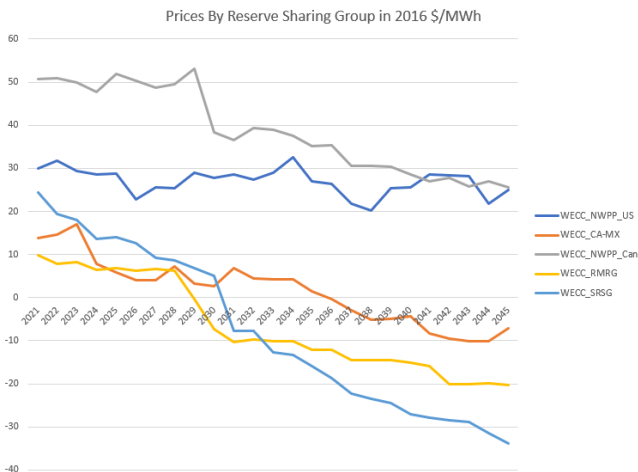


1. Planning reserve margins are mostly met
2. Clean/RPS Policies met until 2037

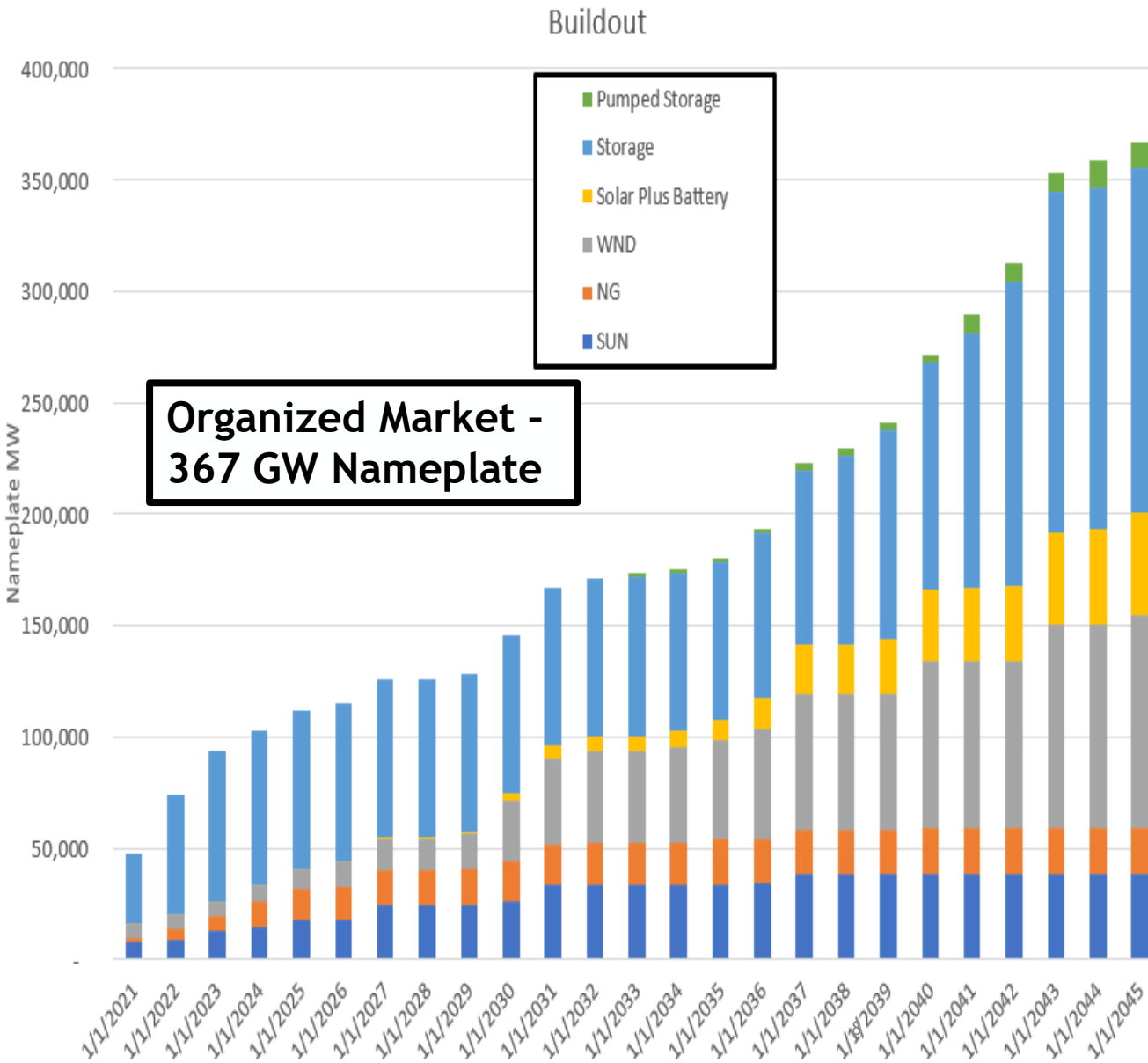


Limited Market (No PRM)

1. Planning reserve margins are missed nearly immediately primarily in California.
2. Clean/RPS Policies met until 2030
3. Prices are low in non-NWPP regions, but volatile

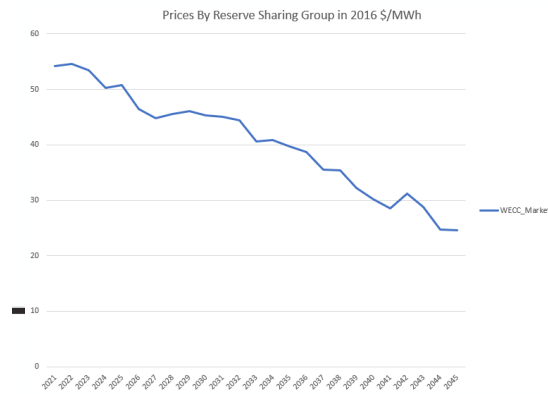


Organized Market (preliminary results)



Simulated market starts in 2021

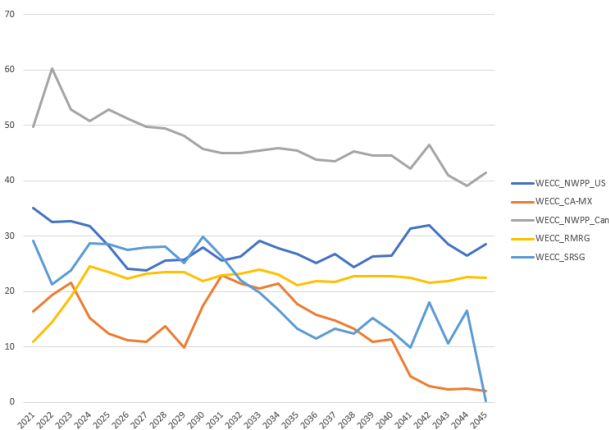
1. Planning reserve margins are met consistently, but system not adequate
2. Clean/RPS Policies met until late 2020s
3. WECC Prices drop



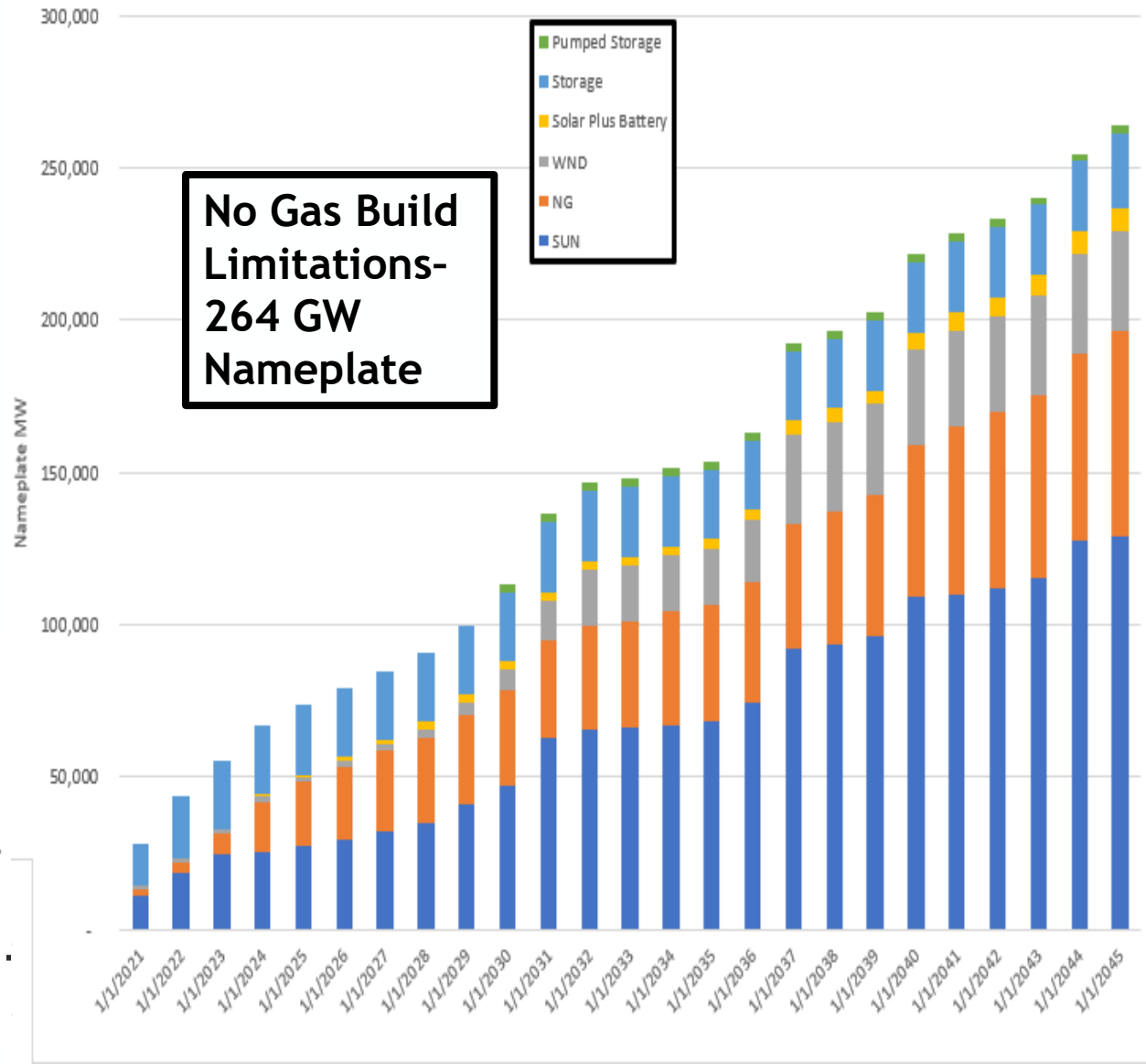
No Gas Build Limitations

1. Planning reserve margins are met consistently
2. Clean/RPS Policies met until 2030
3. Gas stays on the margin more often.

Prices By Reserve Sharing Group in 2016 \$/MWh

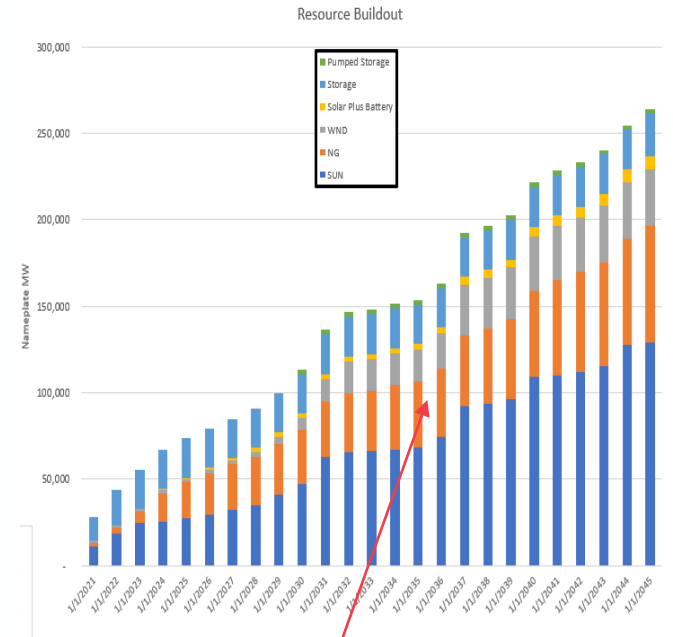


Resource Buildout



Comparisons of Buildout

- WECC-wide and PNW builds
- By Nameplate MW's by fuel type
- Color coding of table should align (almost) with previous graphs
- Wind includes onshore and offshore wind *in CA only*

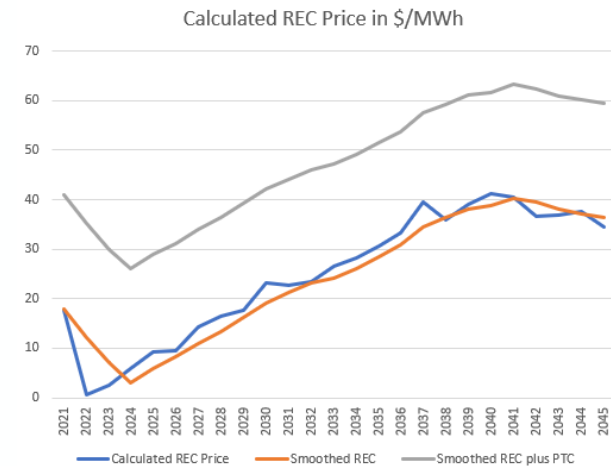


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Caveats About Market Studies

- Baseline build is adequate throughout study, all the rest of the builds are less adequate.
 - Adequate in the context of AURORA means minimal or zero load control events.
- Baseline build meets RPS and Clean constraints until late 2030's with current REC price forecast, the rest of the builds have significant risk of missing clean targets persistently.
 - Higher prices enforcing clean credit than RECs
 - Load shifting to time of clean energy use



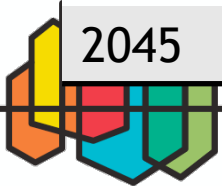
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Solar and Solar Plus Storage Build Comparisons

Year	Baseline	Organized	Limited	No Gas Limit
2025	51,538	17,878	27,742	27,183
2030	89,838	26,374	42,077	47,270
2035	100,357	34,003	61,830	68,357
2040	135,054	38,629	98,642	109,221
2045	147,554	38,631	107,032	128,886

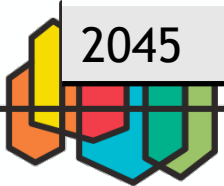
Year	Baseline	Organized	Limited	No Gas Limit
2025	46,600	48	1,907	1,041
2030	86,600	3,018	7,098	2,445
2035	145,500	9,140	7,860	2,954
2040	179,800	32,512	17,041	6,008
2045	198,000	46,488	27,598	7,167



Battery and Pumped Storage Build Comparisons

Year	Baseline	Organized	Limited	No Gas Limit
2025	6,004	70,984	23,491	22,846
2030	6,004	70,984	23,558	22,846
2035	6,004	70,984	23,690	22,846
2040	6,004	101,951	23,974	22,846
2045	6,055	154,270	26,622	24,773

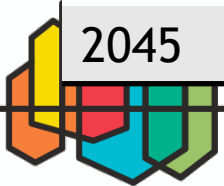
Year	Baseline	Organized	Limited	No Gas Limit
2025	0	0	400	0
2030	4,900	0	800	0
2035	5,650	1,500	800	2,700
2040	6,050	3,400	800	2,700
2045	9,690	11,940	8,440	2,700



Wind and Gas Build Comparisons

Year	Baseline	Organized	Limited	No Gas Limit
2025	16,775	9,172	110	1,600
2030	35,175	27,526	10,425	7,069
2035	37,063	44,611	20,247	18,354
2040	43,657	74,737	29,255	31,481
2045	51,481	95,394	33,937	32,959

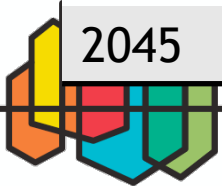
Year	Baseline	Organized	Limited	No Gas Limit
2025	11,351	13,716	5,904	21,003
2030	14,873	17,814	8,192	31,154
2035	16,058	19,824	8,666	38,118
2040	16,532	20,641	8,956	49,407
2045	16,532	20,641	9,536	67,605



Solar and Solar Plus Storage Build Comparisons

Year	Baseline	Organized	Limited	No Gas Limit
2025	0	7,703	11,241	8,090
2030	0	11,556	12,545	12,992
2035	0	13,801	15,701	19,116
2040	459	13,954	21,368	27,366
2045	459	13,954	22,177	28,444

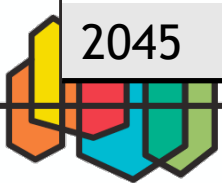
Year	Baseline	Organized	Limited	No Gas Limit
2025	0	0	1,178	0
2030	0	1,841	4,888	0
2035	0	4,246	5,048	0
2040	0	9,472	6,645	690
2045	0	10,850	7,411	690



Battery and Pumped Storage Build Comparisons

Year	Baseline	Organized	Limited	No Gas Limit
2025	2,248	9,000	1,100	2,005
2030	2,248	9,000	1,100	2,005
2035	2,248	9,000	1,100	2,005
2040	2,248	9,000	1,100	2,005
2045	2,248	9,000	1,100	2,005

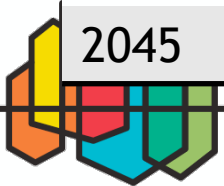
Year	Baseline	Organized	Limited	No Gas Limit
2025	0	0	400	0
2030	400	0	800	0
2035	400	1,500	800	0
2040	800	3,400	800	0
2045	2,900	4,400	3,600	0



Wind and Gas Build Comparisons

Year	Baseline	Organized	Limited	No Gas Limit
2025	0	0	0	0
2030	0	5,718	2,467	0
2035	0	10,048	2,467	0
2040	0	14,372	2,467	0
2045	0	18,339	2,467	0

Year	Baseline	Organized	Limited	No Gas Limit
2025	100	0	0	1,659
2030	100	0	0	1,949
2035	100	0	0	1,949
2040	100	0	0	1,949
2045	100	0	0	5,381



March 31st System Analysis Advisory Committee Feedback

- Positive response to examining market risk
- On the limited market sensitivity, consider the following:
 1. Limiting near term builds to WECC IRP projected levels or check to make sure the builds are of similar magnitude
 2. When implementing limited market scenario into the needs assessment work test higher loads and lower WECC hydro
- On the organized market sensitivity , consider the following:
 1. Starting the market in 2030, if possible, or meld baseline and organized market view
 2. Test different reserve margin levels





No Gas Build Limit

Prices, Avoided Emissions Rates, Needs Assessment and
Resource Strategy Analysis

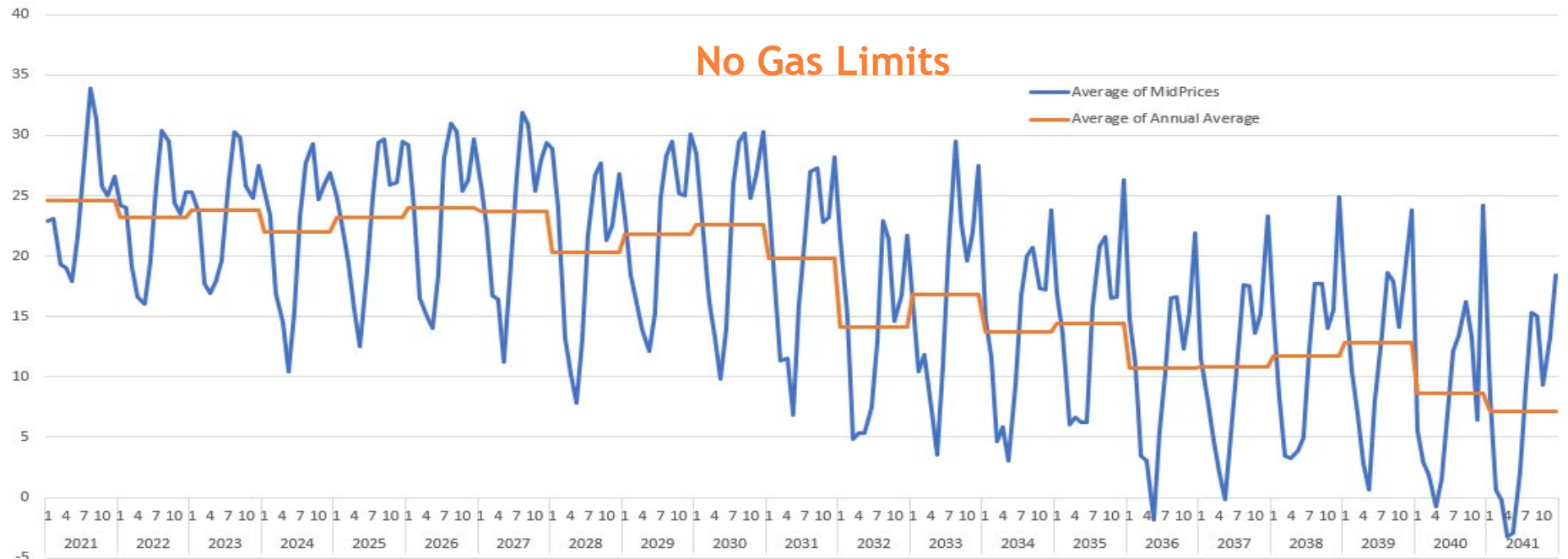
Detailed Comparison of No Gas Build Limit Sensitivity to Baseline

What are some of the effects of not reflecting perceived regulatory limitations on building gas plants?

- Mid-C Prices are a little lower on average and show less seasonal variation than the baseline.
- Avoided CO₂e Emissions Rates start out higher especially on-peak, but end up lower than in the baseline, especially in the summer.
- Needs go up in the region later in the study due to less builds outside the region.

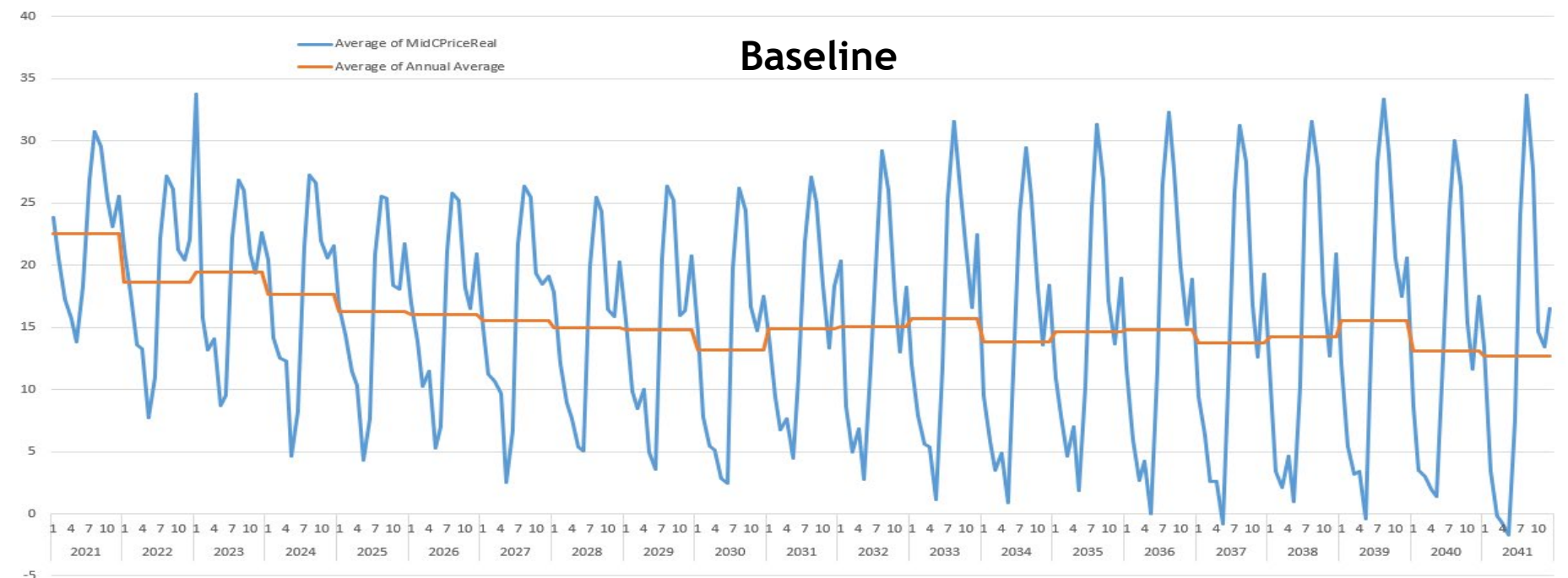


No Gas Limits

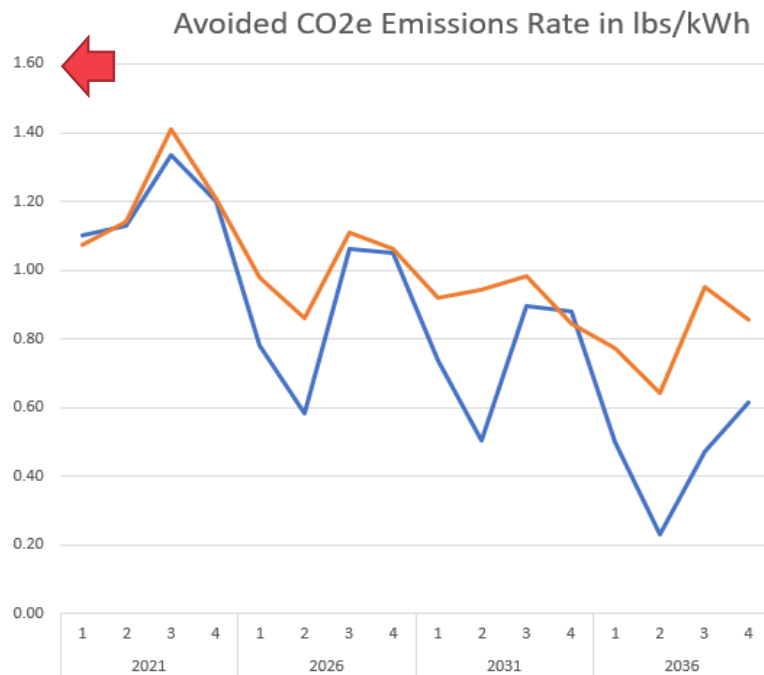


MidC Prices 2016 \$ per MWh Monthly

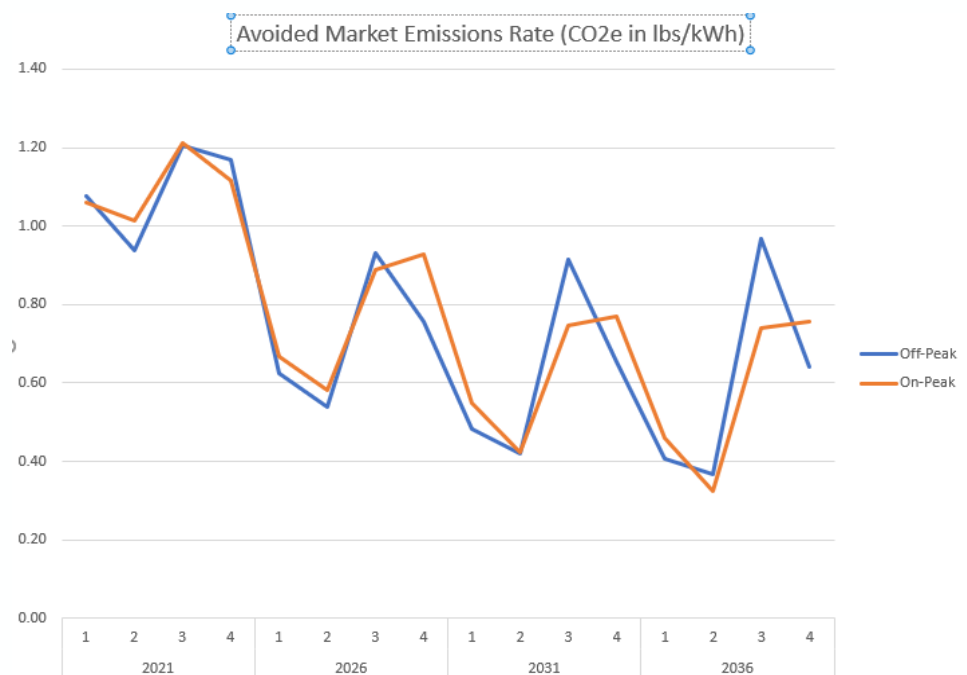
Baseline



- 1) Emissions rate starts higher, but goes lower than baseline
- 2) On-peak avoided emissions rate stays around emissions rate of combined cycle gas units.
- 3) Off-peak avoided emissions rate goes lower than the baseline late in the study as new gas displaces coal.



No Gas Limits



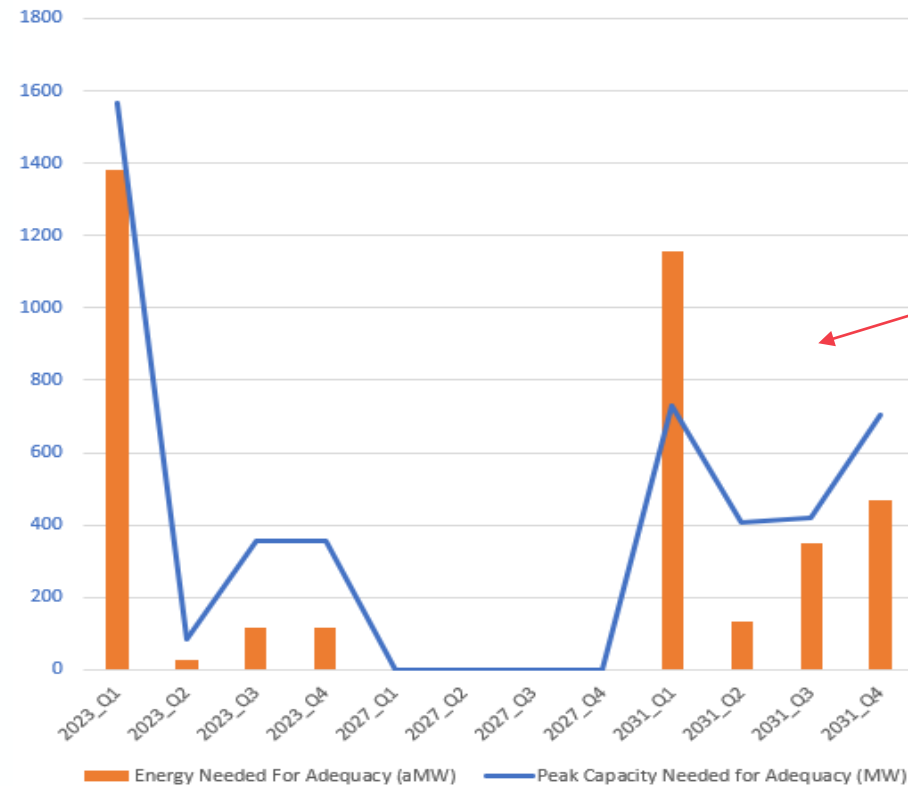
Baseline



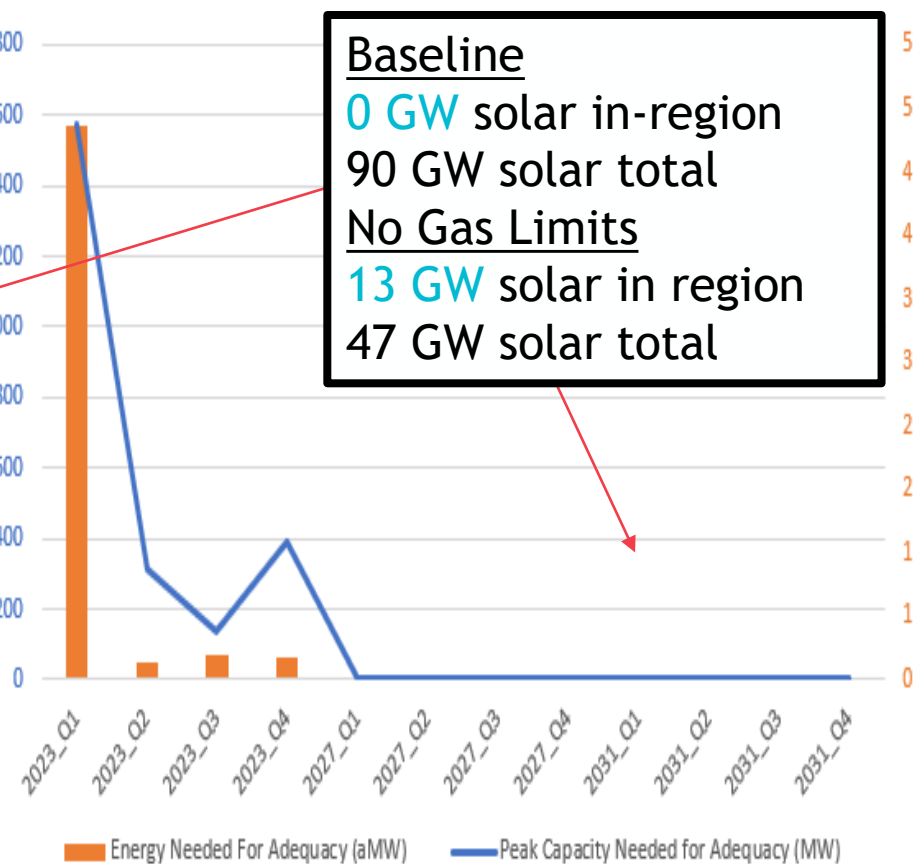
Peak needs are similar in the early years, but are higher in the later years in the *No Gas Build Limits* sensitivity.

Significant regional builds in AURORA removed for needs assessment.

Needs: Peak and Energy



Needs: Peak and Energy



Baseline
 0 GW solar in-region
 90 GW solar total
No Gas Limits
 13 GW solar in region
 47 GW solar total



No Gas Limits

Baseline

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Resource Strategy Results

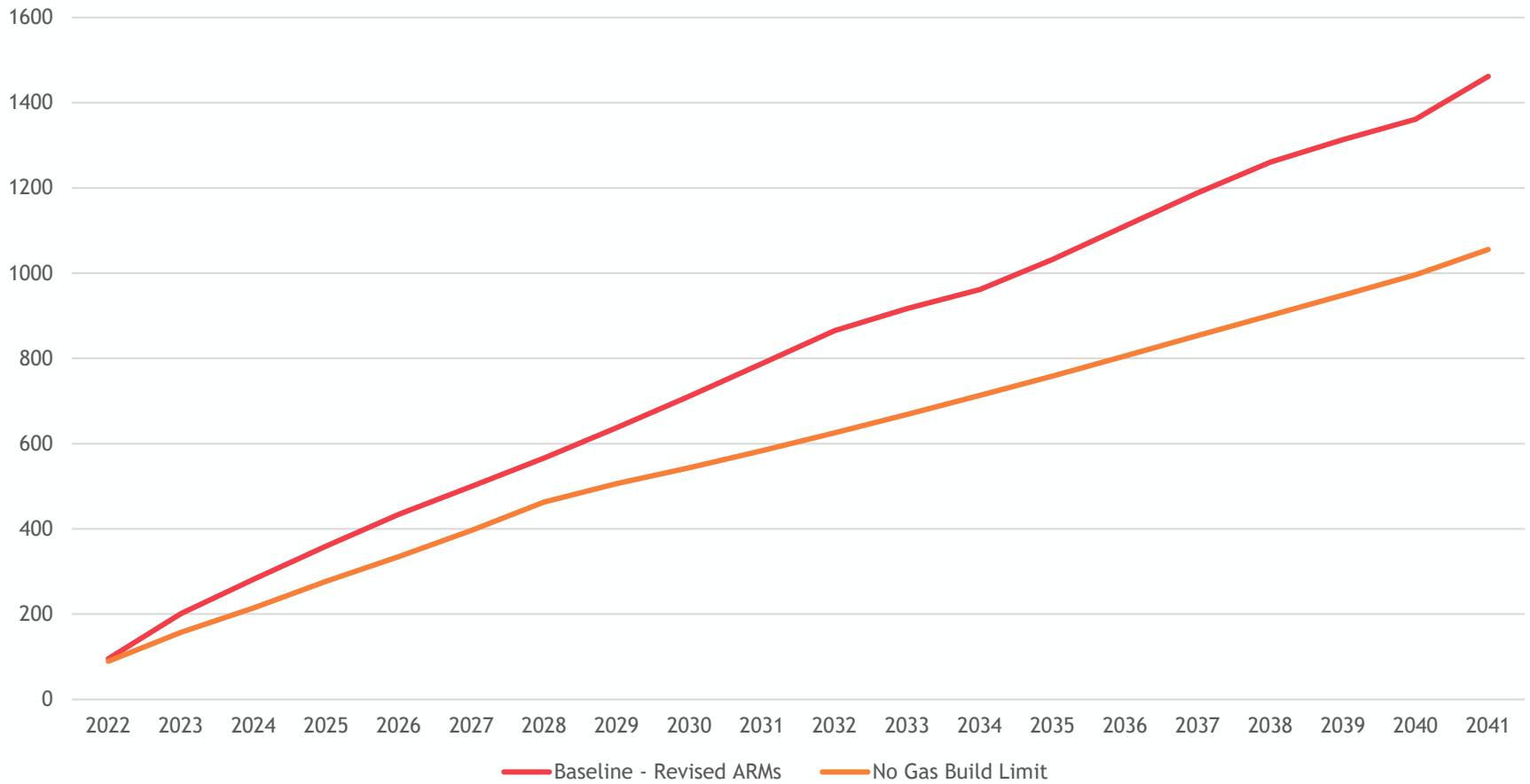
Key Take-aways

Overall, the main finding is that there are not more substantial impacts from this test. However there were some differences including:

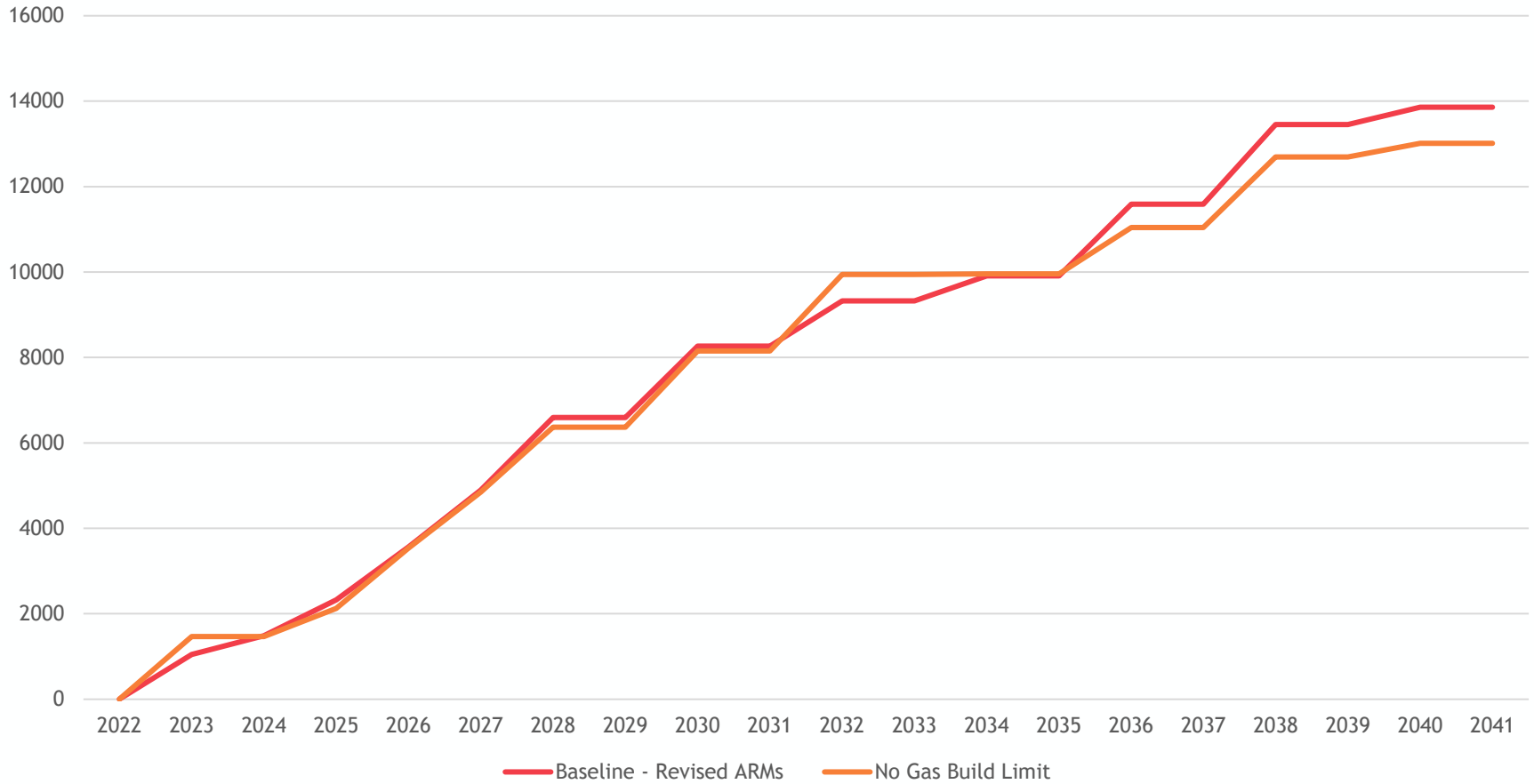
- Reduces EE acquisition
- Similar renewables build
- No thermal build
- Minimal DR late in the study
- Minimal change in residential bills



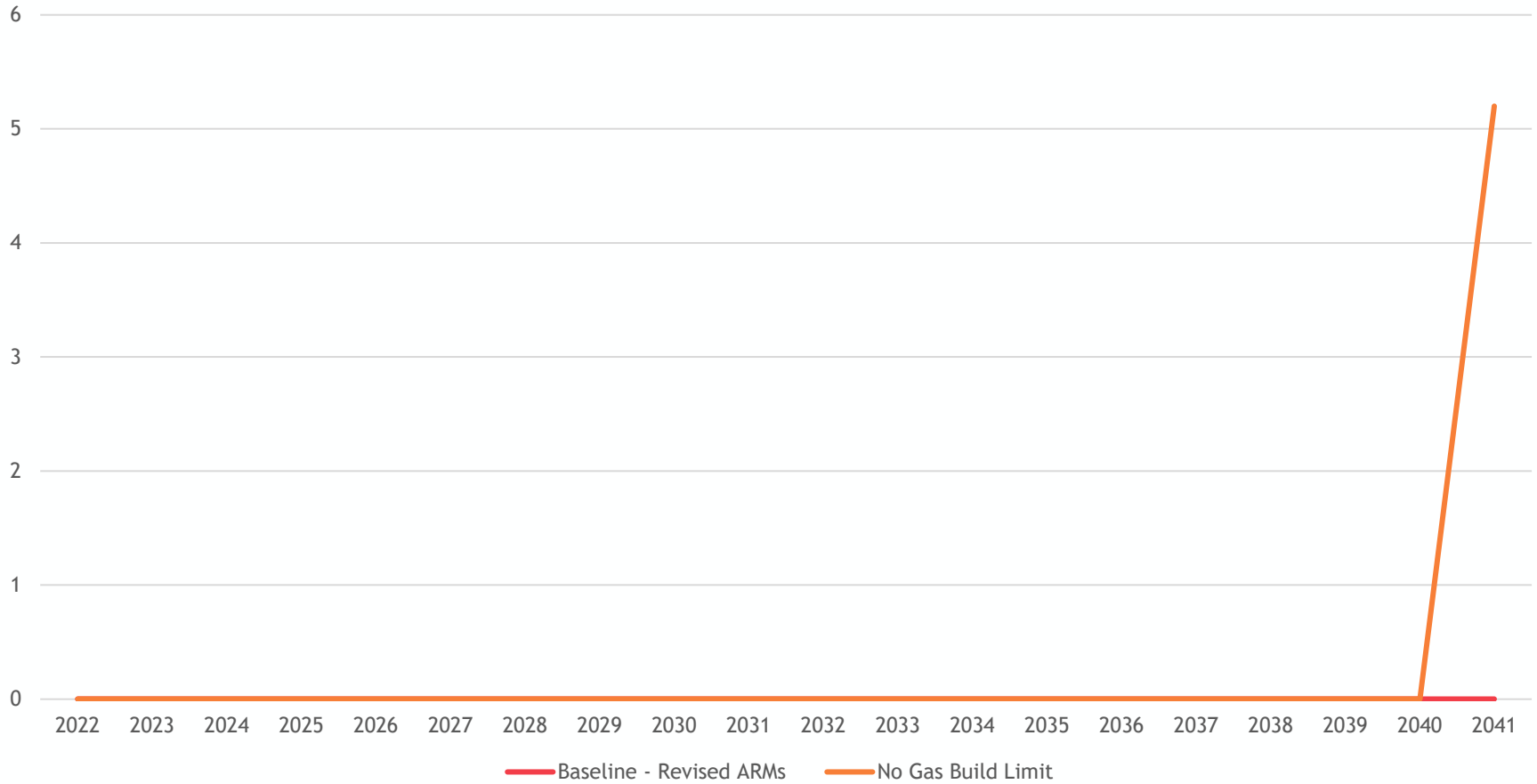
Average EE Acquired



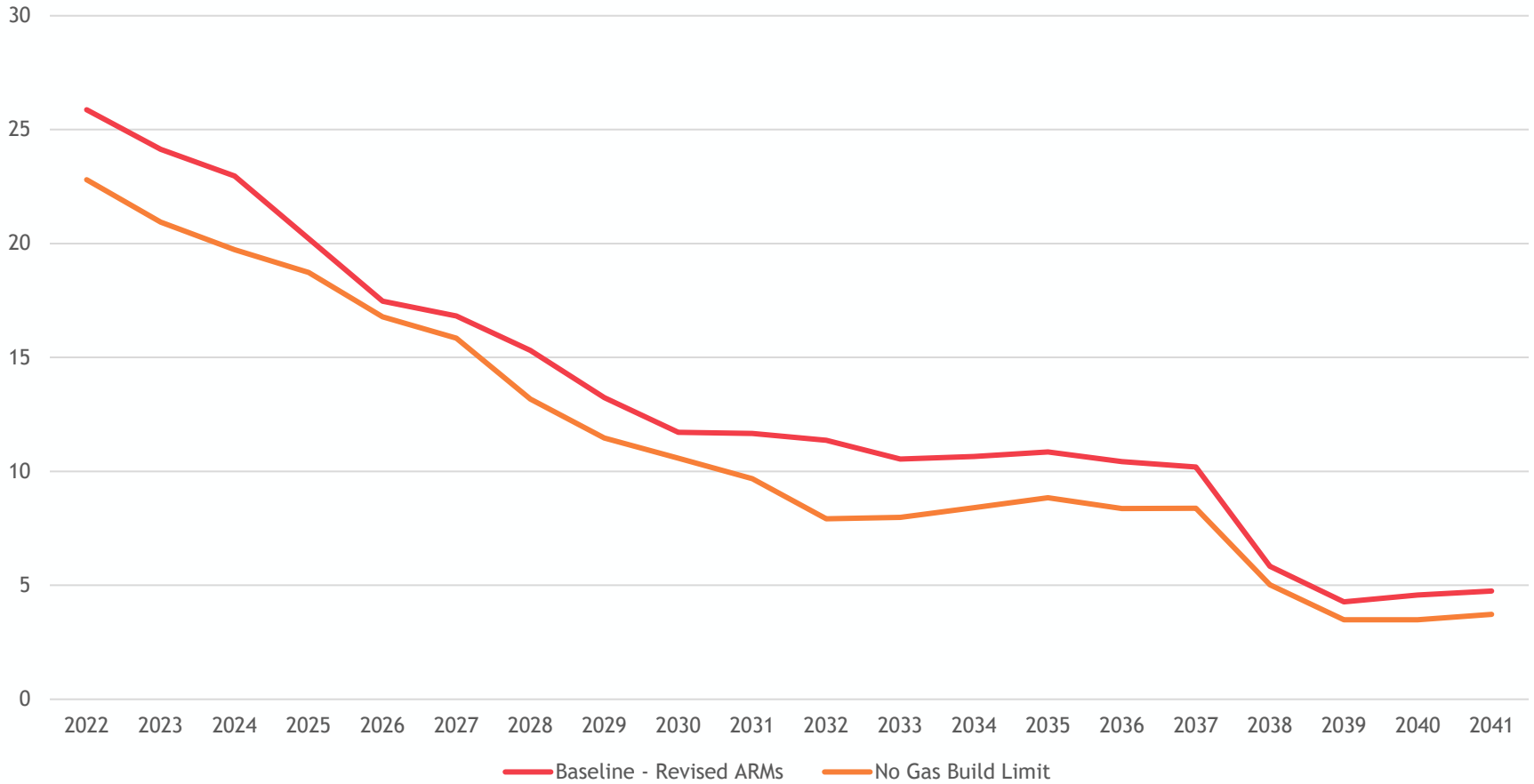
Average Renewable Build



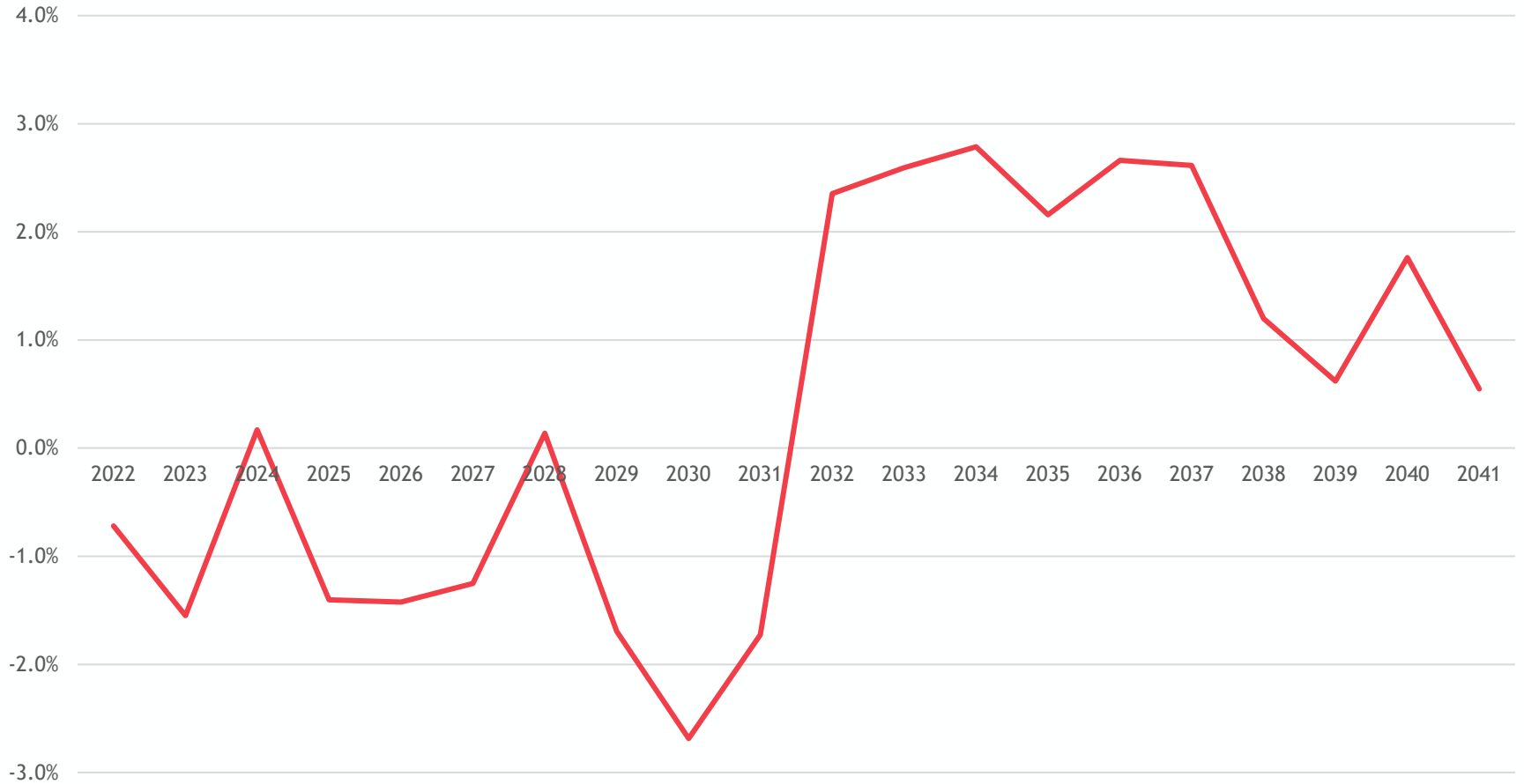
Average DR Acquired



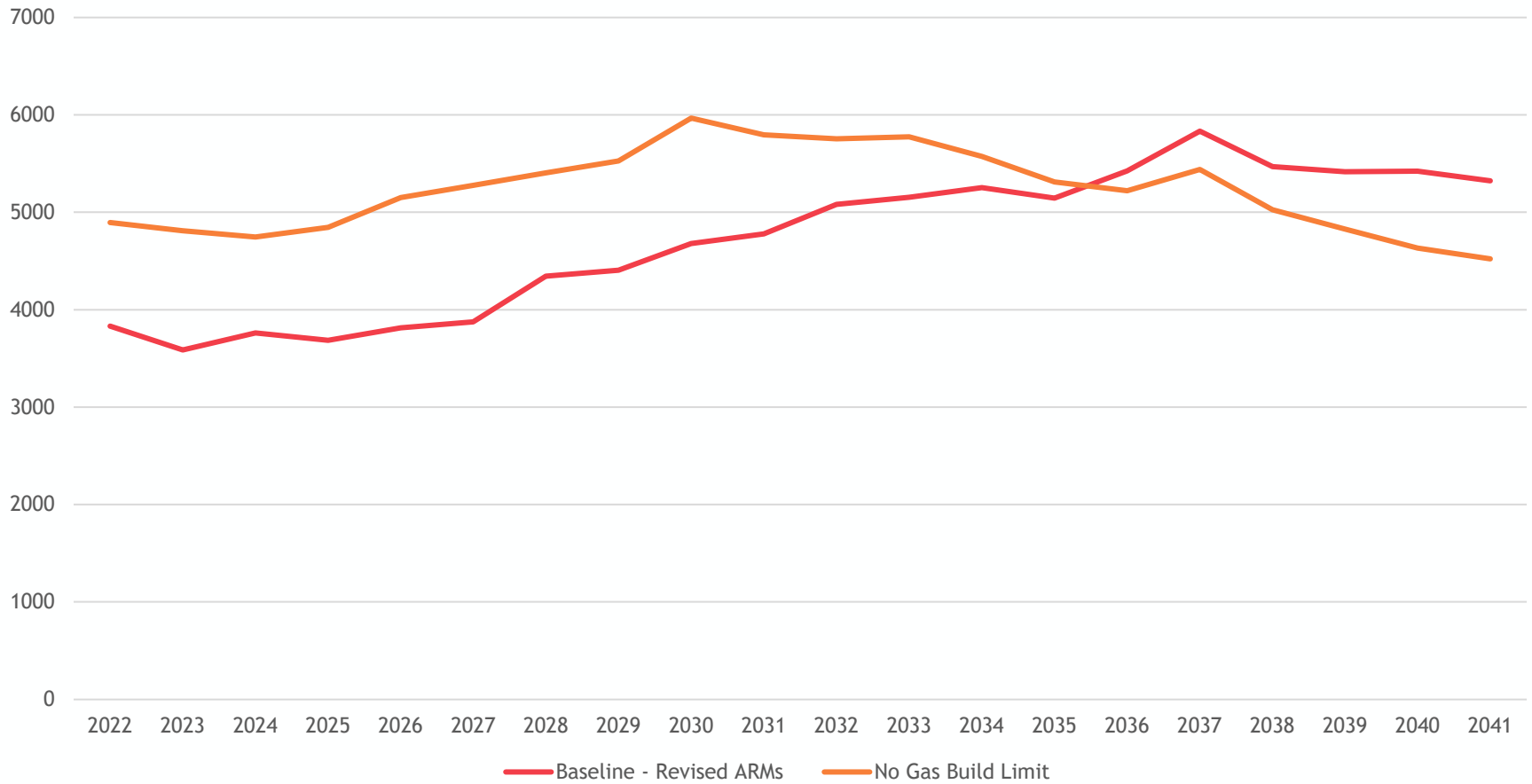
Average GHG Emissions (MMT)



Percentage Increase in Bills

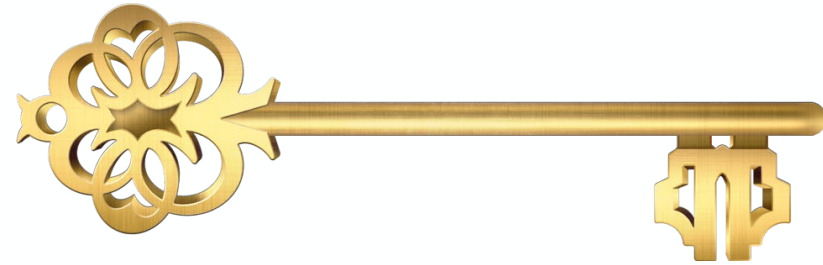


Average Exports (aMW)



Question for the Committee

1. Market risk seems to be a key driver in the plan.



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2. Are there any market structural or fundamentals questions not covered yet that you would like staff to explore?



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Next Steps on This Scenario

- Continue to incorporate stakeholder and committee feedback into AURORA buildout work and price simulations.
- Continue to complete needs and resource strategy analysis on subset of *limited* and *organized market* perspectives and present them to the committee at a future meeting.



A scenic photograph of a mountain range with a lake in the foreground, partially obscured by white geometric shapes.

Questions

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