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

March 2, 2021

MEMORANDUM

TO: **Power Committee**

FROM: **Ben Kujala**

SUBJECT: **Estimating Rates and Bills in the Regional Portfolio Model**

BACKGROUND:

Presenter: Ben Kujala

Summary: While the Regional Portfolio Model (RPM) objective is to minimize the cost of the regional system, it can be difficult to conceptualize the sums of money involved in maintaining and expanding the regional electric grid. To help us communicate the impacts of results in the RPM, we estimate the impact of the strategies tested on the regional electric rates and the residential customer bills.

This helps both in communication of the results and gives information that helps the Council contextualize the potential impacts of different resource strategies.

However, this estimate is heavily impacted by the way RPM estimates system costs. We will go through the details of how this value is estimated in RPM, discuss some of the challenges with this approach, and look at the estimates produced by the Baseline Conditions.

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Estimating Rates and Bills in the Regional Portfolio Model

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

High-level Takeaway

- Rates and bills don't align with historic experience – they are much lower in RPM
- Low market prices substantially reduce the cost of serving regional load
- The combination of aggressive renewable builds external to the region and renewable builds internal to the region displaces substantial regional fuel costs

Why Forecast Rates & Bills?

- It's difficult to put RPM costs into context – using rates & bills allows us to see the impact of different scenarios in a more relatable number
- Historically, Energy Efficiency has increased rates but reduced bills because the per household energy use has decreased – forecasting rates and bills helps quantify this impact

Context for Electric Expenditures

The Gross State Product of the four states in 2018 was $1.015 Trillion

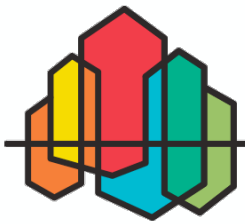
The total annual wages of the four states in 2018 was $391.7 Billion

Annual Regional Electric Utility Expenditure

In 2018, regional utilities spent (2016 $) on the electric customers:

- $2.6 Billion on fuel for power generation
- $14.7 Billion total
- Thus $12.1 Billion was non-fuel expenditures

We use this non-fuel expenditure as an estimate of the annual cost of maintaining the existing power system in RPM



Average Residential Bill in 2018

In 2018

- There were 6,243,283 regional households
- Utilities expenditures were $14.7 Billion
- 47.32% of expenditures were on residential customers

So the average annual residential expenditure was:

($14.7 Billion * 47.32% / 6,243,283 Households)
= $1113.29 per year ($92.77 per month)

Households in 2022

The 2021 Plan forecast of regional households in 2022 is 6,401,875 - if costs in 2022 were the same as 2018, increasing the number of households alone would reduce residential bills to $90.47 per month

Projecting forward we'd expect $11.6 Billion * 47.32% = $5.5 Billion to be the existing system cost in residential customer bills excluding fuel and EE costs

Or for 2022, that would be $851.74 per household a year ($70.98 per month) - or close to $20 a month is for expenditures on fuel and EE

Utilities Expenditures on EE

Based on the RCP utilities spent $478.6 Million (2016 $) on EE in 2018 or $2.33 Million per aMW of EE

Thus our estimate of the annual cost of maintaining the power system without EE expenditures would be $12.1 Billion - $478.6 Million = $11.6 Billion (2016 $)

Annual System Cost in RPM

Estimated Annual Total System Cost w\out Conservation:

RPM Costs less Conservation Costs + 2018 Non-Fuel Expenditures – 2018 Conservation Budgets

Since the last part is constant, this is:

RPM System Costs less Conservation Costs + $11.6 Billion

RPM System Costs

RPM System Costs excluding penalties are:

- Total Existing Resource Fixed O&M
- Value of Generation
- Value of RECs
- Total New Resource Acquisition Costs
- Cost to Serve Load at Market Price
- *Value of Conservation – Treated Separately in Rates & Bills*
  (Avoided Market Costs – Total Conservation Costs)

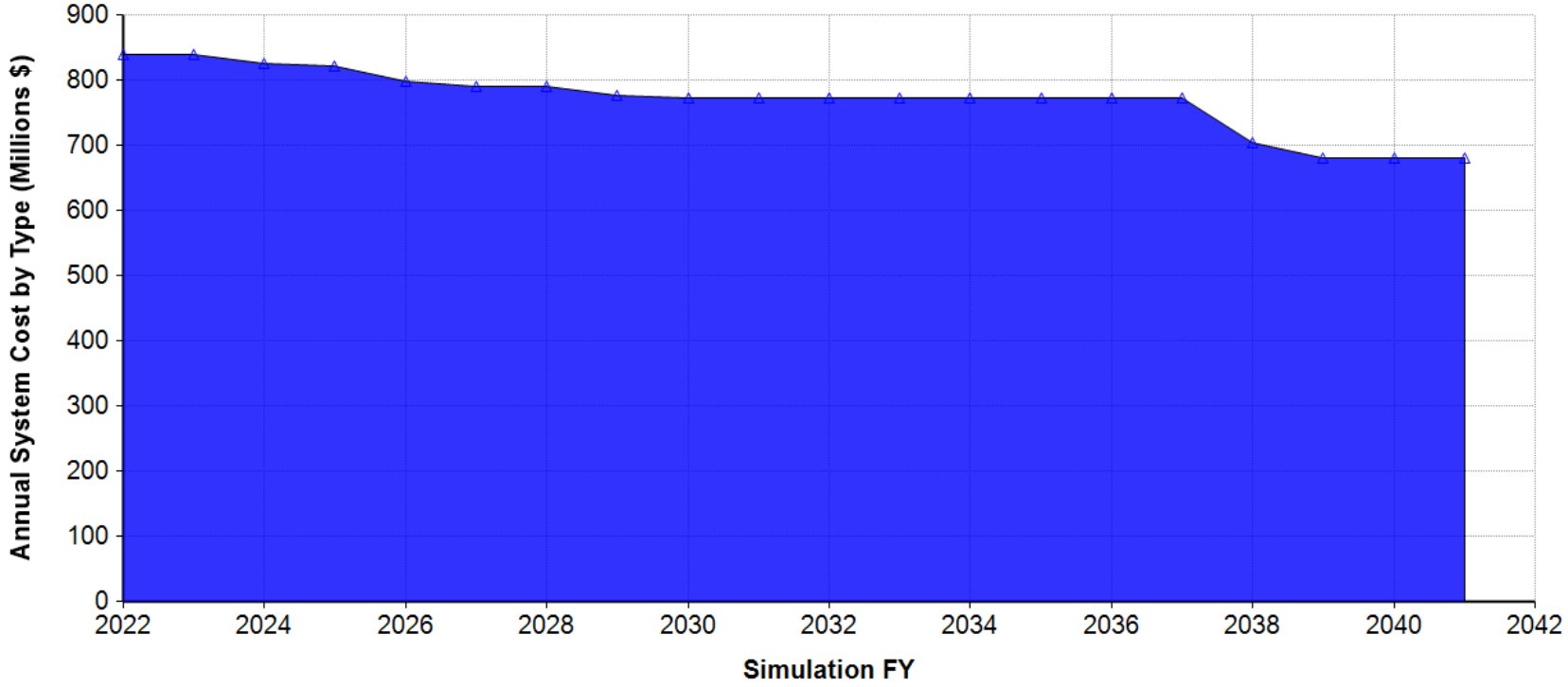
For estimating bills, the value of conservation is replaced with utility costs included in bills

Existing Resource Fixed O&M

- Around $193 Million per quarter at the start of the plan period

- Fixed costs are adjusted down by assumed retirements

Cost of Existing Resource Fixed O&M



Value of Generation

The value of generation is represented as:

$$Generator\ Revenue\ -Generator\ Costs$$

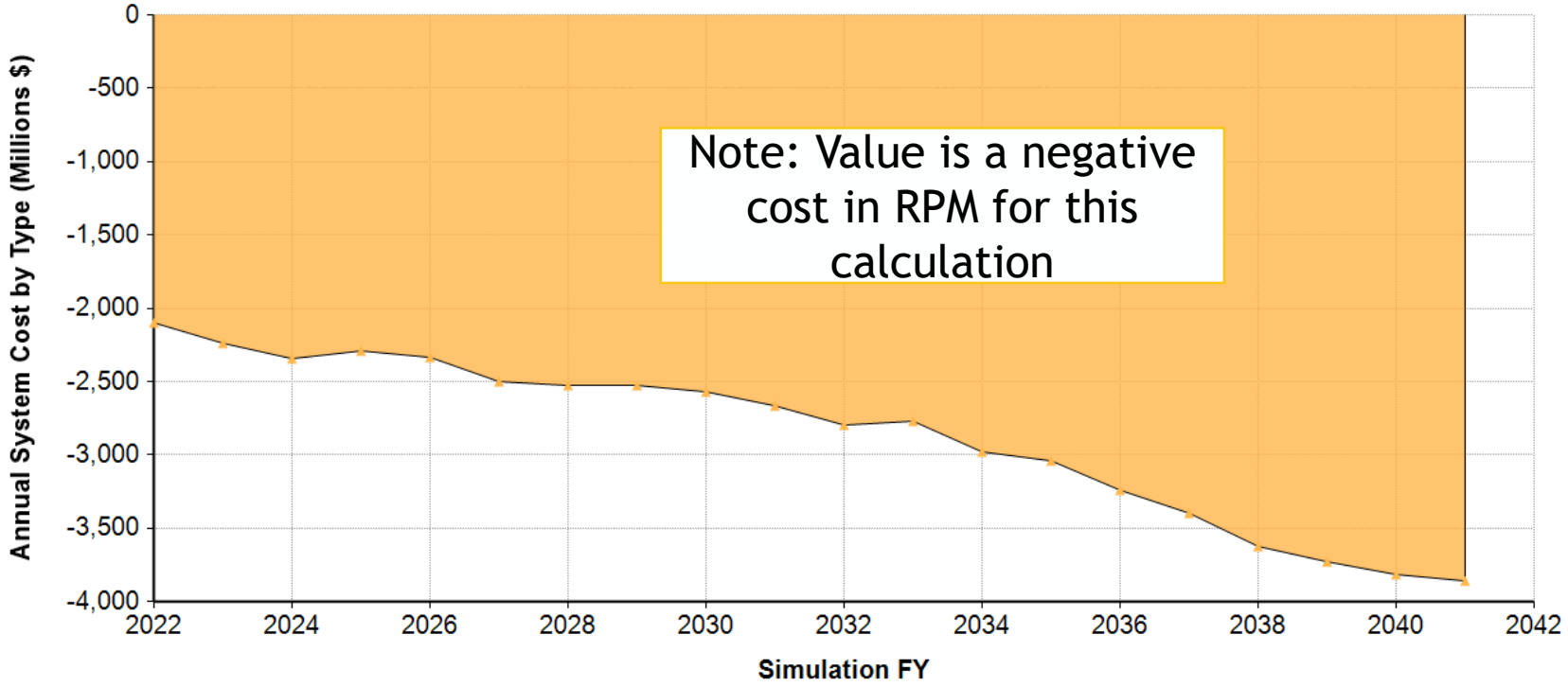
Where

$$Generator\ Revenue = Internal\ Electricity\ Price\ -Variable\ O\&M + REC\ Price$$

And

$$Generator\ Cost = Fuel\ Cost$$

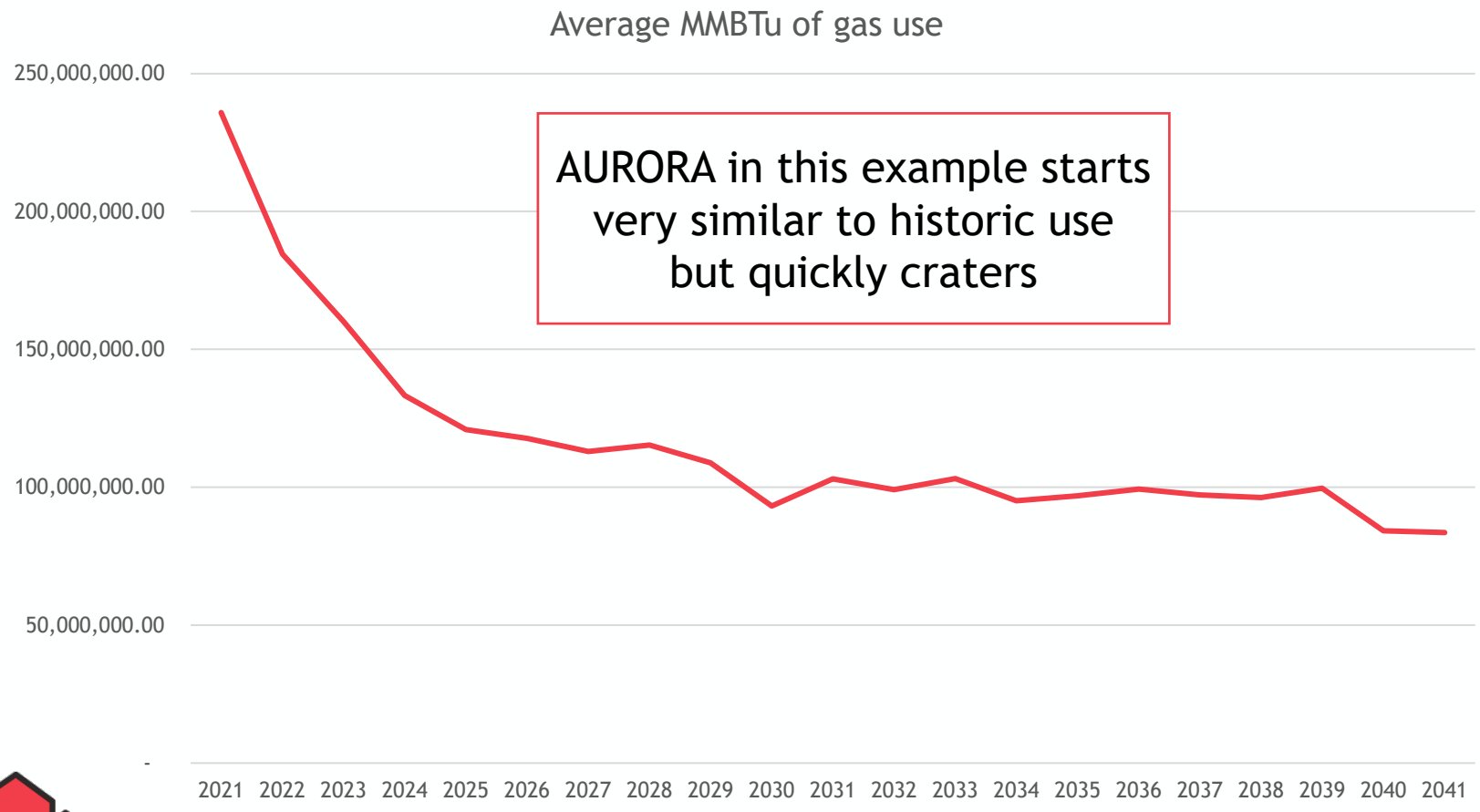
Value of Dispatchable Generation – Including Thermals and Renewables



Historic Natural Gas Used for Power Generation

Year	ID	MT	OR	WA	Total
2017	21,698,065	4,860,949	77,493,291	75,529,382	**179,581,686**
2018	24,558,956	5,318,808	89,762,440	72,881,400	**192,521,604**
2019	32,570,753	5,698,068	103,475,154	95,668,078	**237,412,053**
2020	32,168,577	4,576,444	97,222,903	97,624,569	**231,592,492**

AURORA Example Natural Gas Fuel Use

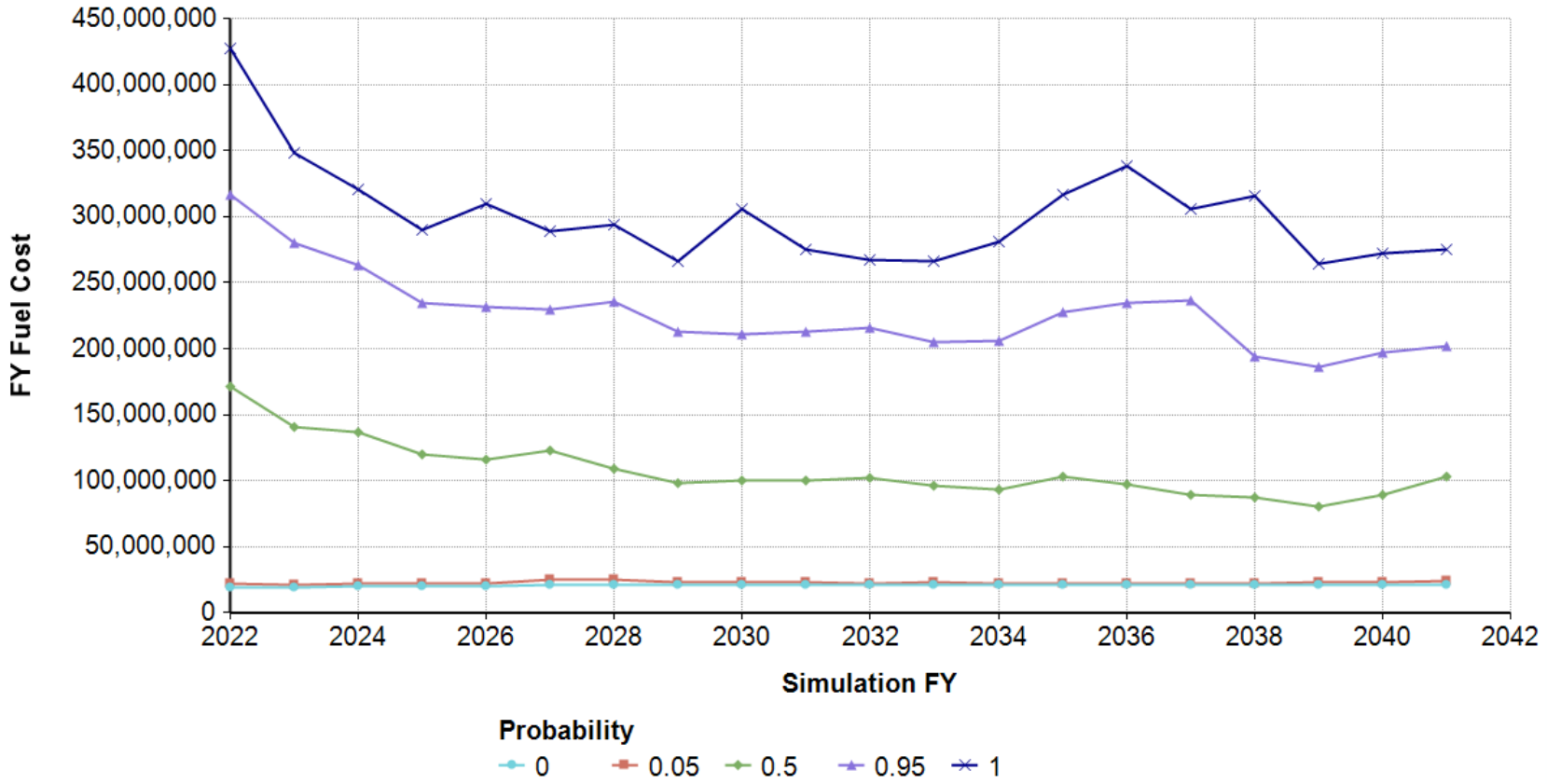


Fuel Burn Comparisons (Bcf – Million MMBTU)

	2019	2020	2022 Average	2022 Max
Natural Gas	237	231	122	331
Montana Coal	162	101	58	121
Wyoming Coal*	348	361	137	279
Idaho, Oregon, Washington	100	78	N/A	N/A

Note: All figures are for state-wide use to generate electricity, not all electricity generation would be represented in RPM because it is not used to serve regional load

RPM Total Fuel Costs



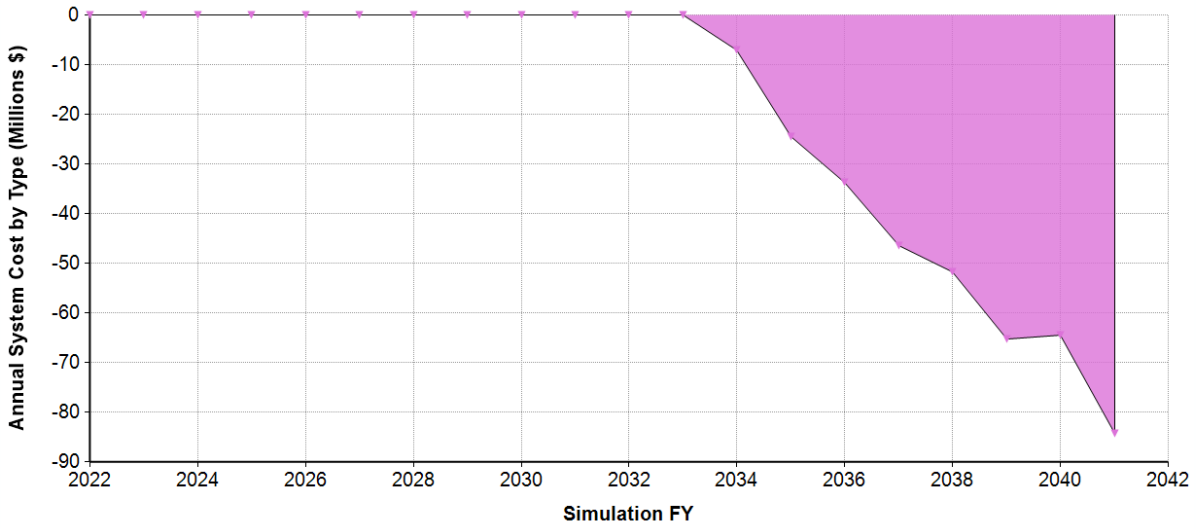
Regional utilities reported spending around $2.6 Billion on Fuel – RPM's maximum starts under $450 Million

Fuel Cost Offset in Rates & Bills

- Large reduction in fuel costs impacts immediate and continued cost reduction in our forecast of rates and bills
- Likely some disparity between how utilities report fuel costs and how RPM sees fuel costs
- But looking at just reduction in fuel consumption through time, reduced fuel use is a major driver of RPMs costs

Value of RECs

- For REC requirements, RECs are used to meet RPS needs and do not count toward the value
- When RECs would expire from the REC bank and there is surplus, then RECs are instead sold and the value is added to the portfolio – generally at the end of the plan period



Total New Resource Acquisition Costs

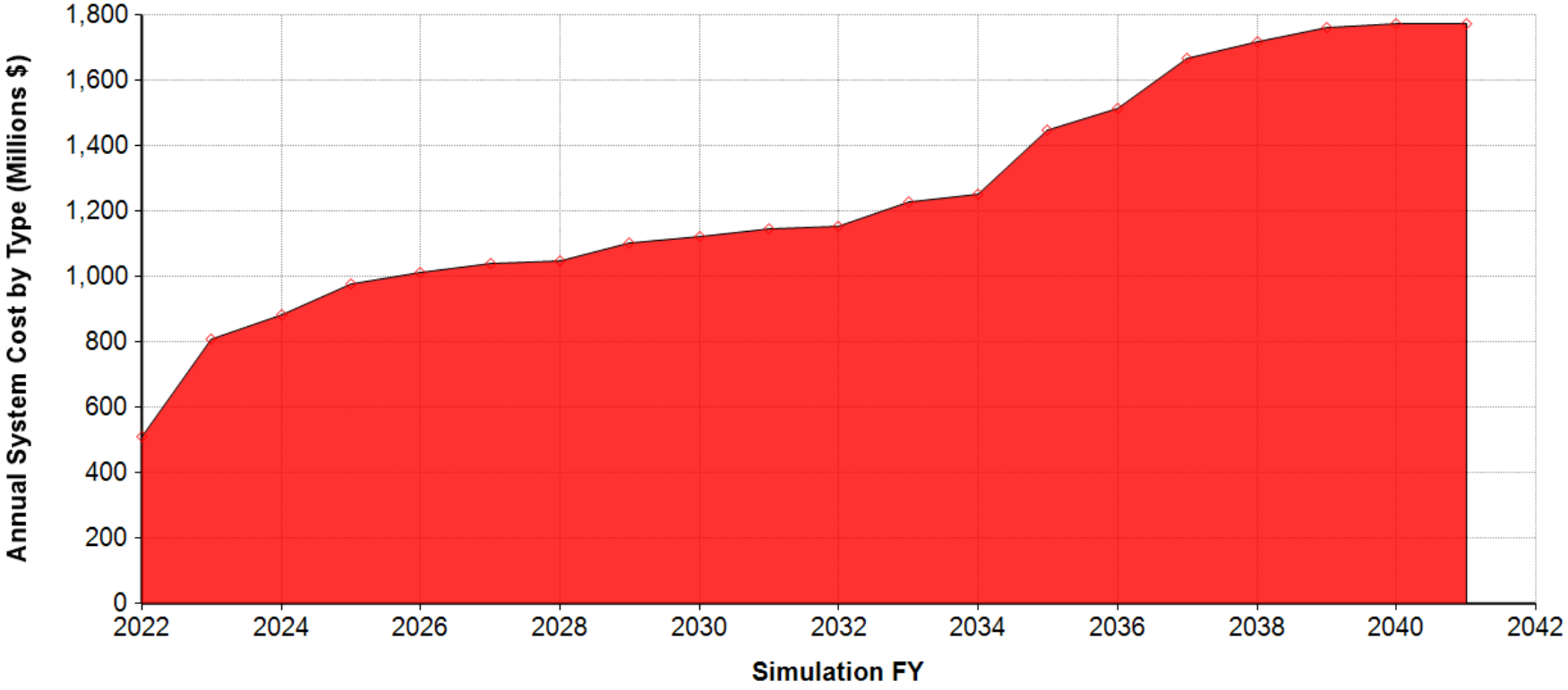
Consists of:

- Real levelized construction costs
- Real levelized Fixed O&M

That is, costs are paid quarterly and grow as more resources are acquired

Fuel costs are captured in the value of generation which is calculated for new and existing resources – the value of generation offsets the costs for acquiring new resources

Annual Cost of New Resources Grows



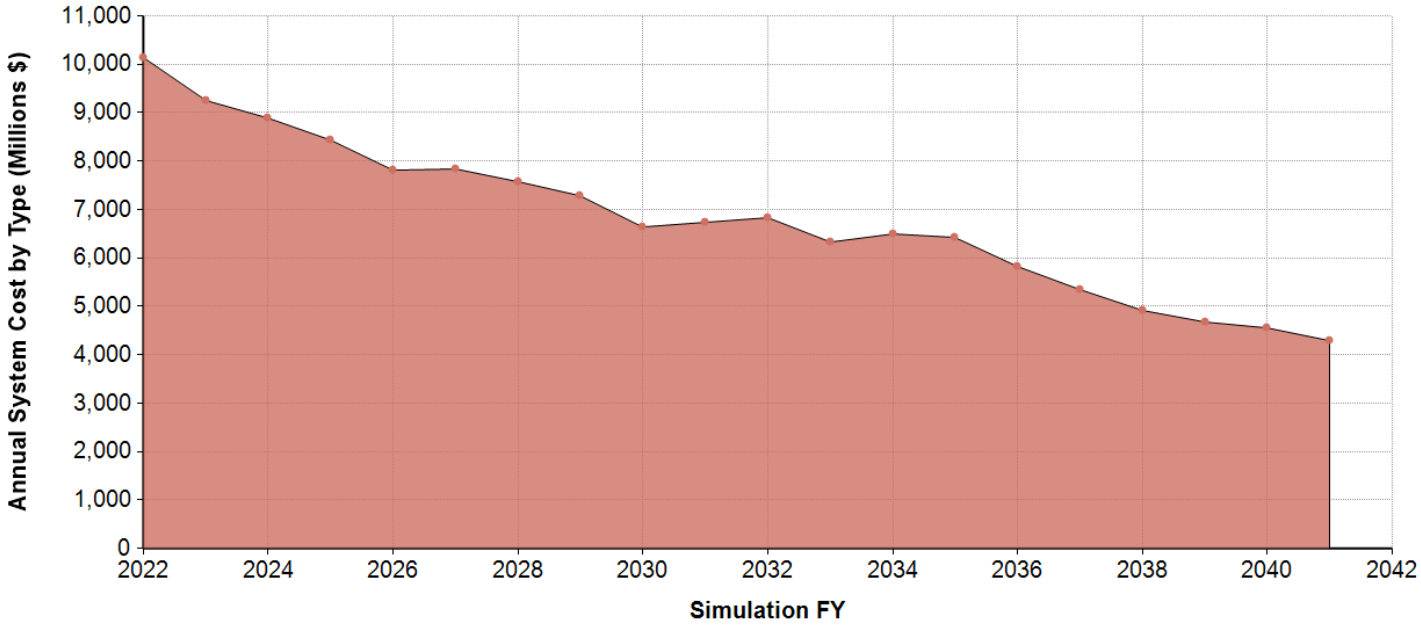
Cost to Serve Load at Market Price

Consists of:

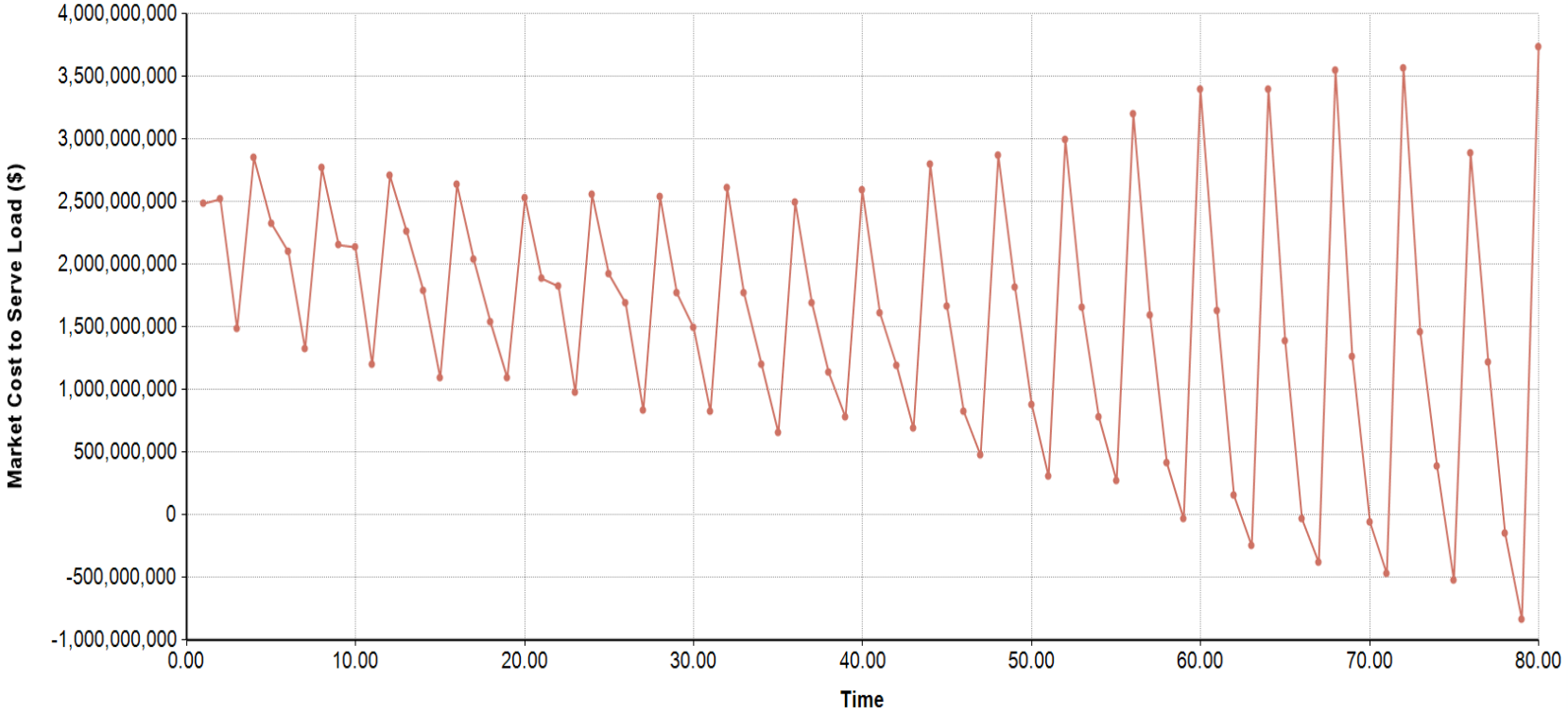
$$Frozen\ Efficiency\ Load\ *\ Internal\ Electricity\ Price + GHG\ Costs\ (Social\ Cost\ of\ Carbon)$$

GHG emission damages are reflected in this costs – and thus included in bills

Average Cost to Serve Load Declines with Market Prices



But is Extremely Volatile and Seasonal

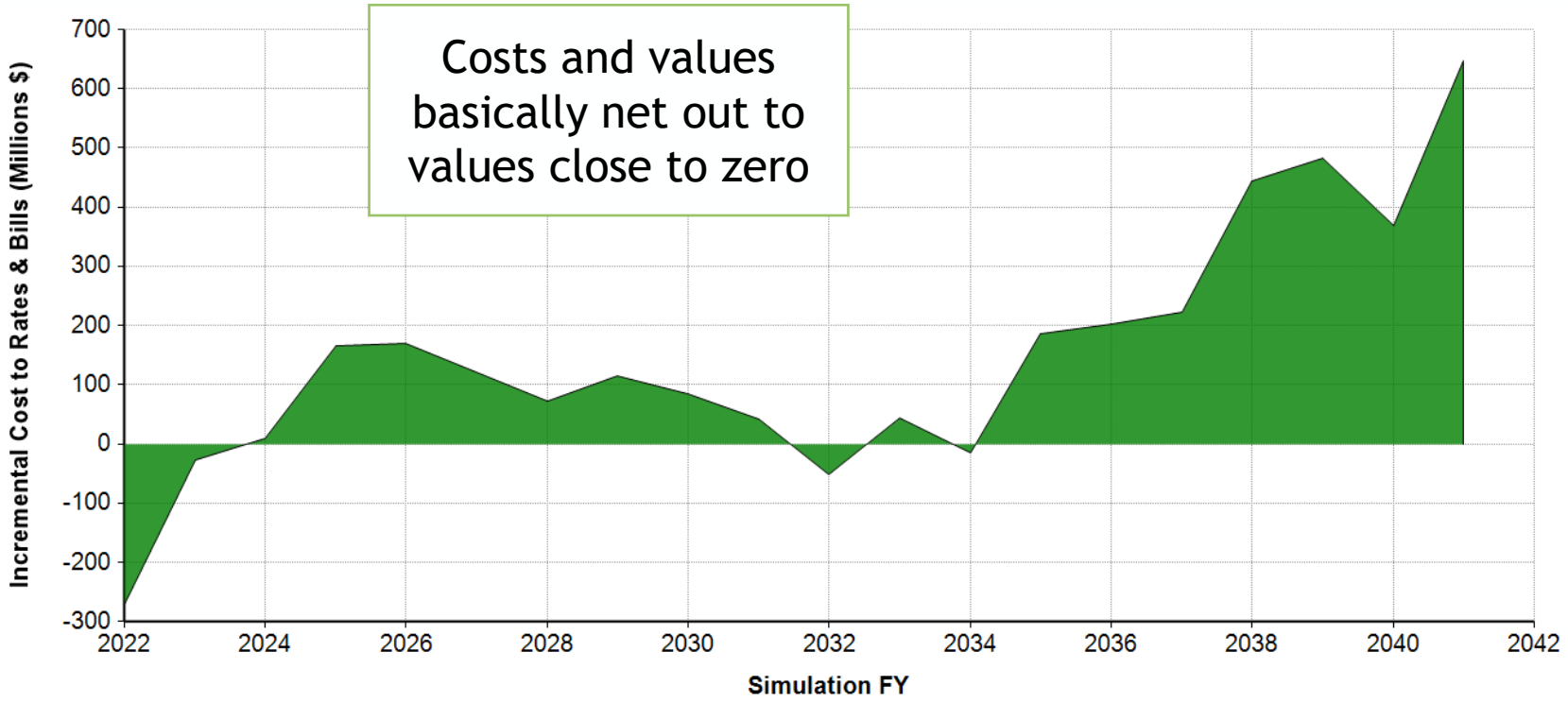


Pulling all the Costs & Value Together

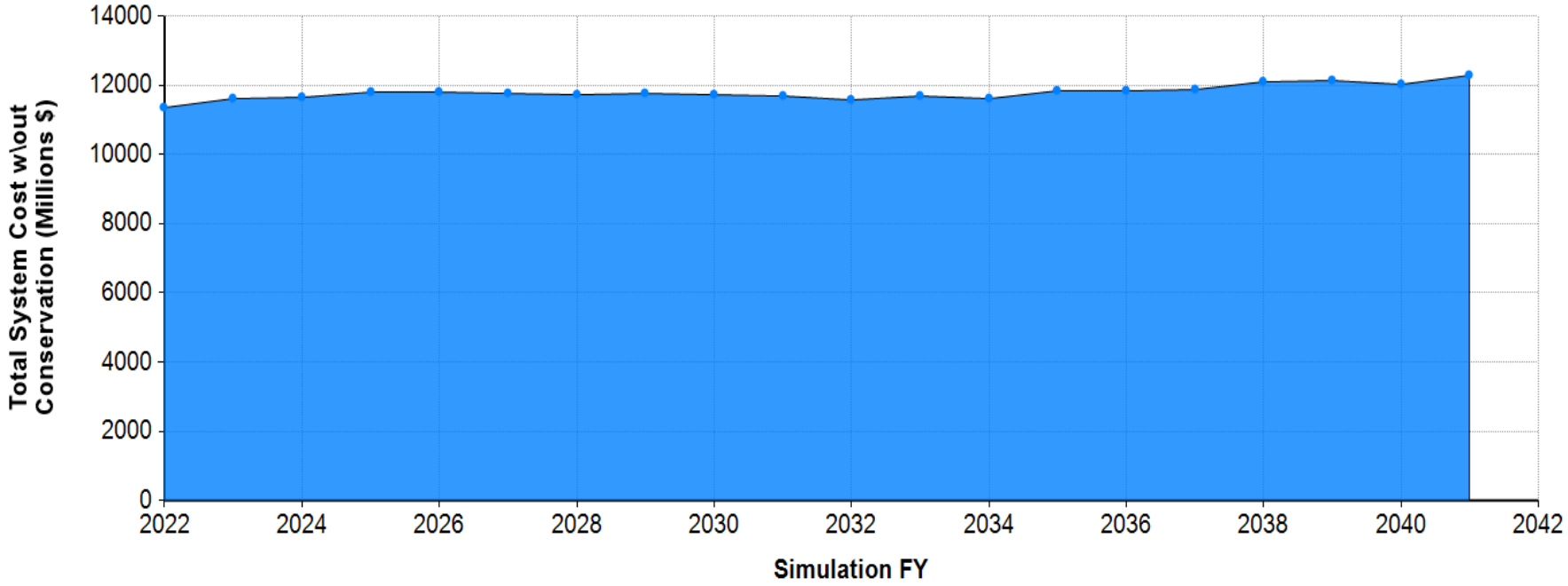
- RPM's average impact is small relative to the 2018 Non-fuel Expenditures we use to estimate the cost of the existing system

- But has a range of uncertainty that makes it hazardous to read too much into the impact on the average bill

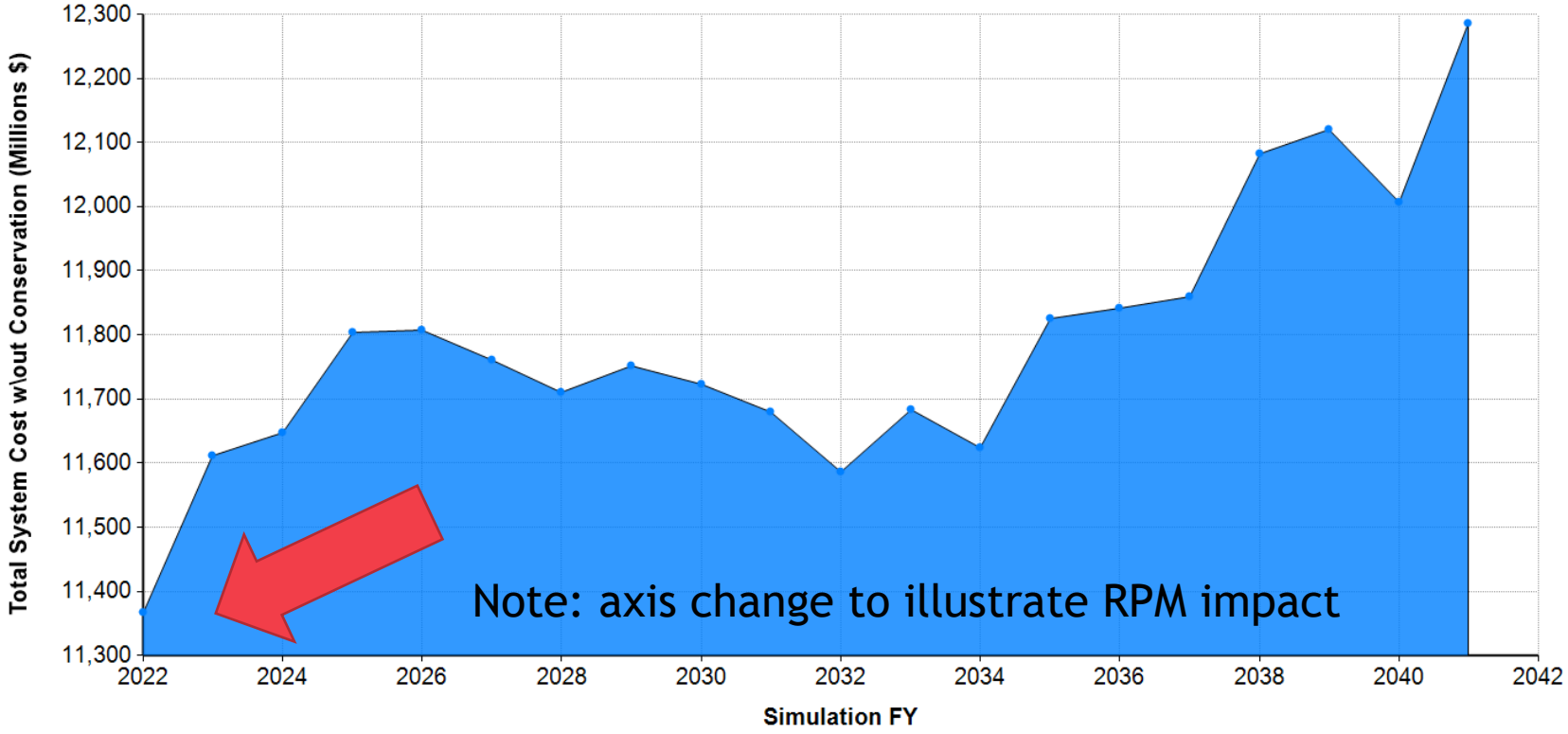
RPM's Incremental Cost to Rates & Bills



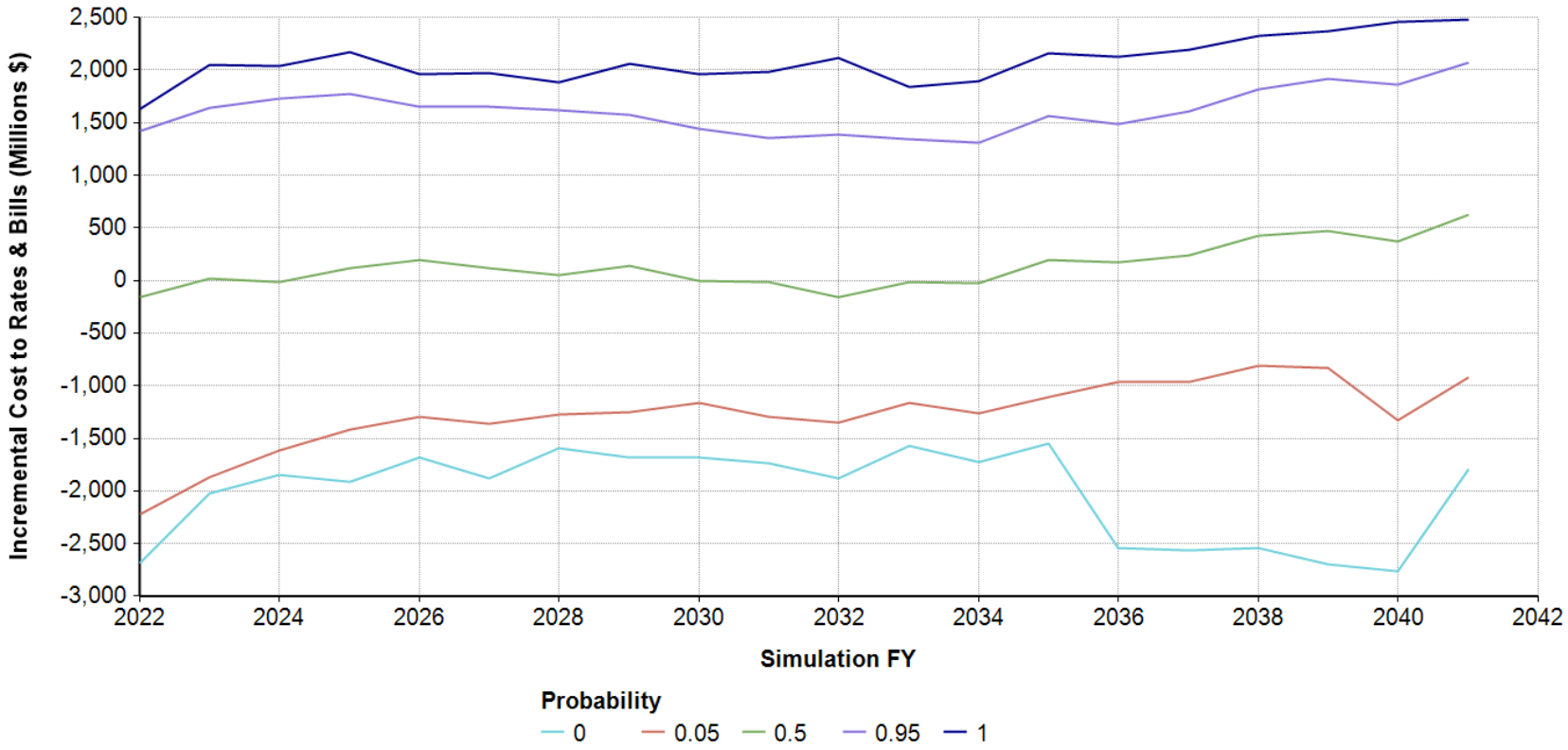
Average Total System Cost Without Conservation Looks Flat



Because the Average RPM Effect is Small



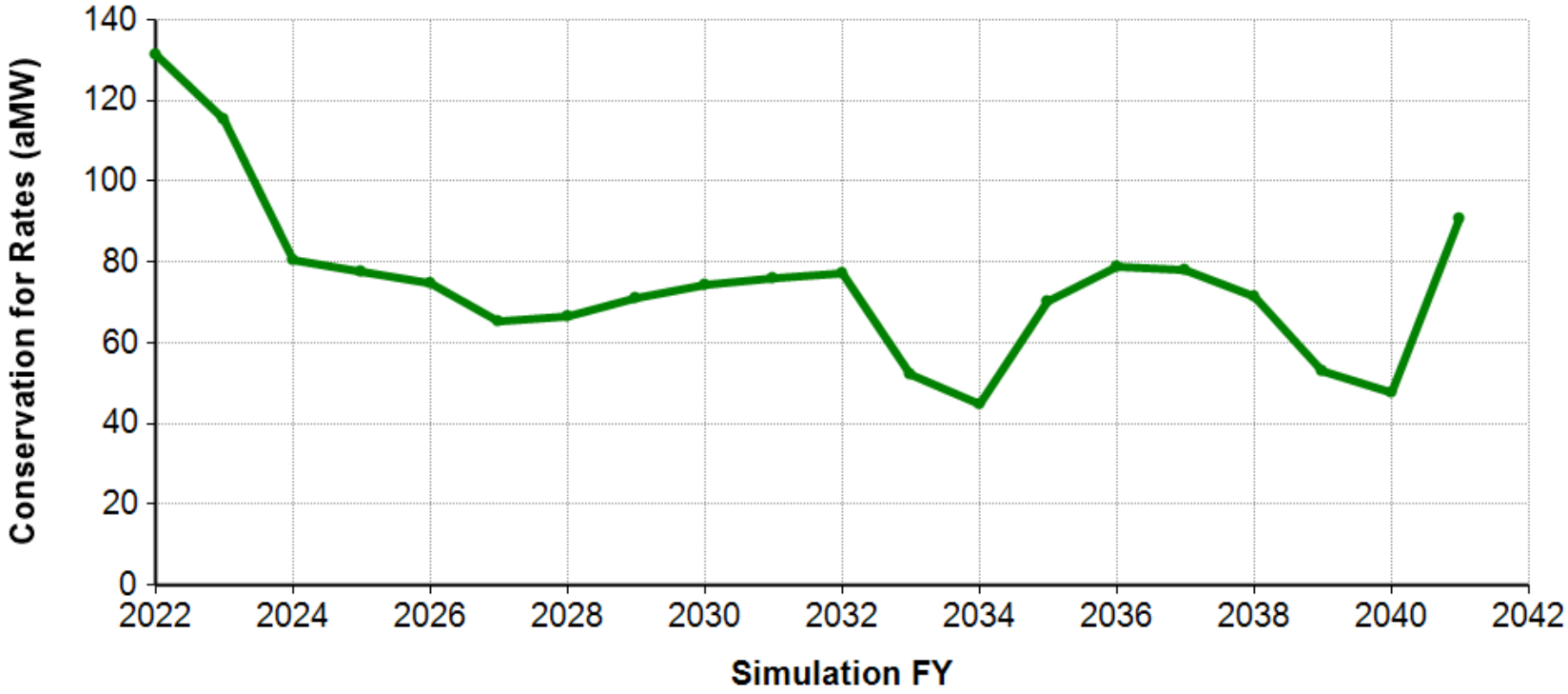
But Possible Range of the RPM Impact Shows Uncertainty



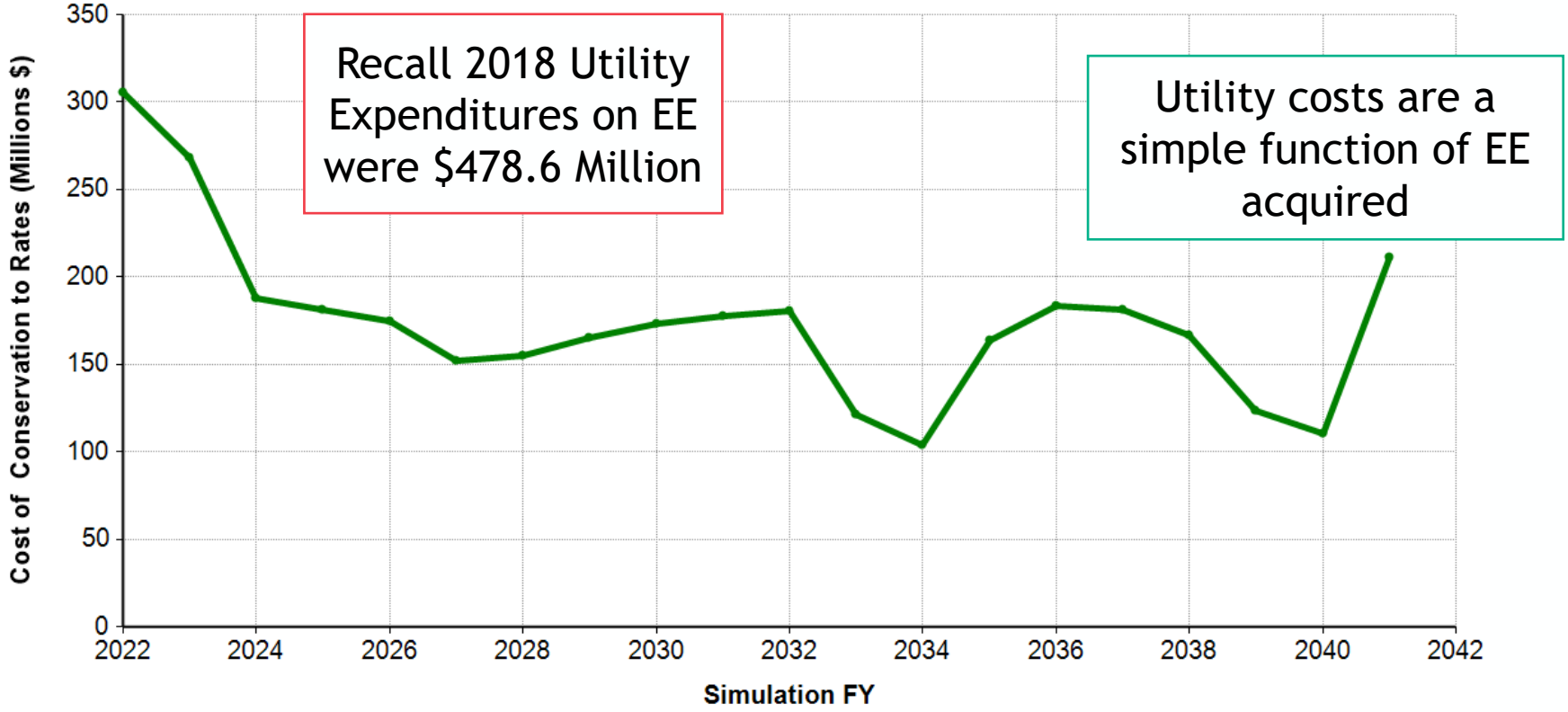
RPM Also Impacts Conservation Costs

Rates & Bills logic does not use the cost in the supply curves – but it does use the amount of conservation acquired in RPM. Then that amount has a $2.33 Million cost per aMW.

Average Conservation Acquired in RPM

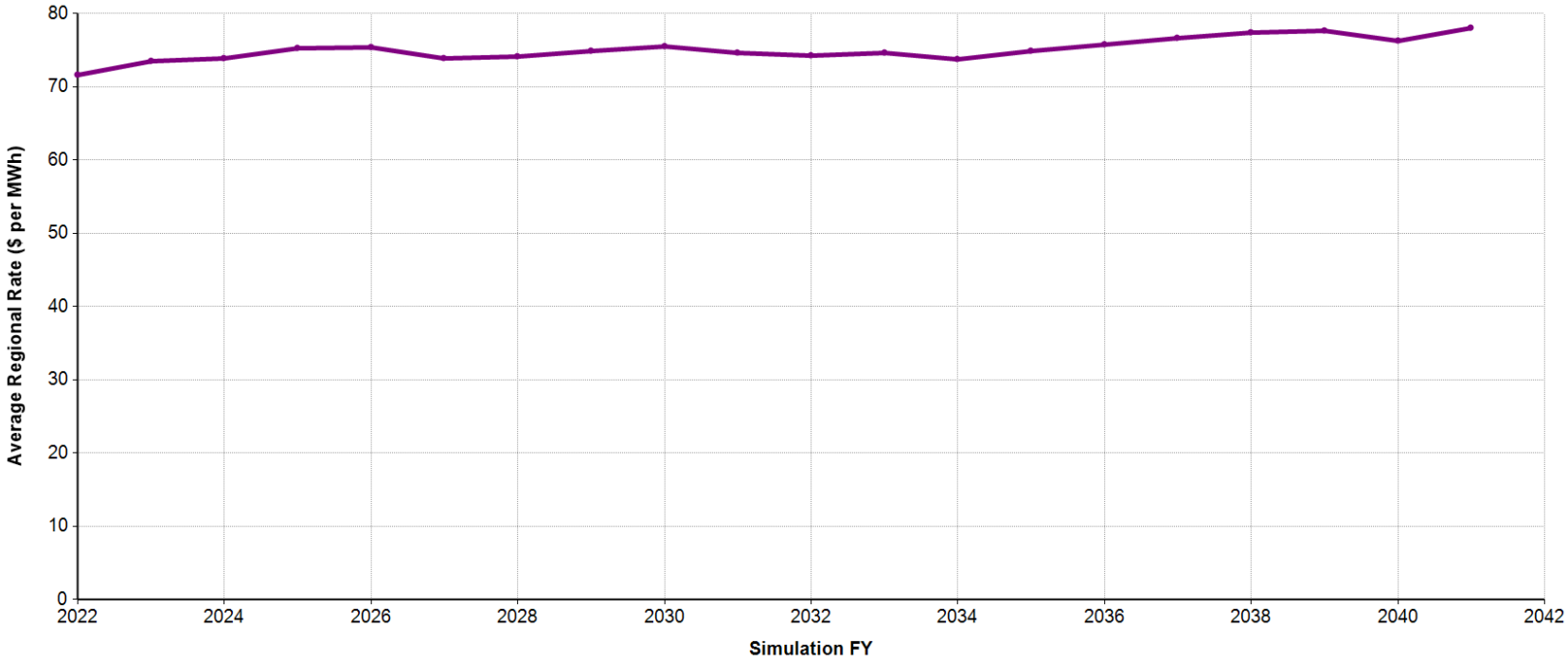


Translates to Incremental Utility Conservation Costs

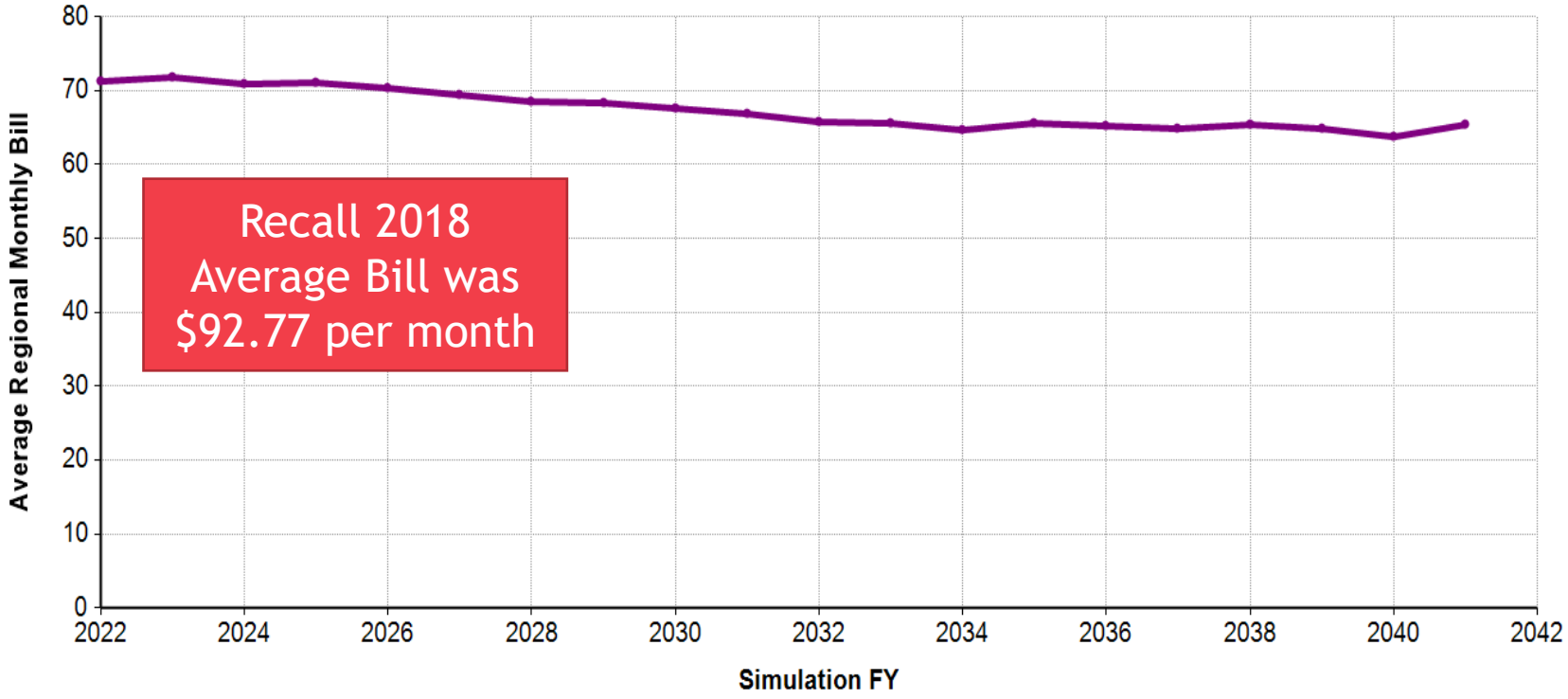


Rates & Bills in Baseline Conditions

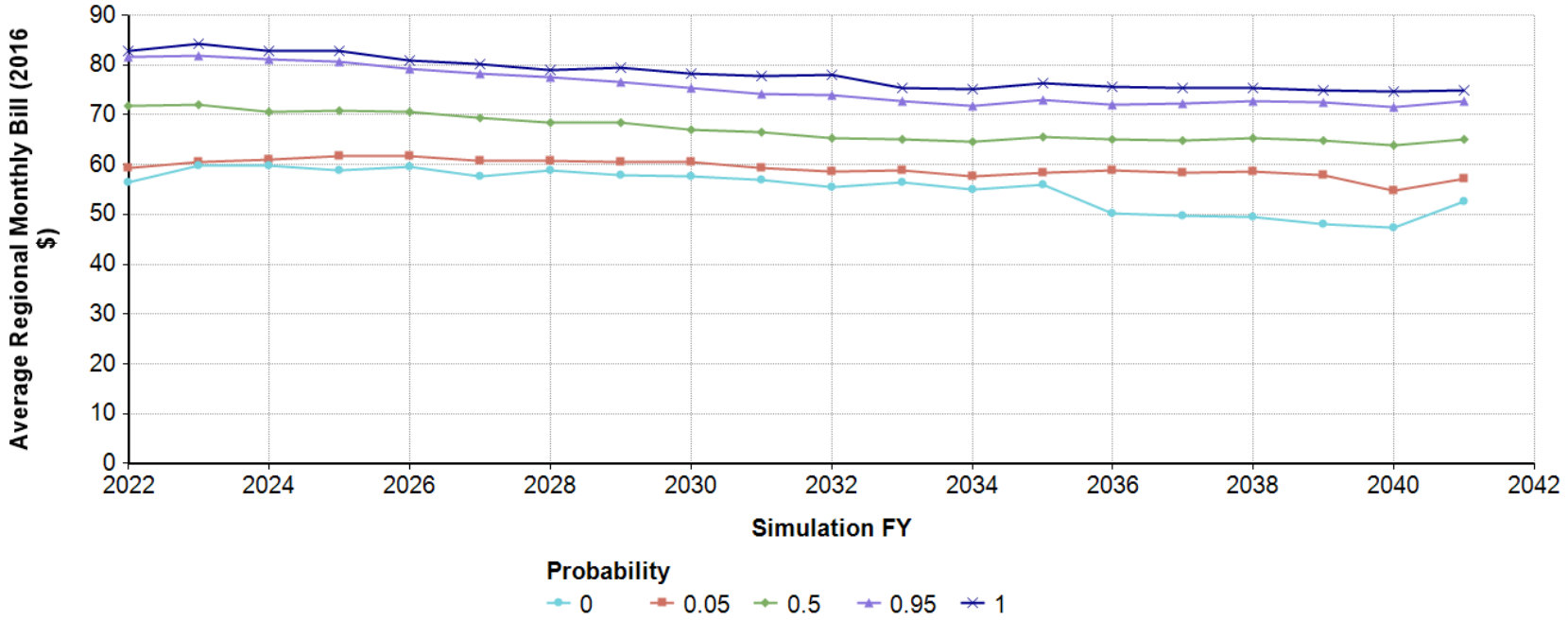
Low Rates with Modest Growth



Turn into Expected Bills Lower than 2018 Average

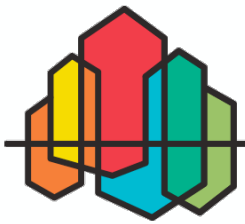


The Maximum Bill in RPM is Below the 2018 Bills



Bills are Lower Likely Because

- Extremely low market prices outside the region subsidize costs to serve load inside the region
- Fuel costs in RPM are much lower than fuel costs reported by utilities in 2018
- Population growth outpaces system cost growth
- Small reduction from reducing EE spending by utilities



Some Conclusions

- RPM uses the region's flexibility and the external surplus to drive down costs – even while building renewables to reduce GHG emissions
- Limiting new natural gas generation and using renewables to maintain adequacy substantially increased our estimates of system cost for the WECC in AURORA - but that dynamic doesn't scale down to the region
- Regional utilities would have very different outcomes in their costs were this environment to develop
- Even if it's not expected that utilities would reduce revenue collected in this environment – this shows a very modest increase in costs over the plan horizon

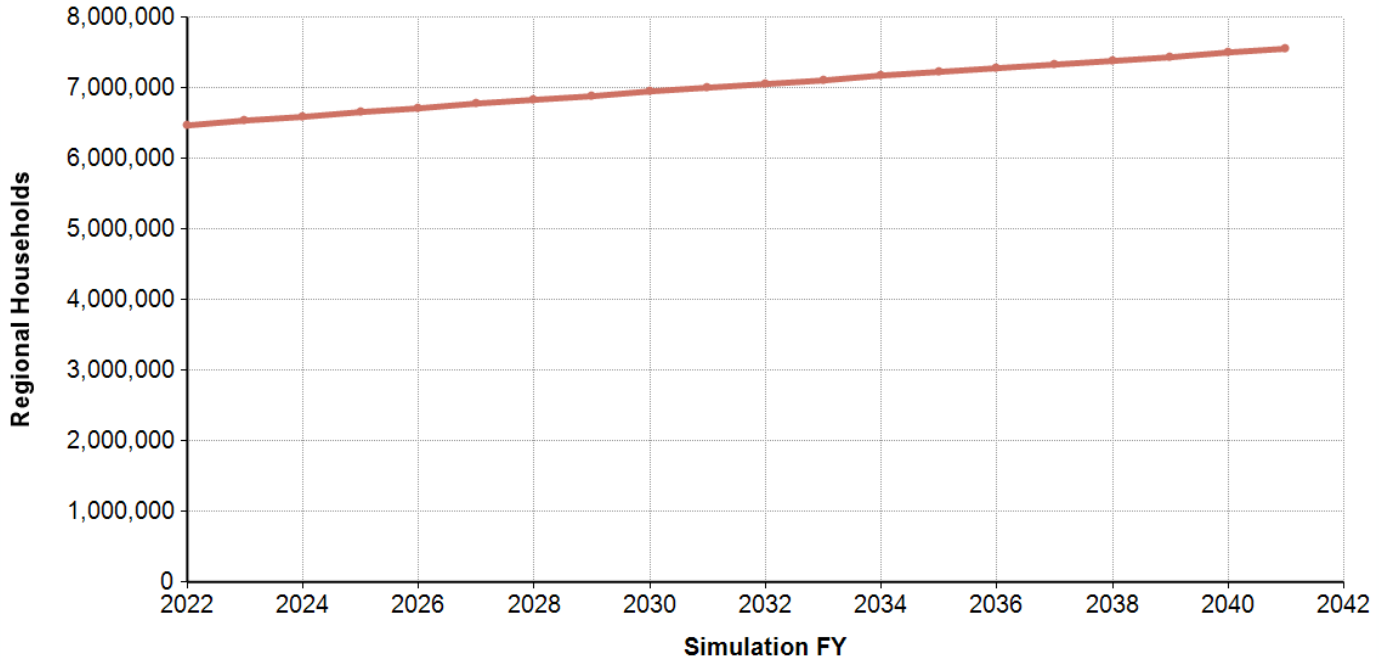

Questions?

Extra Slides

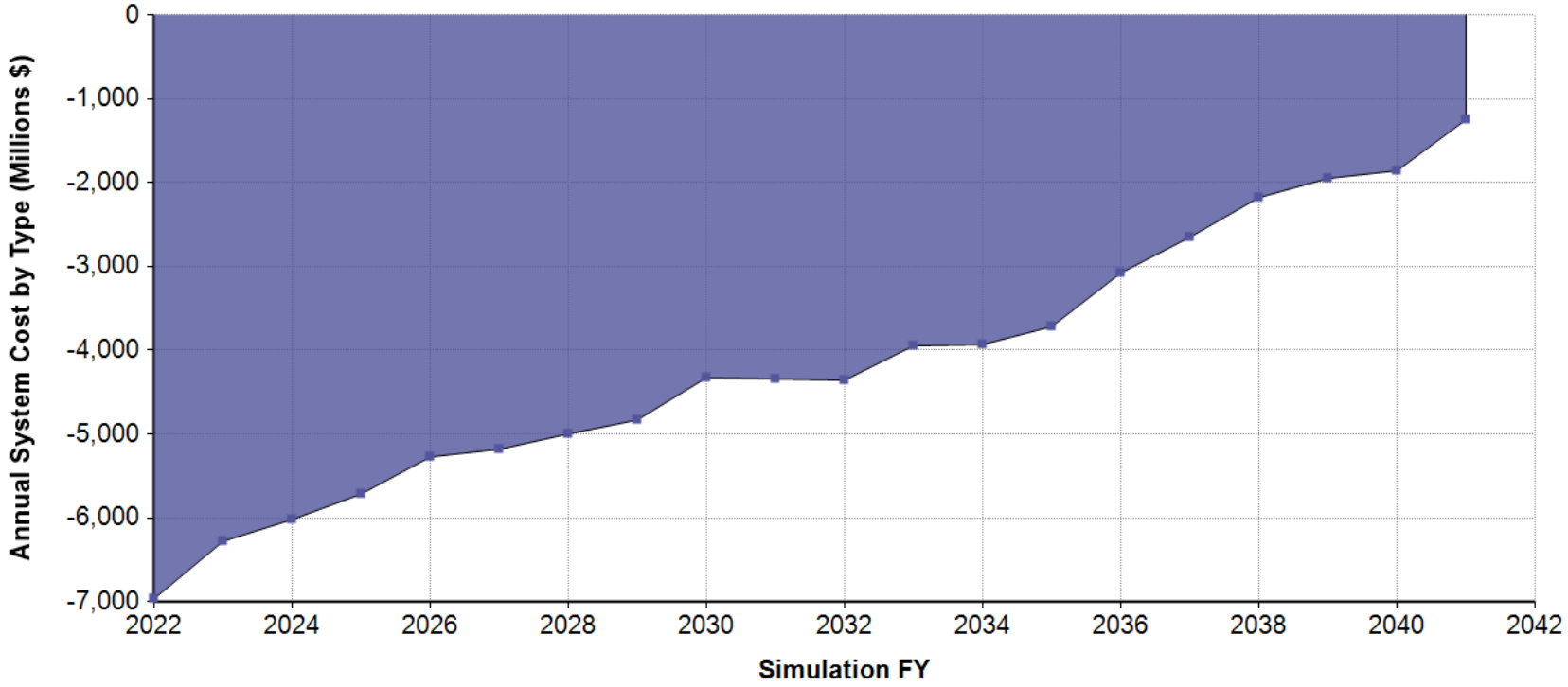
Caveats

- Baseline conditions are not a forecast – they are a basis for comparison
- Fuel costs reported by utilities include fuels not modeled in RPM, like biomass – I would generally expect this to be higher than what is shown in a model
- Outcomes in the RPM heavily depend on assumptions about decisions made outside the region - where we don't have the fidelity of data used for our estimates of dynamics inside the region
- These results were run over the weekend prior to the Council meeting – we'll continue to vet them with Advisory Committees

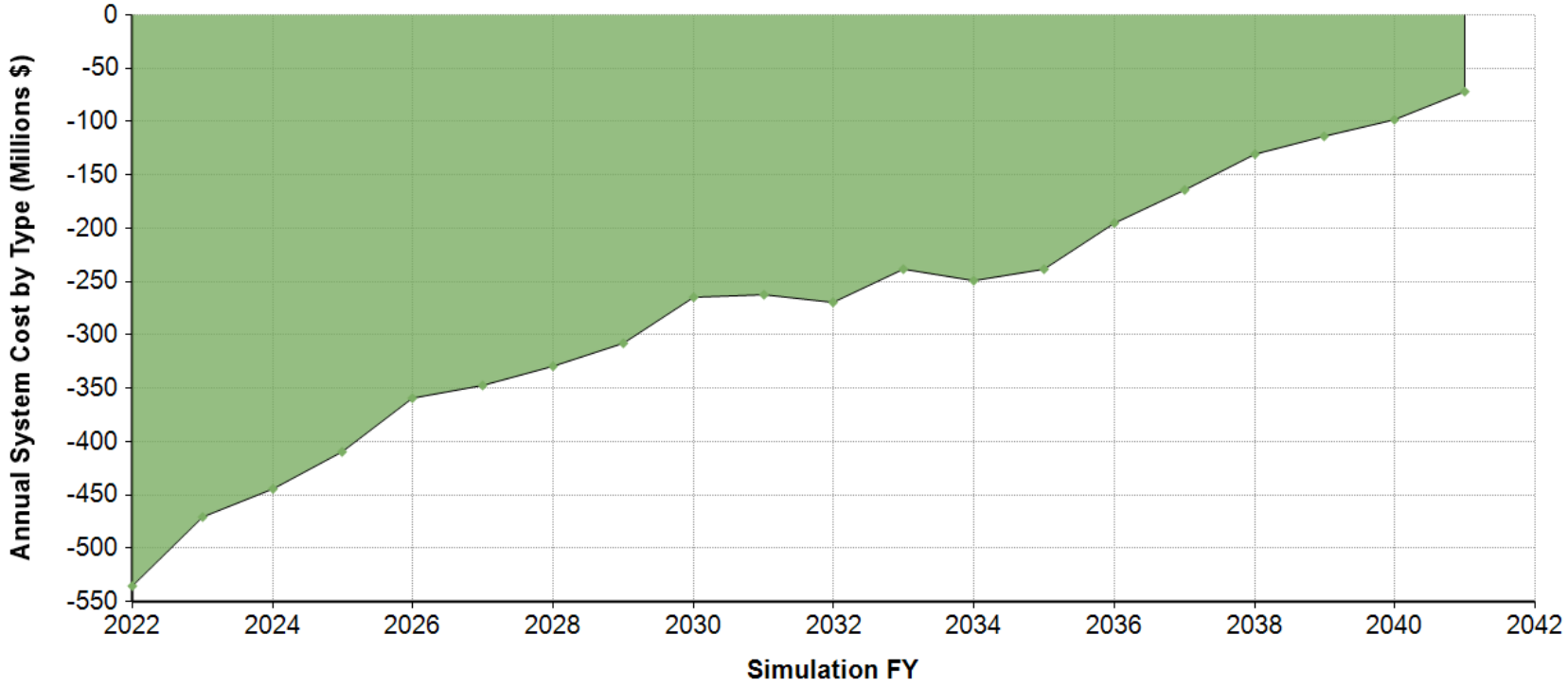
Regional Households in Rates & Bills



Value of Hydro Generation is Largely Driven by Market Prices



Value of Must-Run is Also Driven by Market Prices



Placeholder – Detailed Analysis

We will be running the RPM with the updated Needs Assessment information over the weekend of March 6th & 7th, to allow for the most updated information to be shared with the Power Committee information from those runs will be extracted and included in this presentation. An updated version of these slides will be sent to the committee directly by email when available.