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

June 9, 2020

MEMORANDUM

TO: **Council Members**

FROM: **Jennifer Light**

SUBJECT: **2020 Northwest Regional Forecast**

BACKGROUND:

Presenter: Shauna McReynolds, Executive Director

Summary: The Pacific Northwest Utilities Conference Committee (PNUCC) released its annual update to the Northwest Regional Forecast (NRF). This report is a summation of the region's loads and resources over the next ten years from the utilities' perspective.

The 2020 NRF highlights several key trends, including (from the Executive Summary):

- The increasing number of carbon reduction policies at the state and utility level are foundational to the changing resource picture.
- Ten coal fired units in the Northwest will be closed by 2030, contributing significantly to the "gap" in dependable supply of electricity to meet increasing peak demand in both summer and winter months.
- Continued robust energy efficiency efforts by Northwest utilities, combined with the addition of wind and solar energy resources, may help narrow this gap.
- Solar generation is expanding rapidly and is expected to reach 1,800 megawatts by 2022, a three-fold increase of the amount of Northwest solar predicted in the 2017 Forecast.

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- A new trend in the renewable energy picture is the rapidly increasing use of battery storage, largely to support solar generation. Utilities are also looking to new hydro pumped-storage projects as a viable capacity option.
- Against the quickly changing supply and demand picture, utilities in the Northwest are seeing value in joint resource adequacy efforts.
- The COVID-19 pandemic that erupted around the world in just a few months illustrates the uncertainties of long-range planning forecasts including this one.

Relevance: The NRF provides a forecast of loads and of resource supply to identify potential needs in the near future. This is similar to the Council's annual resource adequacy assessment, which this year will be incorporated into the 2021 Power Plan, but the NRF differs in that it is essentially the sum of each utilities' load forecasts and current/expected resources, providing an expected projection of future needs.

More Info: Read the full report: https://www.pnucc.org/system-planning/Northwest-Regional-Forecast

2020 Northwest Regional Forecast

EXECUTIVE SUMMARY

Since 1952 the Pacific Northwest Utilities Conference Committee's annual *Northwest Regional Forecast* has provided utility decision-makers and others a sense of the region's need for power as they consider decisions about resource requirements to ensure the region has an adequate supply of electricity. By collecting and examining utility-reported information in a consistent manner the *Forecast* functions as a barometer of the region's future electric supply and demand in the midst of uncertainties of weather, evolving energy policies, population growth and the economy.

While this year's *Forecast* continues several themes and trends impacting the Northwest's electric utility landscape, **the increasing number of carbon reduction policies at the state and utility level are foundational to the changing resource picture**. Retirements of Northwest coal-fired generation is both increasing and accelerating at a faster pace than previously predicted, inspiring utilities' creativity and heightening the value of acquiring energy efficiency, demand response, storage and new generation.

Ten coal fired units in the Northwest will be closed by 2030, and some of these may shut down earlier than currently expected, **contributing significantly to the "gap" in dependable supply of electricity to meet increasing peak demand** in both summer and winter months. This trend of accelerating retirements extends to the greater Western Interconnection, contributing to concerns about regional resource adequacy.

Continued robust energy efficiency efforts by Northwest utilities, combined with the addition of wind and solar energy resources, may help narrow this gap. **Solar generation is expanding rapidly** and is expected to reach 1,800 megawatts by 2022, a three-fold increase of the amount of Northwest solar predicted in the *2017 Forecast*.

A new trend in **the renewable energy picture is the rapidly increasing use of storage**, largely to support solar generation. In addition to batteries, utilities are also looking to new hydro pumped-storage projects as a viable capacity option. These technologies are moving faster than previous anticipated in the Northwest.

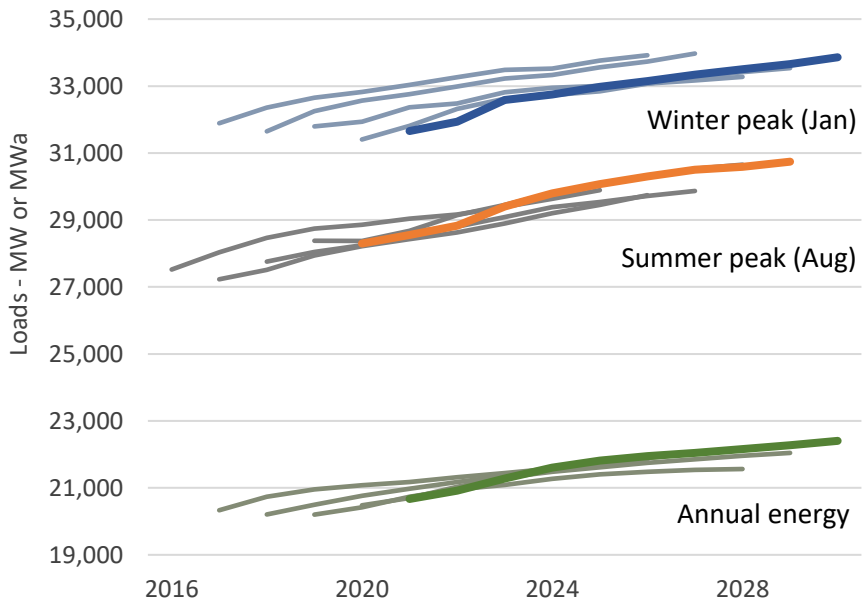
Against the quickly changing supply and demand picture, utilities in the Northwest are seeing value in joint resource adequacy efforts. The Northwest Power Pool's Resource Adequacy Program, currently under development, holds promise to help utilities address adequacy concerns together and share resources in times of short supply.

Finally, the COVID-19 pandemic that erupted around the world in just a few months illustrates the uncertainties of long-range planning forecasts including this one. This outbreak has thrown the social fabric and the economy into uncertain waters. We will wait to see its impact to the Northwest's energy landscape, let alone the health and well-being of all of us.

LOAD FORECASTS STAY STEADY, GROWTH CONCENTRATED IN FEW UTILITIES

The *2020 Forecast's* electric load growth expectations are similar to last year's report. Summer peak growth is 0.92% per year and remains stronger than winter peak growth (0.75% per year). Annual average energy growth is 0.90% per year. These forecasts include the impact of current/future energy efficiency savings.

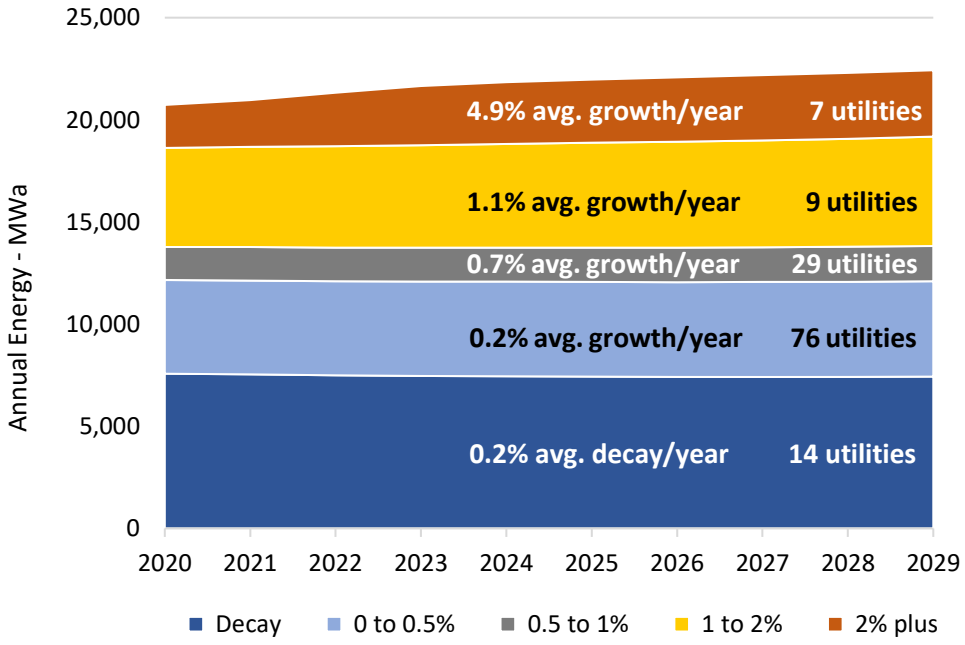
Figure 1. Load Forecast Comparisons (2016 – 2020 Reports)



Looking back at previous years' load projections as compared to actuals, the historical forecasts were optimistic about future growth. This is due in part to more than expected savings from energy efficiency programs, continual changes to codes and standards, lag in timing of new industrial loads or unforeseen industry shutdowns, and other energy related policy changes.

As observed for years, load forecasts vary considerably by utility. This year the majority of forecasted growth is within seven utilities' making up 10% of the region's total load in 2021. On the other end of the spectrum, 14 utilities (37% of 2021 total load) expect load decreases. The remaining utilities anticipate load growth from zero to 2% per year, with the greatest number of utilities expecting load growth under 0.5% per year.

Figure 2. Annual Energy Load Stacked by Growth Rate

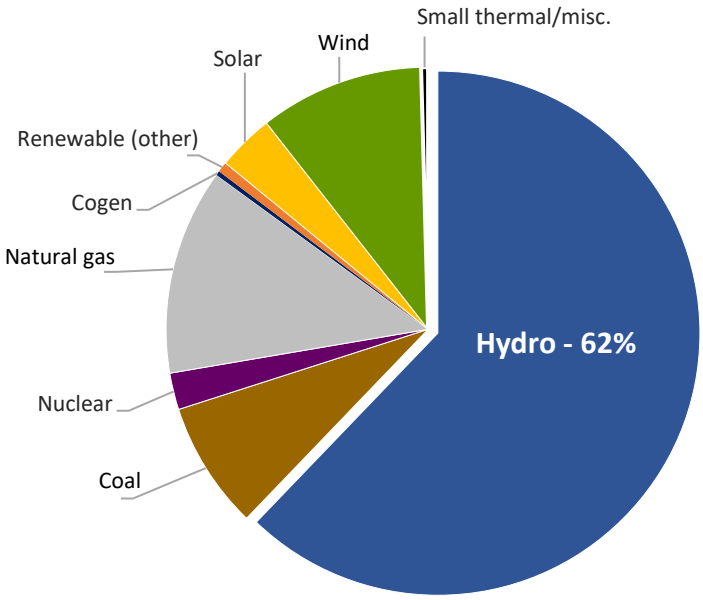


HYDRO DOMINATES RESOURCE MIX, VARIABILITY WELL KNOWN

Northwest utilities depend on more than 54,500 MW of installed nameplate capacity from either owned or firm contracted resources.[1] The region is uniquely situated with more than 60% of the installed capacity coming from hydroelectric projects – a much higher proportion than other parts of the US.

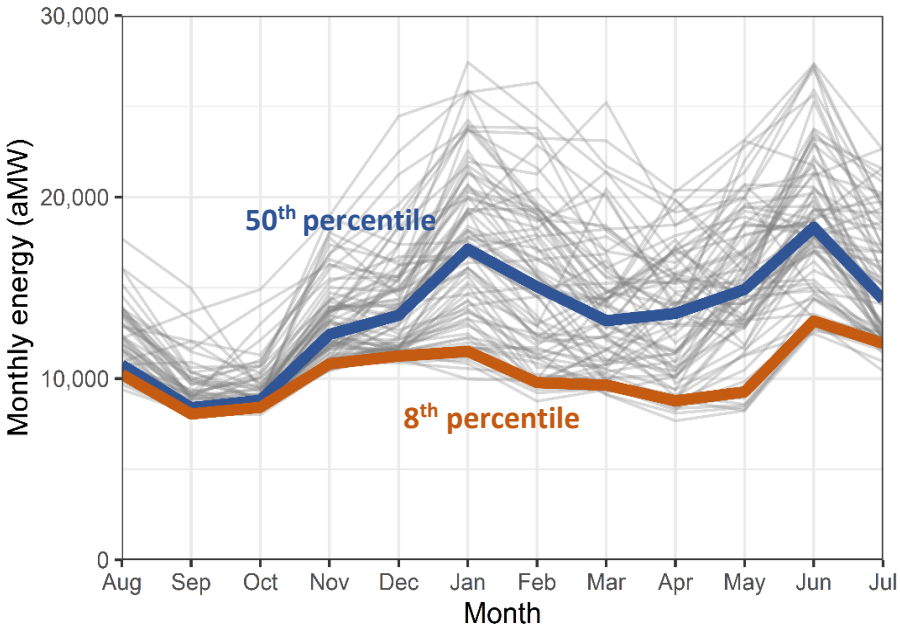
Hydropower plays a critical role in the Northwest due to its magnitude and flexibility as a resource. However, the amount of energy and capacity the hydro system can generate depends on a significantly varying water supply year-to-year. Because of this variation, a low water condition is assumed to determine the need for power in the *Forecast.*

Figure 4. Northwest Utilities Generating Resources
OY 2022 (~54,500 nameplate MW)



NORTHWEST HYDRO GENERATION DEPENDS ON WATER CONDITIONS

Figure 4. Hydro Generation Across 80 Water Conditions



The variability of hydro generation is due to the hydrology of the river systems in the Northwest. Monthly hydro energy generation estimates from the major developments in the coordinated hydro system are shown for each of the 80 different water conditions using the 2018 system operating criteria in Figure 4. For perspective, the 50th percentile and 8th percentile are highlighted.

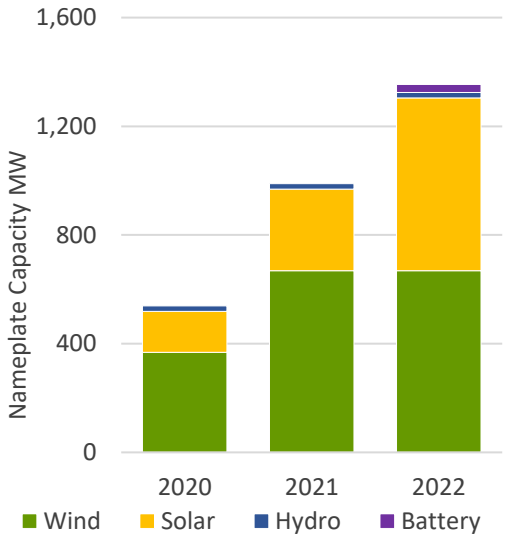
[1] Regional generation is over 60,000 MW nameplate capacity including all generation owned by Independent Power Producers.

NEWEST SUPPLY MOSTLY WIND AND SOLAR

On the supply-side of the ledger are the *2020 Forecast* Committed Resources. Utilities have a high level of confidence this generation will be available as scheduled, with some already under construction. Around 650 MW of wind and solar and some hydro upgrades should be on line by 2022. The Northwest's first large (30 MW) battery storage project rounds out the picture.

As utilities seek to reduce greenhouse gas emissions, and new resource prices fall, solar power is growing in the Northwest. In total, the Northwest is on track to have over 1,800 MW of utility-scale solar capacity online by the end of 2022. For comparison, in 2017 the region was anticipating fewer than 600 MW of solar by 2022. Looking beyond committed resources to planned resources (described later), the future for solar in the Northwest looks bright.

Figure 5. Committed Supply-Side Additions



DEMAND-SIDE SAVINGS PROJECTIONS STAY AGGRESSIVE

Figure 6. Energy Efficiency, 10-year total savings

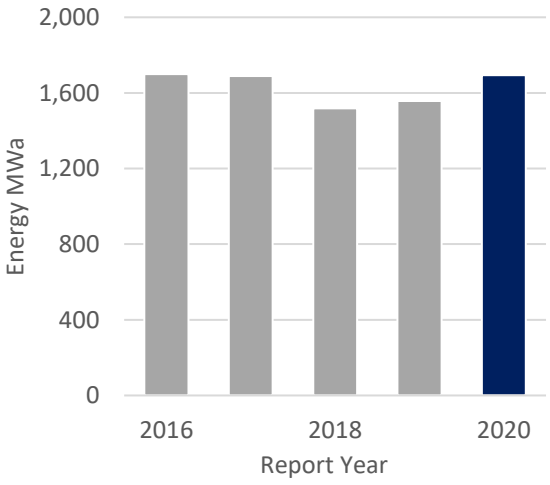
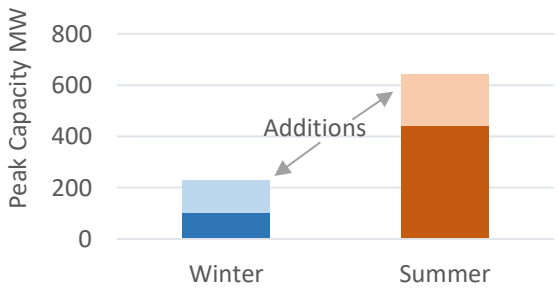


Figure 7. 2020 Demand Response, 10-year total



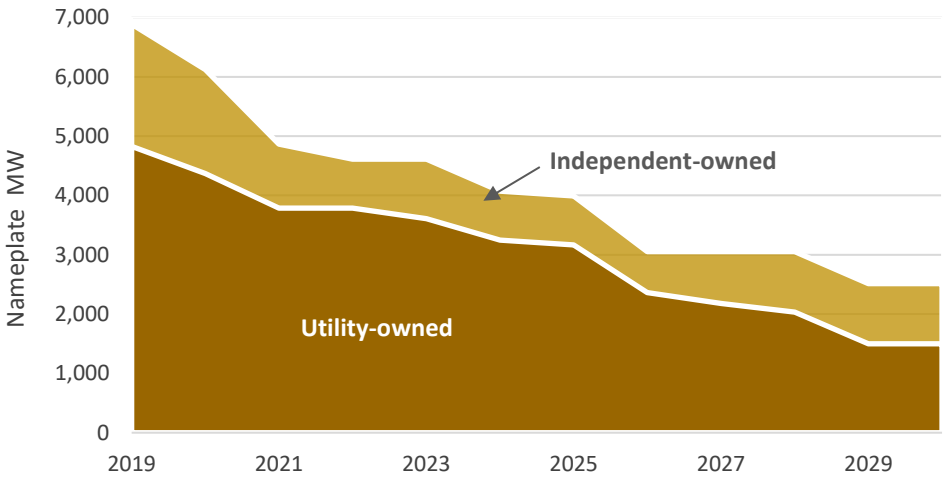
The *2020 Forecast* indicates total energy efficiency savings over the 10-year horizon are slightly up from last year. With nearly 1,700 MWa forecast over the next decade (not including savings from codes and standards) utilities' savings are staying aggressive. State policy changes may contribute to the continued push. The Washington *Clean Energy Transformation Act* (CETA) requires utilities to incorporate the social cost of carbon in their planning. As of this publication, it is not clear whether other states will include the social cost of carbon in their planning. These policies increase the amount of energy efficiency that is cost-effective which reduces the need to run greenhouse gas-emitting generation.

In an effort to reduce peak load during critical times of the year, utilities also continue to explore opportunities to establish demand response programs with customers. This year's *Forecast* indicates demand response program growth of about 125 MW in winter and 200 MW in summer over the 10-year horizon for a total of 225 MW of winter and almost 650 MW of summer demand response by 2030. The summer programs are currently led by Idaho Power and their interruptible irrigation programs.

PACE PICKS UP FOR RETIRING COAL

Coal retirements are accelerating across the Western Interconnection. The Northwest is no different, with ten coal unit retirements anticipated between 2019 and 2030. At the end of this *Forecast's* 10-year planning window, only four units remain operating in the region: Colstrip 3 & 4 and Jim Bridger 3 & 4. About 150 MW of hydropower will also retire in the next few years. The result is a substantial decline in the availability of dispatchable baseload generation across the region.

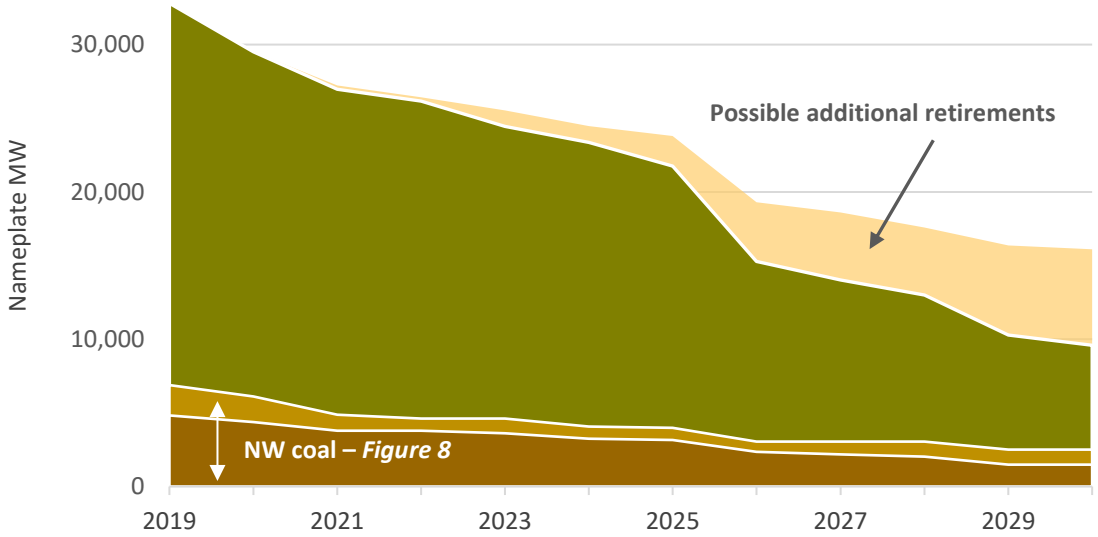
Figure 8. Available Northwest Coal Generation



NW Units	Retirement Year
Colstrip 1 & 2	2019
Hardin	2019
Centralia 1	2020
Boardman	2020
Valmy 1	2021
Jim Bridger 1	2023
Valmy 2	2025
Centralia 2	2025
Jim Bridger 2	2028

Northwest retirements are part of a bigger picture throughout the Western Interconnection. Current estimates indicate over 16,500 MW of coal will retire by 2030 in the Western Interconnection. And an additional 6,500 MW of coal may also face early retirement (shown in Figure 9) as indicated in recent news stories and utility announcements. Beyond coal retirements, there are many other thermal units retiring across the Western Interconnection as well.

Figure 9. Available Western Interconnection Coal Generation

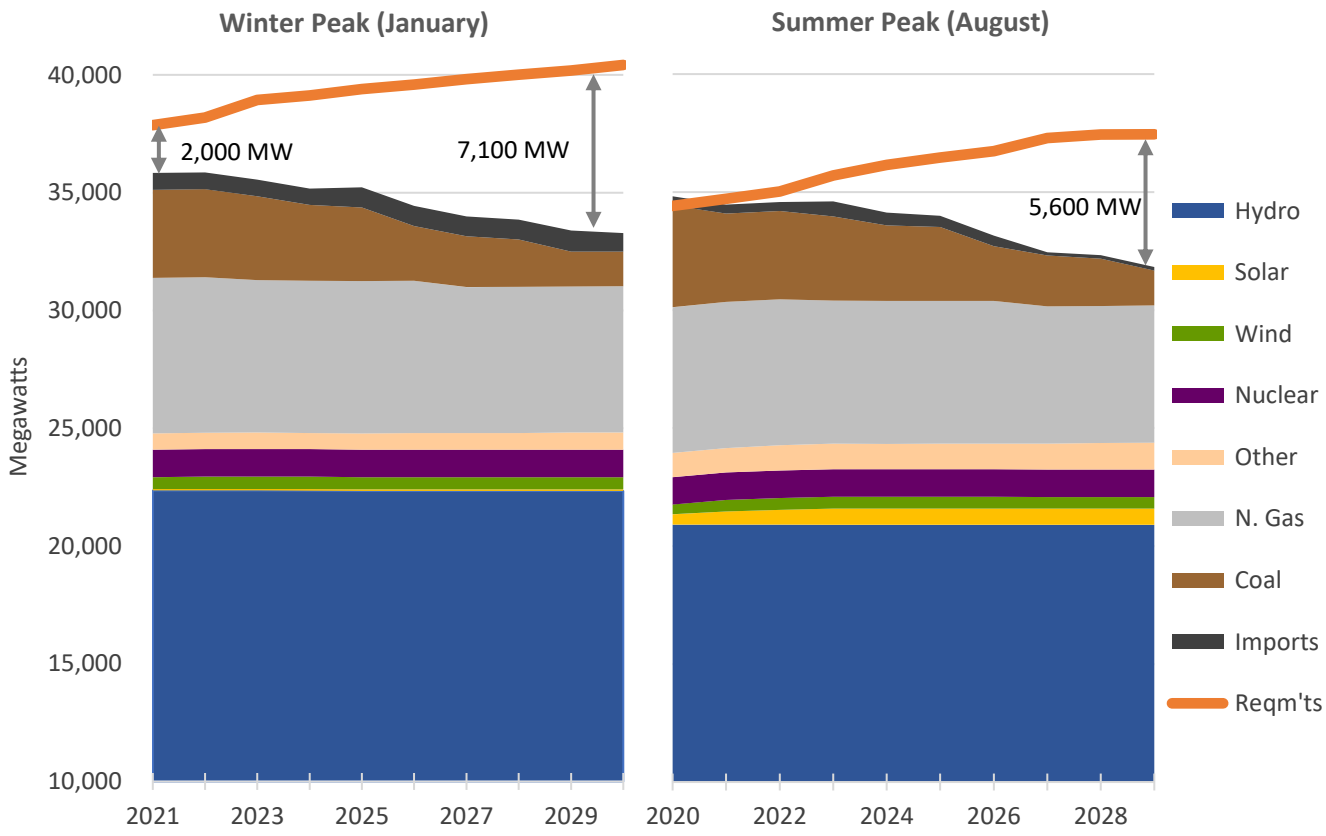


COAL RETIREMENTS & LOADS DRIVE GROWING DEFICITS

As coal units retire and load grows (0.75%/year for winter peak, 0.92%/year for summer peak), the gap between loads and resources increases throughout the *Forecast's* 10-year time horizon. The comparison of requirements (loads, exports and planning margin) to the capability of generating resources for the winter and summer peak hours is shown in Figure 10.[2] The winter indicates a need of 2,000 MW in 2021 growing to 7,100 MW over the 10-year period. Similarly, the summer starts slightly surplus in 2021 and grows to a 5,600 MW gap over time. The annual energy load/resource comparison follows this pattern, starting almost 1,000 MWa surplus, yet marches up to a 3,200 MWa gap by 2030.

This resource gap is not indicative of a precise need for generation. Rather, it shows that without actions beyond the committed resources, the Northwest faces a growing deficit.

Figure 10. Winter and Summer Peak Requirements & Resources



[2] Winter and summer peak load resource comparisons pictured here show the growing gap given the study assumptions of 1-in-2 loads, firm exports,16% planning margin, 8th percentile annual hydro and only generation from utility-owned and contracted resources (no IPP/market resources).

SUMMER PEAK NEED REACHING WINTER LEVEL

When analyzing the growing need for resources to meet peak needs, it is useful to examine the trend of how the region's surplus/deficit projections change over time. Looking at results from the *2016* to *2019 Forecasts*, the winter deficit lessened each year due to declining load expectations. The summer balance for those same reports moved to a more deficit balance primarily due to steadier load expectations.

In this year's *2020 Forecast,* both the winter and summer peak deficits increased compared to last year's predictions, especially in the latter years. This is due to increased resource retirements and similar load expectations as last year's *Forecast*.

Figure 11. Peak Surplus/Deficit Comparison *2016 – 2020 Forecasts*

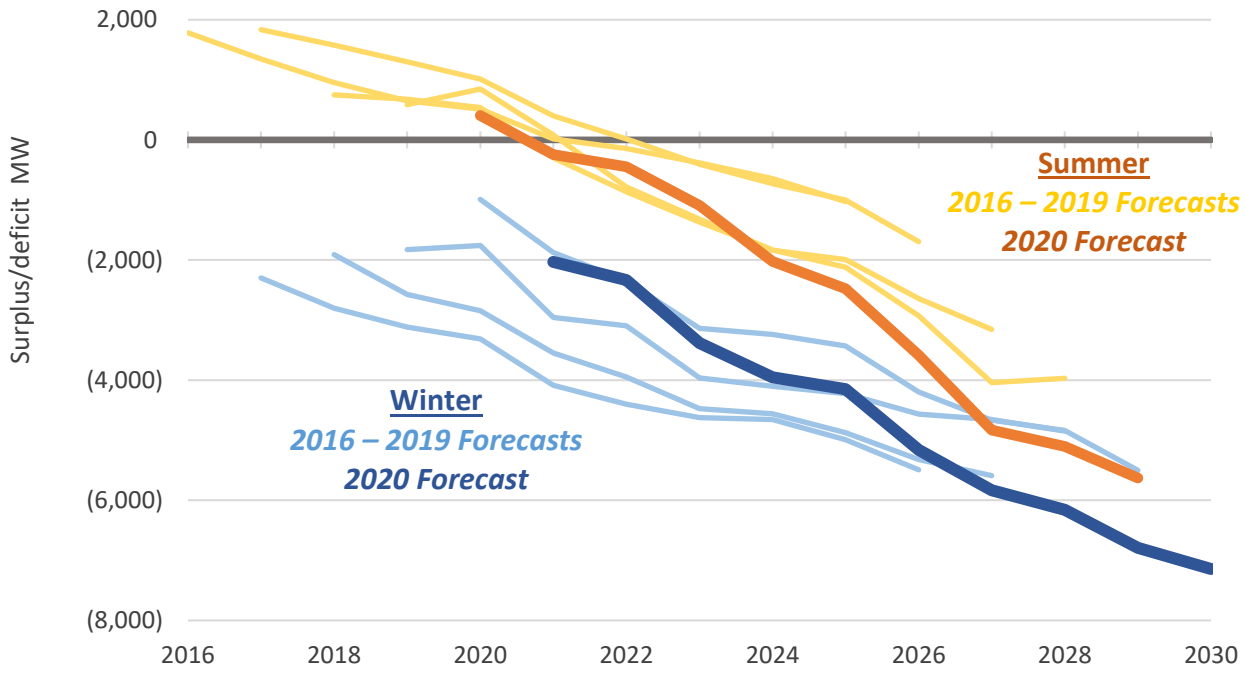


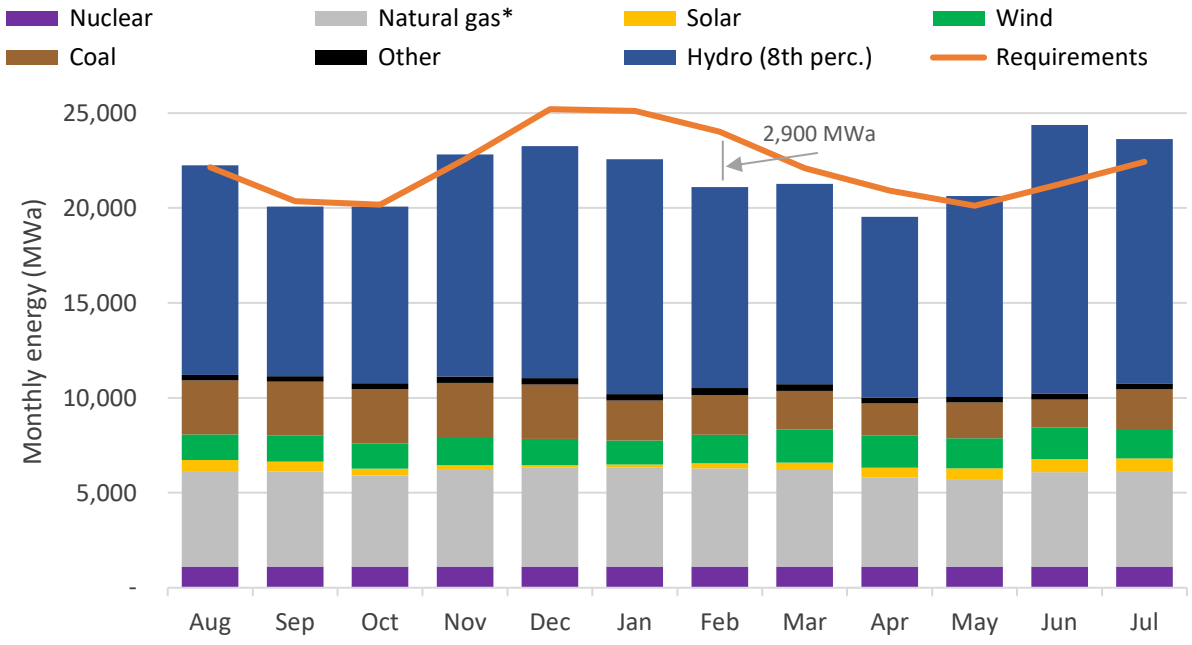
Figure 11 also highlights how the magnitude of the summer deficit is moving closer to the level of the winter deficit. In the *2016 Forecast* summer was less of a concern. Today it is reaching a similar magnitude to the winter projections. This trend is largely due to the differences in expectations for load growth, with summer peak forecasts holding steady or increasing while the winter peak forecasts slipped in each of the 2016 through 2019 reports.

MORE TO ANNUAL ENERGY PICTURE

Turning to the energy needs in the Northwest, the *Forecast* looks at both annual and monthly energy demand. On an annual basis, the region is energy surplus 2021 through 2023, and without additional resources, the surplus depletes to a 3,200 MWa deficit by 2030.

However, the annual energy load/resource balance does not tell the whole story. Due to the variability of hydro throughout the year, high spring energy production can mask issues in other seasons. As shown in Figure 12, the monthly energy picture from August 2025 to July 2026 forecasts a monthly winter deficit (more than a 2,900 MW gap in February) based on this report's energy assumptions.[3]

Figure 12. Monthly Energy Load/Resource Balance, year 2025 - 2026



*gas peakers adjusted to minimum 50% runtime

For context, the Council conducts an annual Northwest resource adequacy assessment. They examine a similar footprint using a stochastic modeling approach. It includes more non-utility owned resources than this report, but fewer committed resources. The metric used by the Council is loss-of-load-probability (LOLP); this metric indicates the probability of an outage of any size each year. An adequate system has a LOLP under 5%.[4]

The Council's most recent study indicates a need for power in both winter and summer seasons, with winter having longer, somewhat energy driven outages, and summer seeing shorter, more capacity related outages. The LOLP from their most recent analysis in Figure 13 shows a growing concern in the absence of new supply.

Figure 13. Council's 2019 Adequacy Assessment

Year	Loss of Load Probability
2020	under 5%
2021	8%
2024	13%
2026	26%

[3] 1-in-2 loads, zero planning margin, 8th percentile hydro, utility resources, gas peaking units at least 50% run-time

[4] Council's *Resource Adequacy Assessment* www.nwcouncil.org/reports/pacific-northwest-power-supply-adequacy-assessment-2024

MORE RENEWABLES AND STORAGE PLANNED

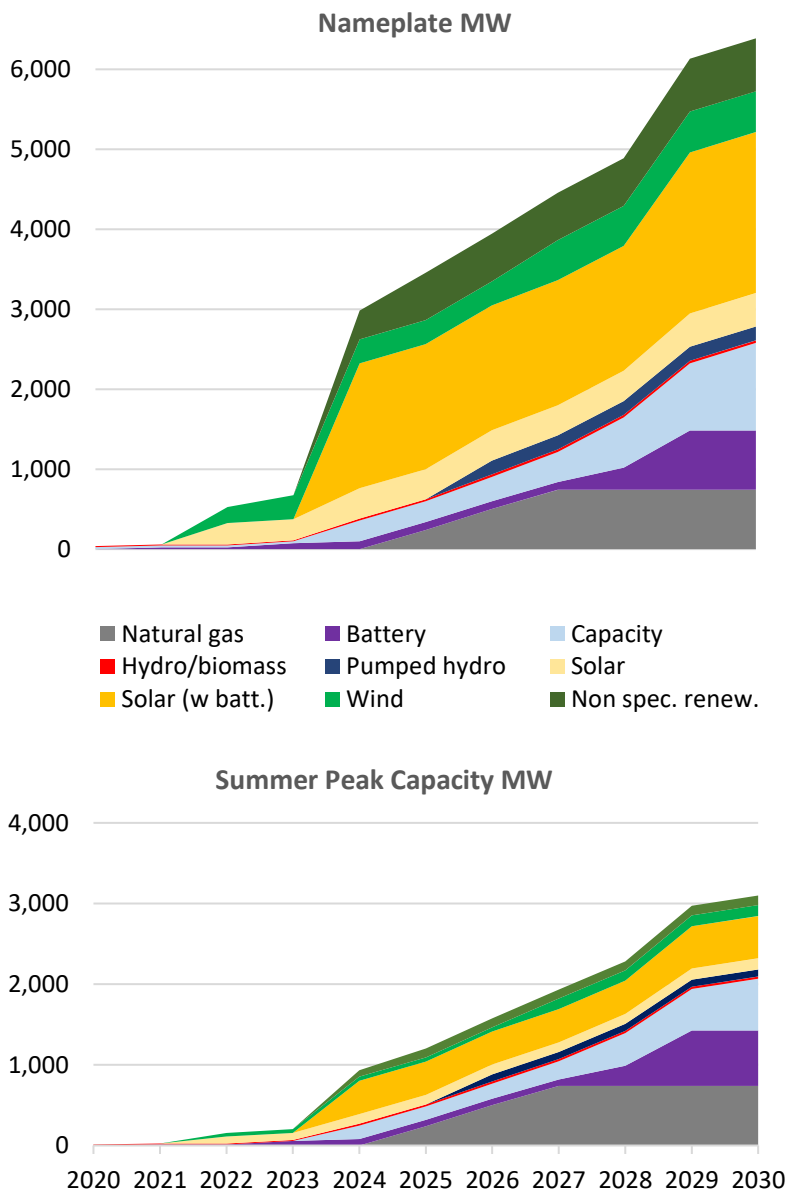
This report includes utility committed resources (around 650 MW of both wind and solar), but does not incorporate utility planned resources. Planned resources have been identified by utilities for their systems to be adequate. However, they are not yet firmly committed – they may come online as scheduled, or may be modified as utilities' needs change.

The planned resources in this year's *Forecast* add up to over 6,000 nameplate MW planned for completion by 2030. The bulk of these resources are solar, wind, storage, natural gas simple-cycle combustion turbines, and generic capacity rounding out the list.

The non-specific renewables will depend on the results of utilities' request for proposals in their acquisition processes and will likely be wind or solar. The generic capacity will likely be a carbon-free resource, and could be longer duration storage (e.g., pumped hydro).

The total capability (peaking capacity or energy production) of these planned resources will not add up to the total nameplate capacity and varies by resource and utility. For example, using estimates from utilities' integrated resource plans and information collected for this report, these planned generating resources could contribute around 3,000 MW of summer peak capacity in 2030 as compared to more than 6,000 MW of total nameplate capacity. The winter peak capacity estimate is similar.

Figure 14. Planned Resource Additions



POLICY AND ECONOMICS CEMENT CURRENT RESOURCE TRENDS

The Northwest electric generation landscape is shifting towards fewer coal power plants and a greater reliance on wind, solar, and storage facilities. This shift will continue throughout the decade due to a combination of policy measures directed at reducing greenhouse gas emissions and the economics of inexpensive renewable resources. Some of these policy measures are government directives, but increasingly, electric utilities are setting their own aggressive emission-reduction or clean energy goals. These policies, coupled with declining wind, solar, and storage costs, illustrate why coal plants are being retired while wind, solar, and storage resources continue to be developed and planned.

Concerns over reliability and resource adequacy are rising in the Northwest. Much of the concern centers on the disappearing coal fleet in the Northwest and greater Western Interconnection, along with the uncertainty regarding the characteristics, timing and magnitude of planned resources. Against this changing generation backdrop, the Northwest Power Pool has launched an effort to create a Resource Adequacy Program.

With this as background, PNUCC is paying especially close attention to:

- The design of the Northwest Power Pool Resource Adequacy Program
- The development of rules for the Washington *Clean Energy Transformation Act*
- The potential for additional environmental regulations in the Northwest
- The development of the Northwest Power & Conservation Council's *2021 Northwest Power Plan*
- The buildout of infrastructure needed to support new resources

Each of these items has the potential to change or influence long-term planning in the Northwest. And as we go to press, the full implications from the rapid spread of COVID-19 throughout the world remain unknown.

As it has been for years, the one constant in the Northwest electric power system is change.

2020 Northwest Regional Forecast

June 17, 2020

Northwest Power & Conservation Council

Shauna McReynolds, Executive Director

PNUCC

A regional adequacy barometer

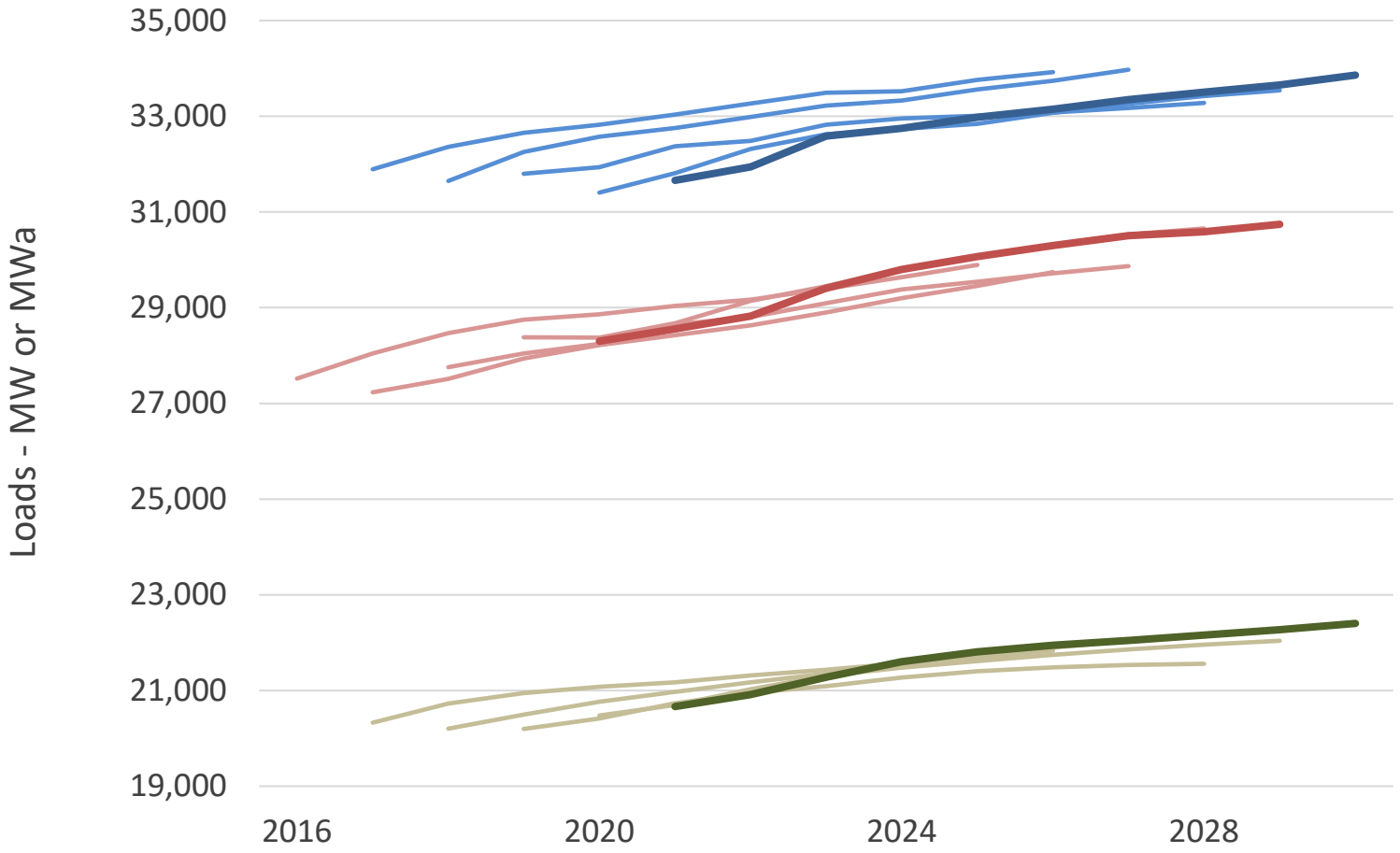
- Annual look at electric utilities' firm requirements and resources out 10 years
  - 28 entities provide data (largest utilities, PNGC Power, BPA and the Corps)
- Snapshot of resource need for winter & summer peak, annual energy
- Requirements
  - Expected (1-in-2) loads with energy efficiency
  - Firm exports
  - A 16% planning margin for peak
- Resources
  - Utility owned/contracted resources only
  - Long term imports/exchanges from outside the region
  - Hydropower under critical water conditions

Forecast footprint

- Based on 1980 Northwest Power Planning Act (aligns with the Council's Plan & BPA White Book)
- Includes utilities in Oregon, Washington, Idaho, Western Montana and some BPA customers on the outer edges
- For accounting purposes, PacifiCorp West and one-third of NorthWestern Energy's system are reflected

2020 load projections similar to last year

Regional Load Forecasts (2016 – 2020)



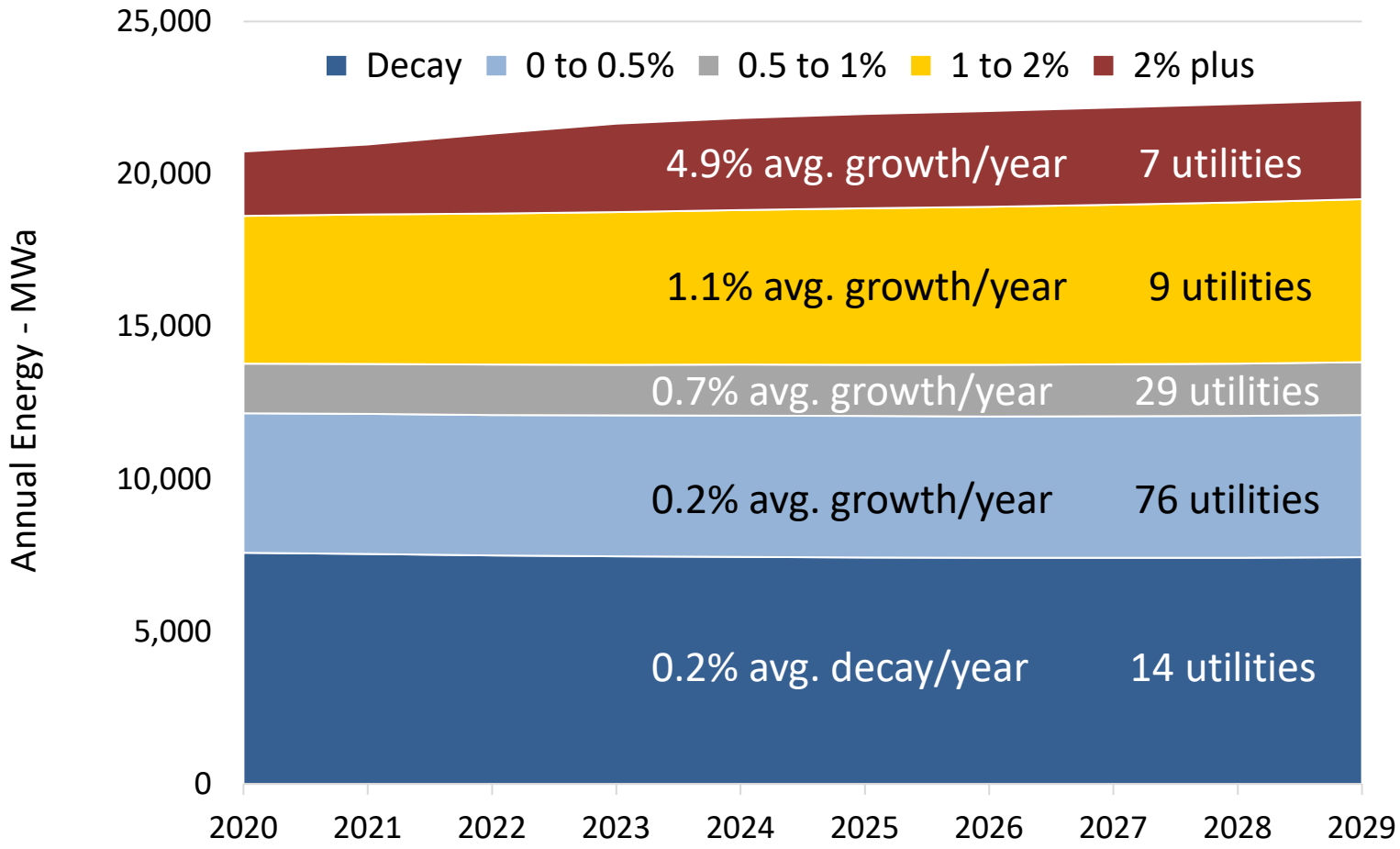
Winter peak (Jan)
0.75% per year growth

Summer peak (Aug)
0.92% per year growth

Annual energy
0.90% per year growth

Load growth forecast concentrated in few utilities

2020 Annual Energy Load Forecast Stacked by Growth Rate



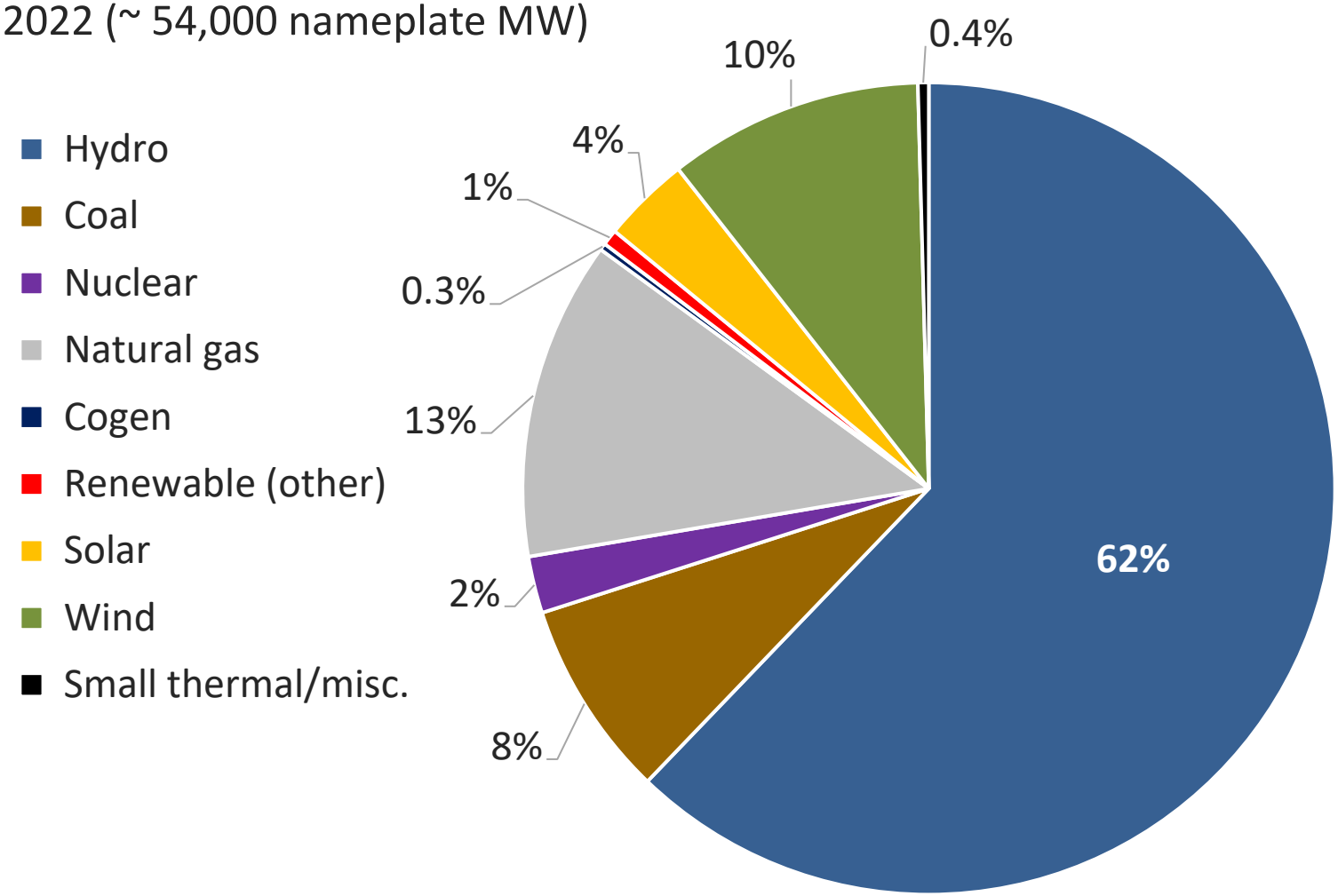
Over 60% of total growth (1,150 of 1,750 MWa) in 7 utilities

Over half of load and two-thirds of utilities are experiencing minimal load growth (or decay)

PNUCC

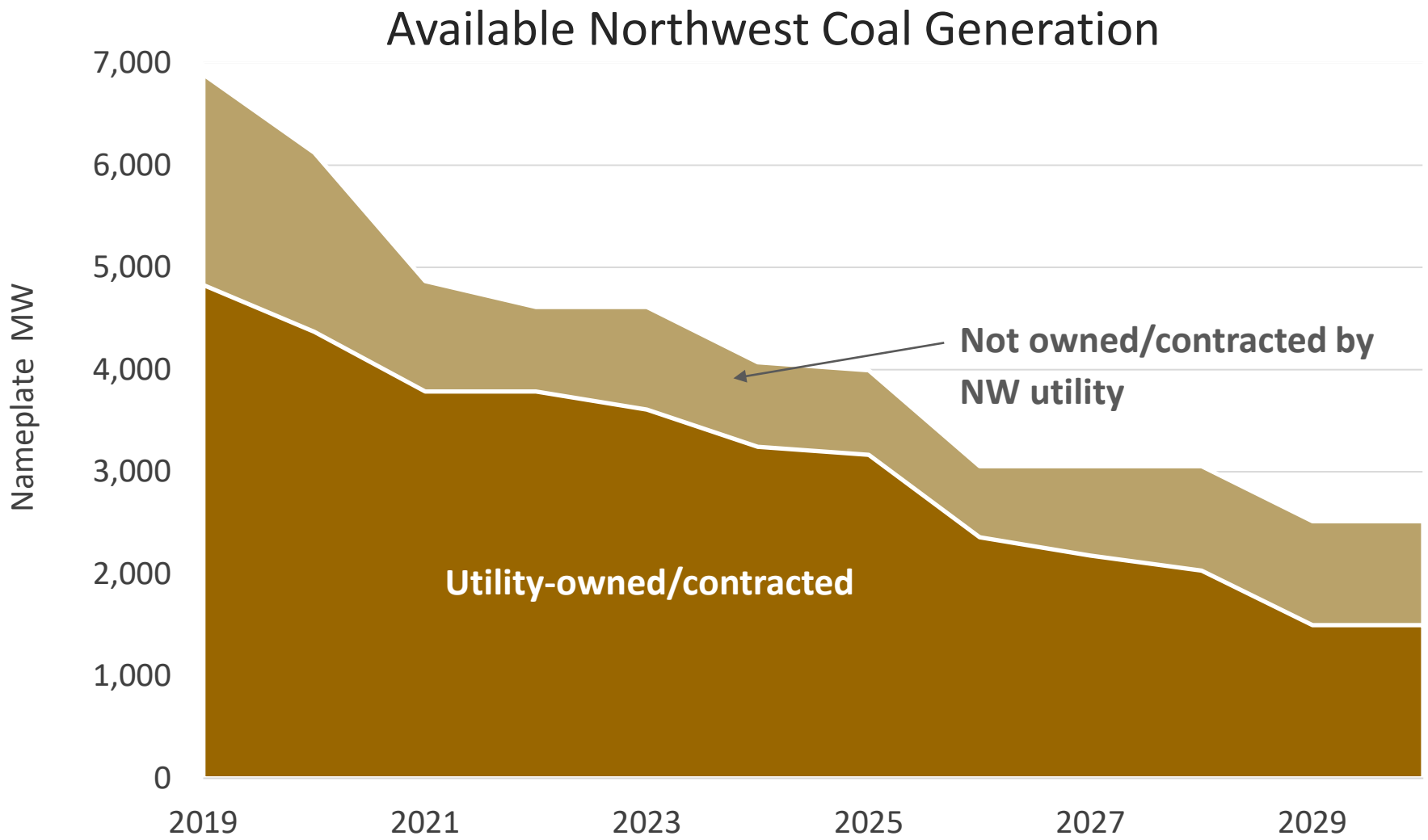
Hydropower is big share of today's resources

NW Utilities' Generating Resources
OY 2022 (~ 54,000 nameplate MW)

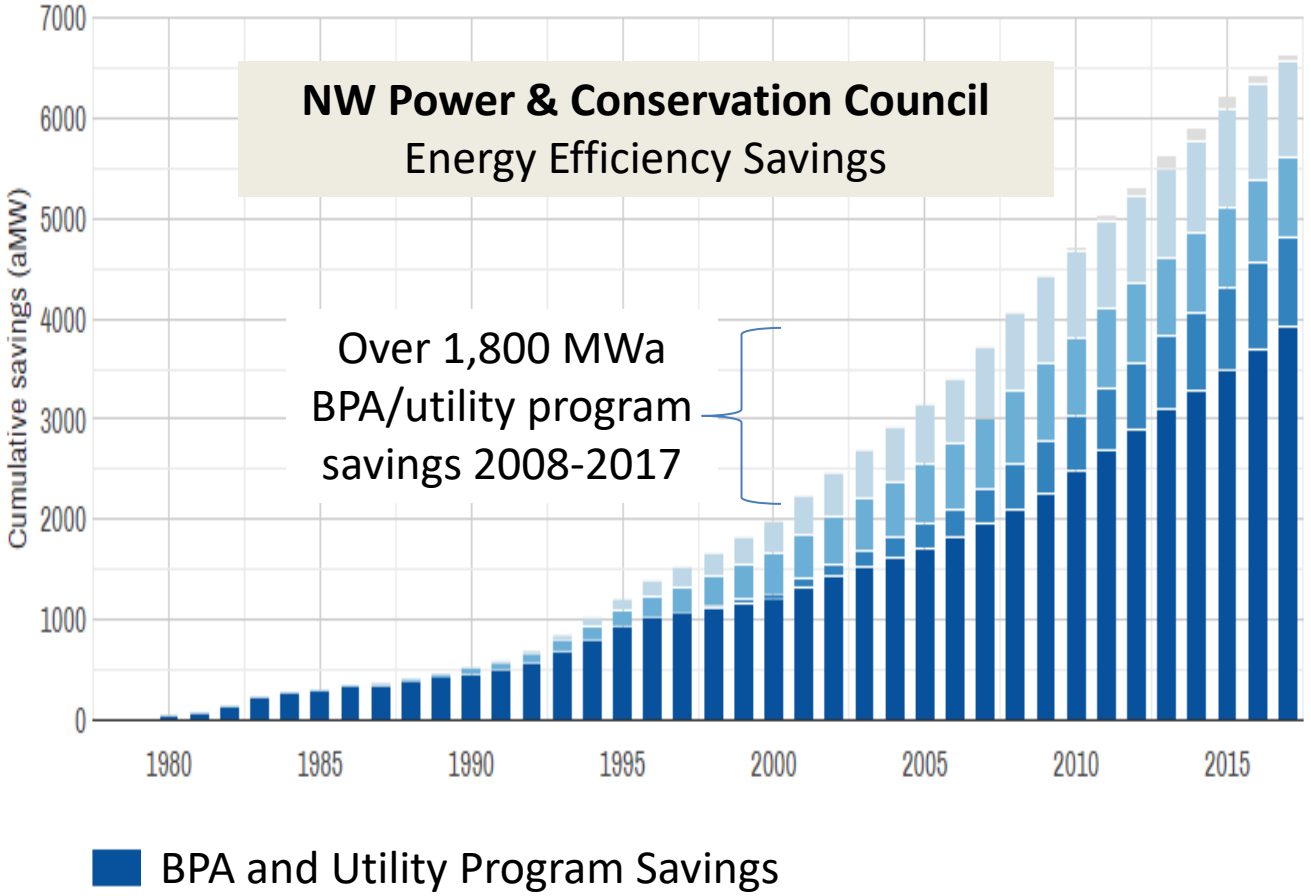


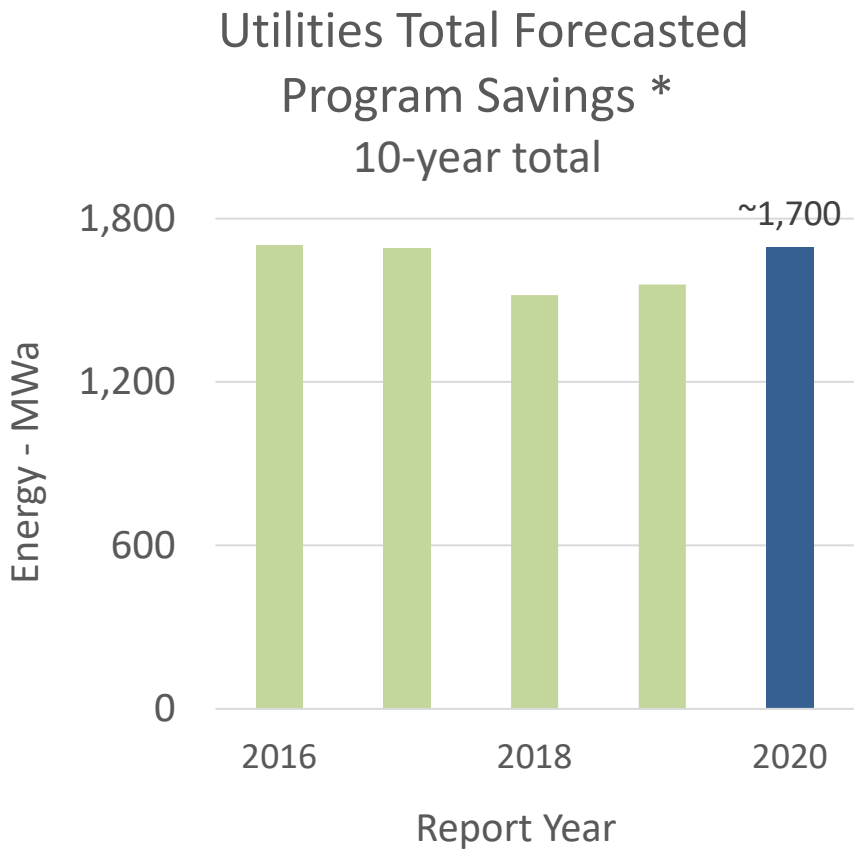
- Proportions differ for energy & peak generation
- Uncommitted IPPs excluded
- QF solar as reported

Over half of NW coal generation offline by 2030



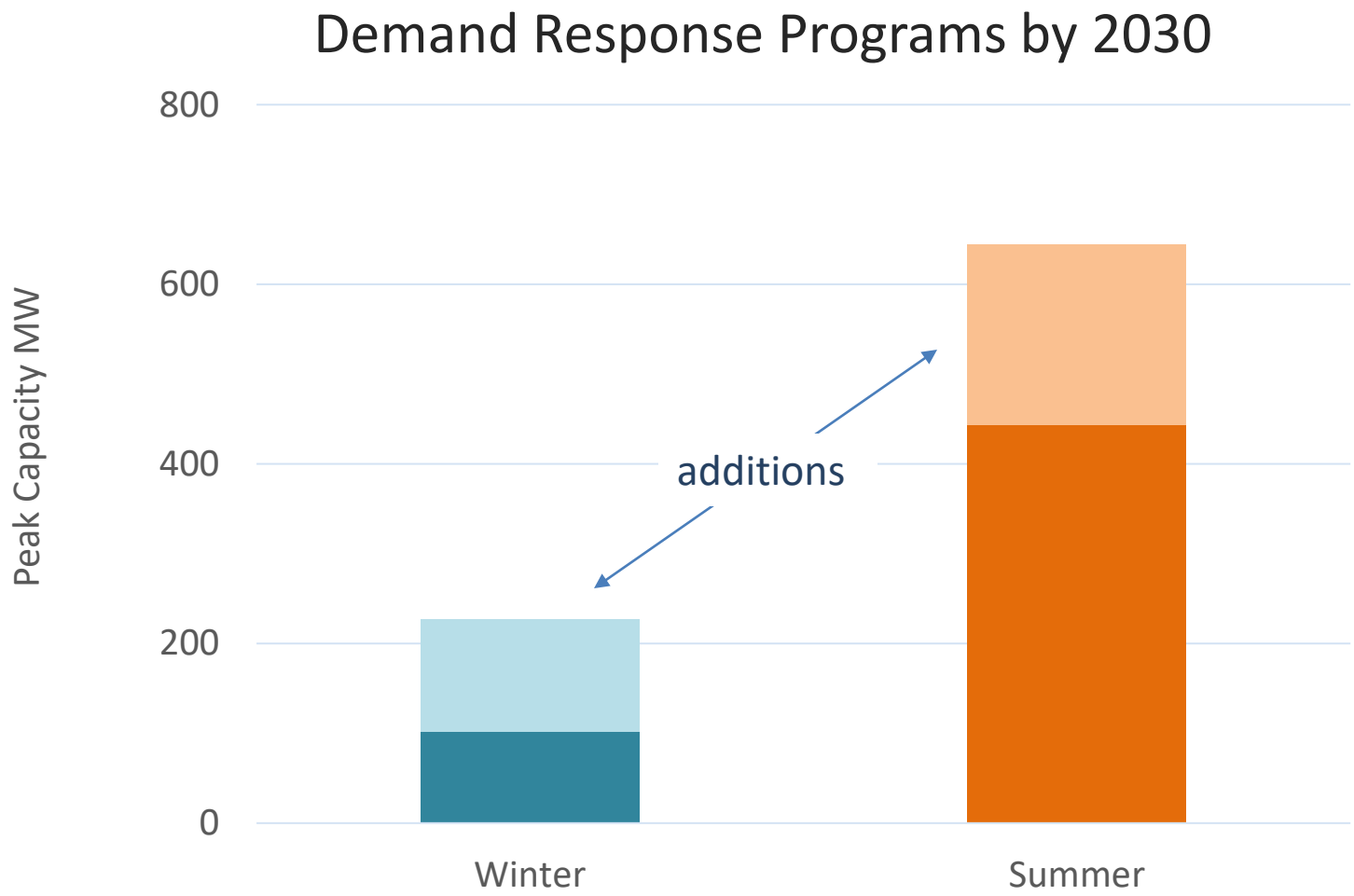
Utility energy efficiency valuable part of the picture





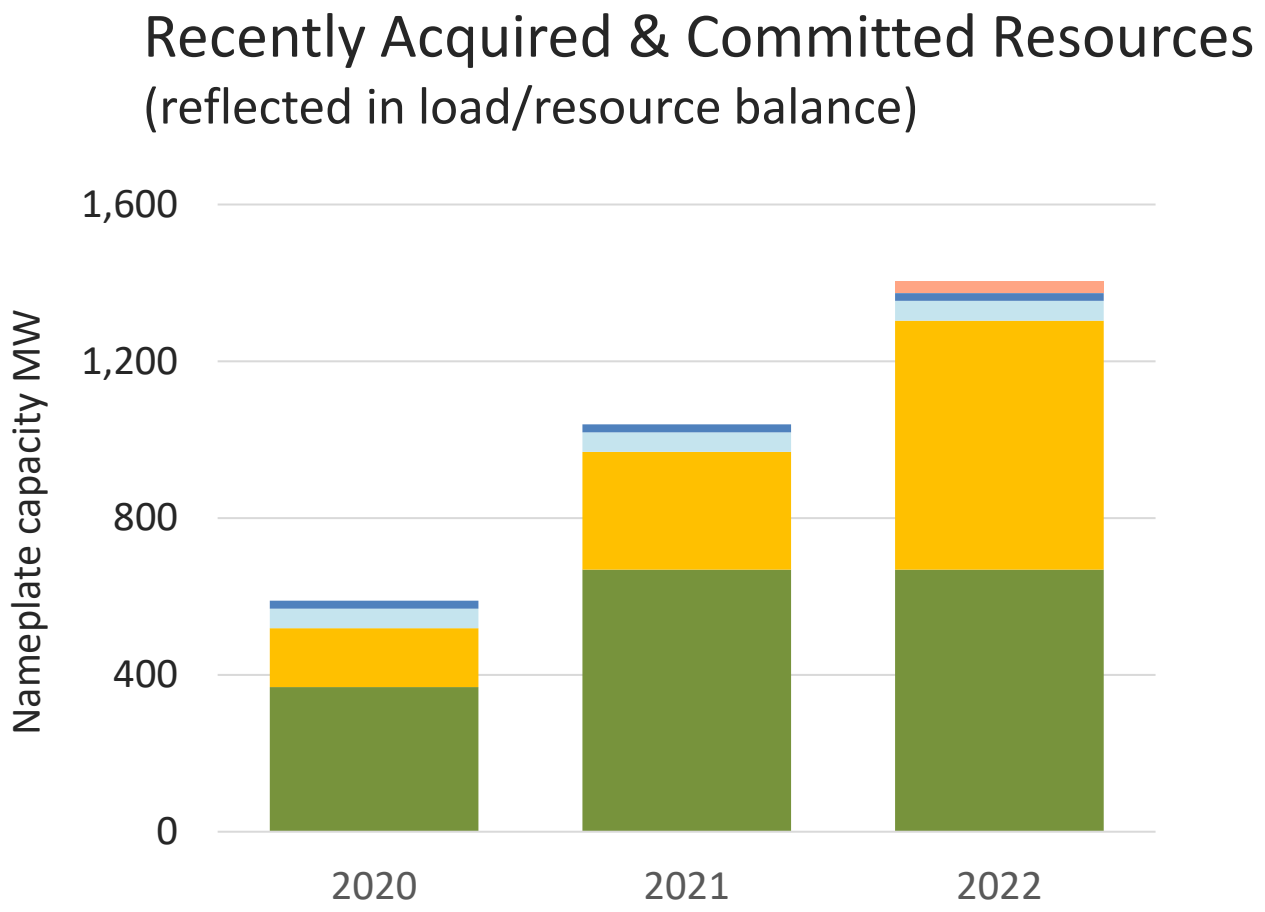
* Not exact apples-to-apples comparison

More demand response identified for summer

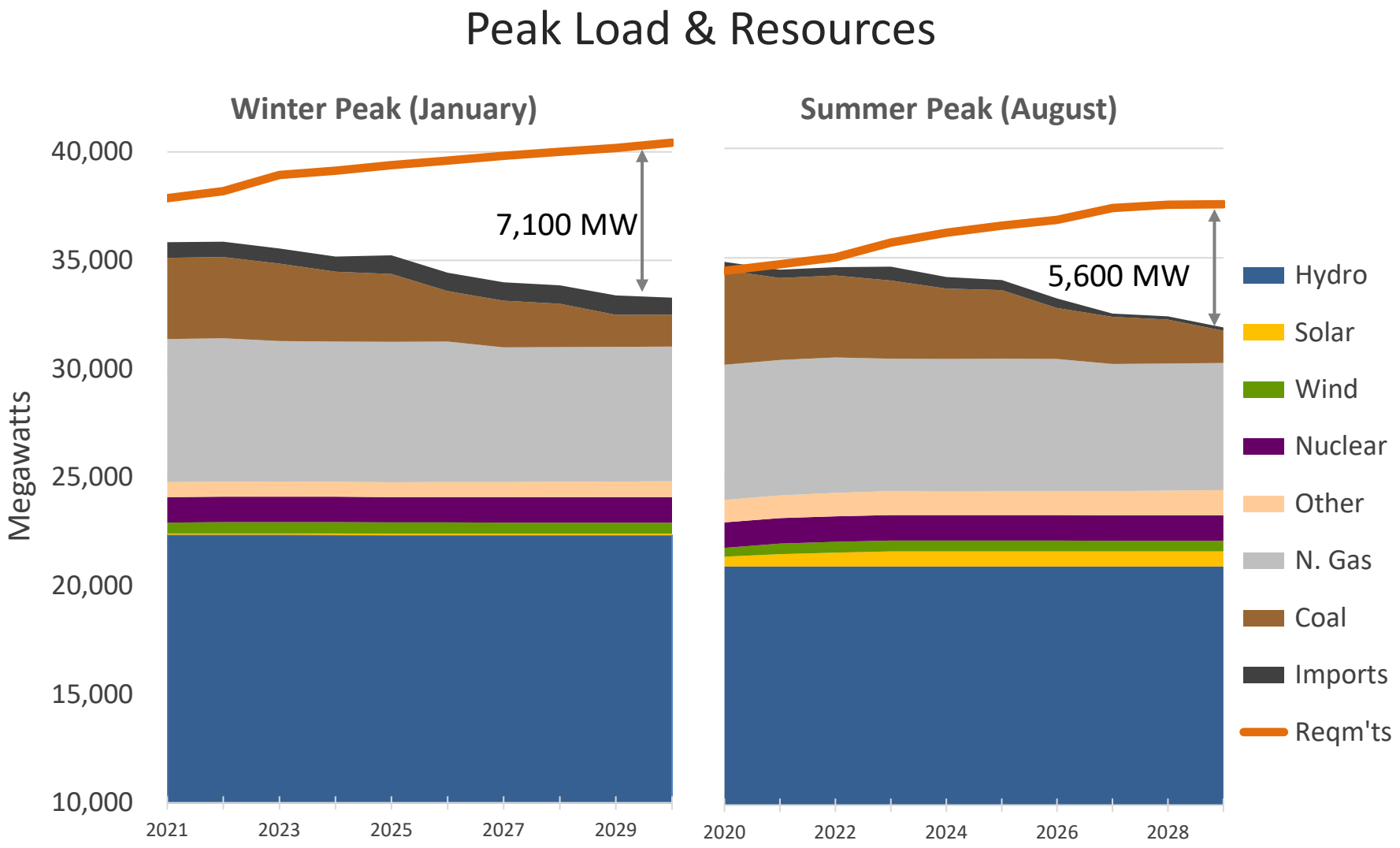


Newest supply mostly wind & solar

- Wind - 669 MW
- Solar - 636 MW
- Capacity - 50 MW
- Hydro - 20 MW
- Battery - 30 MW

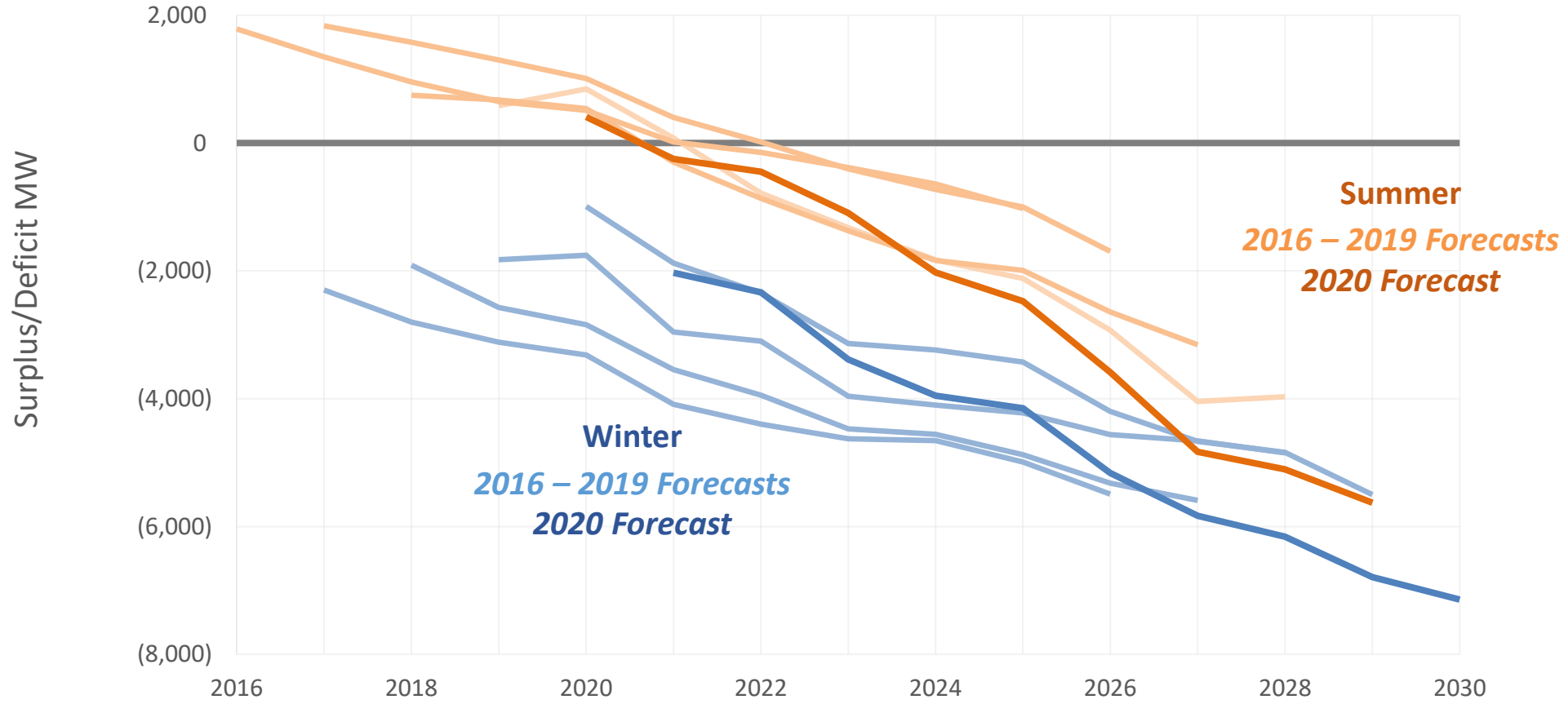


Retirements/loads drive growing resource gap

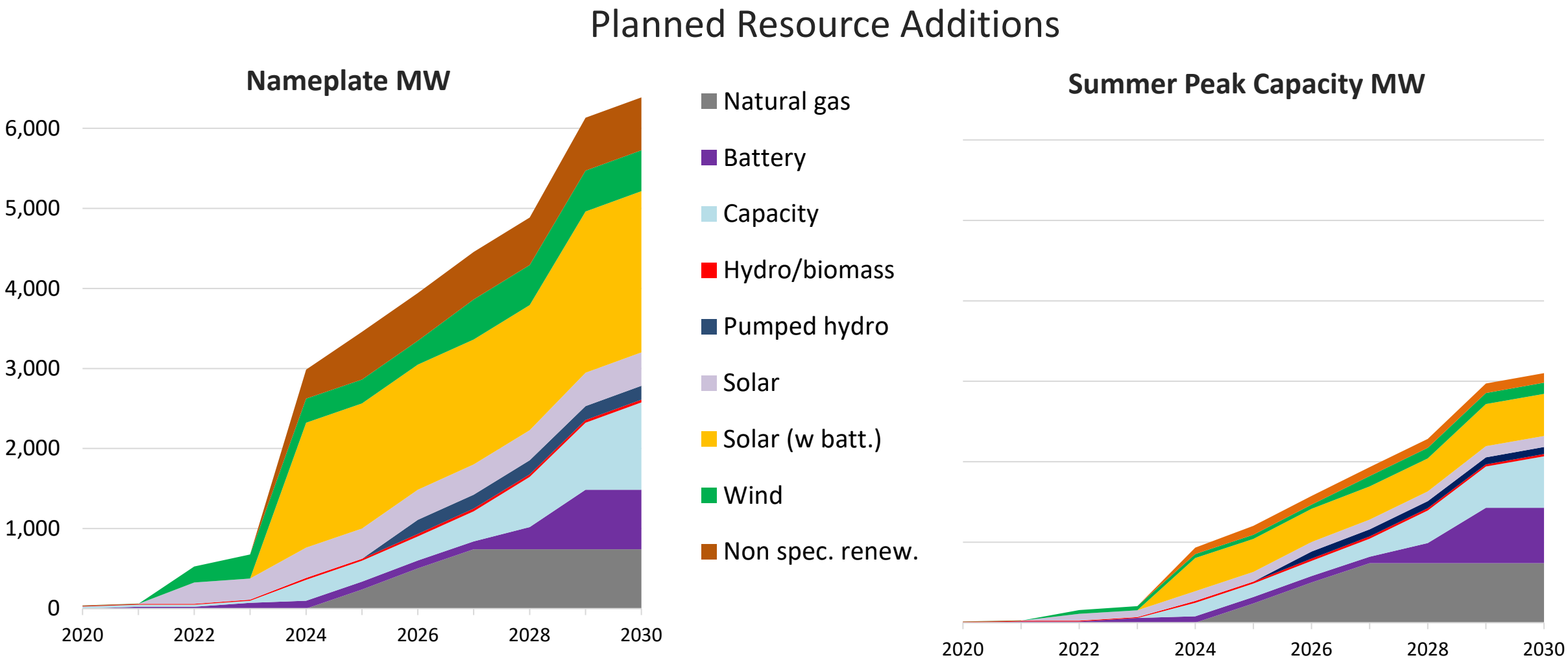


Summer peak deficit approaching winter deficit

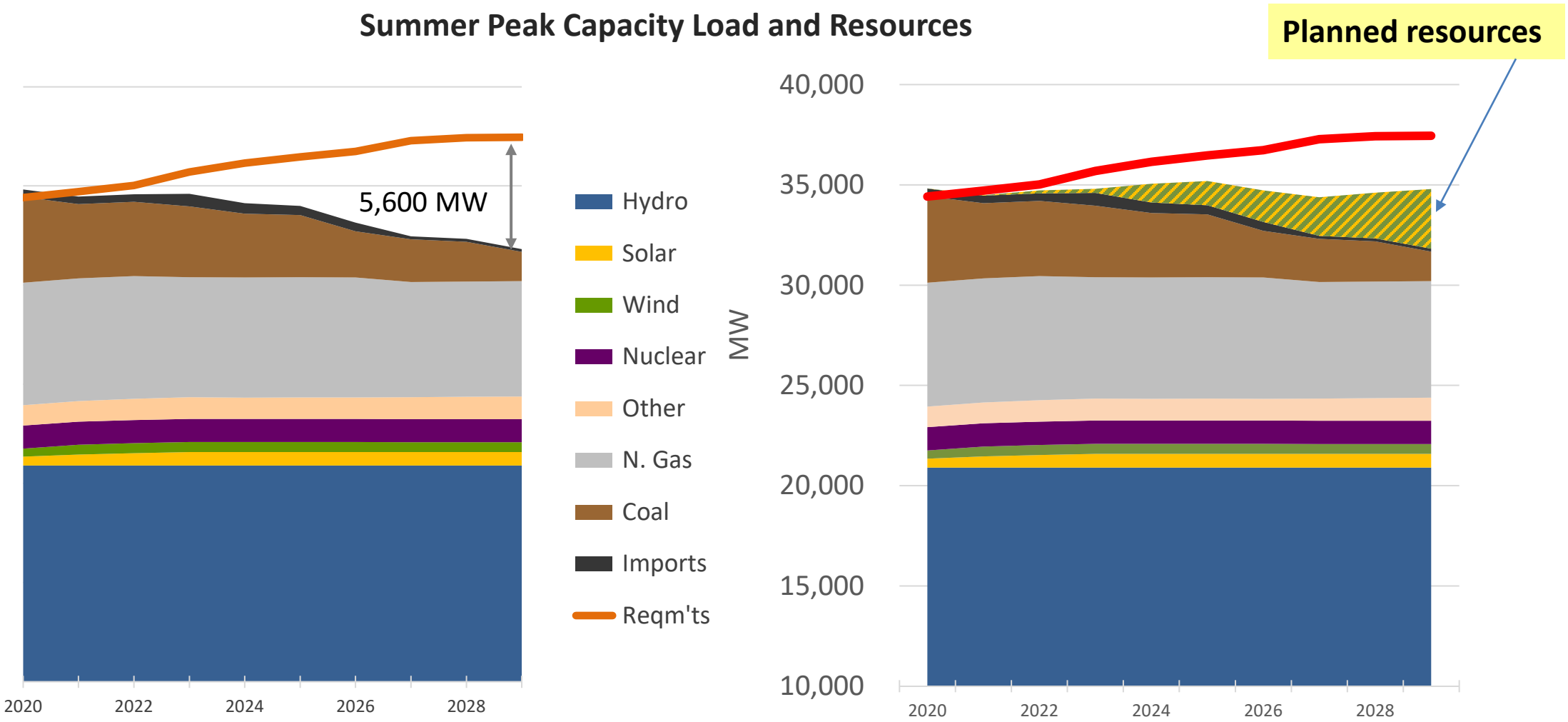
Peak Surplus/Deficit Comparison 2016 – 2020 Forecasts



Renewables and storage lead the way



Future resources improve picture



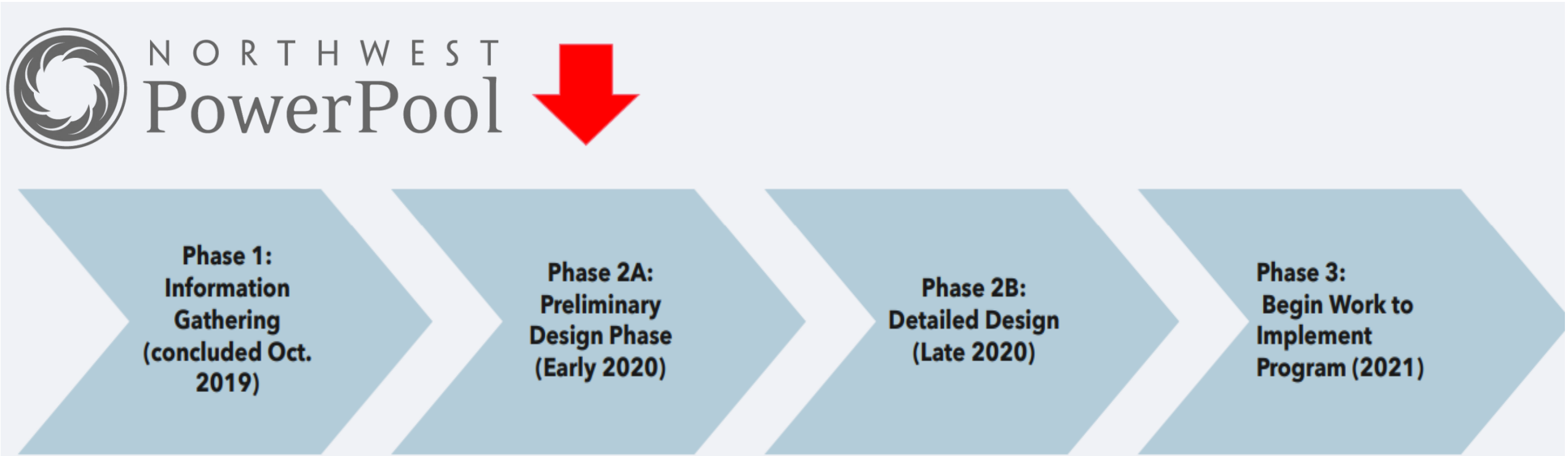
Highlights

- Load projections remain similar to last year
  - growth concentrated in few utilities
- Retirements and load growth drive resource gap
- Solar and storage top planned resources
- Committed & planned resources partly offset growing deficit

Last thought: Beyond the Northwest Regional Forecast

Concern for near-term resource adequacy remains

Regional Resource Adequacy Program under development




THANK YOU
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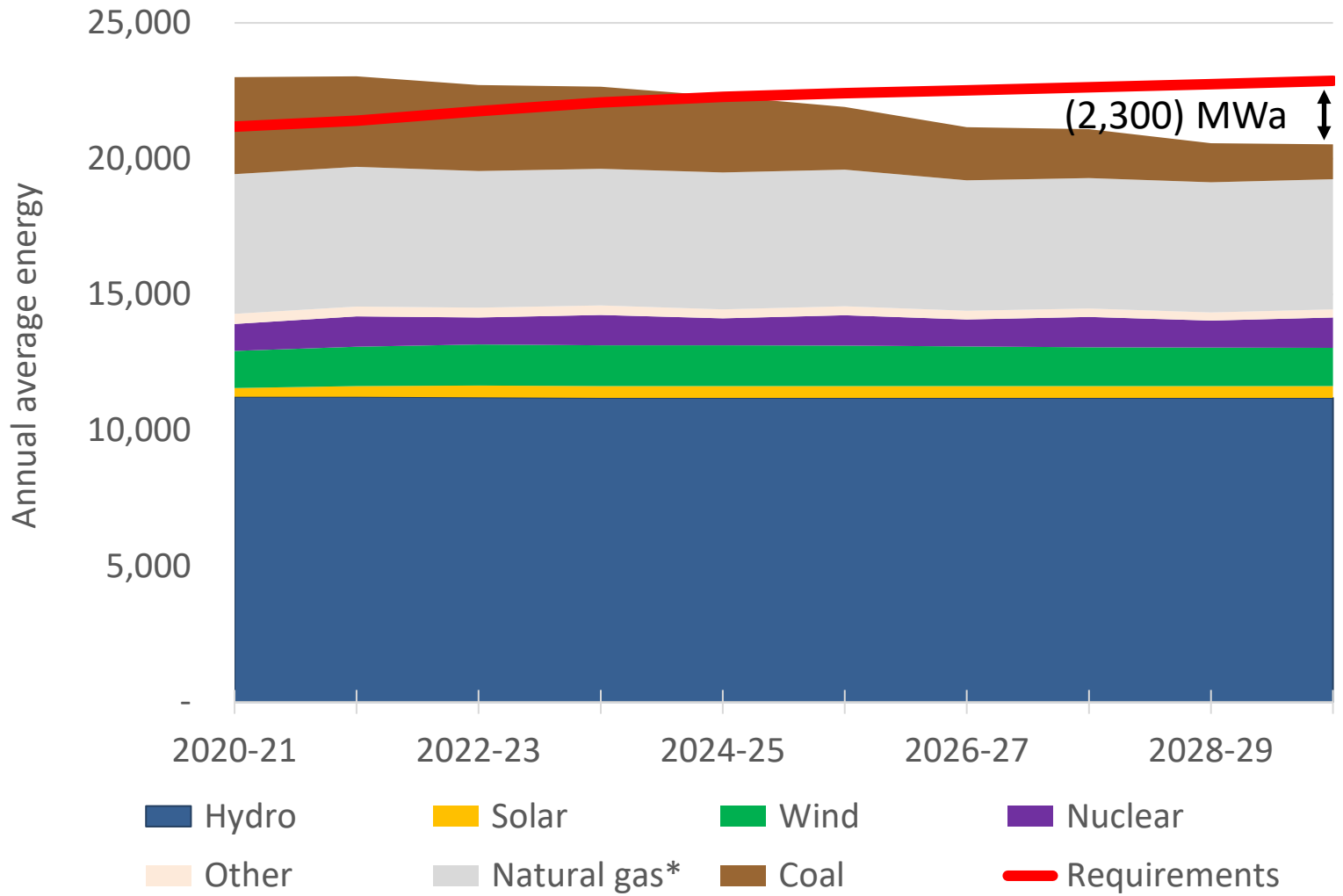
PNUCC
Bringing the *Power* of good ideas *Together.*

Extra slides

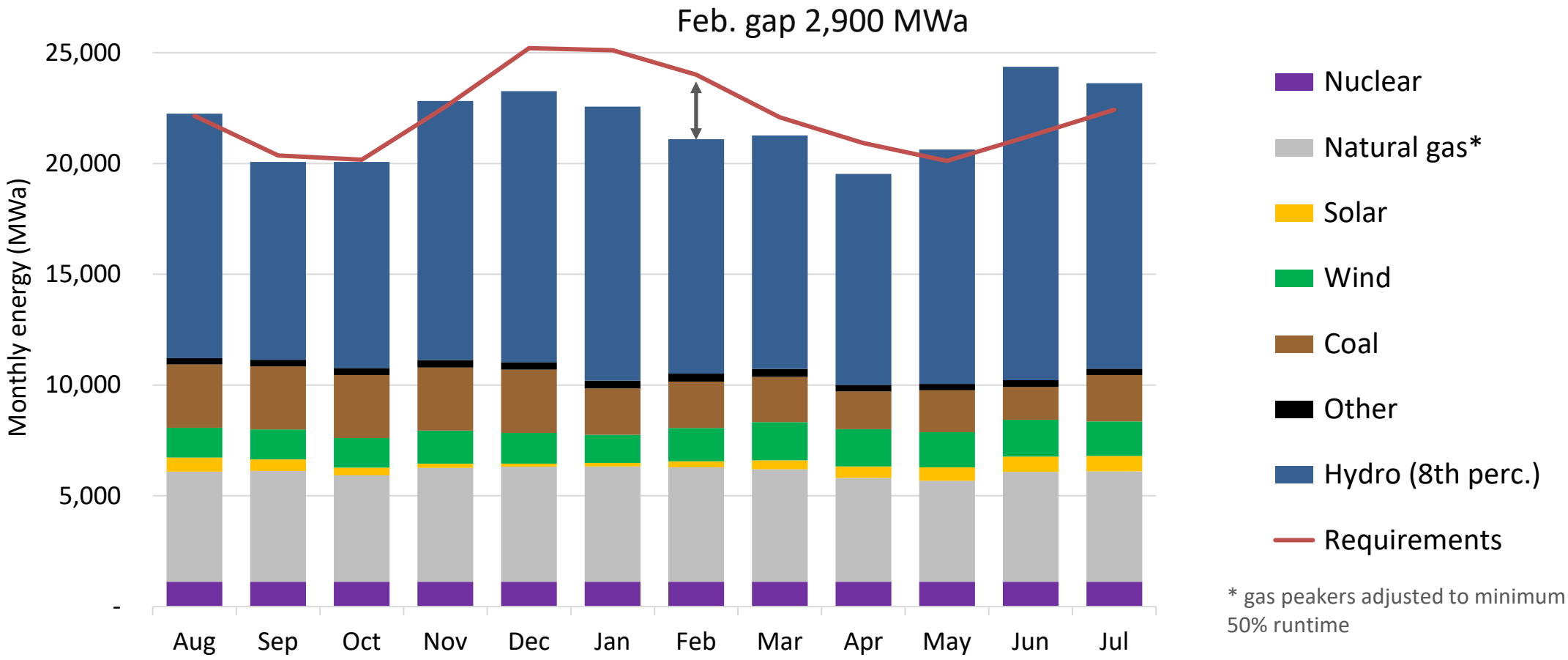
Annual energy load/resource balance

- 8th percentile hydro generation
- 1-in-2 loads
- Utility resources only
- No planning margin assumed
- Coal committed by utility
- * Gas peakers adjusted to a minimum 50% capacity factor



Energy needs vary throughout the year

Monthly Energy Loads and Resources (OY 2025 – 2026)



* gas peakers adjusted to minimum 50% runtime

Planned resources

Nameplate MW, utility only, cumulative

Not included in report load/resource balance

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Battery	0	23	23	73	98	98	98	98	278	743	743
Battery (w solar/wind)	0	0	0	0	313	313	313	313	313	406	406
Biomass	0	0	0	0	12	12	12	12	12	12	12
Capacity	25	25	25	25	262	262	301	377	627	840	1,094
Hydro	12	12	12	12	12	12	20	20	20	20	20
Natural gas	0	0	0	0	0	239	502	741	741	741	741
Pumped hydro	0	0	0	0	0	0	175	175	175	175	175
Solar	0	0	266	266	1,627	1,627	1,627	1,627	1,627	2,026	2,026
Wind	0	0	200	300	300	300	300	500	500	510	510
Non spec. renew.	0	0	0	0	362	595	595	595	595	662	662
Total	37	60	525	675	2,985	3,457	3,942	4,457	4,887	6,134	6,388