

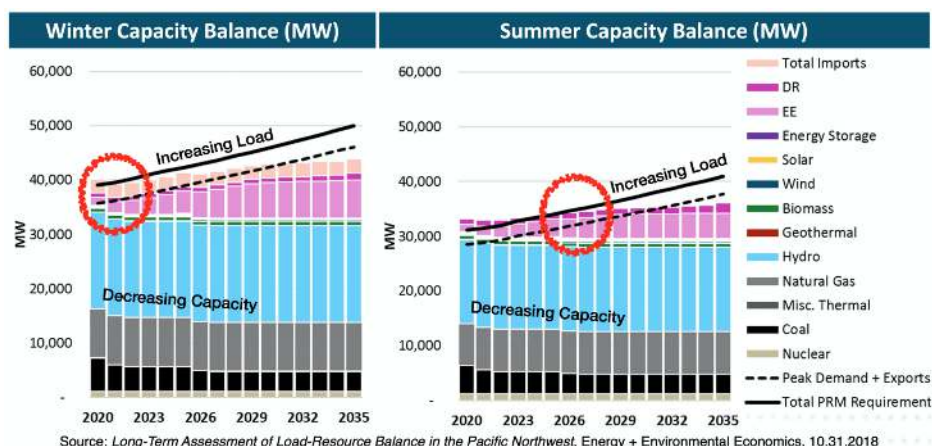
## Quick Facts

### Energy Shortages Part 4 of 4

**Climate Impact and Our Energy Future:** This is a four-part series looking at how climate impact is rapidly changing our world and the coming challenges as we make the transition to a future that is climate sustainable

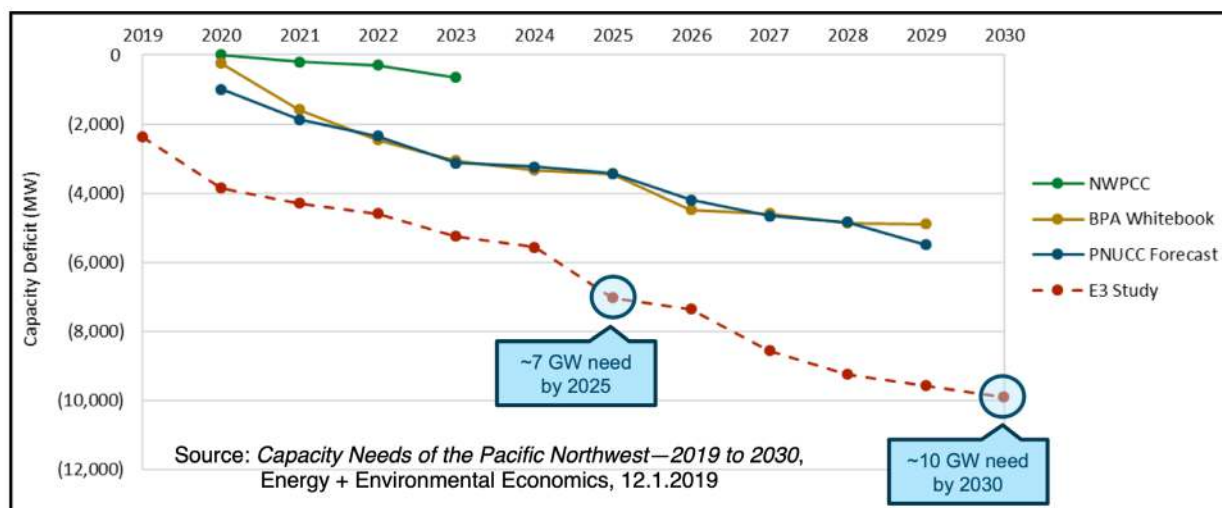
### Increasing load, reduced capacity

- Decarbonizing energy generation and consumption must be accomplished as quickly as possible. But the increase in electric load and decrease in capacity to meet that load is projected to lead to power outages and rolling blackouts in the next few years, especially in winter when load in the region peaks to meet heating needs. In the chart below, note the two red circles which denote the point at which the capacity (hydro, solar, wind, coal, natural gas and imports) is less than the peak demand load Planning Reserve Margin (PRM). The PRM is set about 15% above typical expected load, to have some headroom to handle unexpected spikes in load such as during winter cold snaps.



Source: Long-Term Assessment of Load-Resource Balance in the Pacific Northwest, Energy + Environmental Economics, 10.31.2018

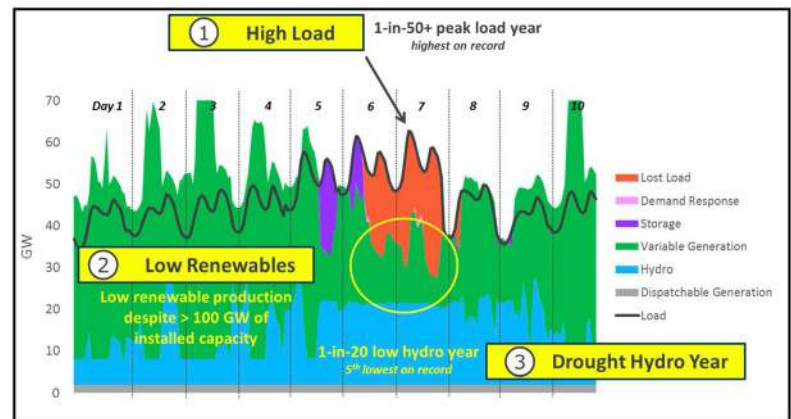
- It is worth noting that this forecast probably understates the current outlook, since it was prepared before passage of CETA's accelerated decommissioning of coal power plants, which further reduces capacity. And it also doesn't include the emerging increase in load from electrification of transportation and heating.
- When load exceeds the capacity, power outages and rolling blackouts result. And in the coming decade, this capacity deficit is projected to steadily increase, heightening the likelihood of outages (see chart below)



Source: Capacity Needs of the Pacific Northwest—2019 to 2030, Energy + Environmental Economics, 12.1.2019

## Emerging Solutions: Hydro + Wind + Solar + Battery Storage

- As shown above, by 2030, the capacity deficit could be as much as 10 GW (10 billion watts). To give some idea of the physical scale of a project to fill that gap:
  - » 10 GW of solar would require acquiring about 70 thousand acres of land, or about 1 million acres for 10 GW of wind turbines.
  - » In addition to land acquisition cost and logistics, 10 GW of solar or wind power would cost about \$20 billion for equipment and installation.
  - » That equipment would need to be replaced periodically. The design life for solar is 20 to 30 years and for wind turbines, about 20 years.
  - » Because wind and solar are intermittent generation resources, hydro and storage batteries would be needed to ensure reliable operation across a range of conditions (extended sunless/windless periods).
- The chart provides an example of how the combined energy produced varies with time of day, weather, climate, wind and sun conditions. The blue area is hydro, green is a combination of wind and solar, purple is battery storage, and red is a deficit, where the combination of hydro + wind + solar + battery is unable to meet load (black line), so a blackout occurs.
- In this example, it is a drought year, with lower than normal hydro flow, wind + solar output is weak during days 5, 6, 7, 8 and 9. And the battery storage fully discharged on day 6. Note that winter solar output in the northwest is about one-fifth of what it would be in summer. And, overcast days and windless periods can go for weeks, requiring adequate backup hydro or battery storage (very expensive compared to hydro or natural gas) to “firm” them up.
- To minimize capacity shortfalls, regional governments and utilities are working together to develop a combination of new wind and solar capacity, firmed by hydro and battery storage, with natural gas turbines as a last resort (due to carbon emissions) in emergency conditions.
- OPALCO is working to reduce its dependence on the mainland for energy generation. OPALCO’s Integrated Resource Plan (IRP) calls for decreasing our dependence on mainland power by up to 50% by 2040. This plan increases our local energy resilience, especially for population centers (town and village) where essential services are located. To learn more, see the references below.



### Learn more:

- Read the full four part Quick Fact series at: [www.opalco.com/quick-facts](http://www.opalco.com/quick-facts)
- [OPALCO Integrated Resource Plan](#)
- [Capacity Needs of the Pacific Northwest – 2019 to 2030](#)
- [Electrification of Transportation and Heating](#)