

**Jennifer Anders**  
Chair  
Montana

**Tim Baker**  
Montana

**Guy Norman**  
Washington

**Patrick Oshie**  
Washington



## Northwest Power and Conservation Council

**Richard Devlin**  
Vice Chair  
Oregon

**Ted Ferrioli**  
Oregon

**Jim Yost**  
Idaho

**Jeffery C. Allen**  
Idaho

June 4, 2019

### MEMORANDUM

**TO: Power Committee Members**

**FROM: John Ollis**

**SUBJECT: Forecast Electricity Prices**

### BACKGROUND:

**Presenter:** John Ollis

**Summary:** In preparation for the 2021 Power Plan, staff will be providing the Power Committee a series of presentations on different aspects to developing the Plan. This presentation will be on the forecast of the electricity prices.

**Relevance:** The Council updates a 20-year forecast of electric power prices for each power plan. The model the Council uses to analyze different resource strategies, the Regional Portfolio Model (RPM), does not have significant fidelity on the out of region Western Electricity Coordinating Council (WECC) market dynamics without information from the higher fidelity and granular look that comes from a WECC-wide production cost model. The AURORA model dispatches all resources in the WECC, generating an hourly fundamentals-based wholesale electricity price forecast. The forecast cases will likely include the following scenarios: high, medium, and low fuel prices and demand forecasts. In addition, AURORA will be used to examine electricity prices under a number of hydro conditions (in the past, it has been up to 80 different conditions). Representation of appropriate existing state and federal policies underly all electric price forecast scenarios.

These scenarios are used create a range of quarterly on and off – peak forecast prices which, in conjunction with historical Mid-C prices, are used to create an external wholesale electricity price distribution. That distribution is used as a basis for generating an equilibrium price forecast against which regional resources are evaluated against market economics. Note that the marginal

carbon emissions rate is also established per the information derived from the WECC-wide electricity price forecast.

Workplan: A.5.2 Update models to get ready for 2021 Power Plan modeling

More Info: Presentation on methodology associated with most recent price forecast,  
[https://www.nwcouncil.org/sites/default/files/2018\\_0710\\_p3.pdf](https://www.nwcouncil.org/sites/default/files/2018_0710_p3.pdf)

Forecast used in 7th Power Plan,  
[https://www.nwcouncil.org/sites/default/files/7thplanfinal\\_appdixb\\_wholesaleretail\\_pricefcst.pdf](https://www.nwcouncil.org/sites/default/files/7thplanfinal_appdixb_wholesaleretail_pricefcst.pdf)

Methodology behind incorporating forecast into RPM in 7<sup>th</sup> Power Plan,  
[https://www.nwcouncil.org/sites/default/files/7thplanfinal\\_appdixl\\_rpm\\_1.pdf](https://www.nwcouncil.org/sites/default/files/7thplanfinal_appdixl_rpm_1.pdf)

# Forecasting Wholesale Electricity Prices

Power Committee

June 11, 2019

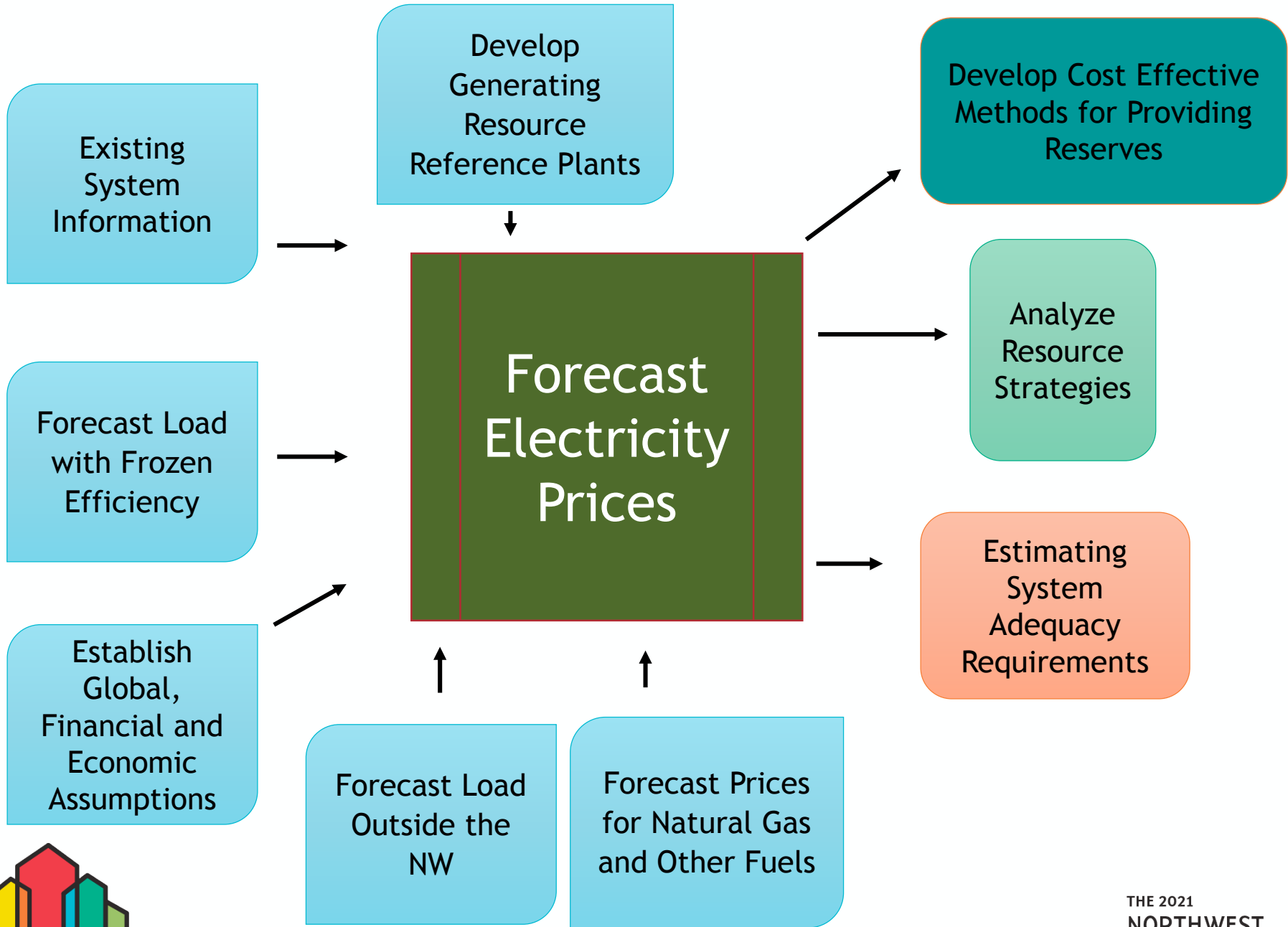
John Ollis



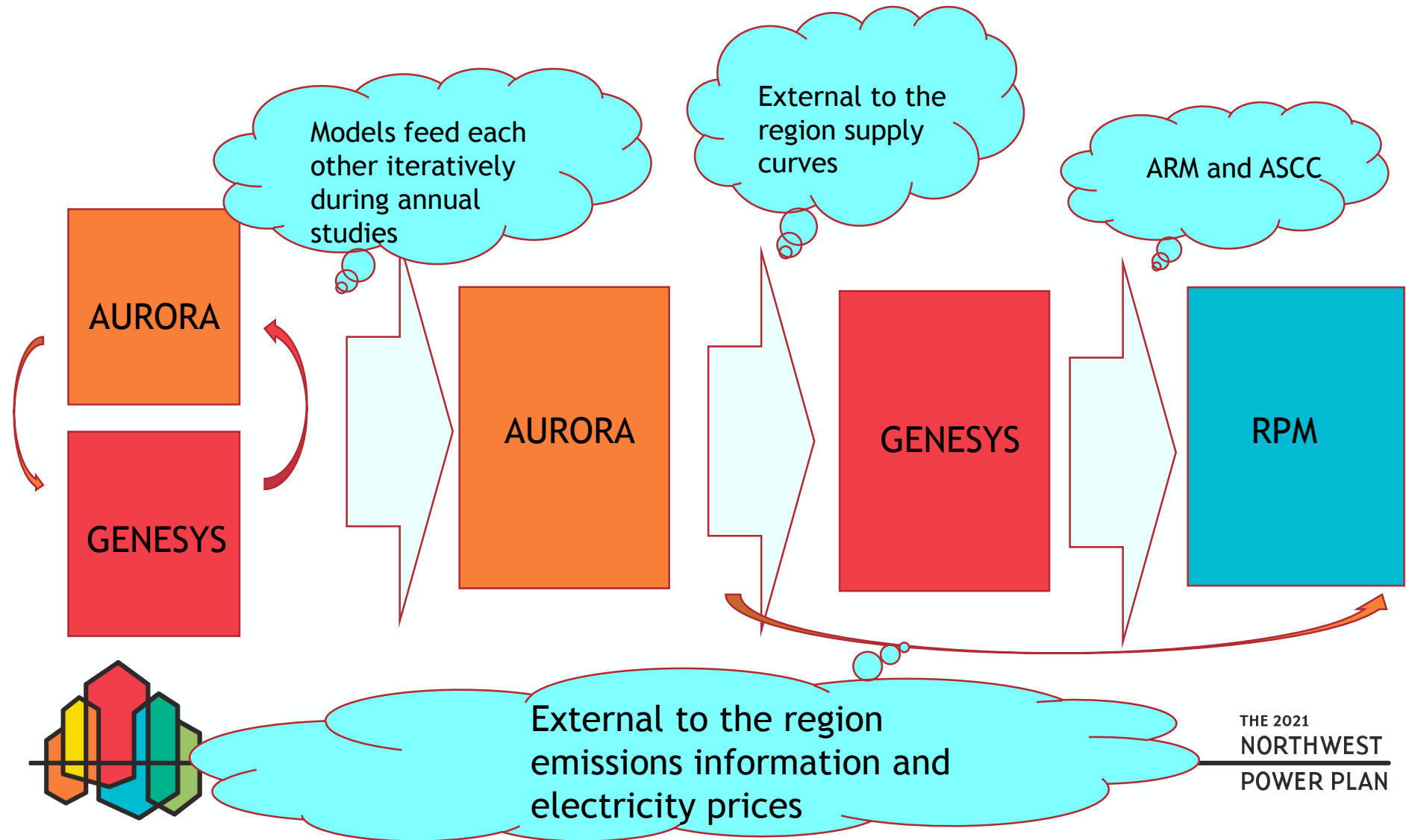
---

THE 2021  
NORTHWEST  
POWER PLAN

FOR A SECURE & AFFORDABLE  
ENERGY FUTURE



# Modeling Strategy Overview



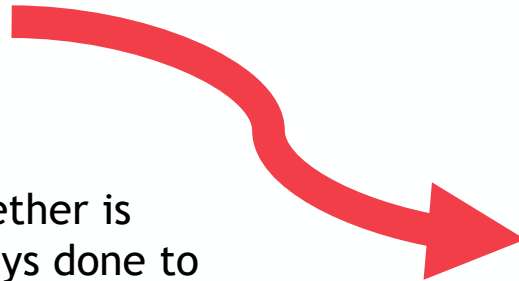
# Portfolio of Models Versus Universal Model Approach



This Photo by Unknown Author is licensed under [CC BY-NC-ND](#)

1. “Knitting” models together is something that is always done to some extent.
2. Council analytics focus mostly on region, but attempt to capture external to the region market dynamics using AURORA

1. Global models can give a false sense of precision if data sources are of differing quality
2. But mostly they just take too long to run...

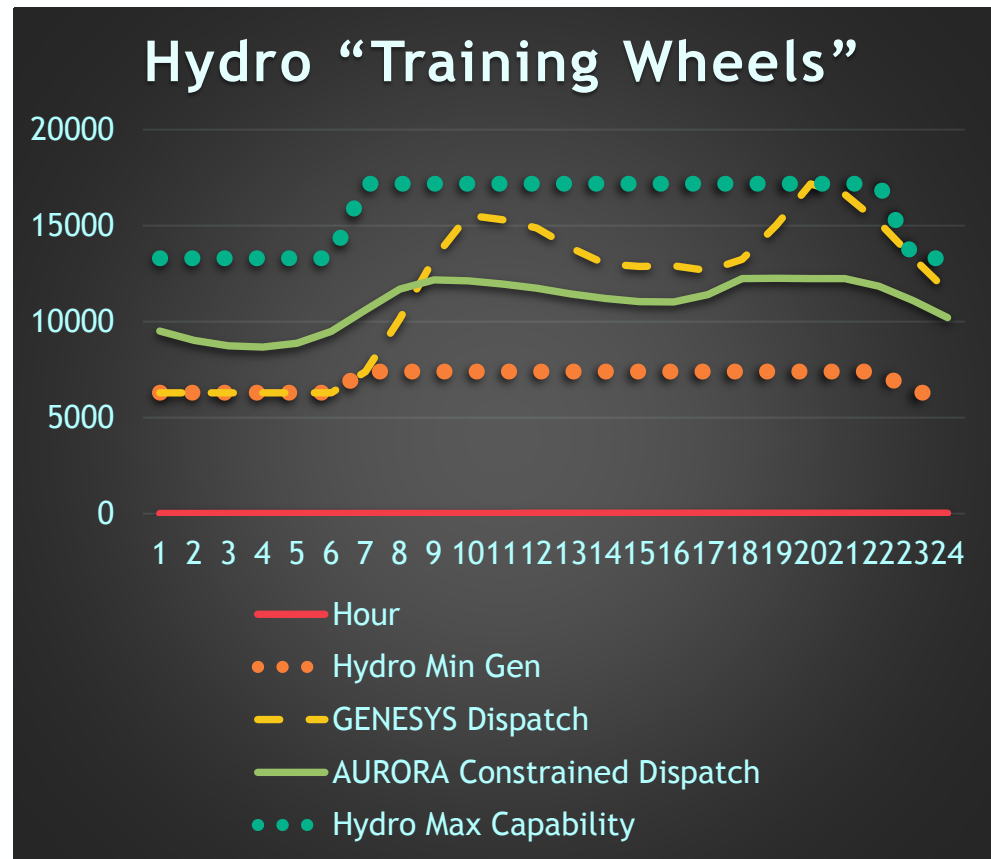


This Photo by Unknown Author is licensed under [CC BY-SA](#)



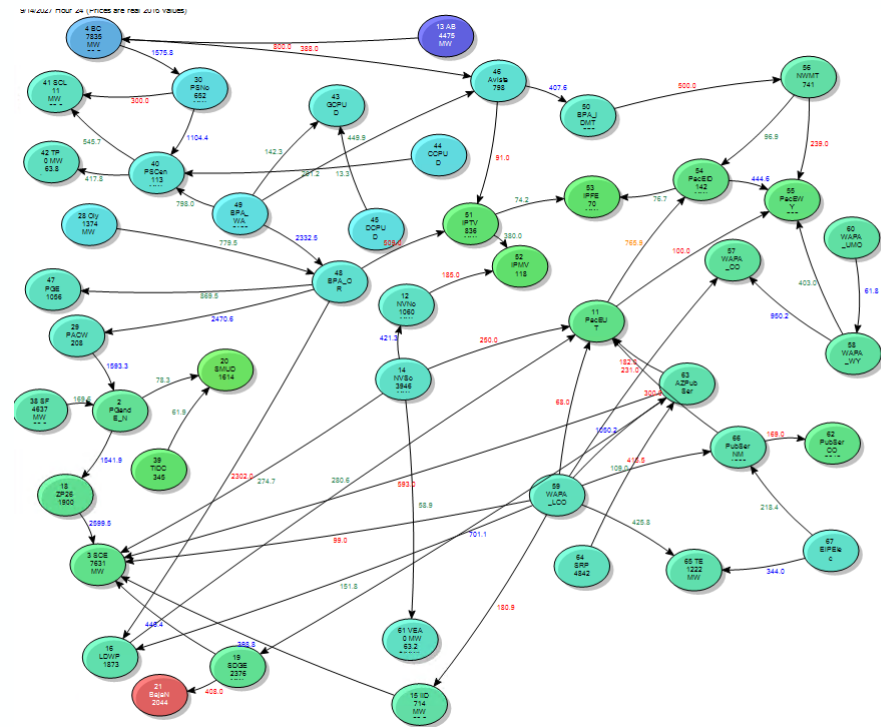
# Review of Upstream Processes

- Forecast of WECC loads by balancing authority (BA)
- Forecast of fuel prices throughout WECC
- Development of potential new resources
- Interpretation of existing state policies
- Development of hydro constraints for AURORA from GENESYS information



# Review of Price Forecast Methodology (Part 1)

- The AURORA production cost model simulates a fundamentals-based, transmission constrained economic dispatch of power plants in the WECC.
- Each balancing authority (BA) will have an associated price set by a marginal unit which will incorporate losses and charges associated with transmission system.



Transport representation of the transmission system in the WECC





# Review of Price Forecast Methodology (Part 2)

- To perform a price forecast from 2021 to 2040 the following must be considered
  - Plant retirements and additions\*
  - Adequacy considerations for planning regions (generally reflected via planning reserve margins)
  - Existing state and regional policies (i.e. RPS, clean policies, carbon cap and trade policies, etc.)
- AURORA simulates a long-term buildout of resources per the above considerations
  - This buildout is added to the existing WECC fleet and tested over different load, fuel price and hydro conditions to provide information about market supply, marginal carbon emissions rates, and electricity prices at different places in the WECC.



# Review of Downstream Processes

- Development wholesale electricity price distribution sampled in the RPM as a starting point for developing the equilibrium price forecast.
- Development in associated market marginal carbon emissions rate information.
- Development of market supply curve used in GENESYS adequacy work.

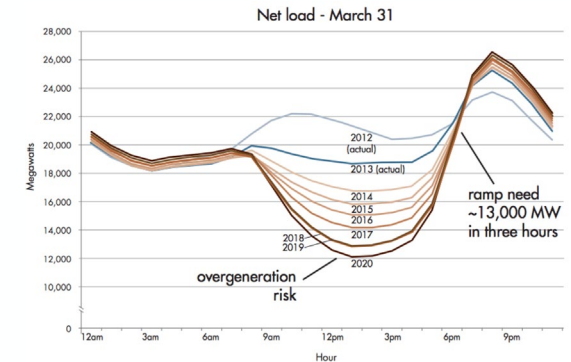


# Establish Market Supply Curve for Adequacy Analysis

## What do we do?

### Simplify market representation in adequacy work

- Convert a long-term buildout in AURORA to market supply curve for the redeveloped GENESYS.
- Speeds up adequacy runs by simplifying external to the region economic calculations to supply blocks.
  - Still considers flexibility and operations external to the region via seasonal shape of electricity price blocks
  - Economic signals external to the region will be considered in adequacy analysis



This Photo by Unknown Author is licensed under [CC BY-ND](#)

## Why do we do it?

### Time and regional focus

- Scheduling and dispatching all the plants in the WECC in GENESYS would likely increase run time without gaining much more fidelity than we get from AURORA.
- Council's staff traditionally focuses primarily on resources in the region when considering planning and adequacy (less focus on data external to the region)
- And hydro scheduling and dispatch under constraints is computationally intensive, but a key focus for the Council.

THE 2021  
NORTHWEST  
POWER PLAN

This Photo by Unknown Author is licensed under [CC BY-SA](#)



# Develop Electricity Price Futures in RPM

## What do we do?

### Use AURORA prices as a starting point for RPM economic calculations

- Convert electricity price forecasts in AURORA to a distribution of electricity price futures to be tested in the Regional Portfolio Model
- Correlate electricity price forecasts with natural gas price, load and hydro condition forecast futures.
- Use the price futures as starting point for an equilibrium price forecast which takes into account the effect the resource strategy has on the supply demand balance within the region.



This Photo by  
Unknown  
Author is  
licensed under  
CC BY-SA



This Photo by  
Unknown Author  
is licensed under  
CC BY-SA

## Why do we do it?

### Capital expansion decisions hinge mostly on fixed costs, adequacy and policy

- Scheduling and dispatching all the plants in the WECC in RPM would likely increase run time and variable costs associated with dispatch is only part of the complexity (and in recent times, a fraction of the cost) considered when designing a low cost resource strategy.
  - Resource strategy in the 7th Power Plan was driven primarily by policy and adequacy considerations.
- Council's staff focuses primarily on resources in the region when considering planning, but external to the region market prices may drive resource decision making.

