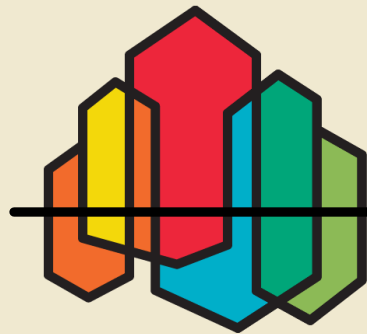


PNW Regional Energy Assessment, Looking Forward

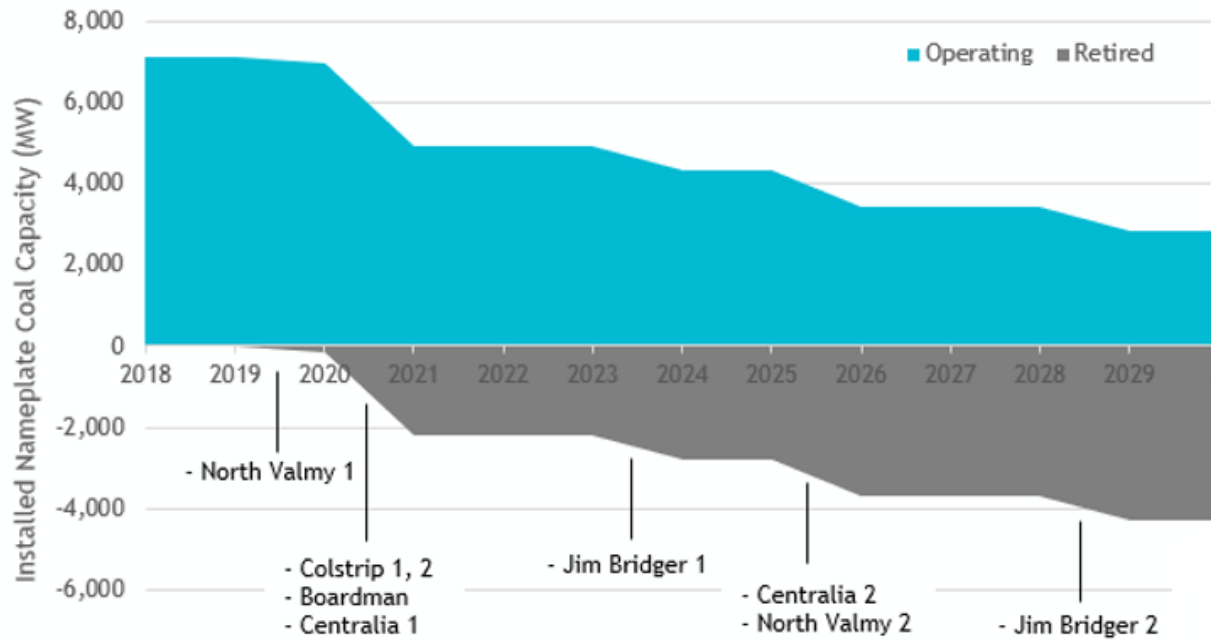
IEEE Northwest Energy Systems Symposium, April 6-7, 2022



**THE 2021
NORTHWEST
POWER PLAN**

FOR A SECURE & AFFORDABLE
ENERGY FUTURE

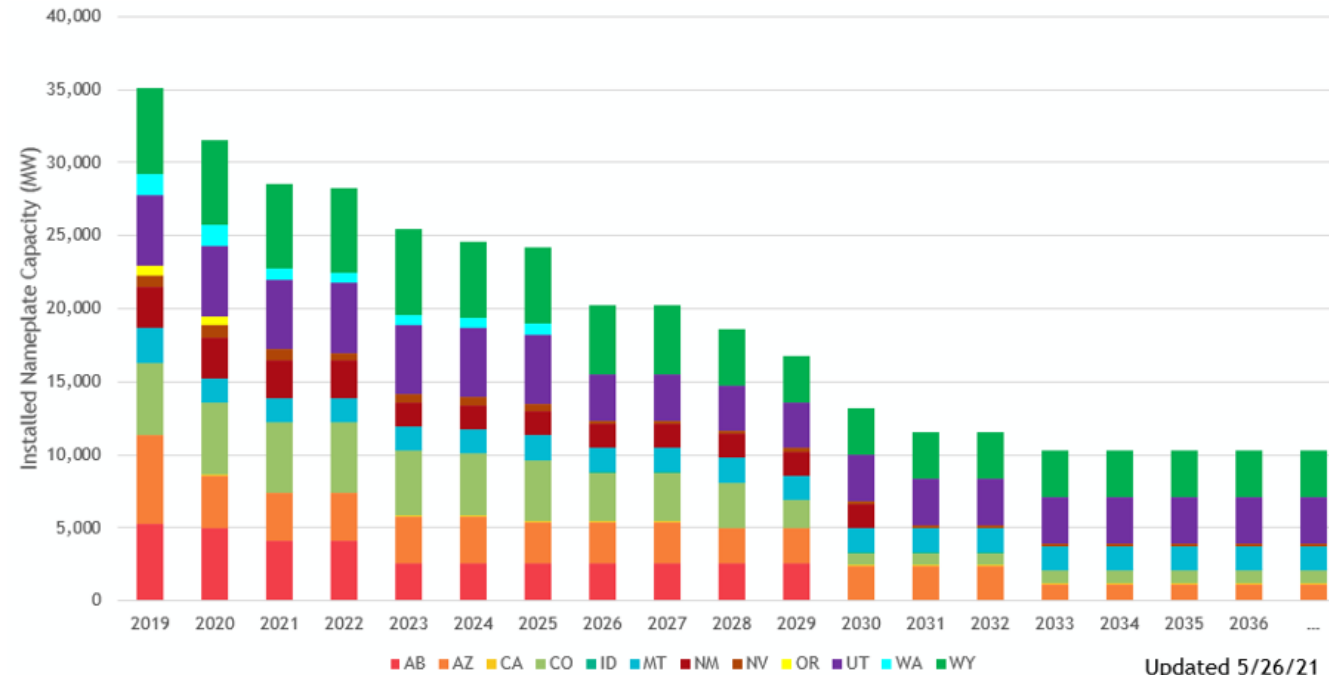
PNW: Planned Coal Unit Retirements



Coal Unit Retirements

- The coal fleet in the region and across the west is set to decrease by about 60% over the next decade
- By 2028, the Pacific Northwest will have retired ~ 4,400 megawatts of its coal capacity, leaving just four units in operation (Colstrip 3, 4 and Jim Bridger 3, 4)

WECC-wide Coal Units in Operation – By State/Province



Significant coal unit retirements occurring and announced due to:

- Deteriorating economics of operating a coal unit in the power system of today with low natural gas prices and cheap renewable resources
- Compliance with state clean policies
- Trade-off between additional capital investments to comply with environmental regulations and closing the unit before the end of its useful life

2021 Power Plan Resource Strategy: for an adequate, economic, efficient, reliable power system

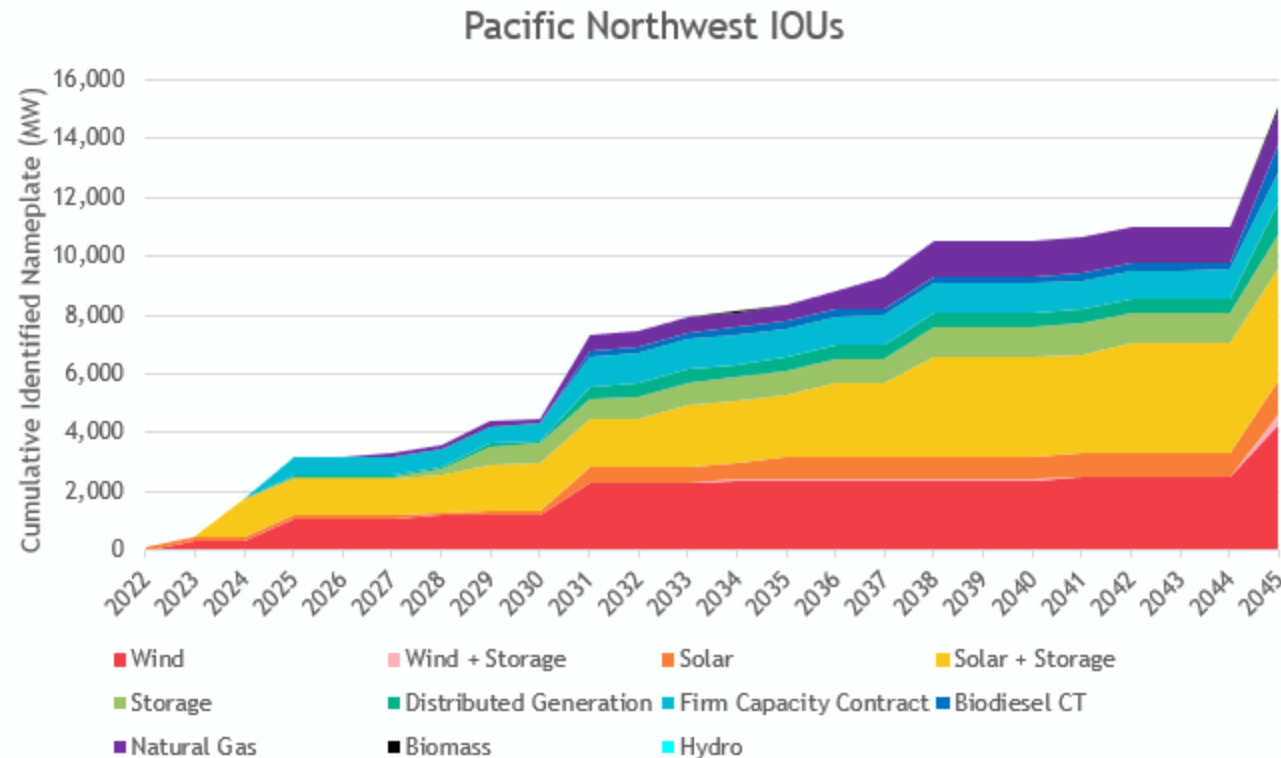
In coordination with- and greater reliance on- the existing system's robust and flexible hydropower system, energy efficiency achievements, thermal fleet, renewable resources, and interregional market transactions, the 2021 Power Plan's **resource strategy includes the acquisition or implementation of:**

- Between 750 and 1,000 average megawatts of **energy efficiency**
- At least 3,500 megawatts of **renewable resources**
- Low-cost, frequently deployable **demand response**

By 2027



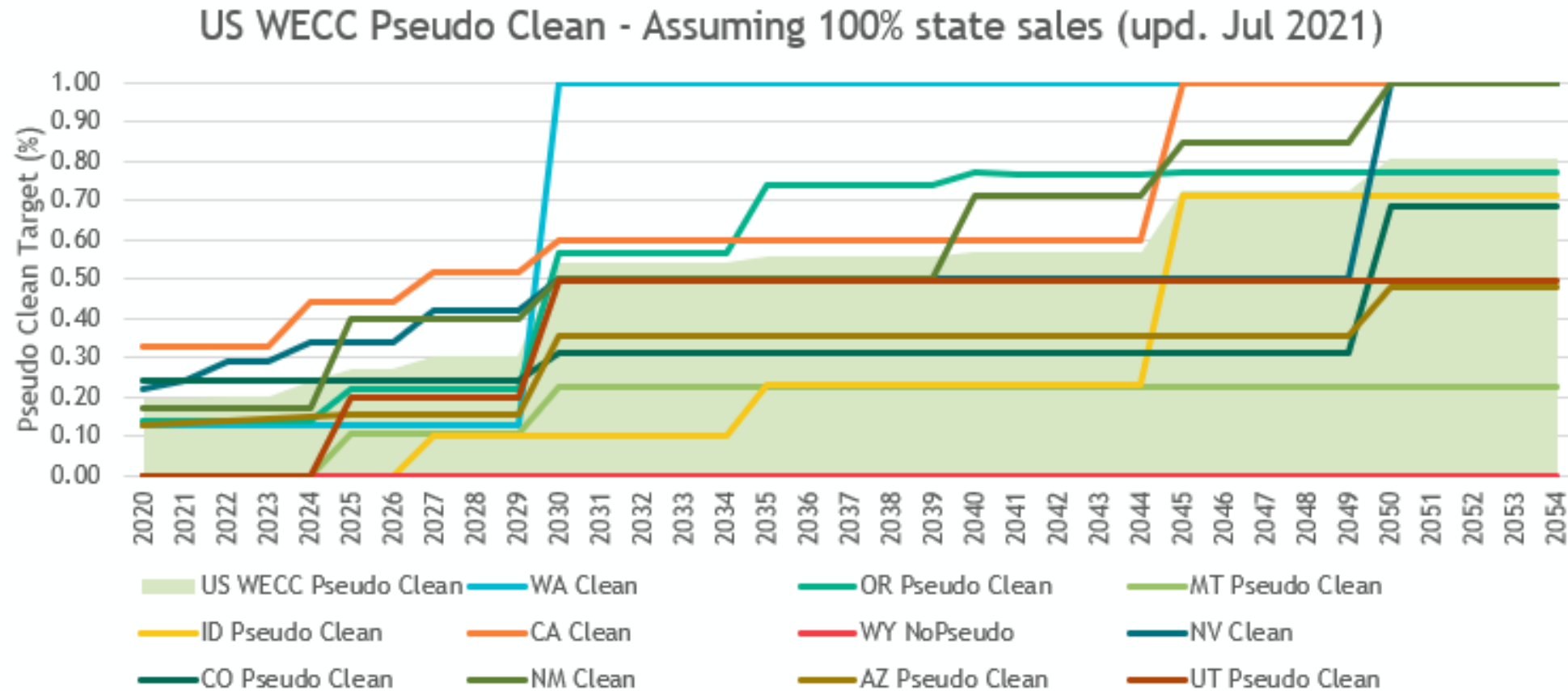
Aggregated Identified IOU New Generating Resource* Needs (Cumulative) – Power Act Region



* Aggregation does not include demand-side resources such as energy efficiency, demand response, and in some cases distributed generation



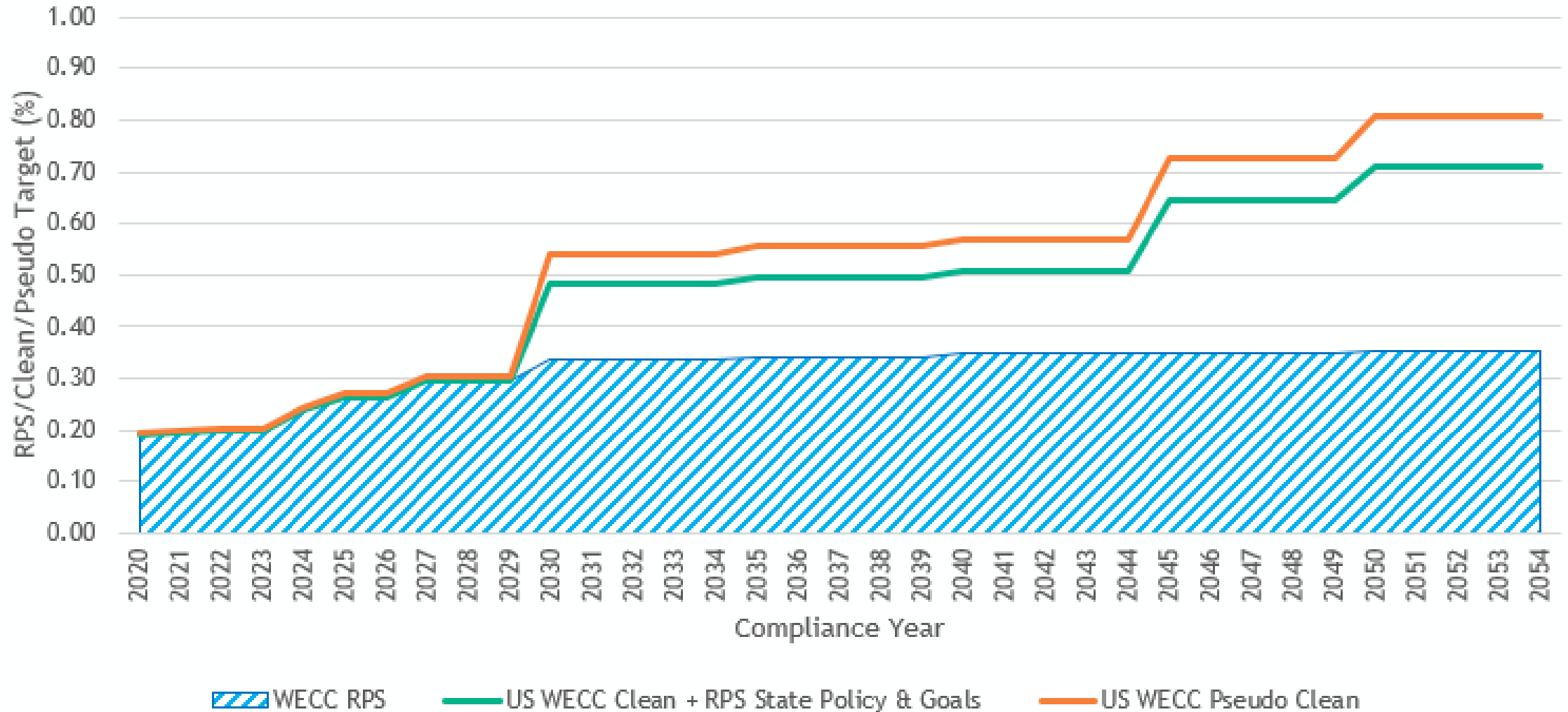
Clean Policy + RPS + Utility/Community Goals: US WECC Aggregate Pseudo Clean Target



Based on 2018 utility bundled retail sales, EIA-861

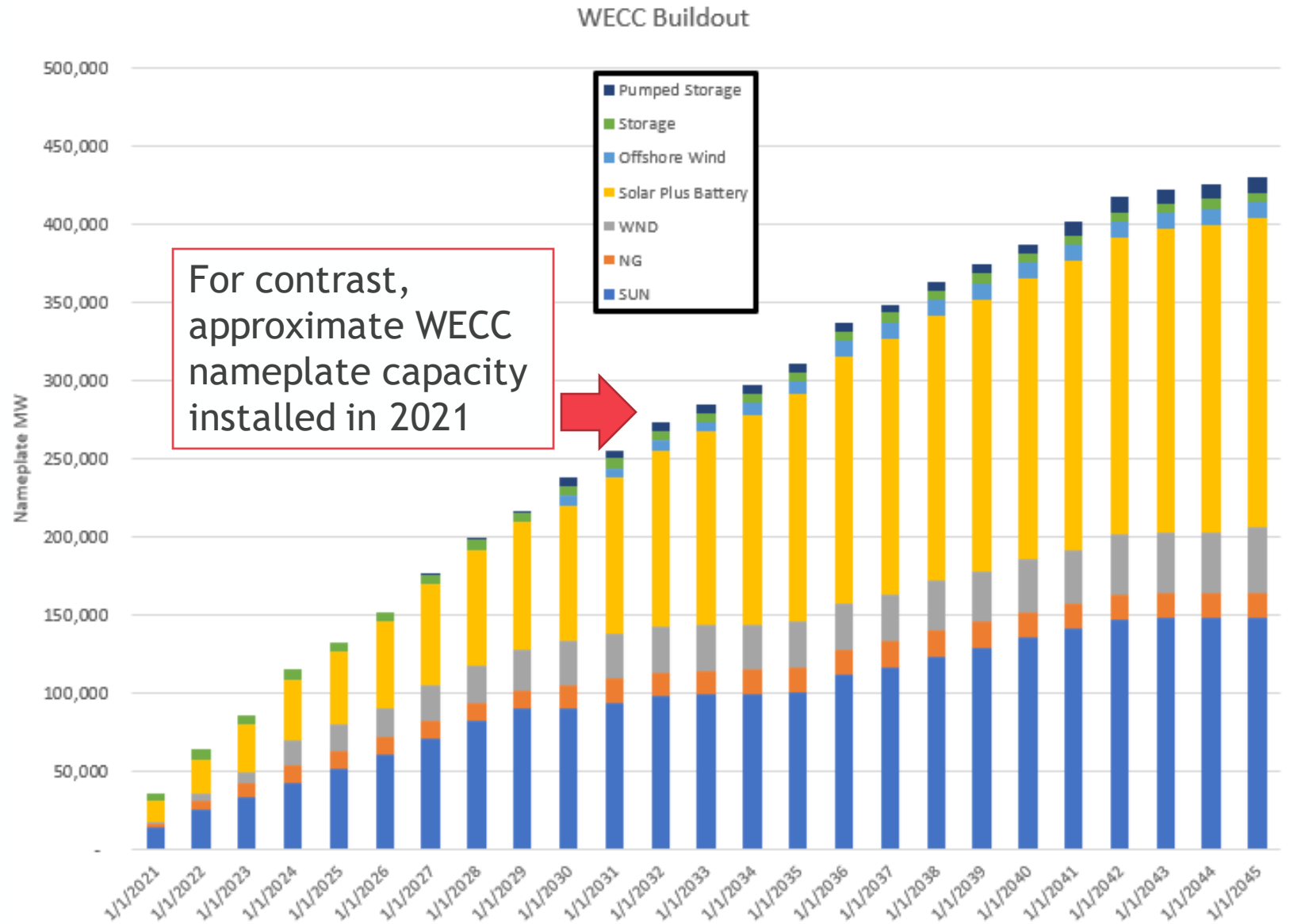


US WECC Clean Targets - Assuming 100% state sales (upd. July 2021)

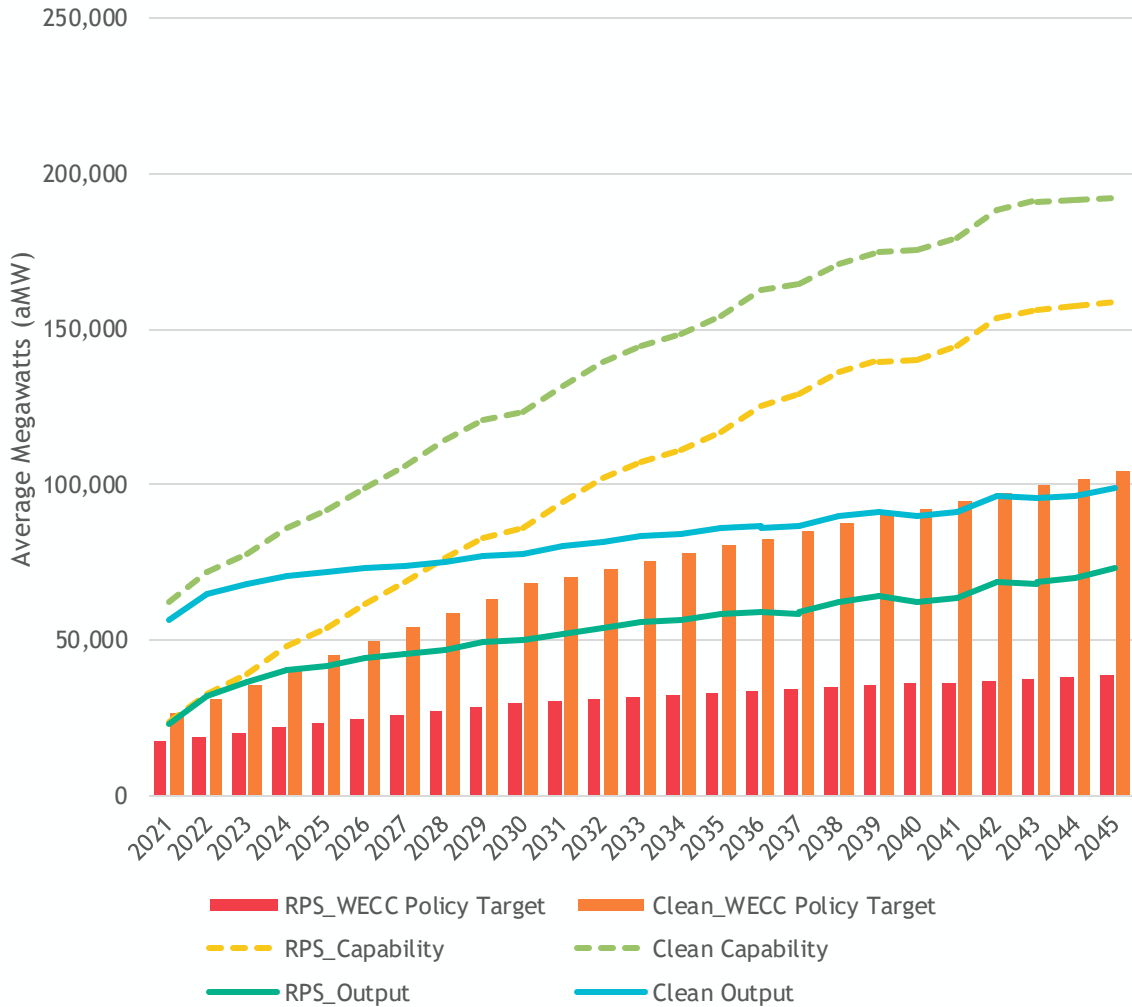


WECC-wide Buildout of Projected New Resources (baseline conditions)

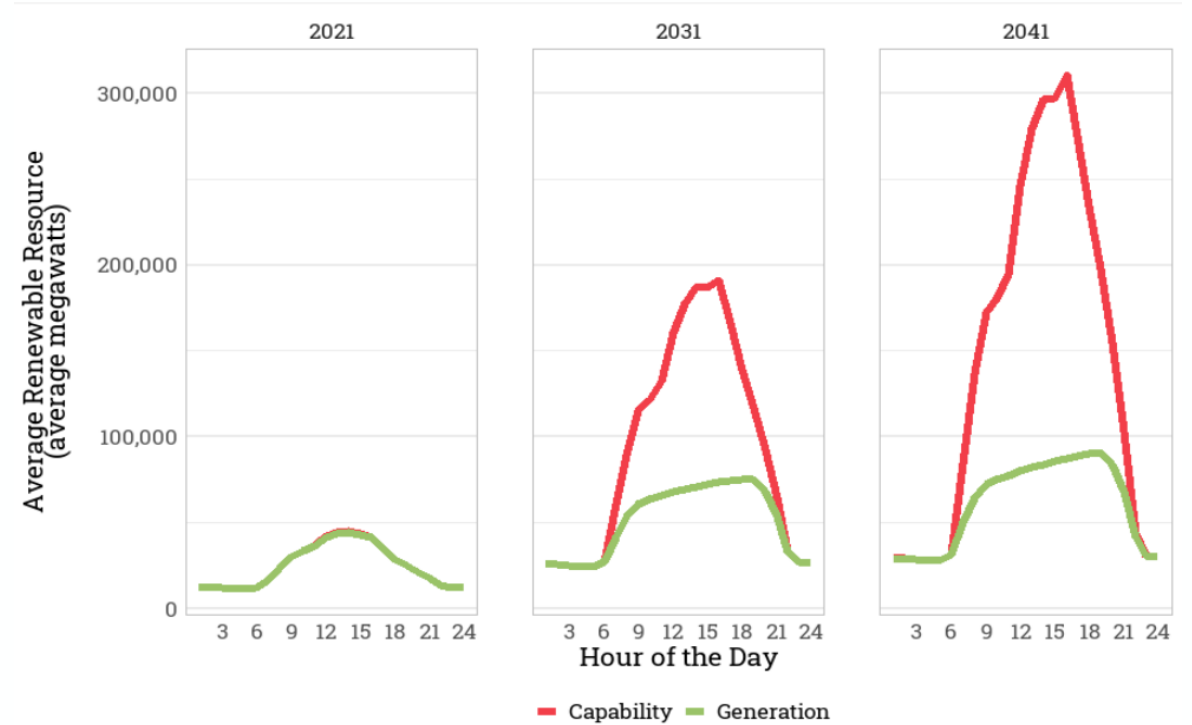
Adequate system throughout WECC, but due to renewable energy curtailment does not meet clean requirement in every year.



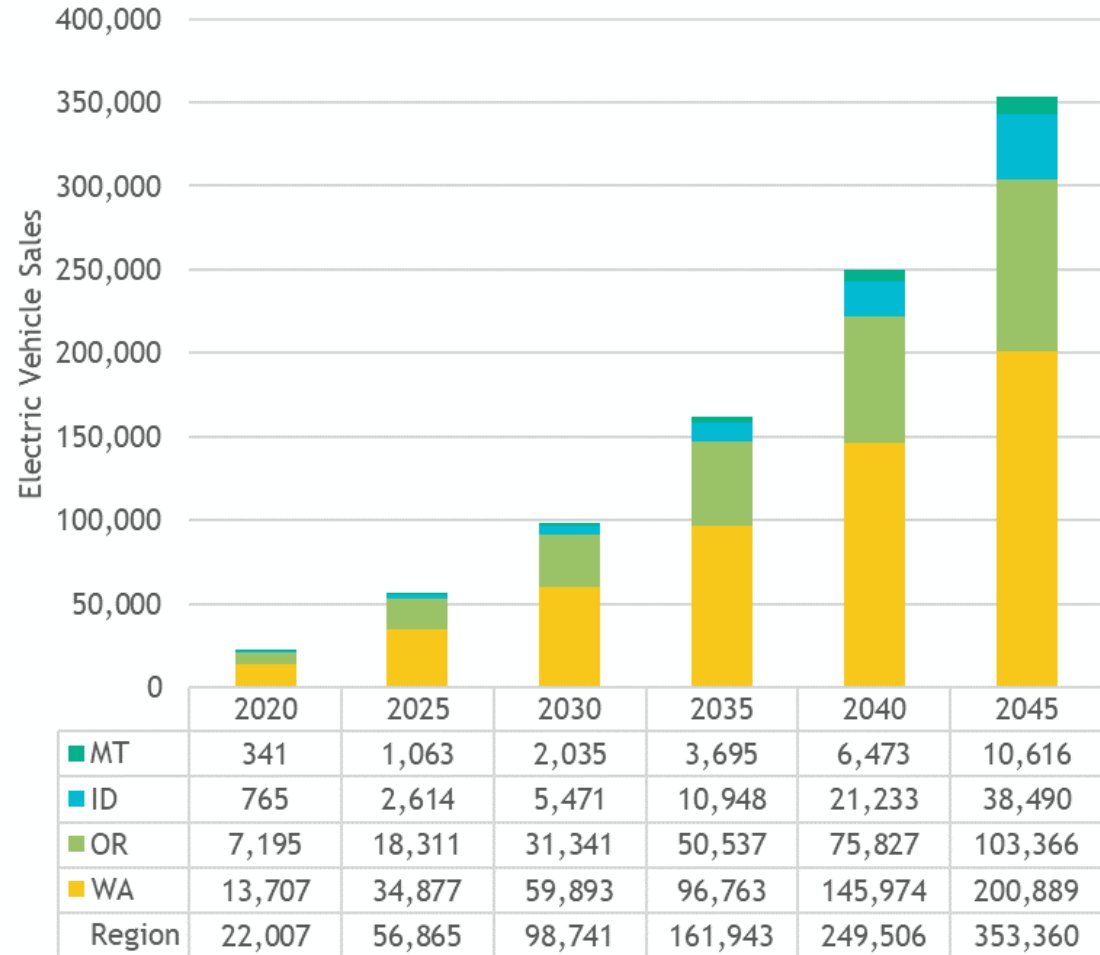
RPS/Clean Policy vs. Capability
(average megawatts)



Clean policies based on annual targets drive renewable builds throughout WECC creating surplus generation, renewable curtailment mid-day, low prices due to foregone credits for clean generation and subsequent operational challenges.



Electric Light-Duty Vehicle Sales Forecast

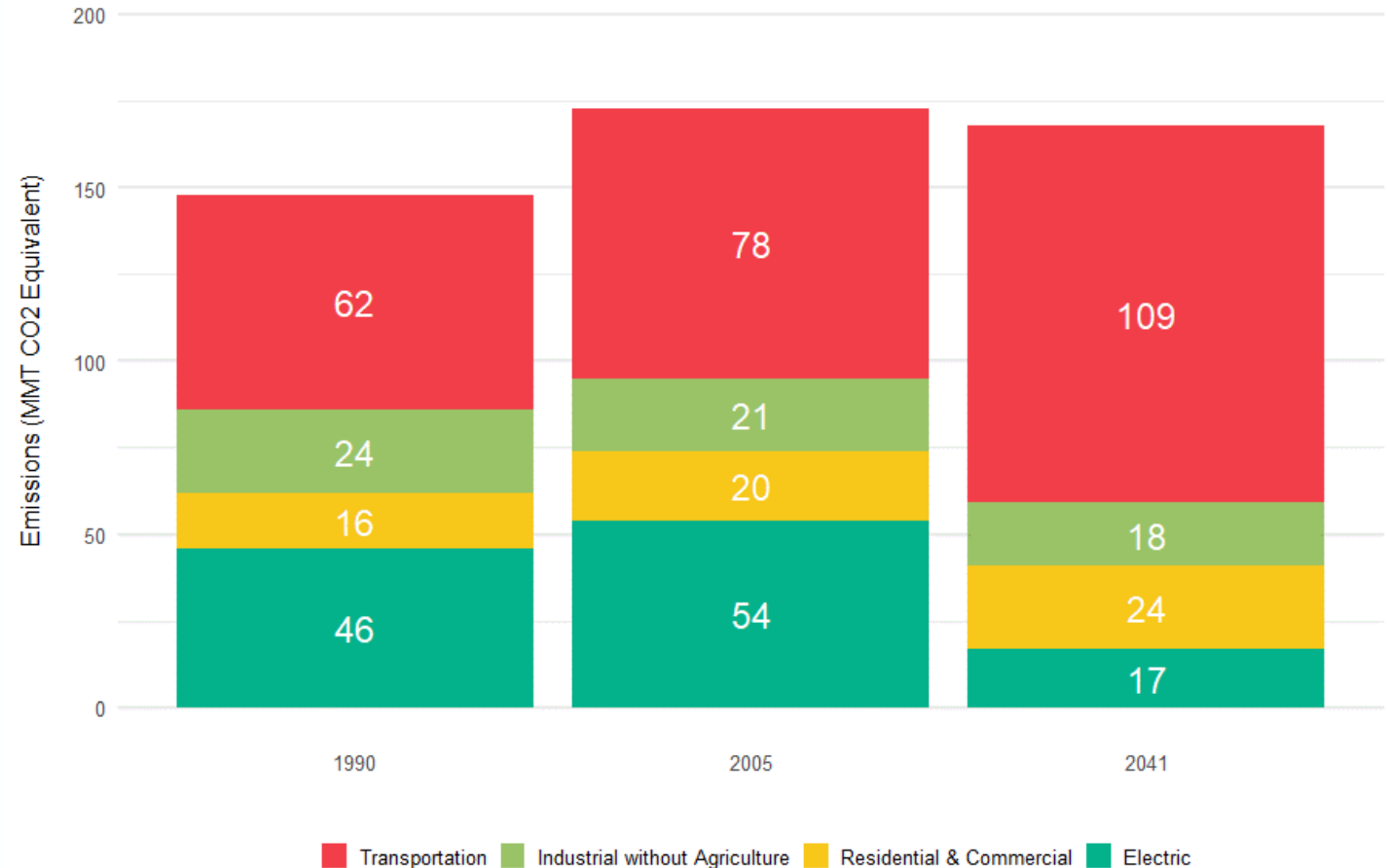


- Increasingly transportation will use electricity
- We forecast rising EV sales through the next 20 years



Expected Emissions by Energy Use Sector

- Emissions from generation electricity are expected to fall substantially over the next 20 years
- However, overall emissions are expected to stay above 1990 levels

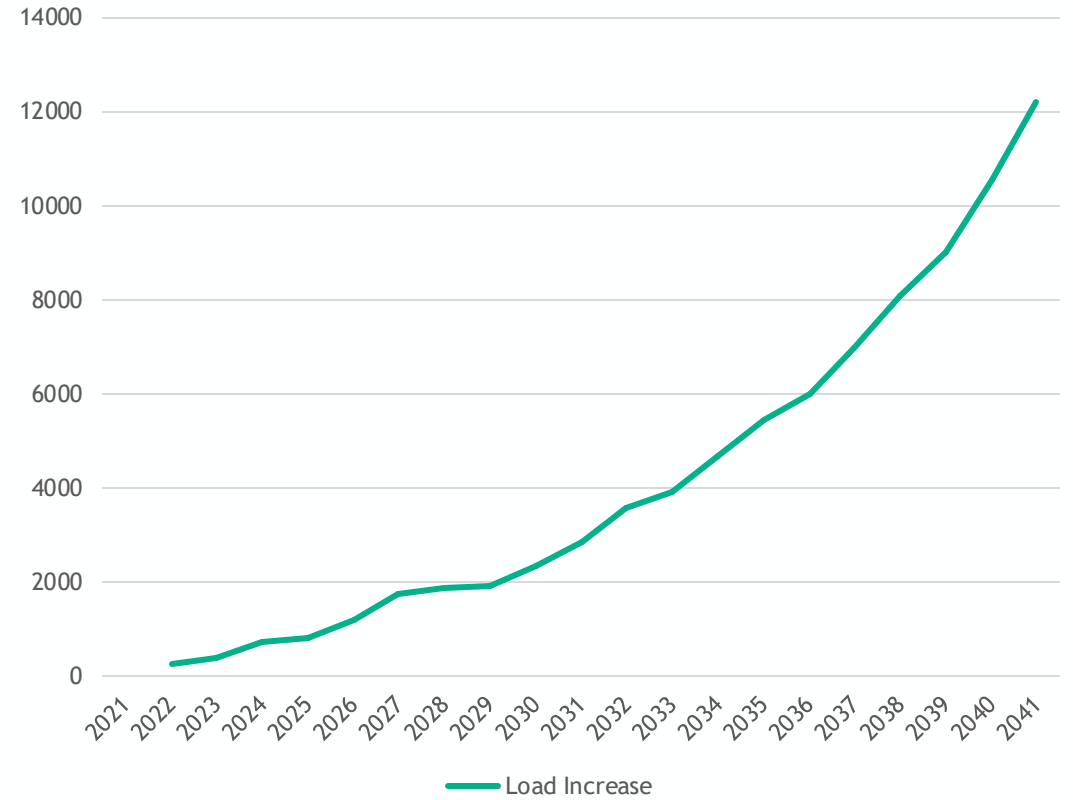
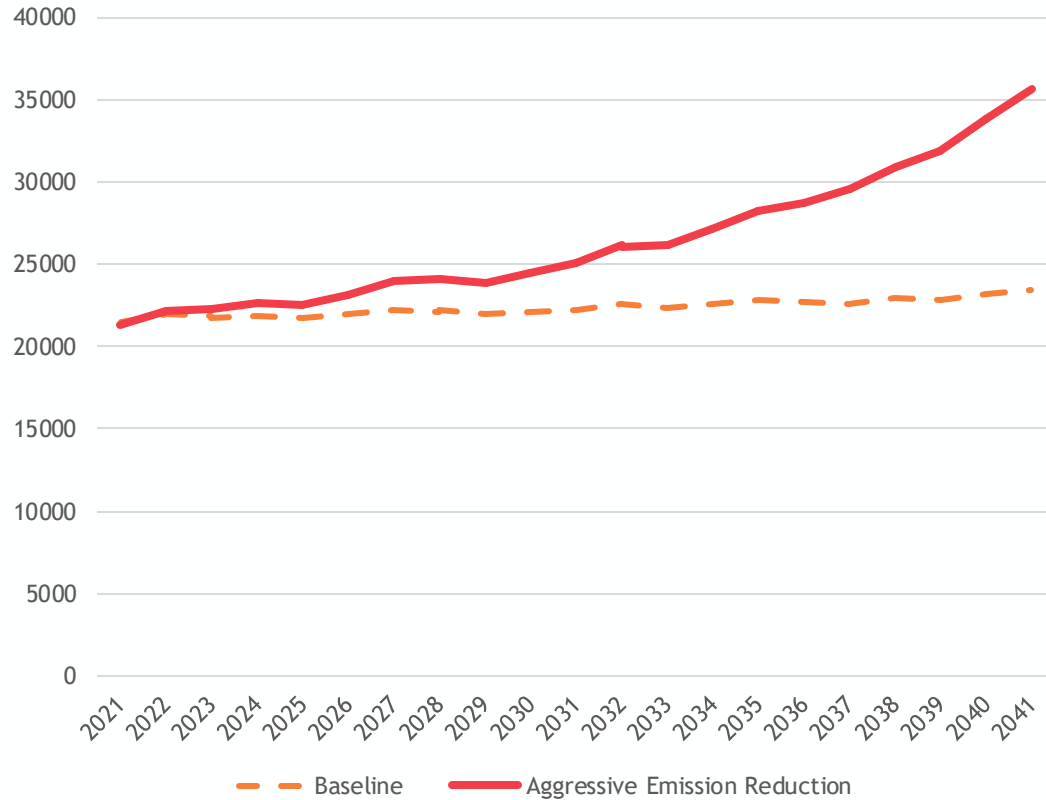


The background features an abstract graphic composed of several overlapping geometric shapes. On the left, there is a small light green trapezoid. In the center, a large teal pentagon is partially overlapped by a light blue trapezoid on its right side. To the right of the blue shape is a large, light green rectangle. The text is centered horizontally across the middle of these shapes.

Pathways to Decarbonization Scenario Findings

Partial Decarbonization Load Forecast

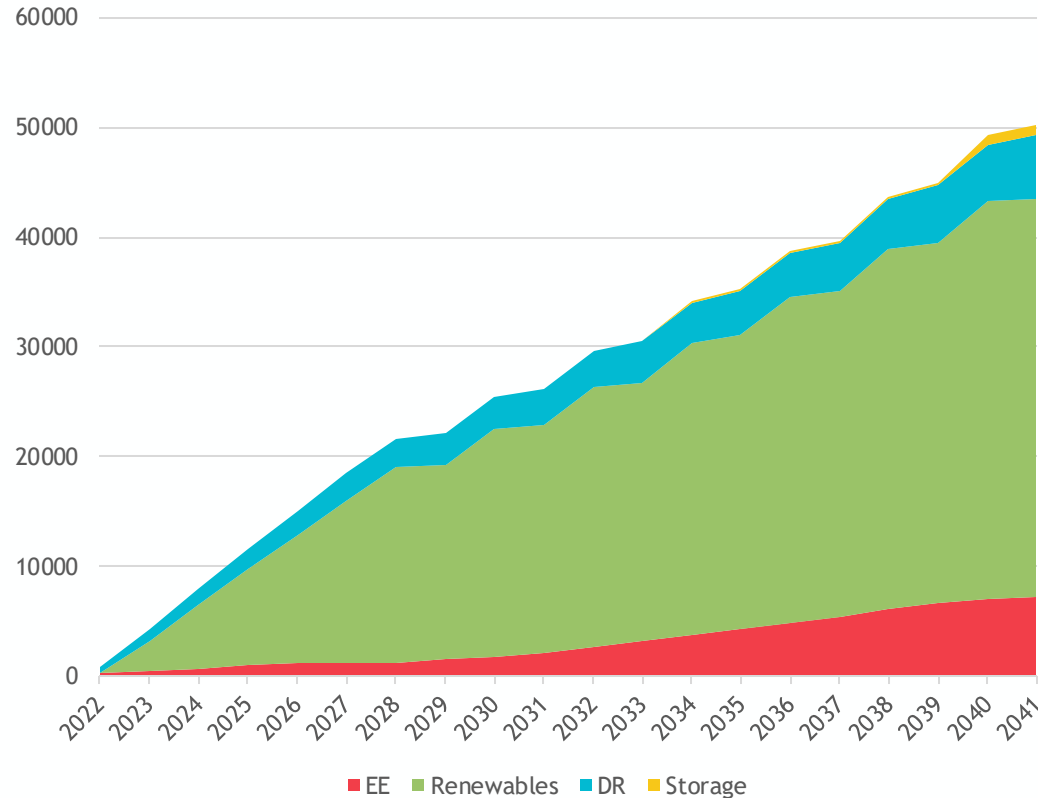
All decarbonization measures except heavy-duty transportation



Supporting Materials: [Pathways to Decarbonization](#)

THE 2021
NORTHWEST
POWER PLAN

Regional Resource Build for Partial Decarbonization



By 2027:

- 14,700 MW Nameplate Renewables
- 1,187 average MW EE
- 2550 MW capability DR

By 2041:

- 36,260 MW Nameplate Renewables
- 7,244 average MW EE
- 5870 MW capability DR
- 800 MW Energy Storage

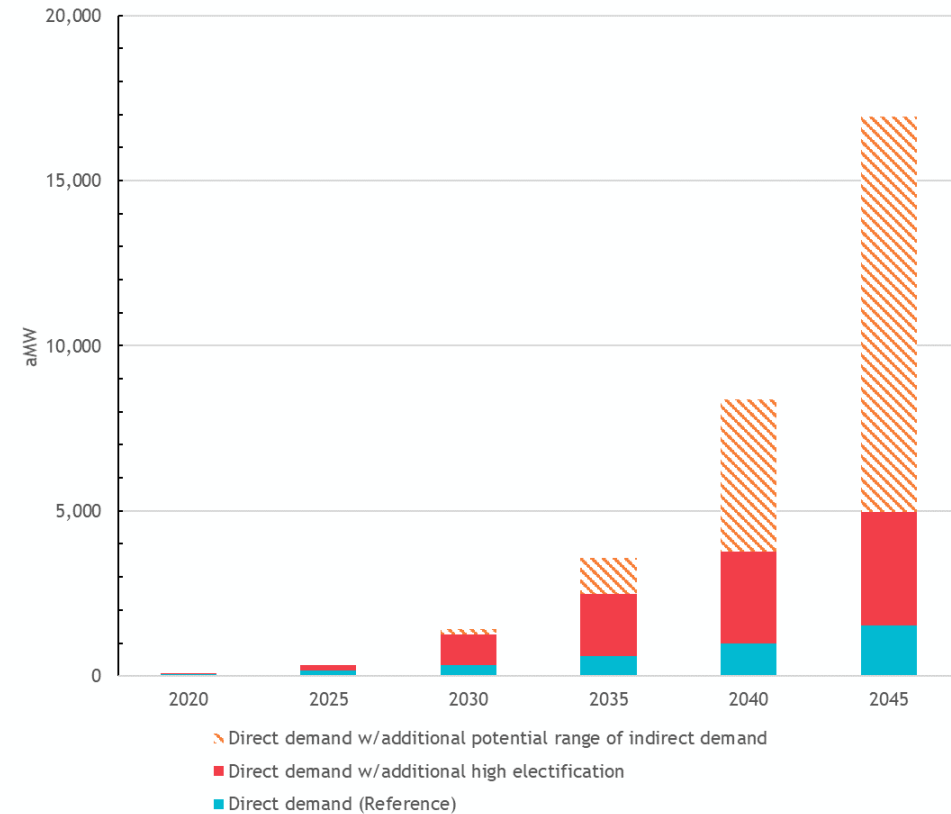


Hydrogen Production Electricity Demand for Heavy Duty Vehicles

Heavy-duty Vehicle Miles Traveled Using by Hydrogen

- 16% by 2040 – H₂ production forecast to require 4,596 average megawatts
- 42% by 2045 – H₂ production forecast to require 11,980 average megawatts

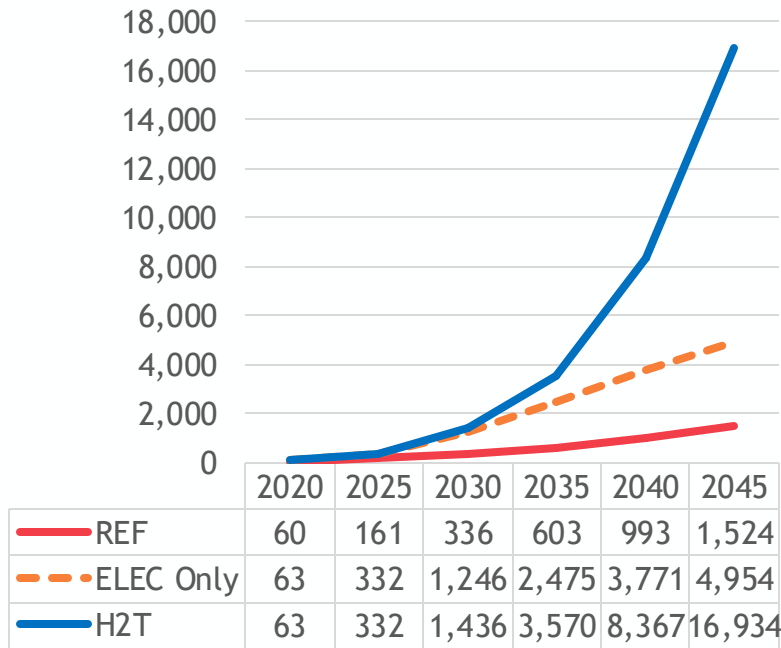
Note: this additional demand was excluded from the Partial Decarbonization Load Forecast



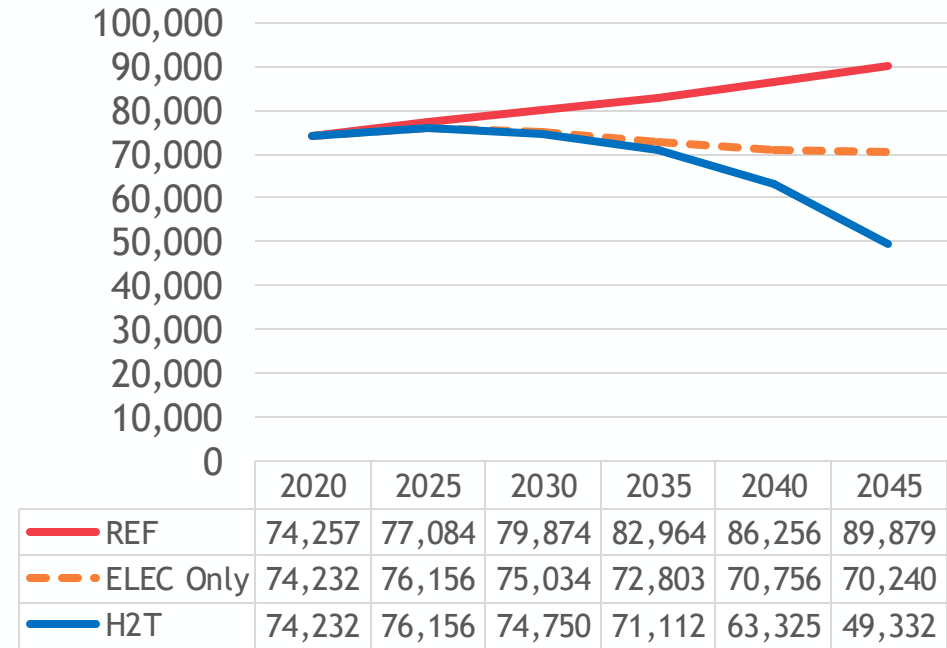
ELEC Only -
 electrification
 changes only -
 no H₂

Results

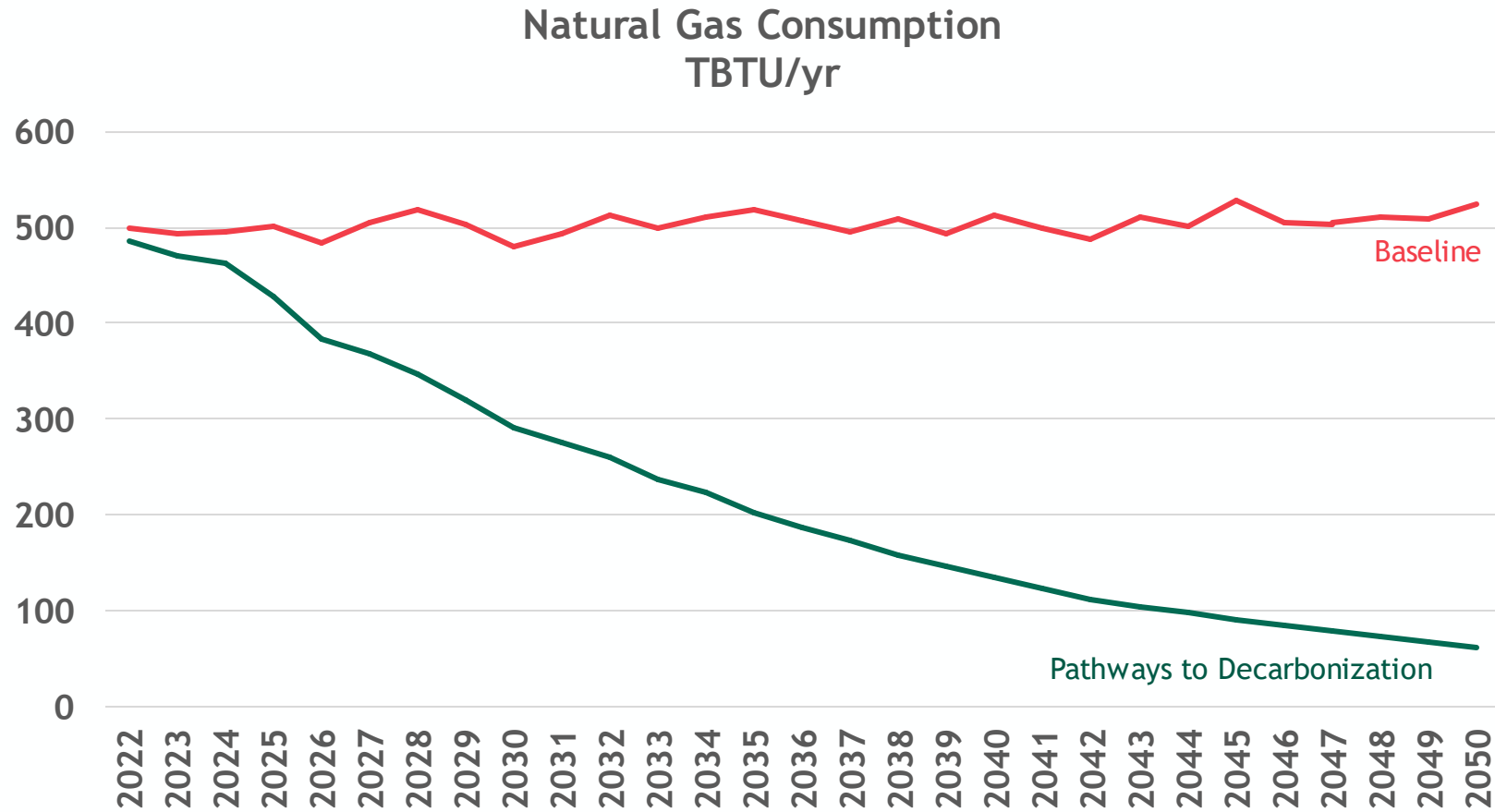
Demand for Electricity
 aMW



Tailpipe Emmissions
 kTonne CO₂e

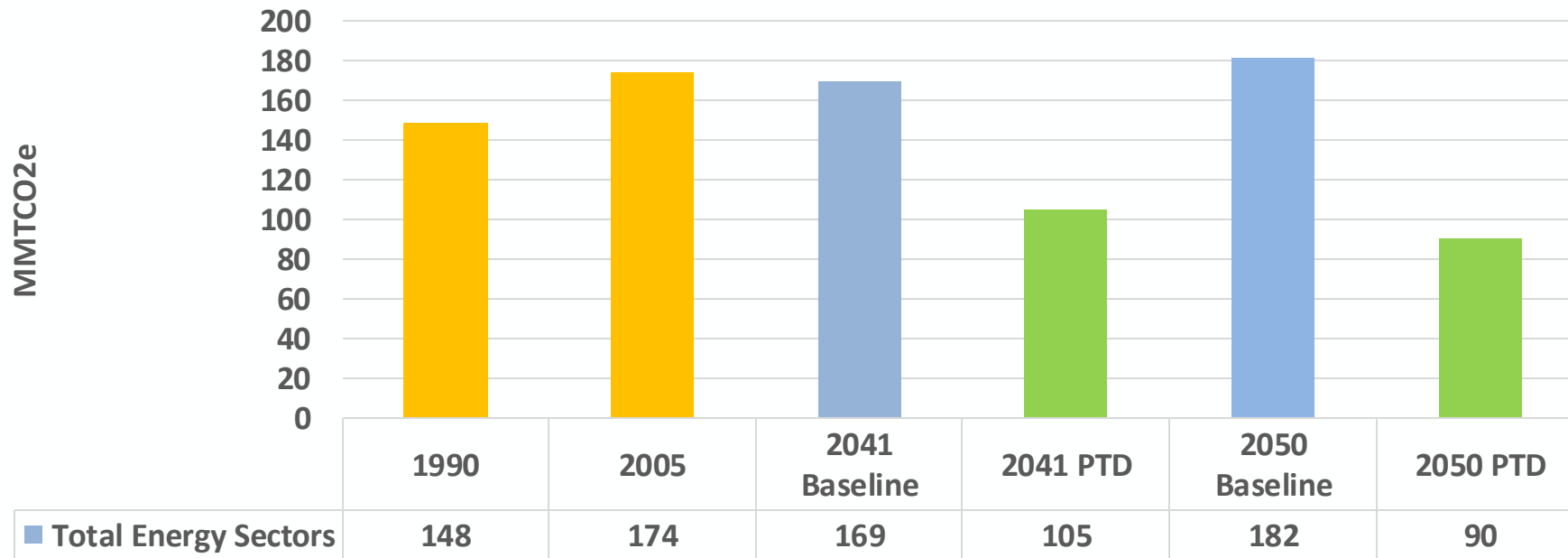


Natural Gas Consumption (Excludes Electric Utility Demand)

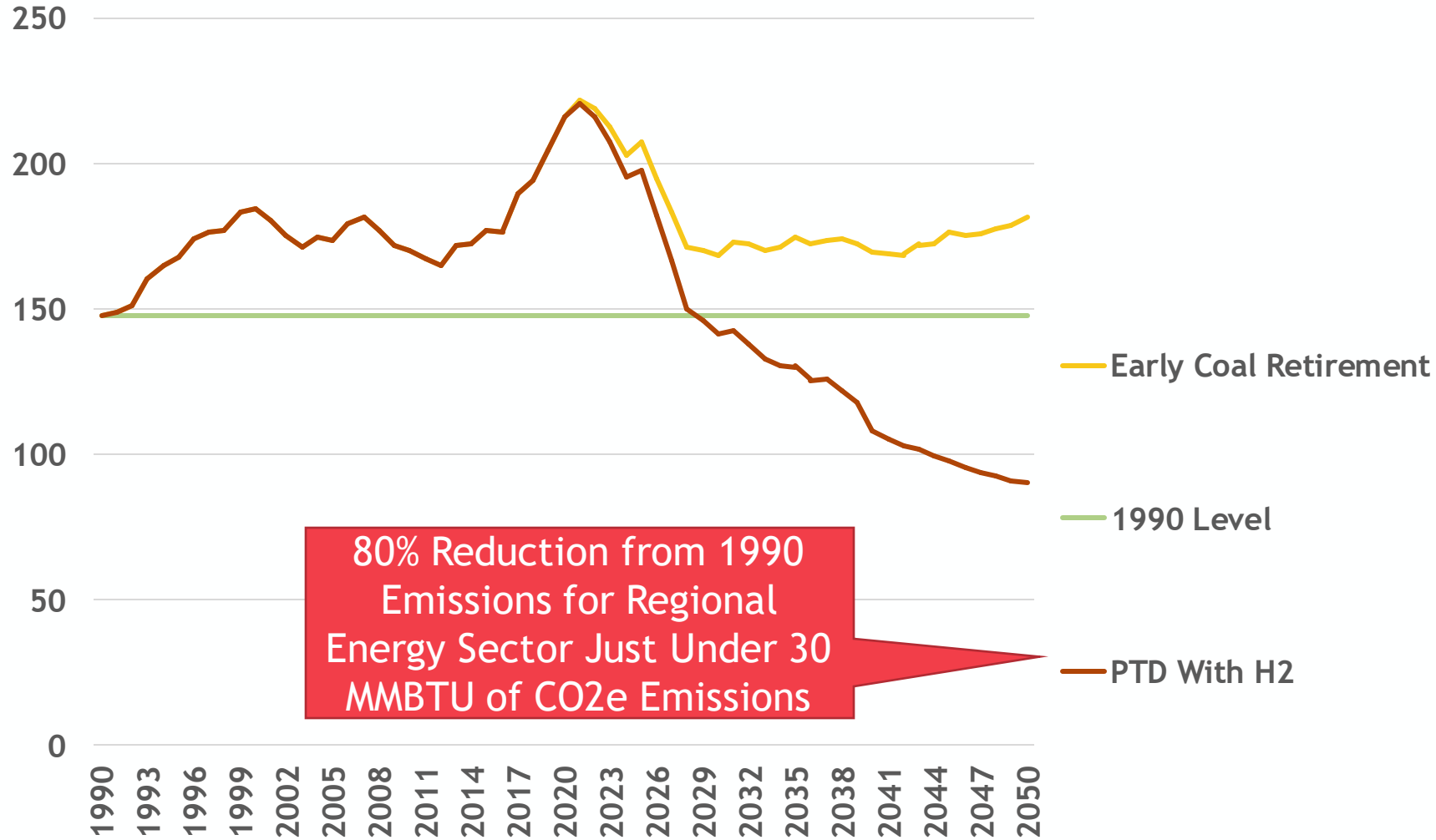


Where Does This Leave Us for Emissions from Energy Use in the Northwest?

GHG Emissions from Energy used in Residential, Commercial, Industrial, Agriculture and Electric Utilities



Decarbonization Looking at Energy Sector Falls Short of Targets



80% Reduction from 1990 Emissions for Regional Energy Sector Just Under 30 MMBTU of CO₂e Emissions



A scenic landscape of a mountain valley with a river, partially obscured by white geometric shapes. The background shows a wide river flowing through a valley, with mountains in the distance. The scene is overlaid with several white, semi-transparent geometric shapes, including triangles and polygons, which create a layered, architectural effect. The overall tone is soft and natural, with muted greens, browns, and greys in the landscape, contrasted by the bright white of the geometric overlays.

Questions?

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<https://www.linkedin.com/in/kujala/>