Decarbonization in PGE's Service Area

Oregon Global Warming Commission
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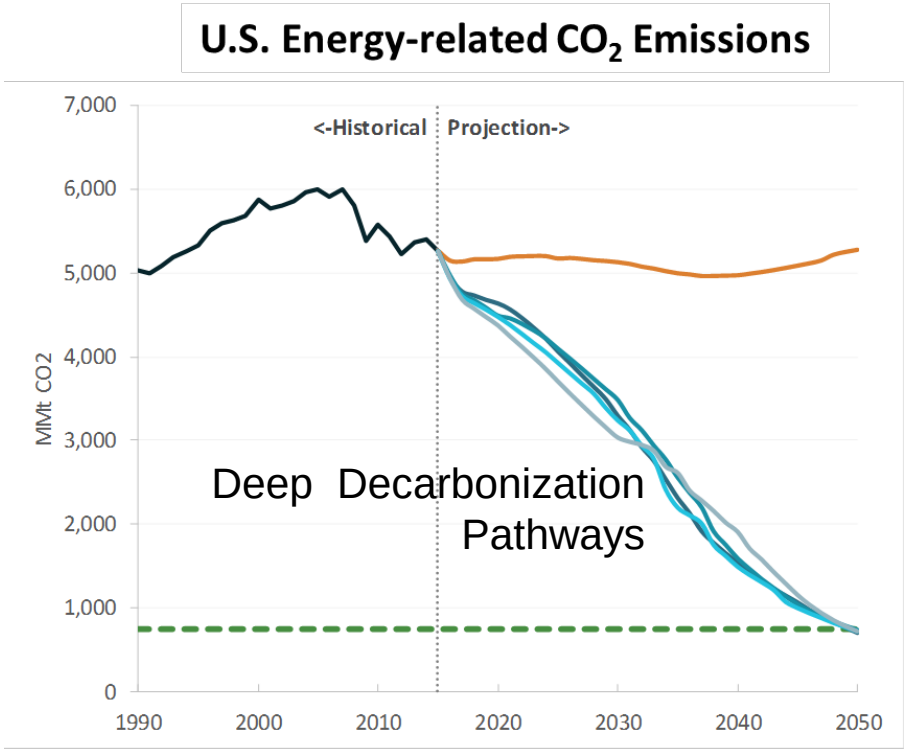
What is Deep Decarbonization?

- **Deep Decarbonization**:
  - Transformation of the energy economy consistent with keeping global warming less than 2°C
- **Energy system**:
  - The network of all energy producing, converting, delivering, or consuming infrastructure
- **Pathway**:
  - Plan or blueprint to achieve deep decarbonization of the energy system



Source: historical emissions data from EIA Monthly Energy Review.

Source: Evolved Energy Research

PGE's Decarbonization Study

PGE commissioned a Decarbonization Study to inform the next IRP and to help inform carbon policy conversations in Oregon

- Study developed economy-wide decarbonization pathways across PGE's service area (including transportation and non-electric end uses)
- Emissions target: **80% reduction by 2050**, consistent with guidance from the scientific community for limiting global temperature rise to 2°C
- PGE commissioned the study to address key questions:
  - How might energy services be met in PGE's service area in a decarbonized future?
  - What are the implications for PGE's electricity demand – both magnitude and shape?
  - How much renewable infrastructure will be needed to support economy-wide decarbonization?
  - What might energy (not just electricity) costs look like for our customers?

Scope of Decarbonization Study

- PGE service territory only
  - Three energy scenarios (pathways) that transition to a low carbon future
- All energy types
  - Gasoline, hydrogen, etc.
- Energy-related CO_2 only
  - Does not include industrial process emissions, landfills, agricultural CO_2 emissions or non CO_2 GHGs
- Allocated state-wide budget to PGE service territory using its share of state's population (45-47% of total)
  - By 2050, per capita energy CO_2 emissions decrease from 16.0 tCO_2 to 1.6 tCO_2/person

GHG Policy
- 2035: 45% below 1990 levels
- 2050: 80% below 1990 levels

Emissions Types
- Energy CO_2 only

State-to-Service Territory Allocation
- Population-based

PGE Service Territory Carbon Budget
- 2035: 11.7 MMT CO_2
- 2050: 4.3 MMT CO_2

Study Principles

Natural Stock Rollover

- No early replacement - vehicles and appliances replaced upon failure
  - This creates inertia in the energy system, limits the rate of emissions reductions

Technology Cost and Performance

- No technological breakthroughs – study uses only commercial or near-commercial technologies and today's forecasts for gradual technology improvement
  - More rapid technological improvement would reduce costs

Conservation and Behavior Change

- Study assumes no structural change to the energy services demanded by our customers
  - Additional conservation, behavioral change, smart city planning, etc. make it easier to meet the reduction goals

Deep Decarbonization Pathways Investigated

High Electrification

Fossil fuel consumption is reduced by electrifying end-uses to the extent possible and increasing renewable electricity generation

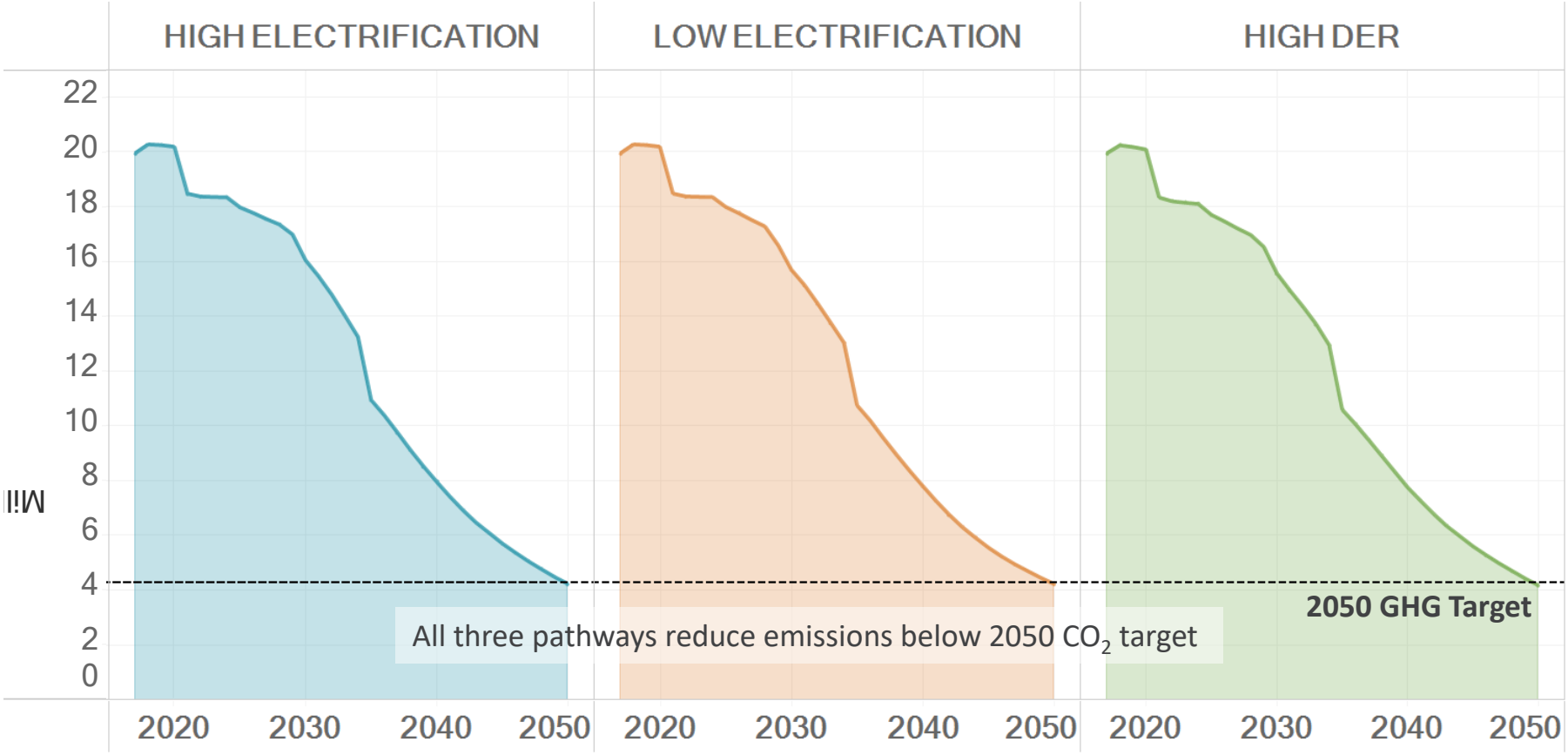
Low Electrification

Greater use of renewable fuels, notably biofuels and synthetic electric fuels, to satisfy energy demand and reduce emissions

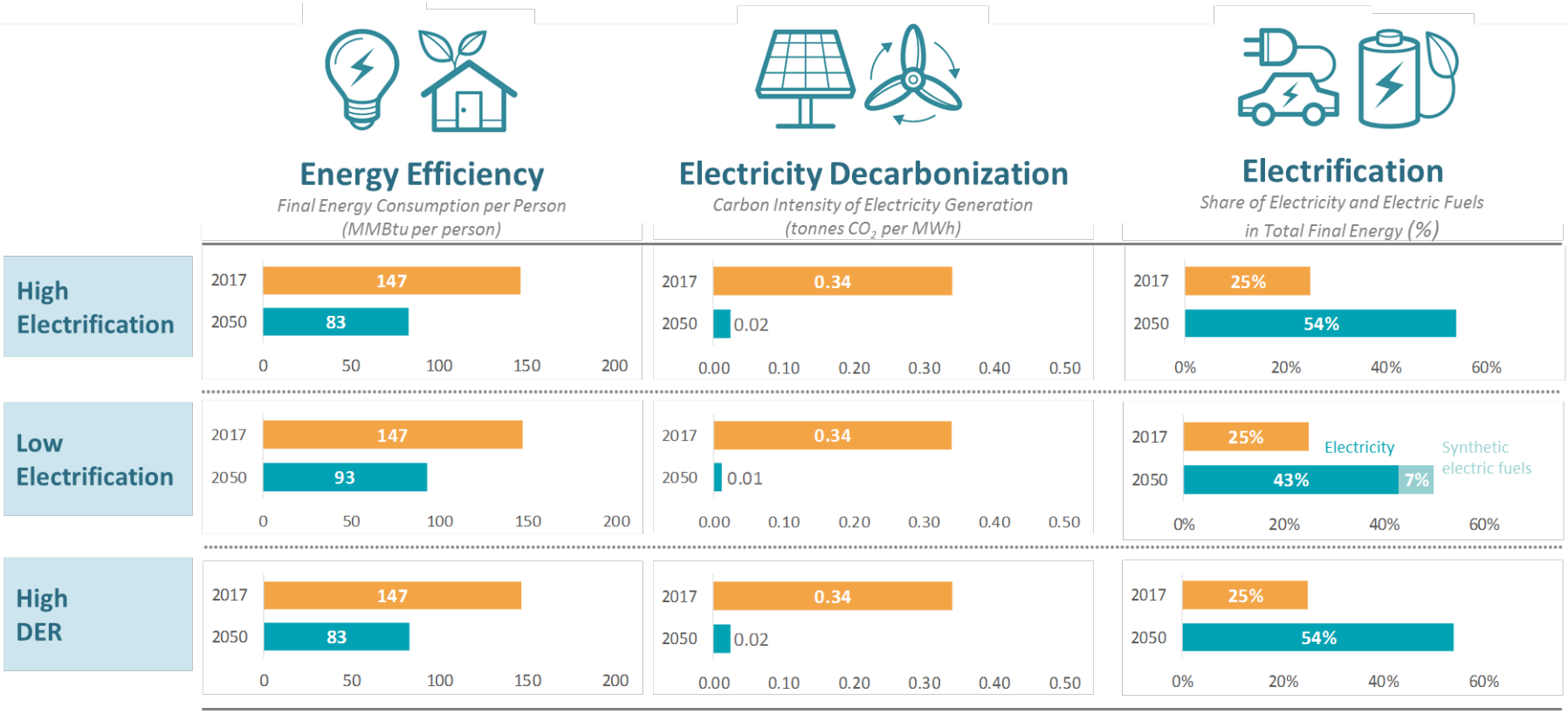
High DER

Distributed energy resources proliferate in homes and businesses, which also realize higher levels of electrification

Multiple pathways achieve 2050 reduction targets

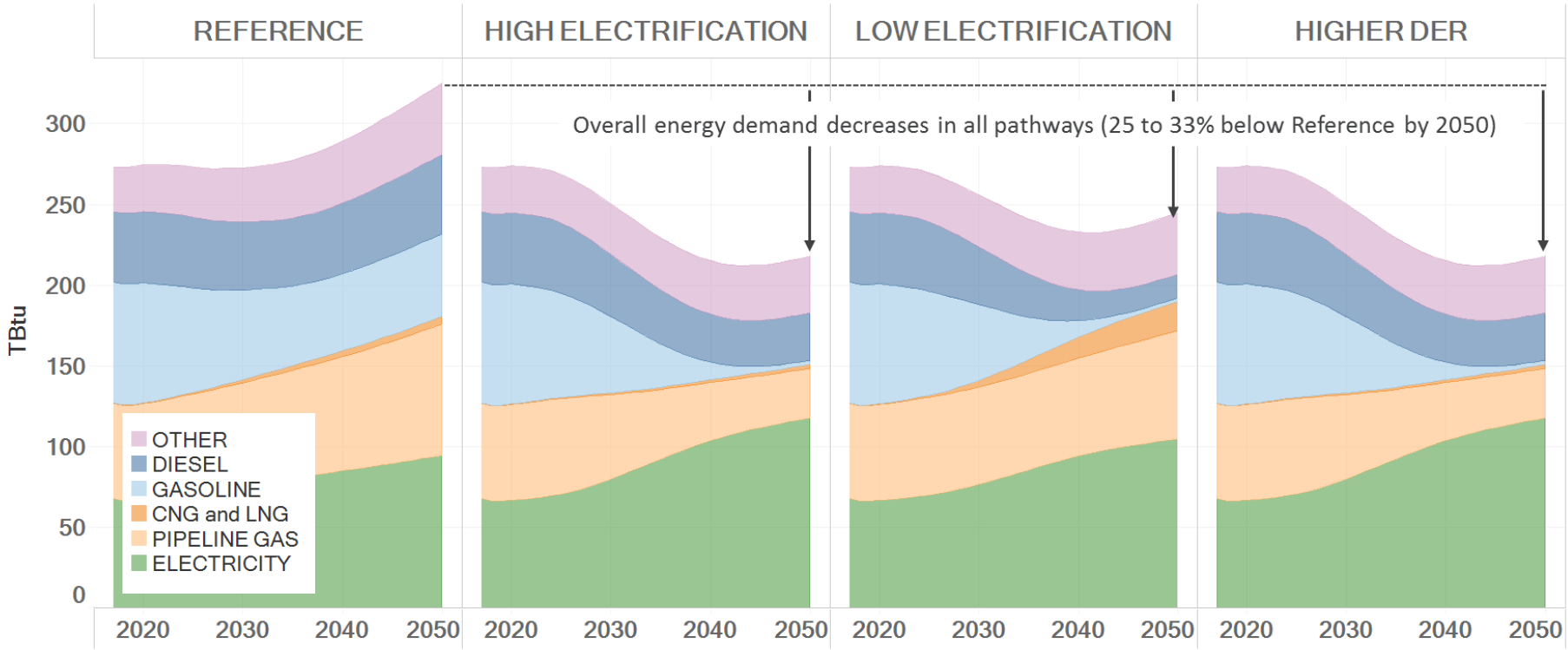


All pathways require success across <u>all</u> three pillars



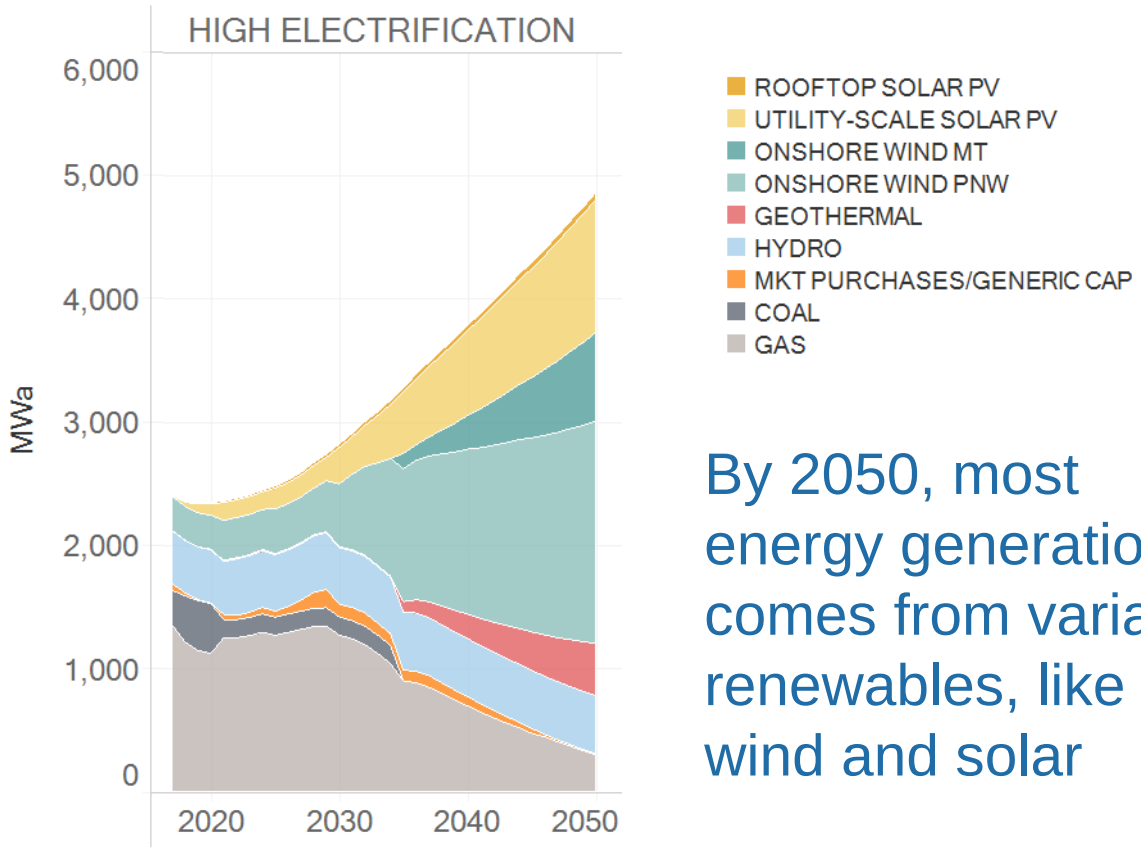
Impacts to energy demand

In deep decarbonization pathways, total energy consumption drops 25-33% relative to the Reference Case by 2050, but reliance on electricity increases



Implications for the electricity system

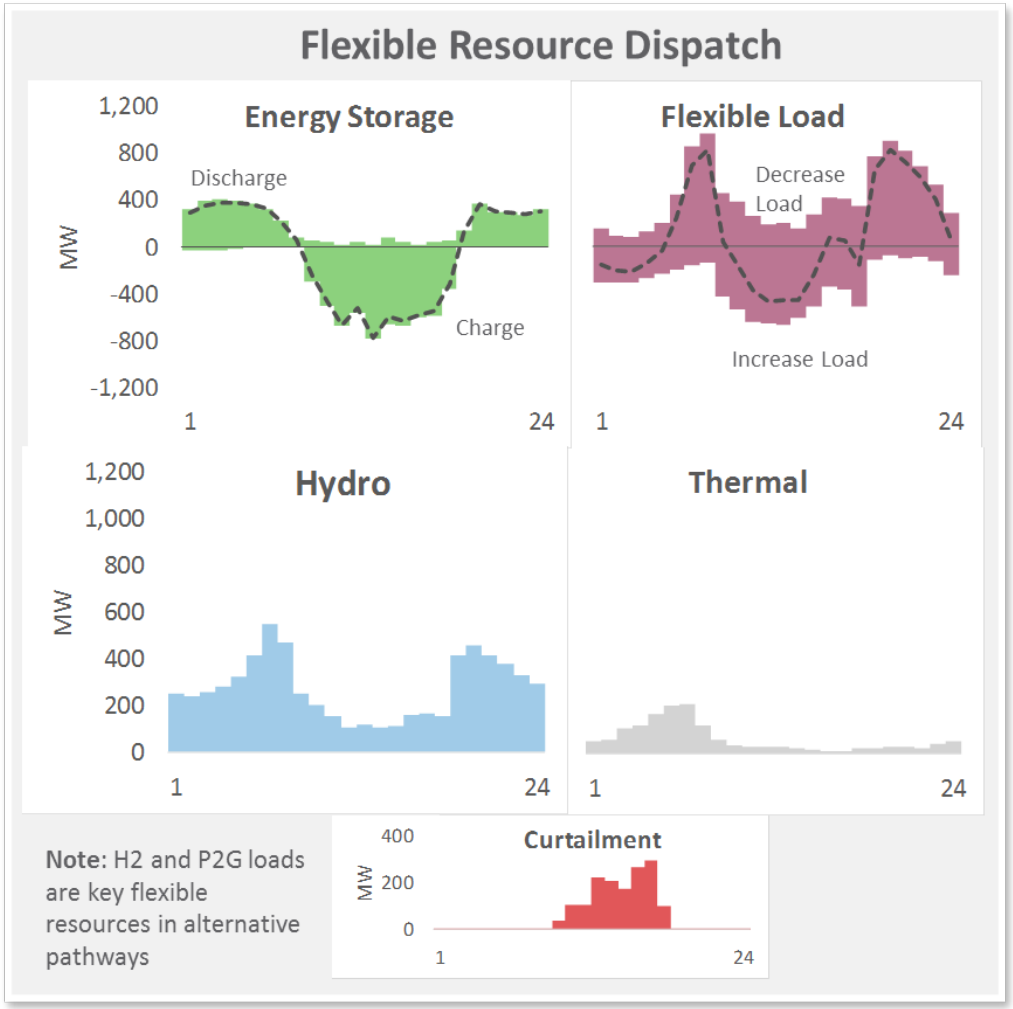
Electricity systems in a deeply decarbonized future will need new capabilities to efficiently integrate variable renewable resources



By 2050, most energy generation comes from variable renewables, like wind and solar

Balancing solutions

In a deeply decarbonized future, flexibility in the electricity system is provided by generators, loads, and storage



Decarbonization Takeaways

- Meeting 2050 GHG goal across the economy in PGE's service area is possible, but will require transformative changes in how we use, produce, and deliver energy
- Transformation of the energy economy will rely on:
  - Both consumer and producer participation
  - Timely planning and coordination to reduce barriers to implementation
- New sources of flexibility (e.g., energy storage and flexible loads) can complement traditional sources of flexibility (hydro and thermal) to ensure renewables are efficiently integrated
  - Flexible EV charging and flexible water heaters show particular promise under the electrification pathways
- Electrification of the transportation sector plays a critical role in achieivng the GHG reduction targets

Thank you!

To learn more about our Decarbonization Study:
https://www.portlandgeneral.com/our-company/energy-strategy/resource-planning/integrated-resource-planning