Meeting the Challenge of Our Time: Pathways to a Clean Energy Future for the Northwest

An Economy-Wide Deep Decarbonization Pathways Study • June 2019

K4C Elected Officials Work Summit | 10.23.2019

Agenda

- Clean Energy Transition Institute & Evolved Energy Research
- Brief Overview of Northwest Deep Decarbonization Pathways Study
- Relevance to King County-Cities Climate Collaboration Work
- Q & A

Clean Energy Transition Institute

Independent, nonpartisan Northwest research and analysis nonprofit organization with a mission to accelerate the transition to a clean energy economy. Provide information and convene stakeholders.

- Identifying deep decarbonization strategies
- Analytics, data, best practices
- Nonpartisan information clearinghouse
- Convenings to facilitate solutions

Evolved Energy Research

Energy consulting firm addressing key energy sector challenges accelerated by changing policy goals and new technology development. Developer of planning tools to explore economy-wide decarbonization and electricity system implications

- National and sub-national deep decarbonization studies
- 2016 study for State of Washington Office of the Governor
- 2018 study for Portland General Electric

EVOLVED ENERGY RESEARCH

Why a Northwest Deep Decarbonization Study?

Common set of assumptions to inform decisions about how the clean energy transition could unfold over the coming decades

- Unbiased, analytical baseline for the region
- Variety of pathways to lower carbon emissions
- Surface trade-offs, challenges, and practical implications of achieving mid-century targets
- Broaden conversations about actions needed

Study Questions

- **How does the energy sector need to transform** in the most technologically and economically efficient way?
- **How does electricity generation need to be decarbonized** to achieve economy-wide carbon reduction goals?
- **What if we can't** achieve high electrification rates?
- **What is the most cost-effective use** for biomass? What if biomass estimates are wrong?
- **What would increased electricity grid transmission** between the NW and CA yield?

Scope & Methodology

- **Scope:** WA, OR, ID, MT
- **All Energy Sectors Represented:**
  - Residential and commercial buildings
  - Industry
  - Transportation
  - Electricity generation

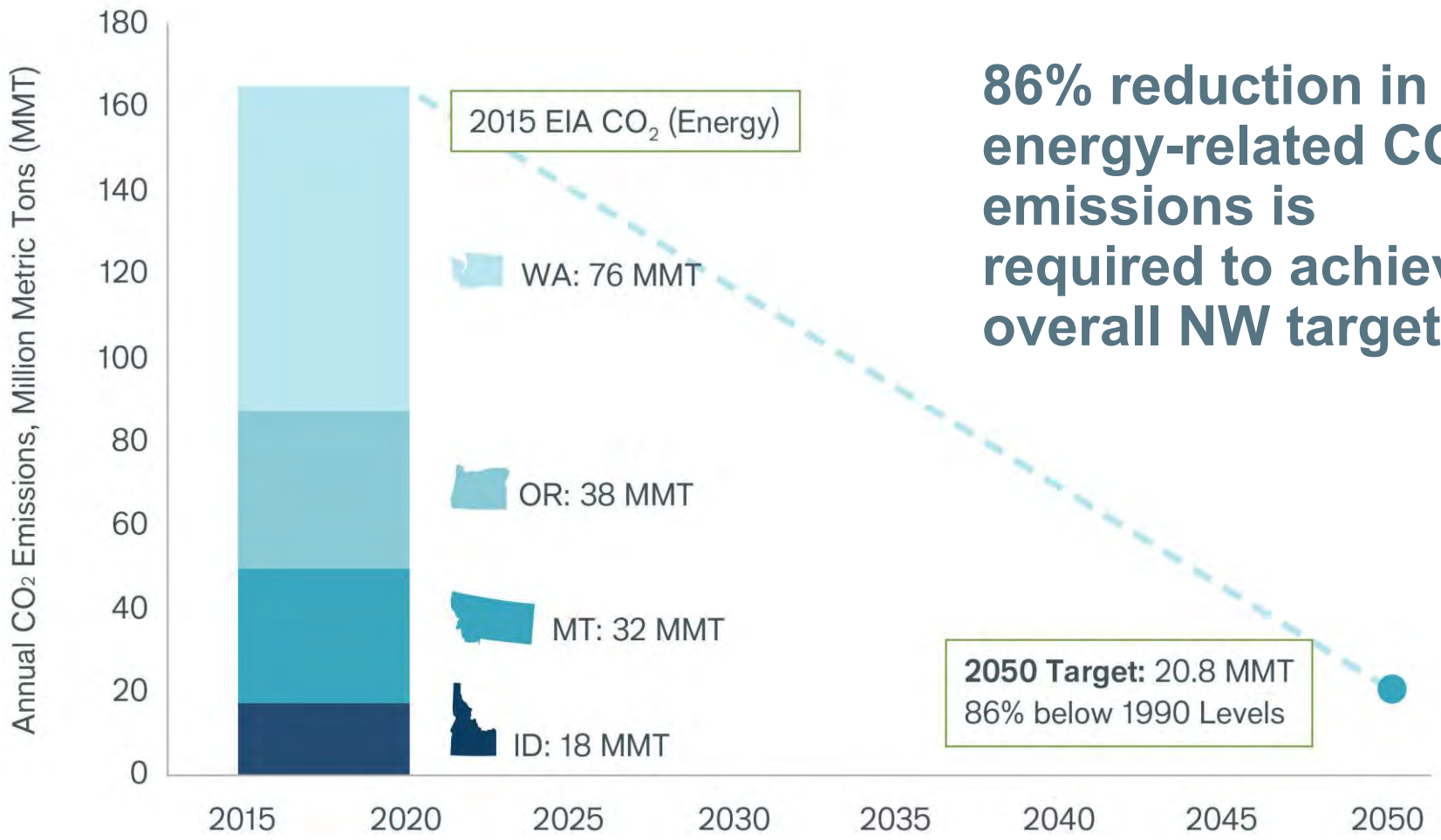
Evaluating holistically provides an understanding of cross-sectoral impacts and trade-offs

Study Emissions Target

86% reduction in energy-related CO_2 below 1990 levels by 2050

- Applied to each Northwest state independently instead of regionally
- Consistent with economy-wide reduction of 80% below 1990 levels by 2050
- Allows for reductions below 80%for non-energy CO_2 and non-CO_2 GHG emissions, where mitigation feasibility is less understood relative to energy

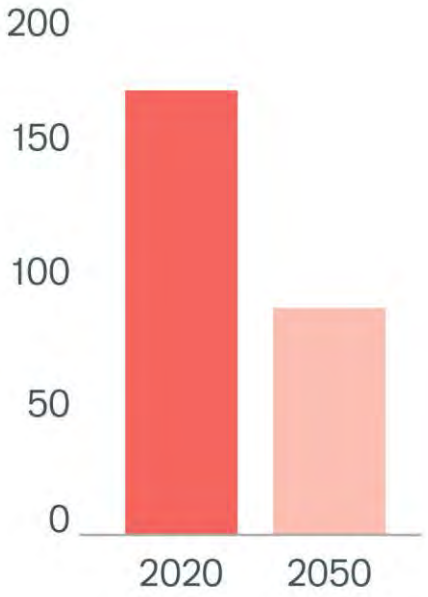
Northwest Deep Decarbonization Target



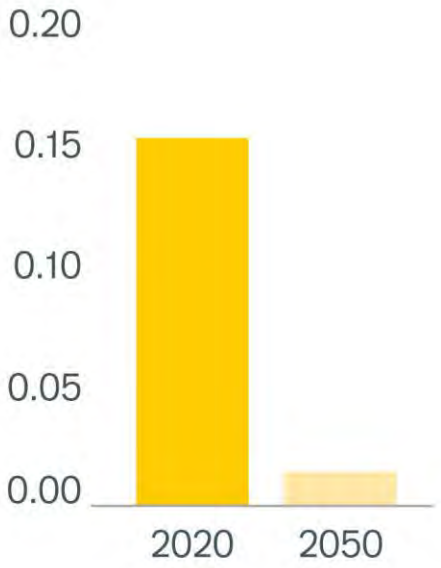
86% reduction in energy-related CO_2 emissions is required to achieve overall NW target.

Five Decarbonization Strategies Deployed

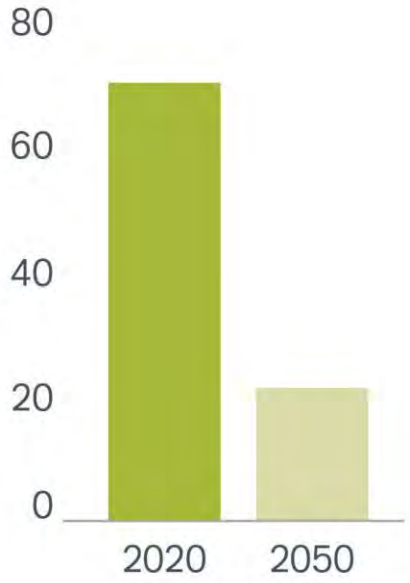
Energy Efficiency Per capita energy decreases 50%



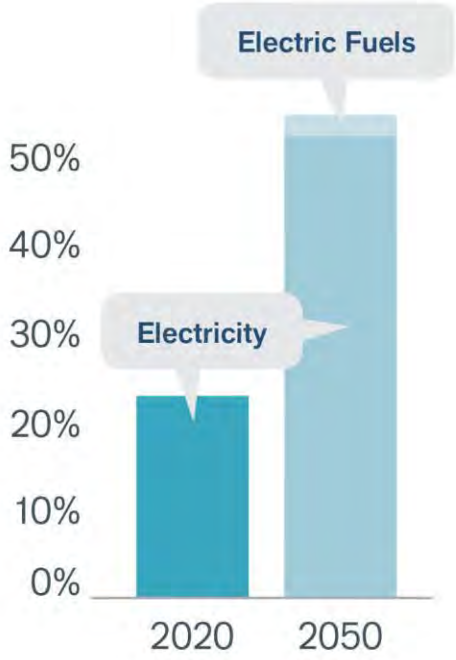
Electricity Decarbonization 96% Clean by 2050



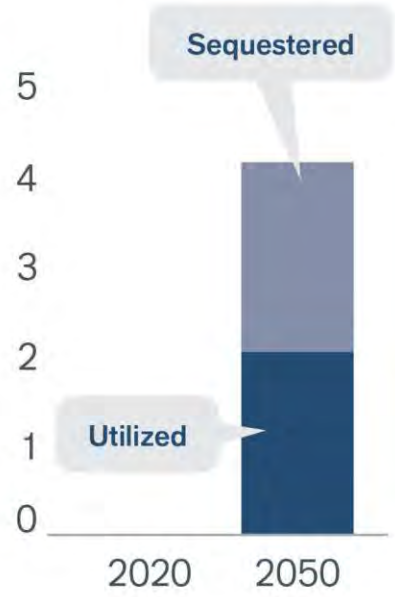
Fuel Decarbonization 70% decrease



Electrification Doubles from 23% to 55%

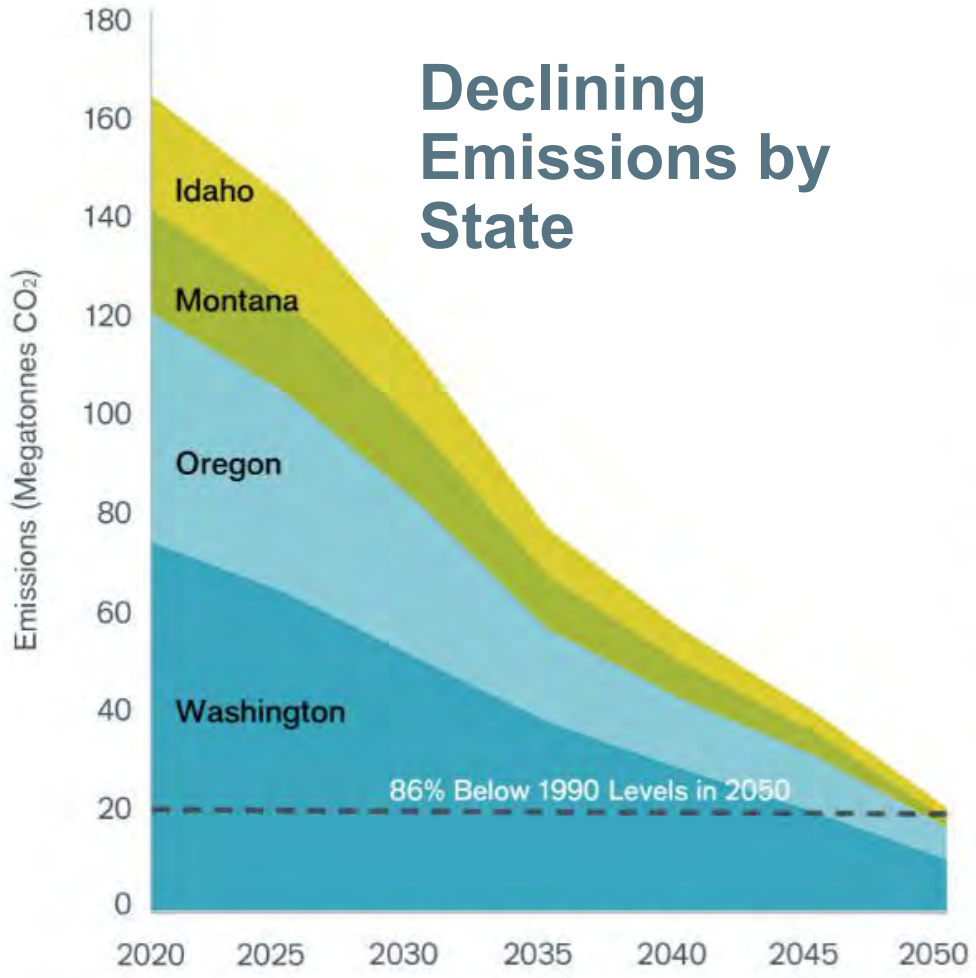


Carbon Capture 1/2 fuel; 1/2 sequestered

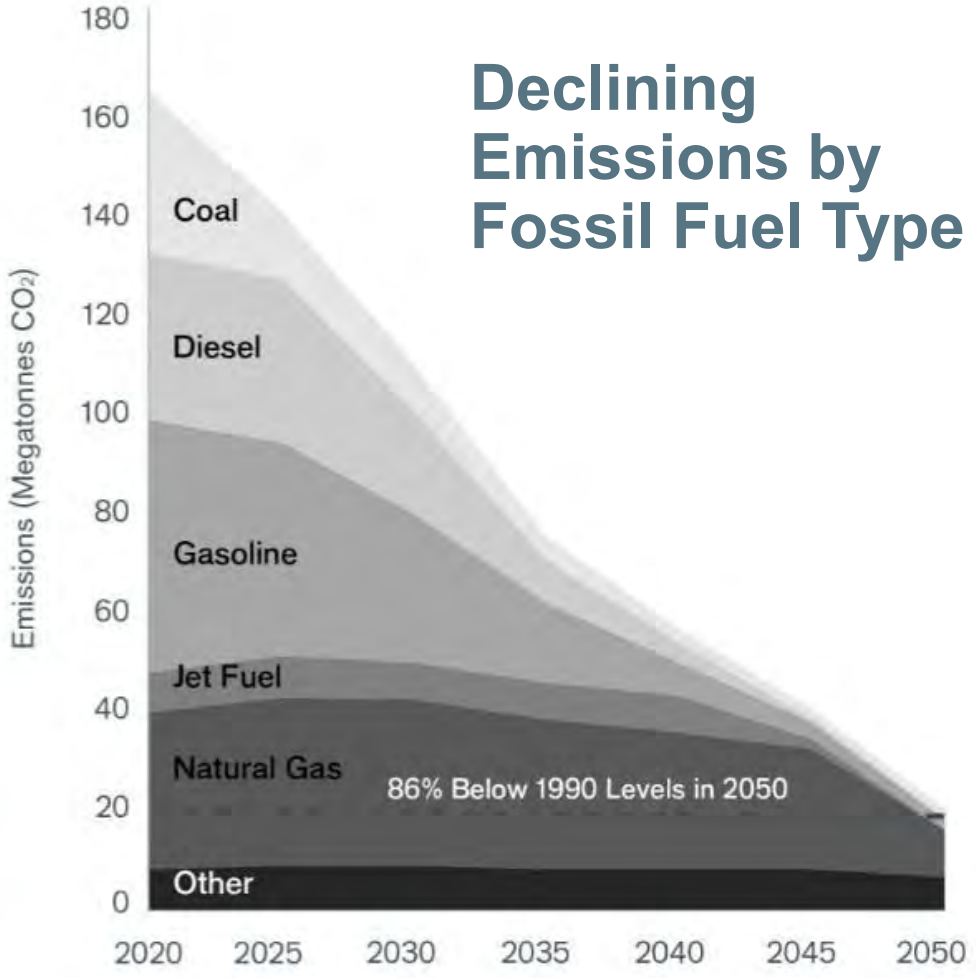


CO_2 Emissions Decrease by State & Fossil Fuel Type

Declining Emissions by State

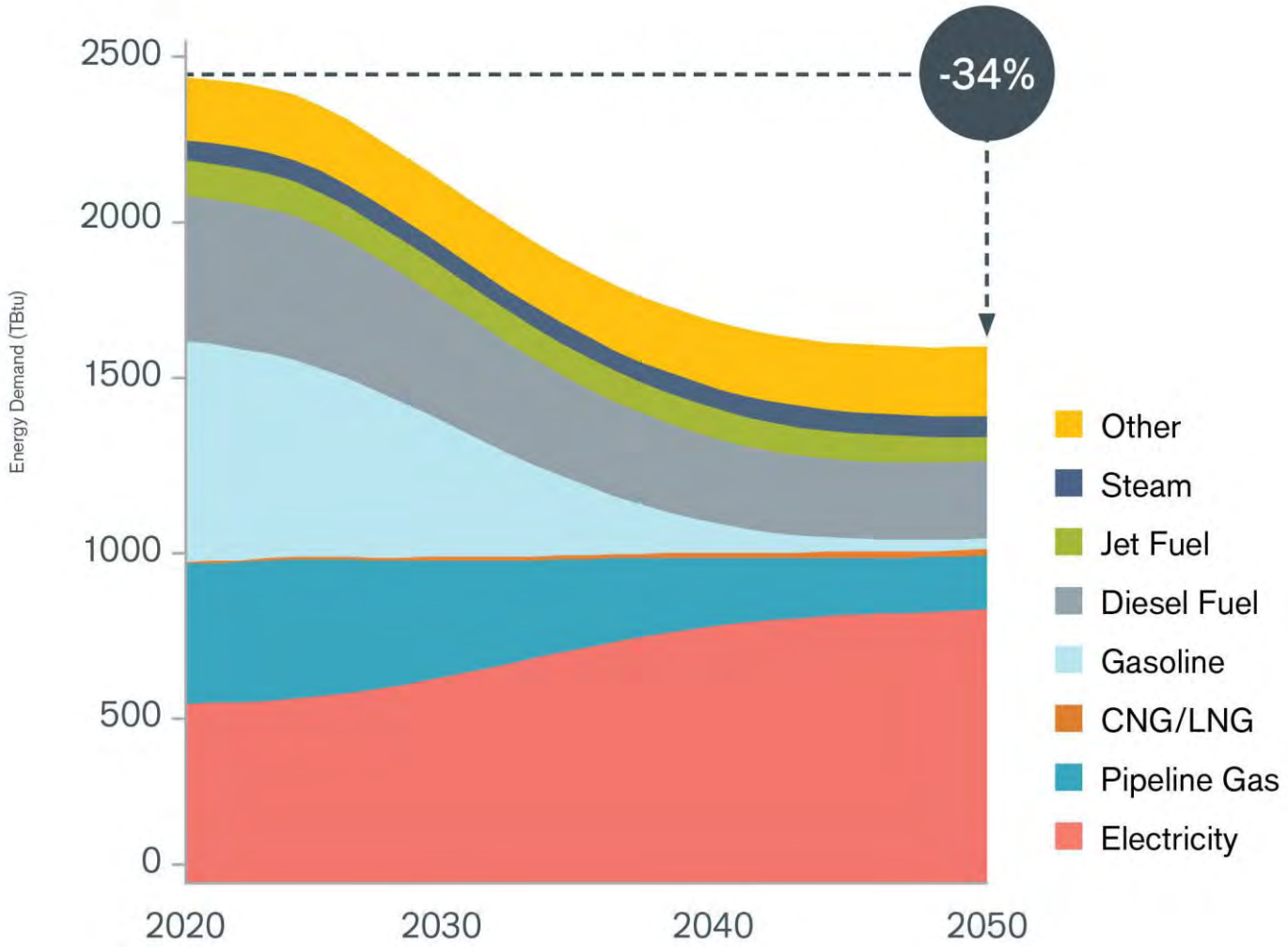


Declining Emissions by Fossil Fuel Type



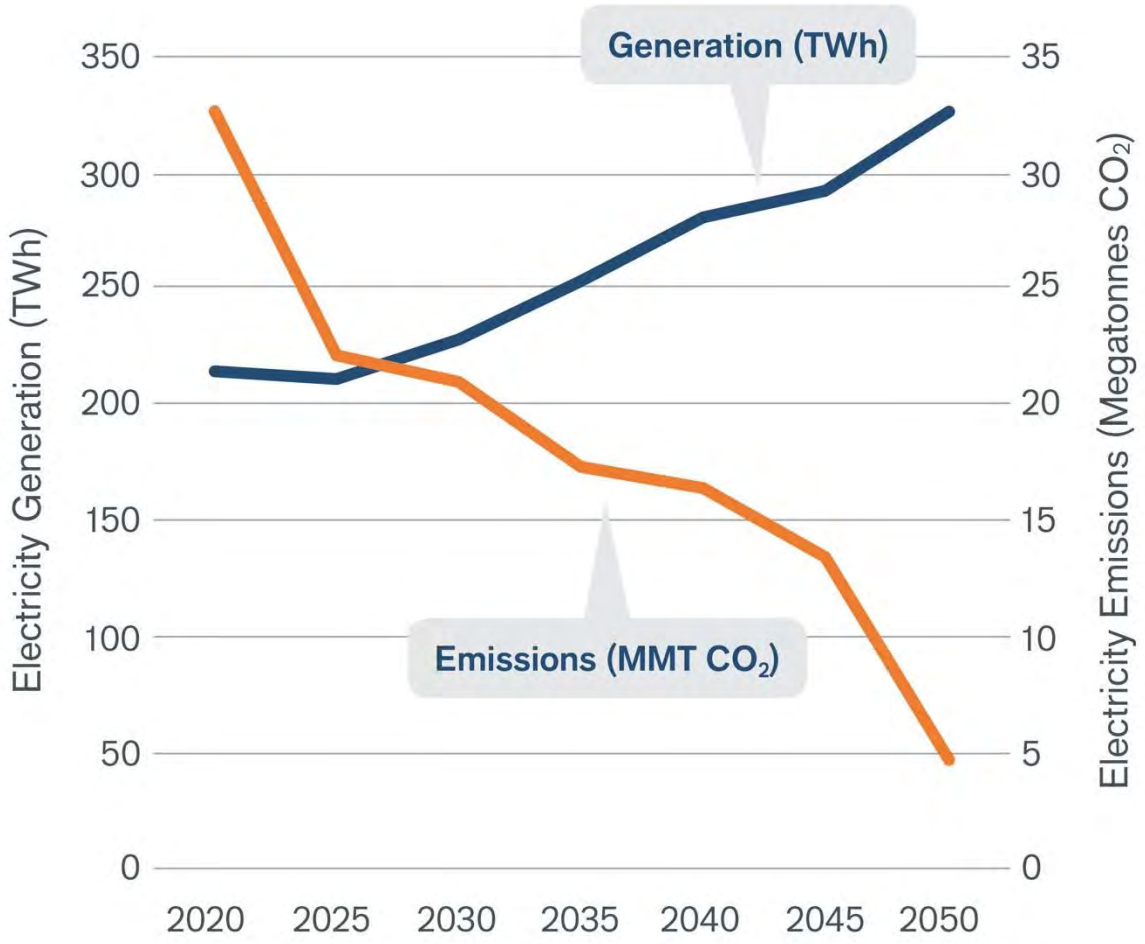
Final Energy Demand

In the Central Case, energy demand is down 34% and electricity consumption is up more than 50% in 2050.



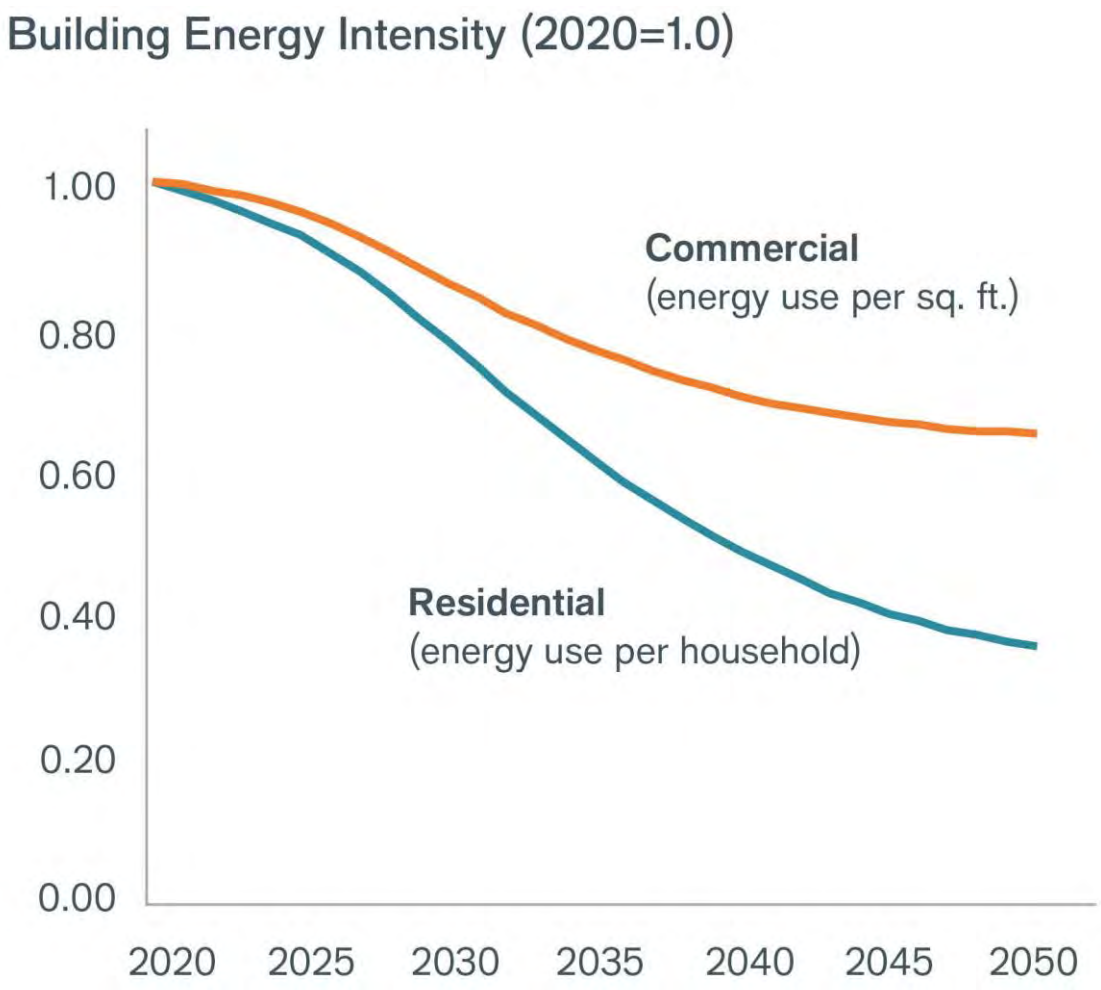
Electricity Emissions & Generation

Electricity emissions decline; electricity generation increases.



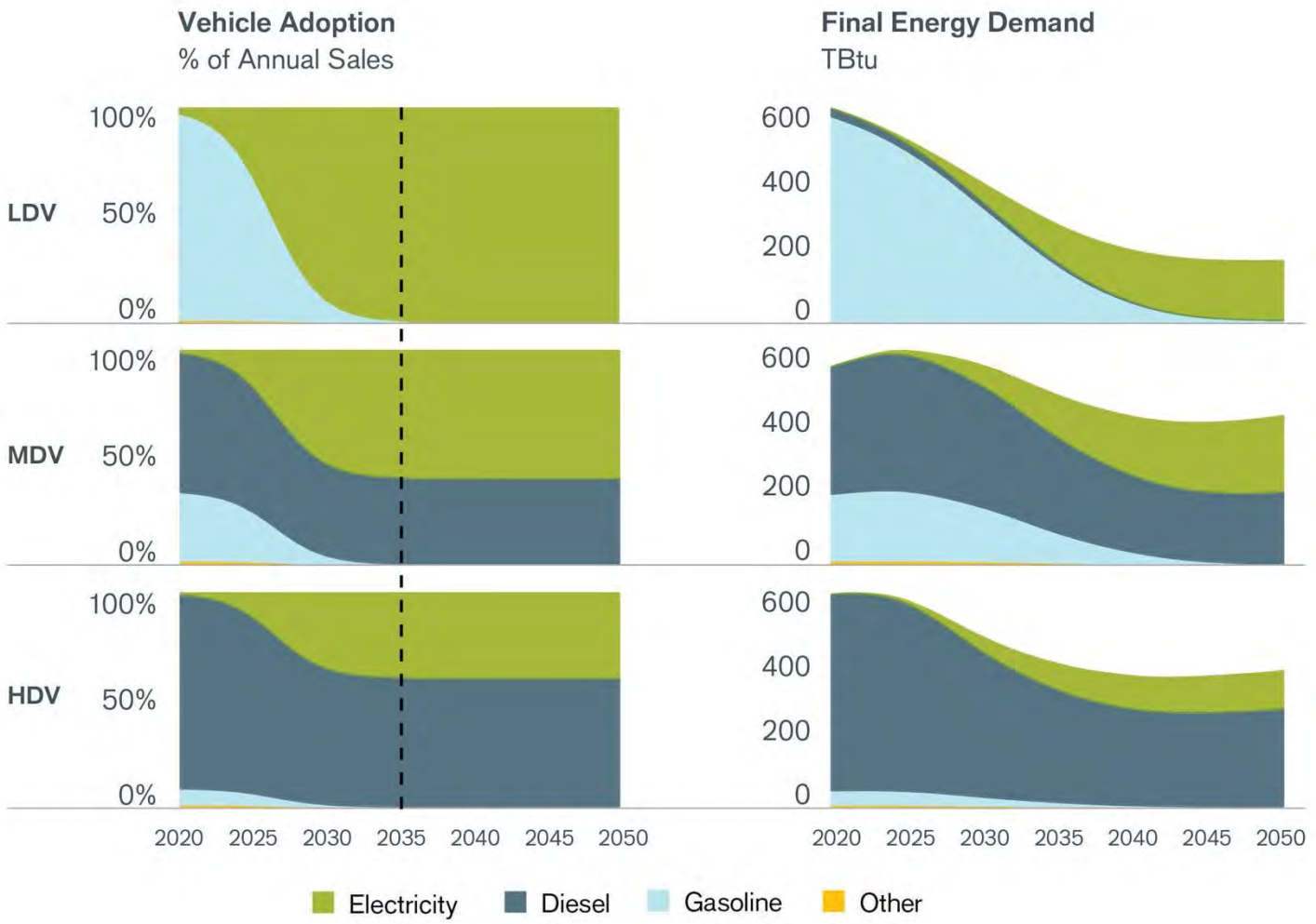
Buildings: Energy Efficiency & Electrification Impacts

Decline in building energy intensity for commercial and residential buildings from 2020 to 2050.



Transportation: Rate of EV Adoption & Fuel Mix

The rate of vehicle adoption as a percentage of annual sales by fuel type from 2020 to 2050 in the Central Case.



Costs

- Cumulative costs of decarbonizing the energy system in the Central Case are 9.5% higher than the capital and operating expenses of the Business as Usual energy system
  - Represents roughly 1% of region's GDP
- Costs for most of the scenarios range from $4B-$11B, with the Central Case's annual net cost $6.1B in 2050
  - However, deep decarbonization is five times more expensive ($32B) if efficiency targets and aggressive electrification are not achieved

Key Findings: Deep Decarbonization Achievable

- **Electricity generation must be ~96% clean**
- **Aggressive vehicle electrification** powered largely by clean electricity is **essential**
- **A highly efficient built environment** powered by clean electricity is also **essential**
- **Thermal generation (natural gas) important for reliability** but operates at low capacity factor in 2050
- **Significant cost savings** if the Northwest and California **grids are better integrated** and modernized

Study Implications for the K4C

- Achieving energy efficiency in all end uses is vital
  - Incentivize developers/HVAC installers to use new efficient green building technologies
- Implementing widespread, regional transportation electrification
  - Critically important to electrify as many transport uses as possible with 100% clean electricity, hence infrastructure is key
- Natural gas must be transitioned out in buildings, transport, and the grid
- Focus on ensuring an equitable transition

Thank you

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