Accelerating Decarbonization in the Northwest

- Eileen V. Quigley—ATG Public Council CAC—September 9, 2021

Agenda

- Clean Energy Transition Institute
- Northwest Deep Decarbonization Pathways Study
- Washington 2021 State Energy Strategy
- Questions and Answers

Clean Energy Transition Institute

- **What We Are:** Independent, nonpartisan Northwest research and analysis nonprofit organization
- **Our Vision:** Accelerate the transition to a clean energy economy in the Northwest
- **Our Role**:
  - Provide unbiased research and analytics
  - Offer an information clearinghouse for policymakers
  - Convene diverse stakeholders

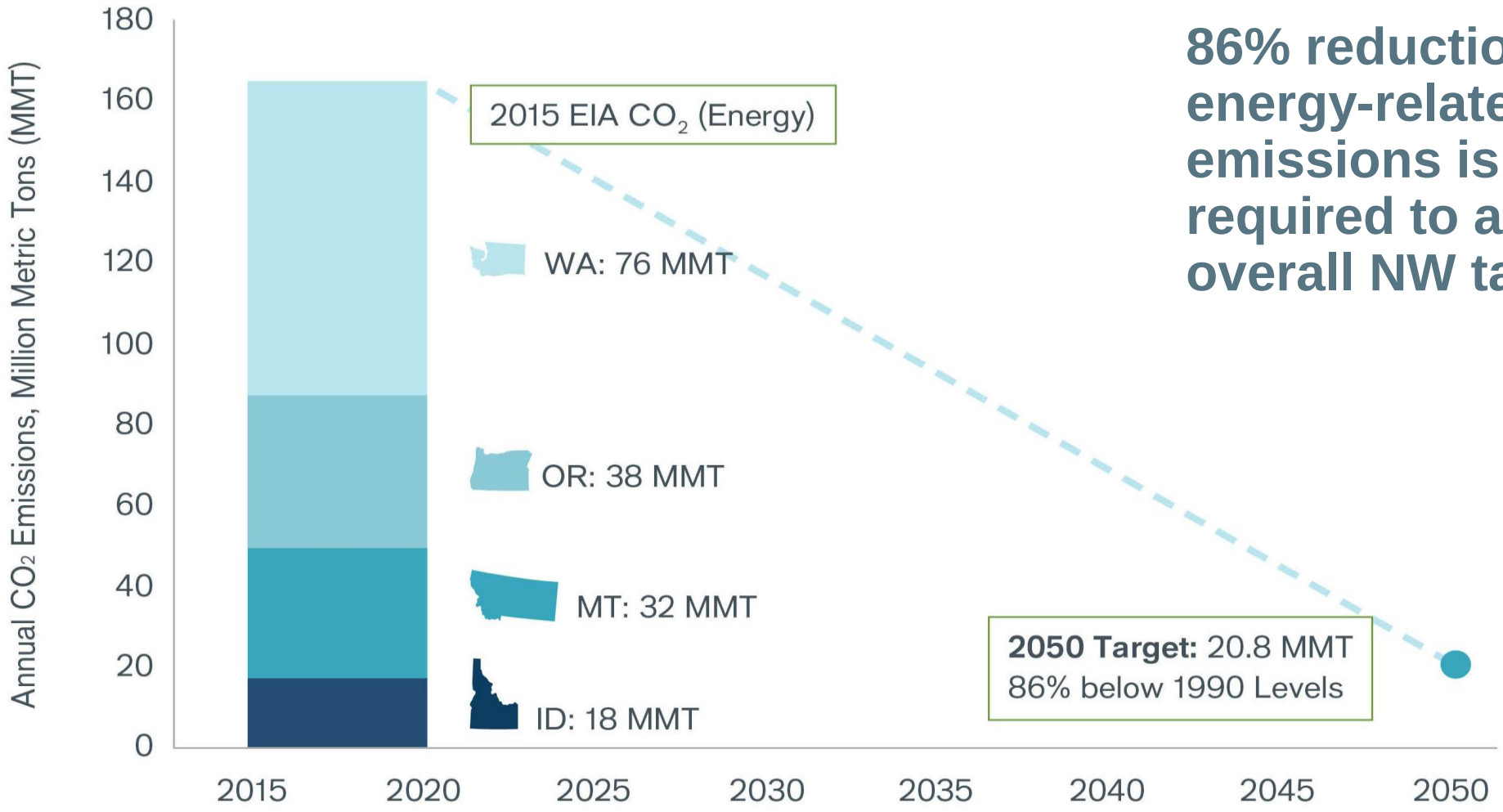
Northwest Deep Decarbonization

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

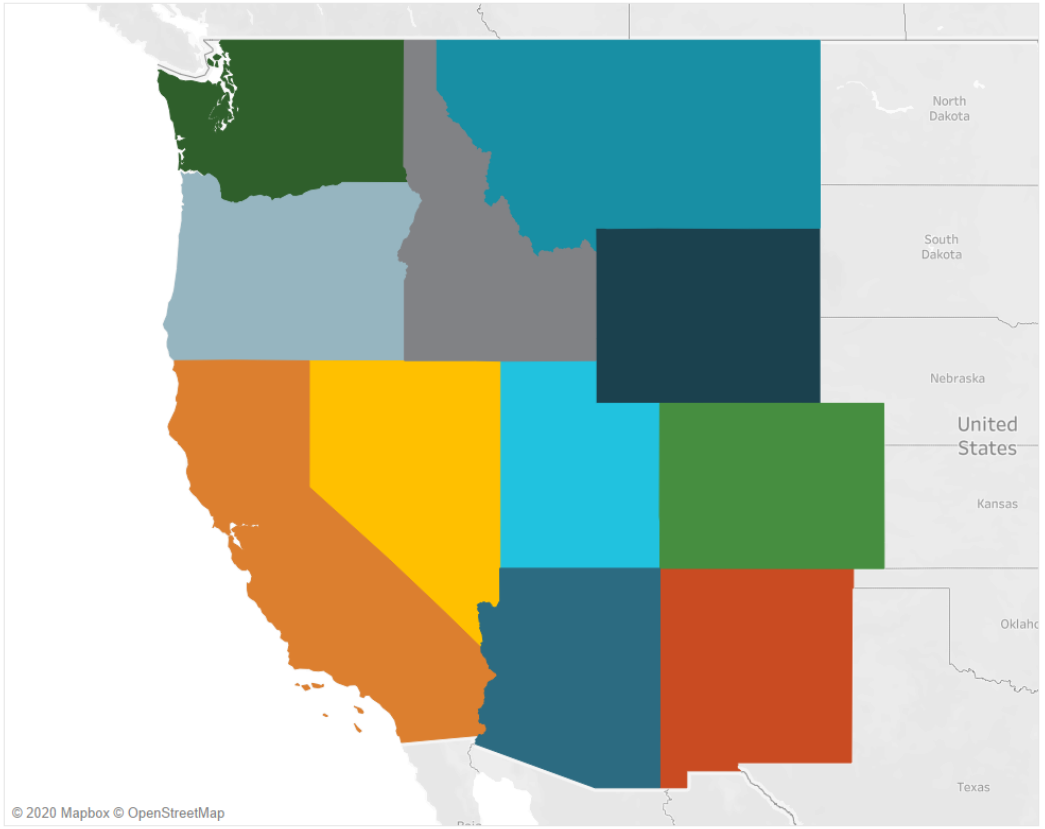
Northwest Deep Decarbonization Target



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

Northwest in the Context of a Western Grid

- Wholistic Approach
  - Integrated across geographies and economic sectors
- Regional Representation
  - Other state's actions impact the availability and cost of solutions
  - 11 Western states
- Remainder of the U.S. also modeled



What Did We Want to Know?

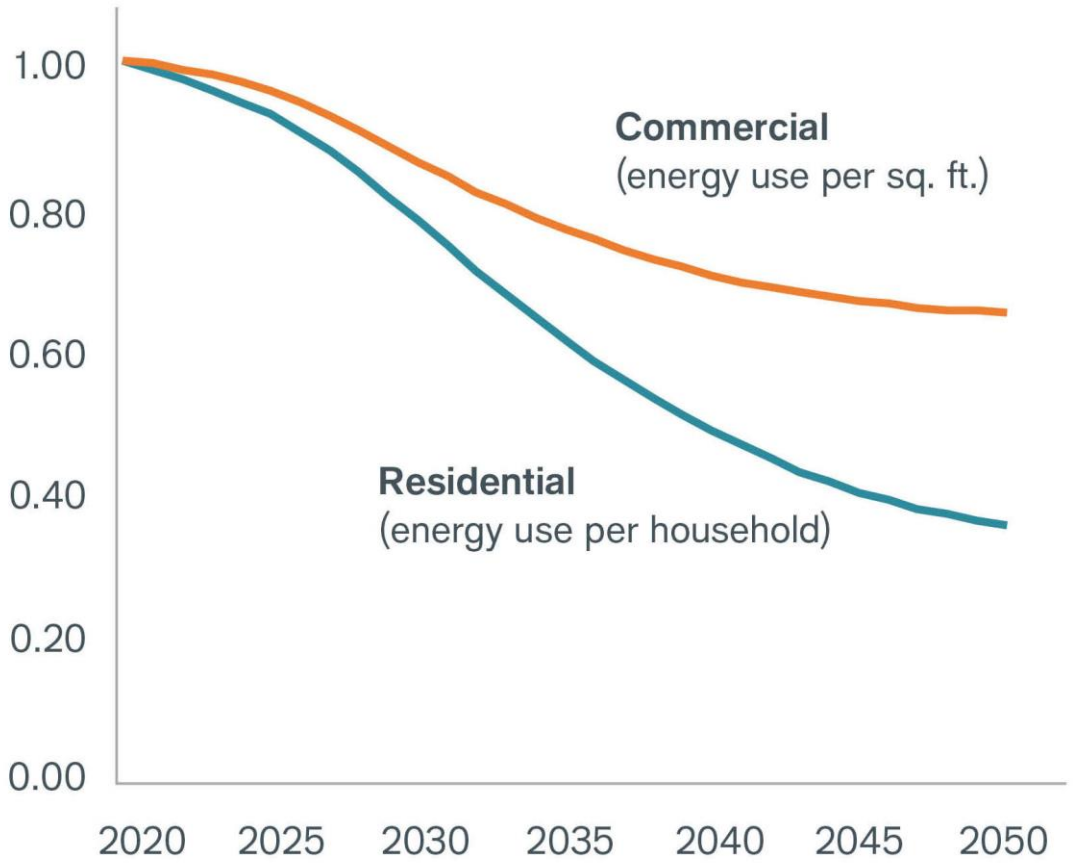
- How do we get to a 100% Clean Grid quickly?
- How do we avoid outages with intermittent supply and changing demand?
- How much and how fast can we electrify?
- How do we manage the cost impacts, overall and for different customers?
- What business and regulatory models and markets are needed?

What Did We Learn?

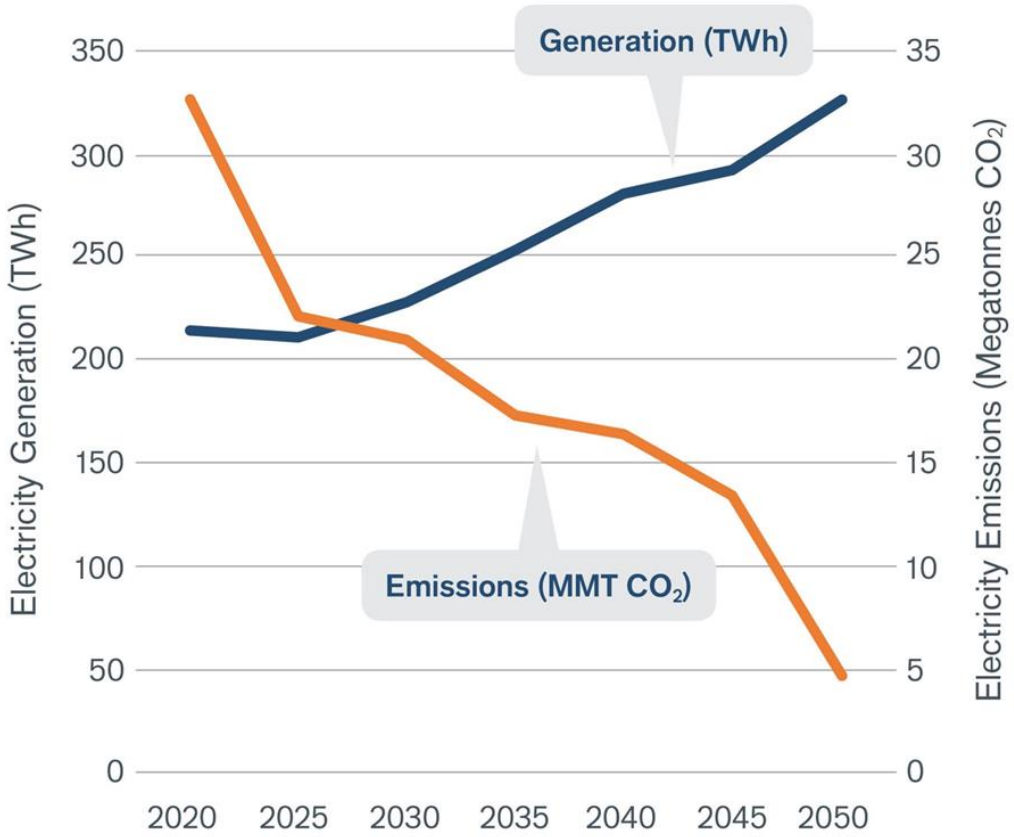
- ~96% clean Electricity
- Clean electricity + highly efficient buildings
- Clean electric vehicles where possible
- Some, but not much, fossil fuel (natural gas) important for reliability and transition
- Improved regional transmission and integration
- Biomass should be used to replace jet & diesel fuel
- Fuels made from electricity will play important role

Deep Efficiency & Clean Electricity Fundamental Pillars

Building Energy Intensity (2020=1.0)



Generation increases 53%, emissions decline by 86%.

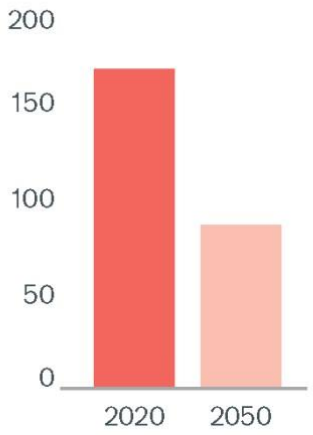


Pillars of Deep Decarbonization

1 Energy Efficiency

Reducing energy consumed to provide energy services

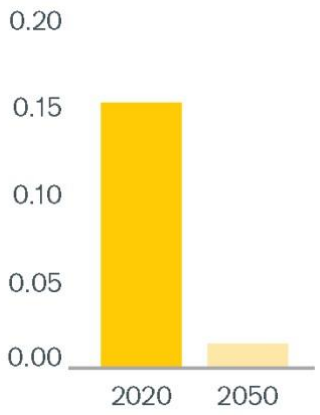
Energy Consumption Per Person (MMBtu)



2 Clean Electricity

Reducing the emissions intensity of electricity generation

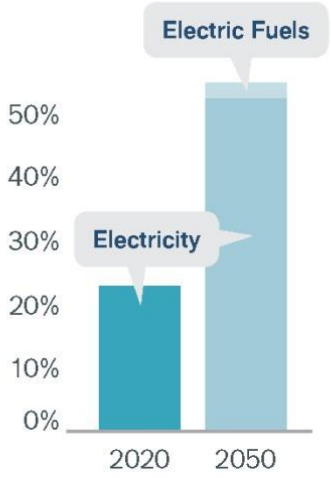
Electricity Carbon Intensity (tonnes CO_2 per MWh)



3 Electrification

Switching end uses from fuel to electricity

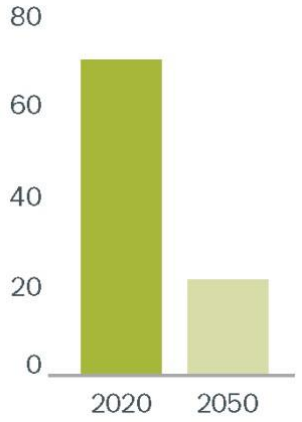
Electricity Share of Total Energy (percentage)



4 Low-Carbon Fuels

Reducing the emissions intensity of liquid and gaseous fuels

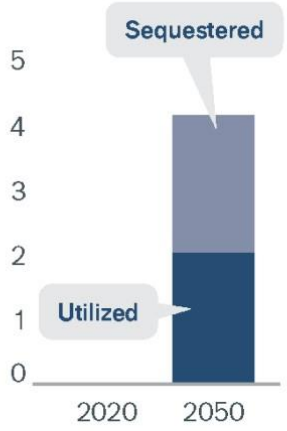
Fuels Carbon Intensity (kg CO_2 per MMBtu)



5 Carbon Capture

Capturing CO_2 from a facility or removing CO_2 from the atmosphere

Carbon Capture (Megatonnes CO_2)



Key Issues and Challenges the NWDDP Highlighted

- **100% Clean Grid**: How to deploy required renewables, transmission, storage, gas?
- **Reliability, Capacity & Resource Adequacy**: How to avoid outages with intermittent supply and variable demand?
- **Electrification**: How much, how fast? What happens to demand and how to manage it?
- **Affordability**: How to manage the cost impacts, overall and for different customer groups?
- **Business/Regulatory Models/Markets**: What is needed for the transition?

Equity and Workforce Implications

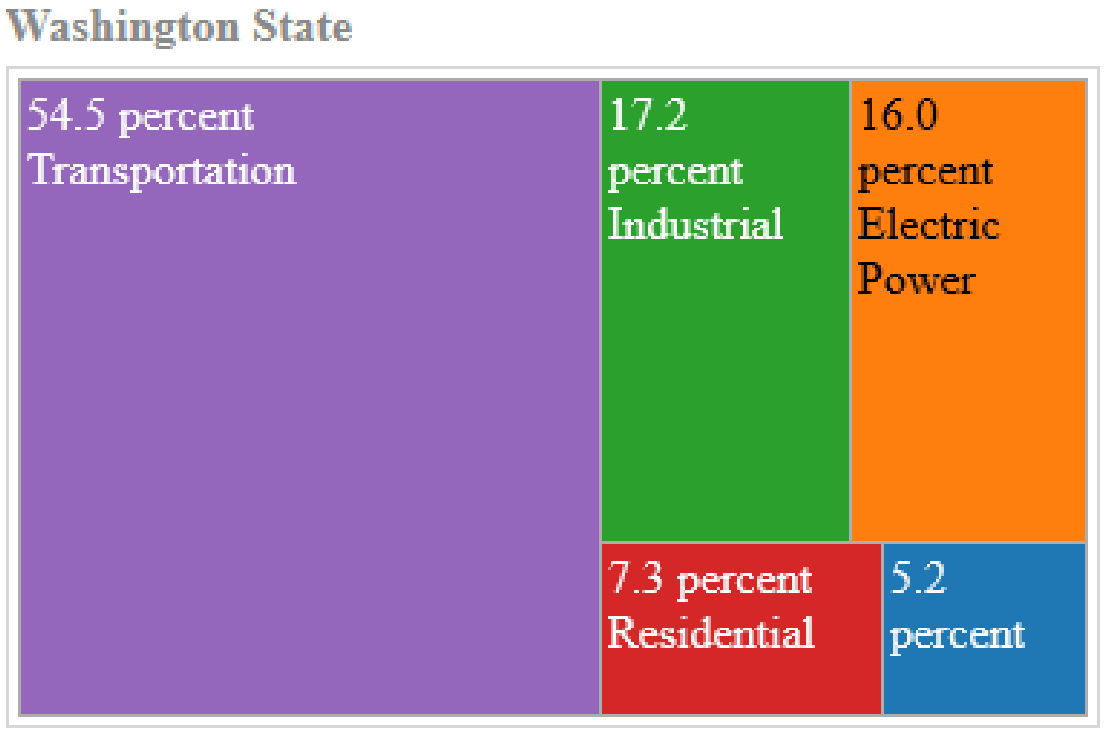
- Regional equity (rural vs. urban)
- Addressing existing environmental/racial justice inequities
- Who makes the decisions about cost distribution and who benefits?
- What jobs are gained, and which are lost?
- How are people compensated for loss?

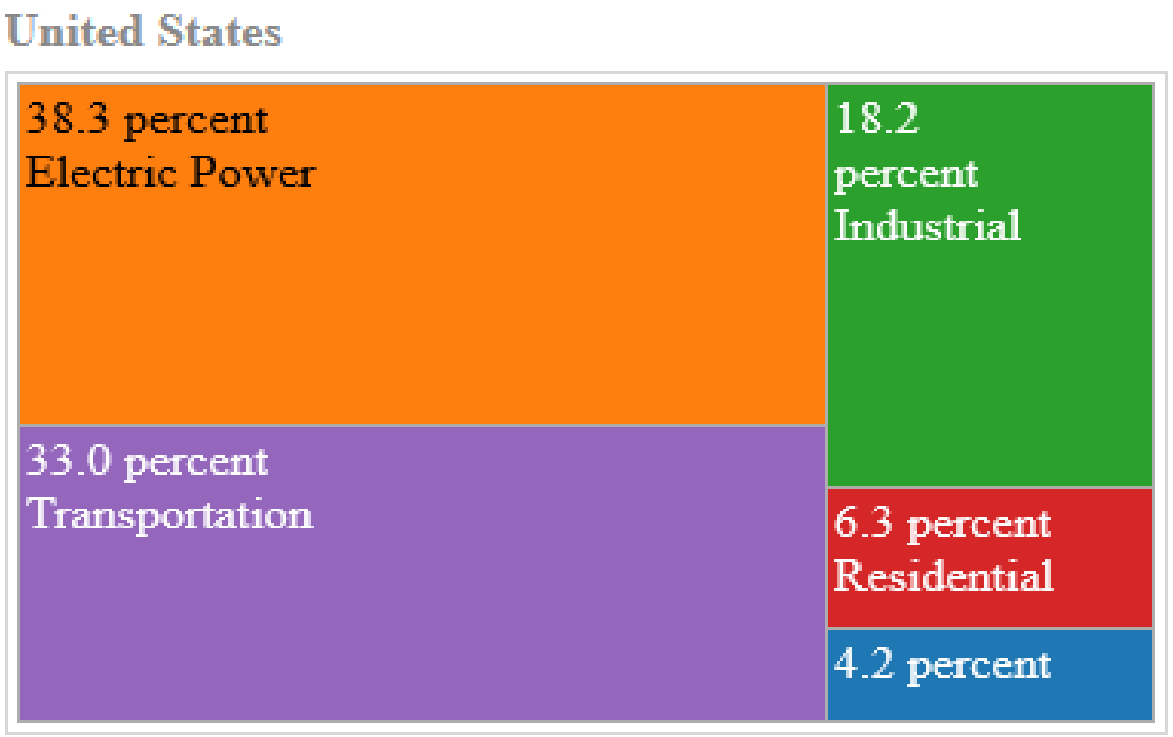
State Deep Decarbonization

Washington State Legislature Direction

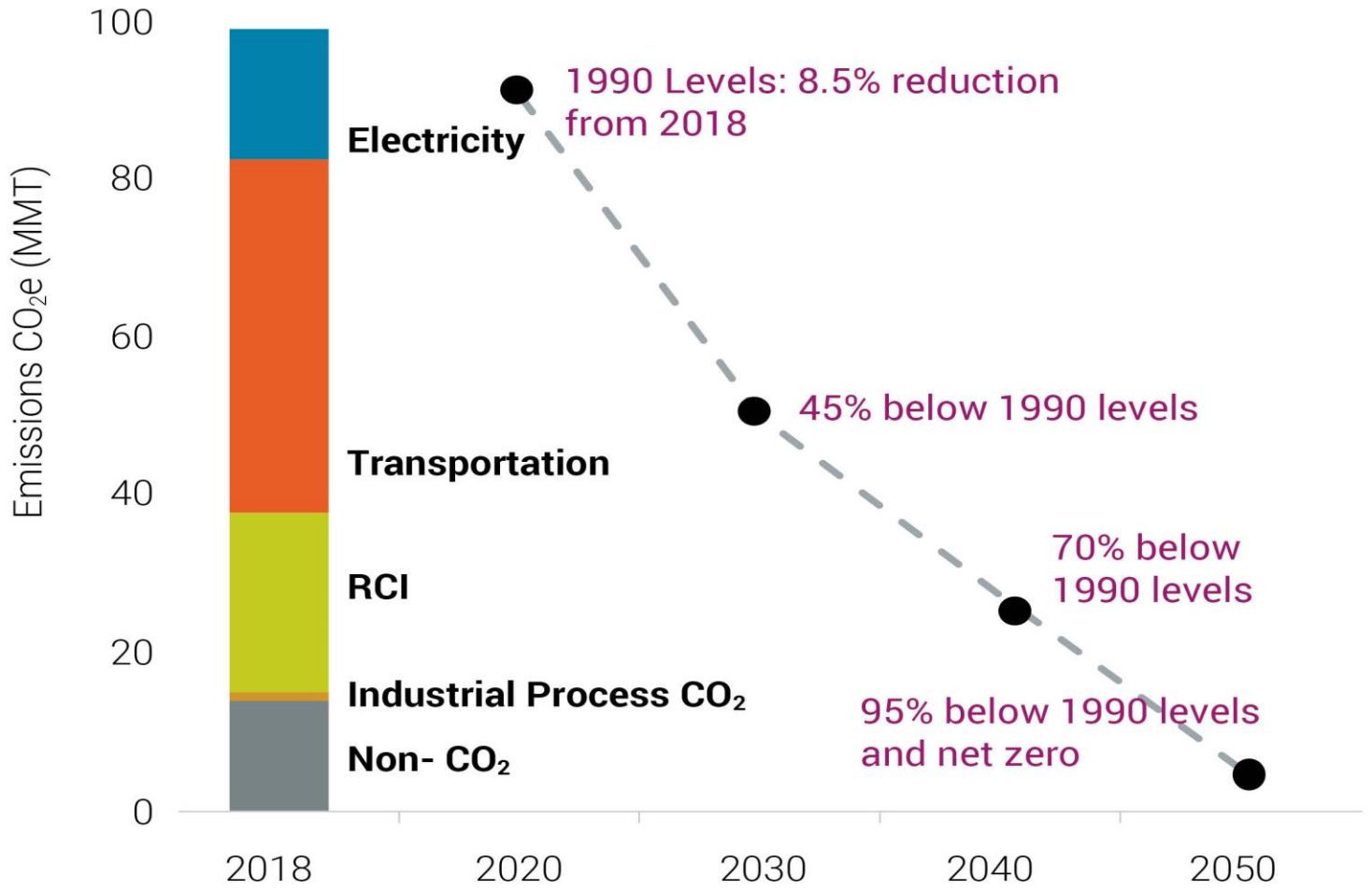
- Maintaining reasonable and **fair prices** and **sufficient supply** of energy
- Promoting a **competitive clean energy economy** and workforce development
- Understanding and addressing the needs of **low-income and vulnerable populations**
- Reaching and responding to both **urban and rural** communities

Washington's Very Clean Electric Grid





Transforming Washington's Energy System



Source: Washington State Department of Ecology and Washington State.
Appendix A –Deep Decarbonization Pathways Modeling Technical Report, December 11, 2020 (p. 15).

Washington State's 2030 Challenge:

- ***53% Reduction in Emissions in less than a decade***

What Did We Want to Know?

- **What is the impact of rapid and aggressive electrification** of energy systems?
- **What if we don't** electrify transportation as quickly as required?
- **What happens if we retain gas** instead of electrifying buildings?
- **What if transmission expansion is limited** due to siting or permitting?
- **What if policies or behavior change** (i.e., more telecommuting after Covid) lower demand?

Sector Results and Strategies

Clean Energy Transition Institute

BLOG | PROJECTS | RESOURCES | ABOUT | SEARCH

- All Projects
- Washington 2021 State Energy Strategy Technical Advisory Process
- Oregon Clean Energy Pathways Modeling
- Montana Governor's Climate Solutions Council
- Decarbonizing Buildings with An Equity Focus
- Northwest Clean Energy Atlas

CLEAN ENERGY TRANSITION INSTITUTE

Independent, nonpartisan Northwest research and analysis nonprofit organization dedicated to accelerating the clean energy transition in the Northwest.

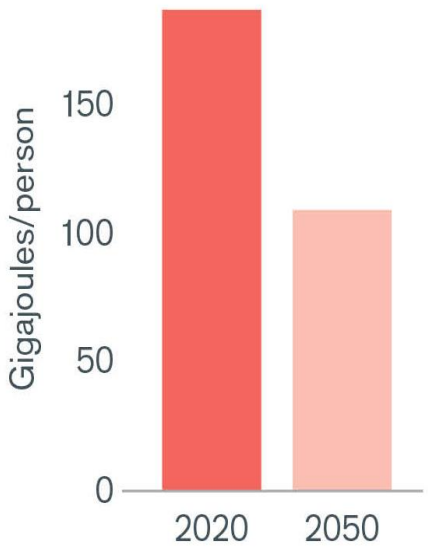
ABOUT THE INSTITUTE

The Clean Energy Transition Institute's Role is to:

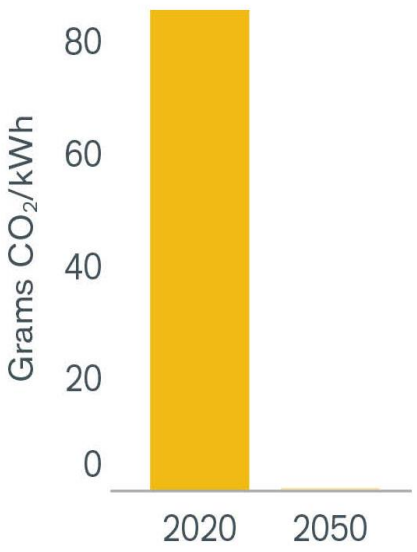
- Conduct Research and Analysis
- Serve as an Information Clearinghouse
- Convene Stakeholders

Washington Deep Decarbonization Pathways

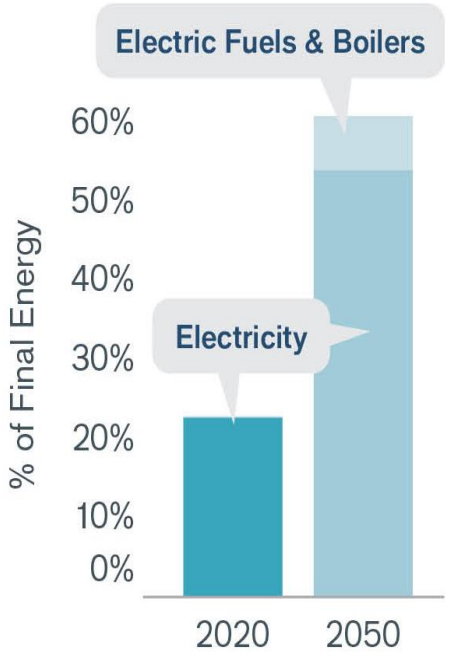
Energy Efficiency
Energy Consumption
(Gigajoules/person)



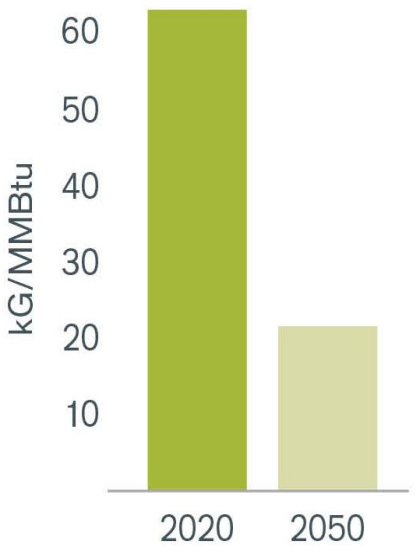
Clean Electricity
Electricity Carbon Intensity
(Grams CO_2 per kWh)



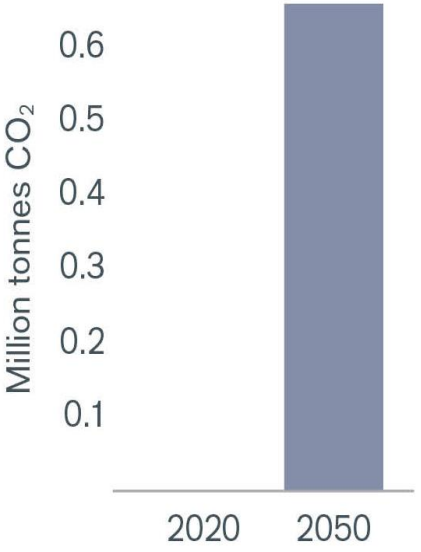
Electrification
Electricity Share of Total Energy
(% of Final Energy)



Clean Fuels
Fuels Carbon Intensity
(kG/MMBtu)



Carbon Sequestration
(Million tonnes CO_2)



Clean Electricity

97%

growth in electricity end use demand over 2020 levels by 2050

43%

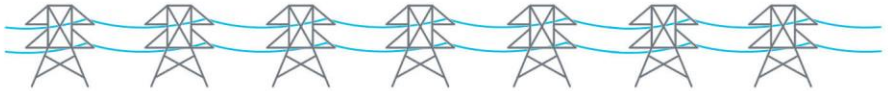
of electricity imported by 2050

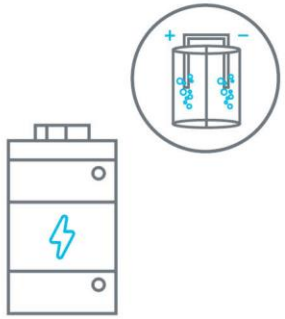
36%

from WY & MT wind

100%

renewable/non-emitting electricity by 2045





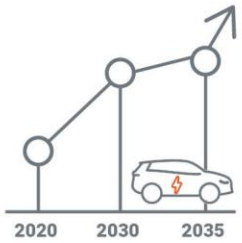
19%

of total electricity demand from electric boilers and electrolysis by 2050

Clean Transportation

43%

improved vehicle efficiency by 2050



100%

electric vehicle sales by 2035

NEARLY 100%

electric vehicle stock by 2050

All transportation fuels

100%

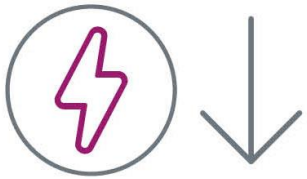
decarbonized by 2050

HEAVY DUTY VEHICLE STOCKS

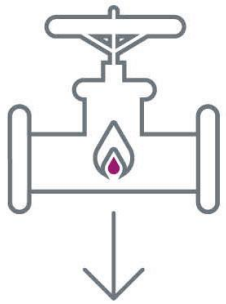
majority electric and hydrogen by 2050

Clean Buildings

ENERGY EFFICIENCY reduces building energy load by 26% in 2050



26%



84%

less pipeline gas used for residential heating in 2050

64%

electric water heating in **2030**

100%

electric water heating in **2050**

64%

electric space heating in **2030**

82%

electric space heating in **2050**

Low-Carbon Industry Sector

1% per year improvement in energy intensity across industrial subsectors

REFINING IN WASHINGTON ASSUMED TO DROP BY

75%

by 2050 from reduced fossil fuel demands

Fuel switching to electricity by 2050 in:

50% of process heating

100% of machine drives

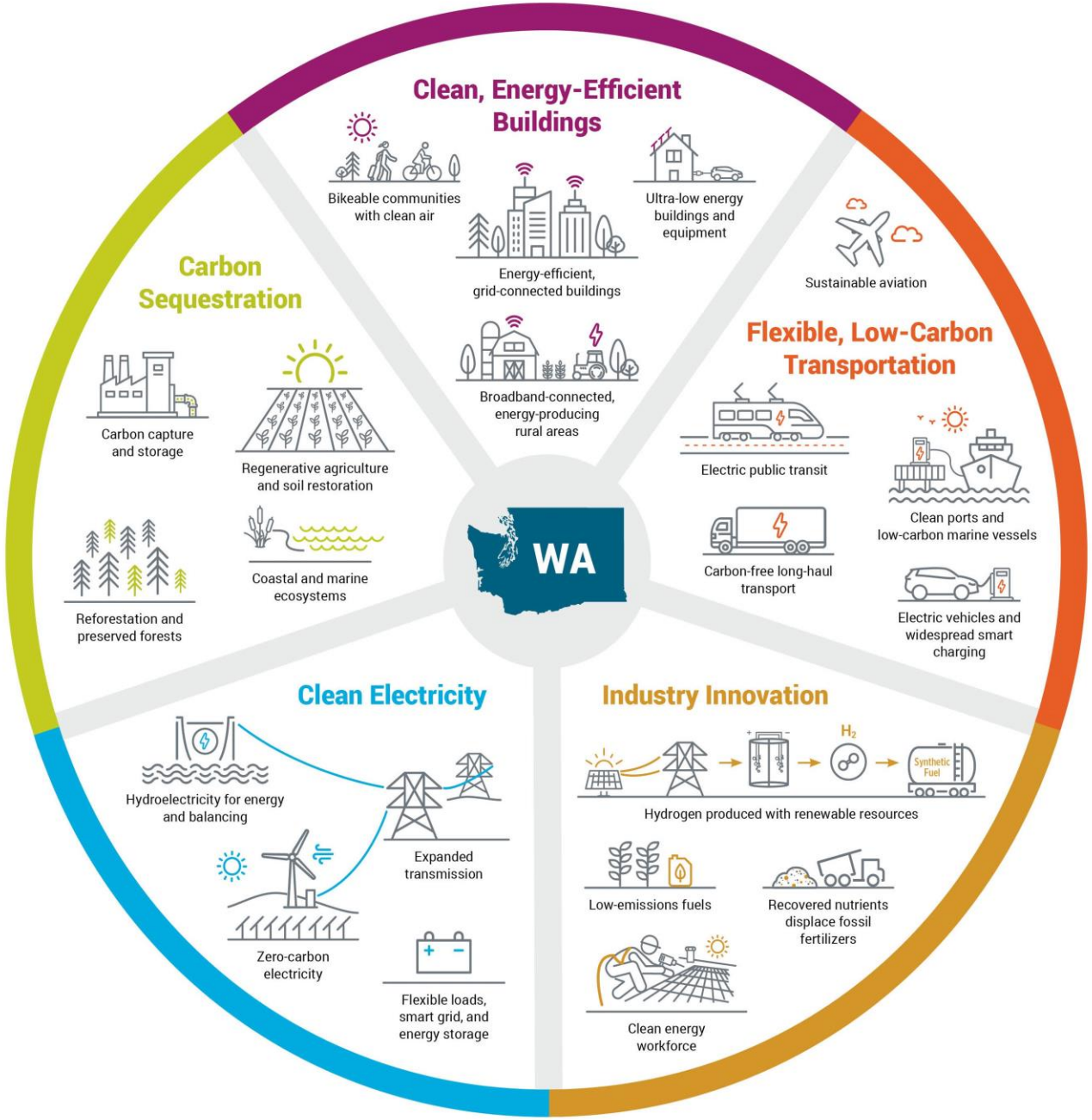
75% of building heating and cooling in industry

What Did We Learn?

- **To Meet the State's 2030 GHG Targets**
  - Deep energy efficiency to reduce energy use
  - Clean electricity grid by 2030
  - Electrifying as many energy end uses as practical
  - Accelerating clean fuels industry critical
  - Regional approach required

Washington Net-Zero Vision

A blueprint for how we can meet our state's climate goals to nearly eliminate the use of climate-threatening fossil fuels by 2050, while growing a prosperous economy and maintaining affordable and reliable energy supplies.



Can We Get There?

Urgency, Scale, Action, Policy

Bill McKibben: Winning Slowly Is the Same as Losing

The technology exists to combat climate change – what will it take to get our leaders to act?

Thank you very much!

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https://www.cleanenergytransition.org

Questions & Answers