



Accelerating Decarbonization in the Northwest

Stoel Rives Climate Change Working Group

▶ Eileen V. Quigley—January 26, 2022

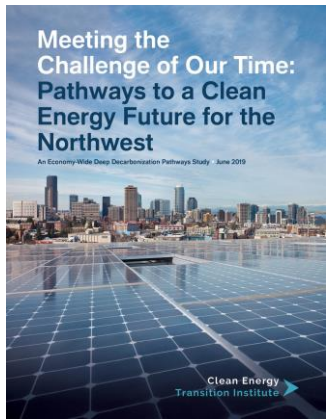
Clean Energy Transition Institute

- ▶ **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



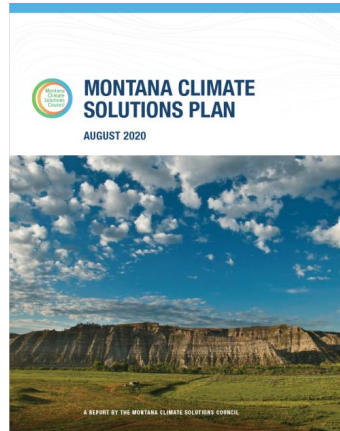
Research and Analytics to Support Policymakers

2019



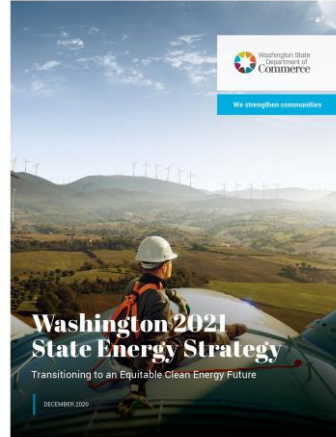
- First economy-wide deep decarbonization study mapped to the Northwest’s economic & institutional realities
- First regional decarbonization study in nation

2020



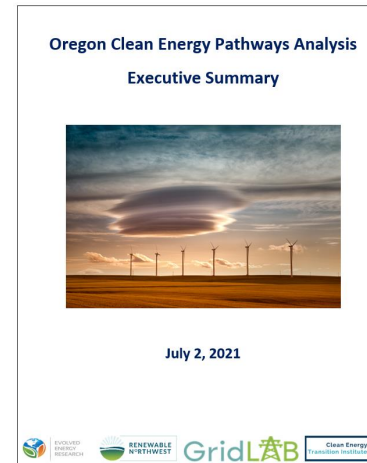
- Provided technical analysis for a chapter in the Montana Climate Solutions Council Plan
- Presented to Montana stakeholders in 2019, 2020, & 2021

2021



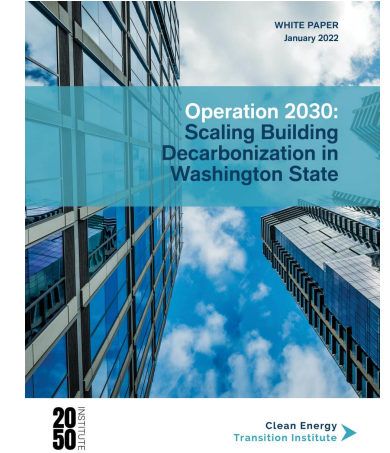
- Provided technical and economic analysis for the 2021 Washington State Energy Strategy
- Roadmap to get WA on the path to net zero over next decade

2021



- Examined technical and economic implications of accelerating decarbonization in OR
- Results informed 2021 OR clean energy standard bill

2022

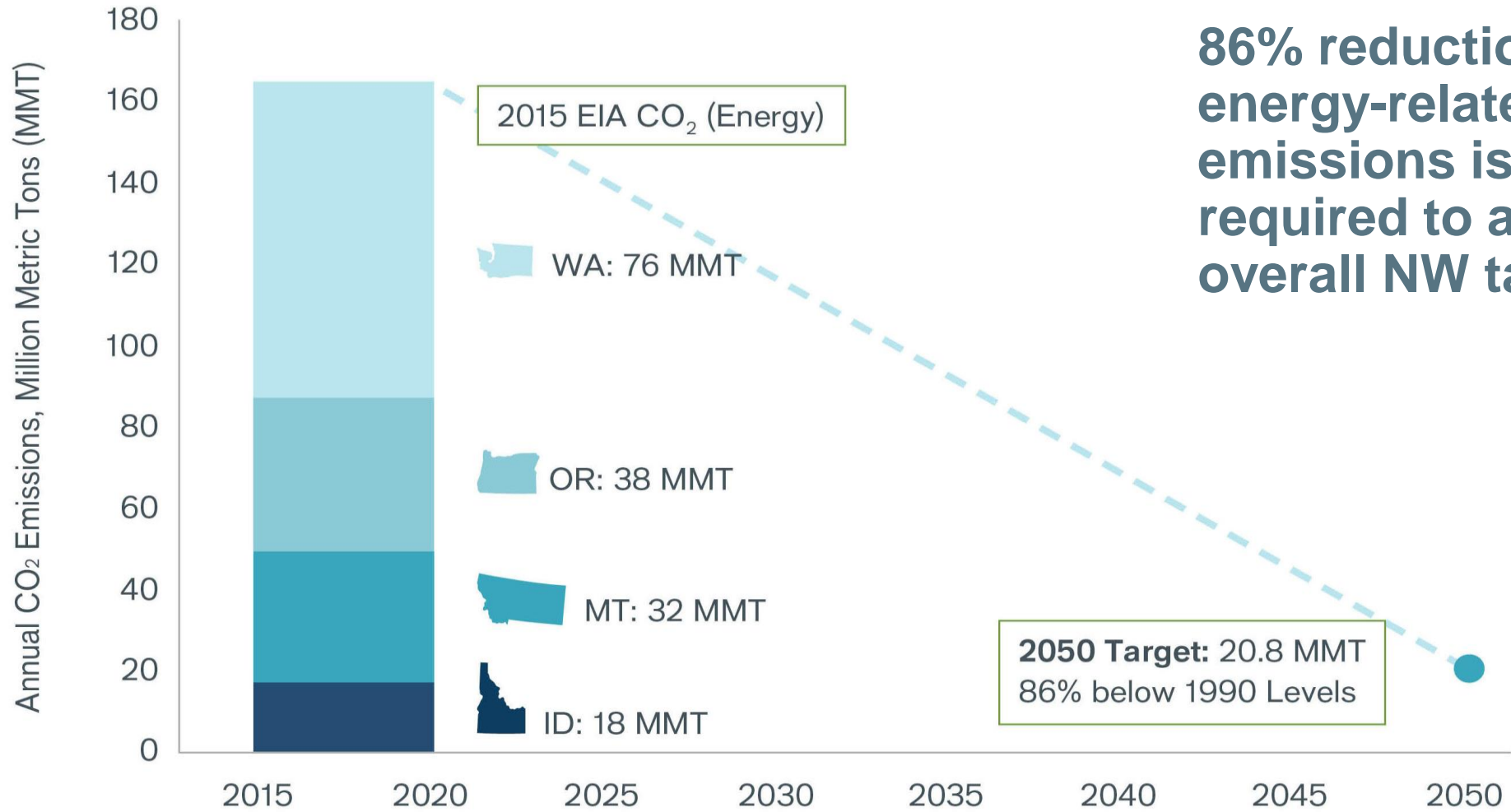


- Charts the targets and requirements for how Washington can scale building decarbonization by 2030
- Released January 5, 2022



Northwest Deep Decarbonization Pathways Study—June 2019

Northwest Deep Decarbonization Target

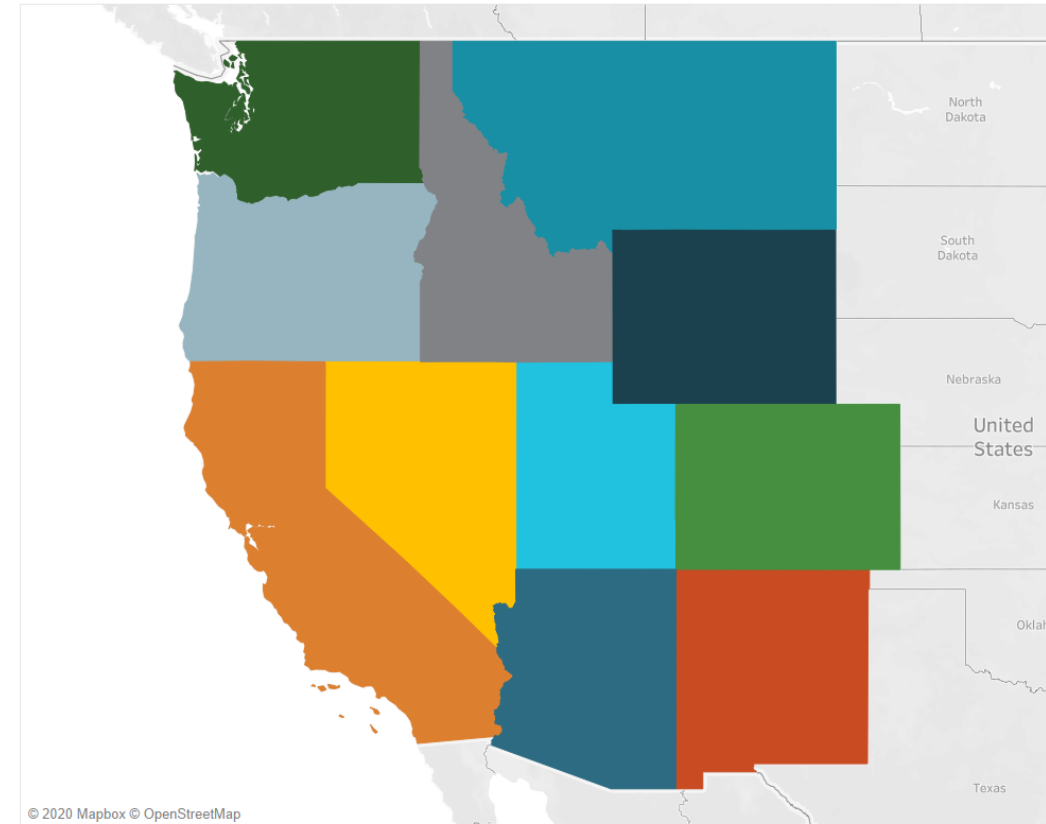


86% reduction in energy-related CO₂ emissions is required to achieve overall NW target.

2050 Target: 20.8 MMT
86% below 1990 Levels

Northwest in the Context of a Western Grid

- Holistic 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

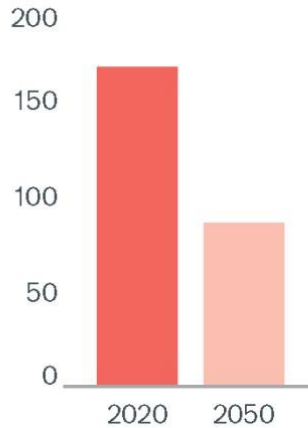


Pillars of Deep Decarbonization

1 Energy Efficiency

Reducing energy consumed to provide energy services

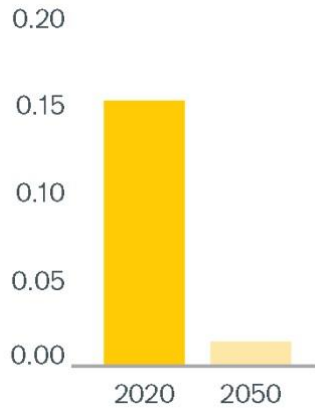
Energy Consumption Per Person (MMBtu)



2 Clean Electricity

Reducing the emissions intensity of electricity generation

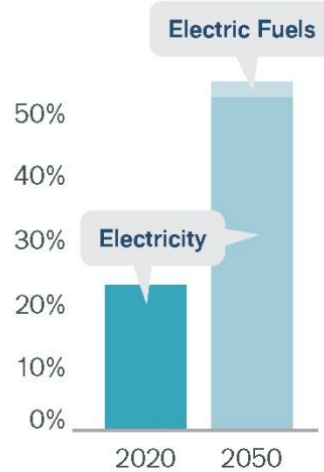
Electricity Carbon Intensity (tonnes CO₂ per MWh)



3 Electrification

Switching end uses from fuel to electricity

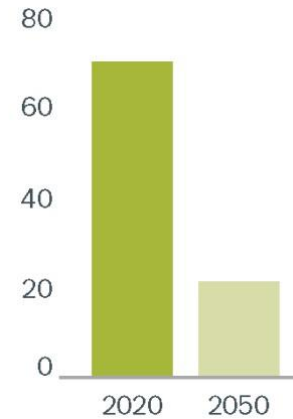
Electricity Share of Total Energy (percentage)



4 Low-Carbon Fuels

Reducing the emissions intensity of liquid and gaseous fuels

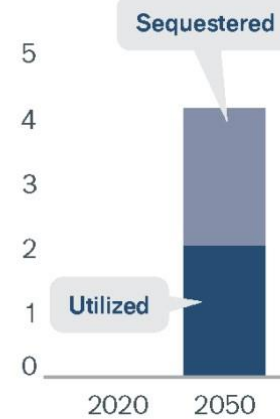
Fuels Carbon Intensity (kg CO₂ per MMBtu)



5 Carbon Capture

Capturing CO₂ from a facility or removing CO₂ from the atmosphere

Carbon Capture (Megatonnes CO₂)

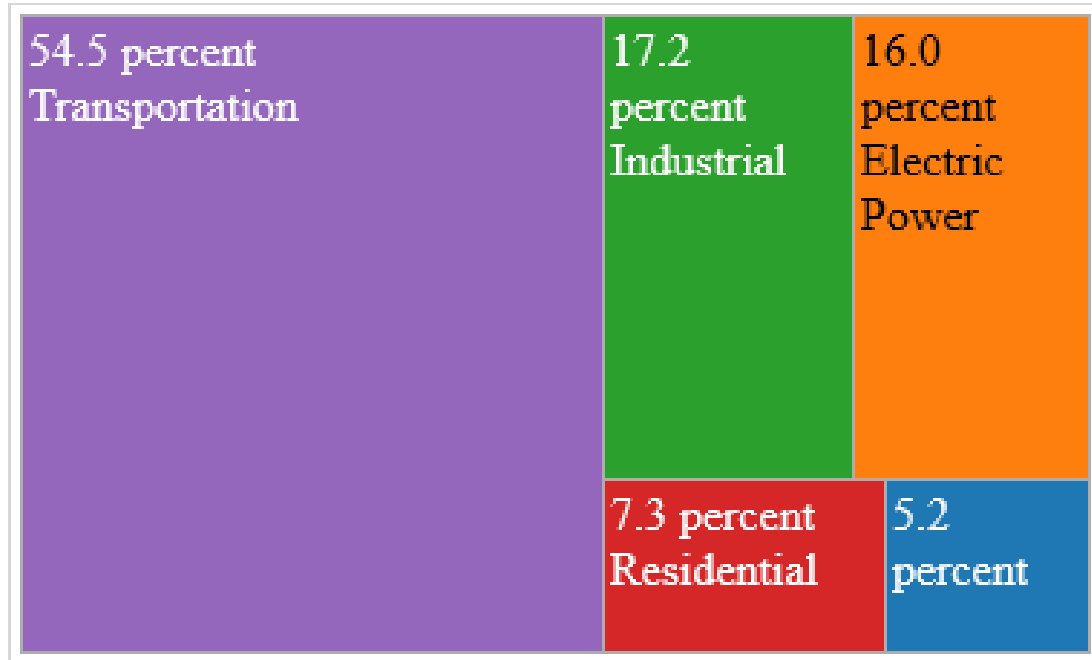


Washington State Energy Strategy—December 2020

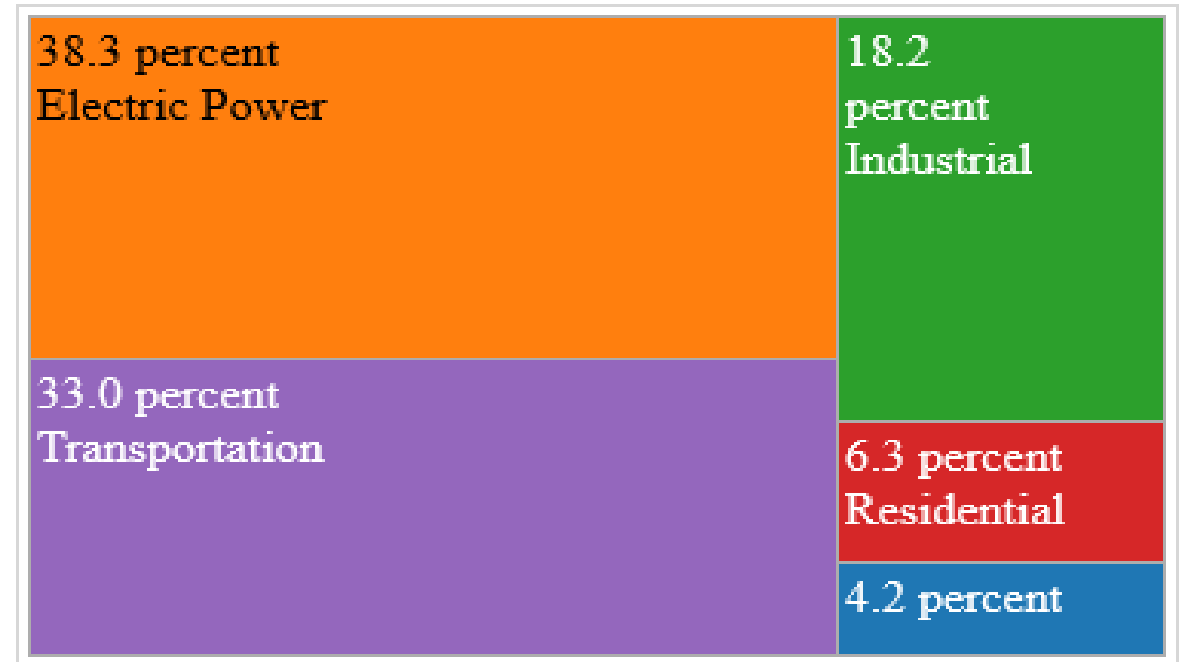


Washington's Very Clean Electric Grid

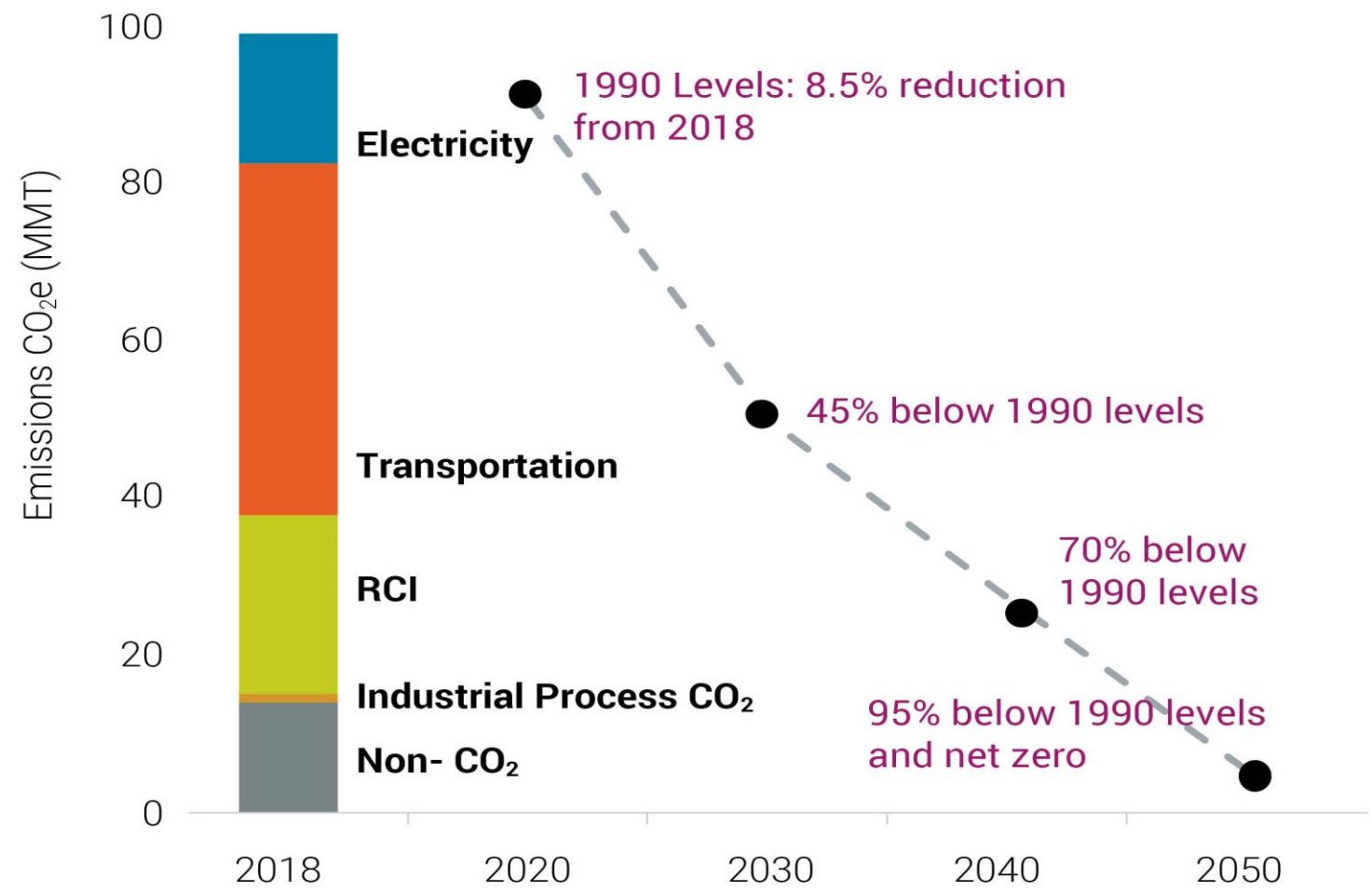
Washington State



United States



Transforming Washington's Energy System



Washington State's 2030 Challenge:

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

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

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?**



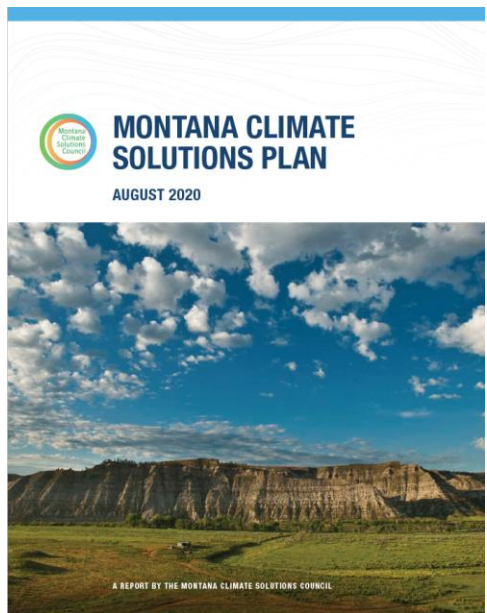
What Did We Learn?

- **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



Montana Climate Solutions Council September 2020

Montana Deep Decarbonization Modeling




- Presented NWDDP results to MT. Gov. Bullock’s Climate Solutions Council
- Worked with Governor’s team to model Montana-specific results
- Incorporated into the Montana Solutions Plan
- Announced September 9, 2020




Oregon Clean Energy Pathways January-July 2021

Oregon Clean Energy Pathways Study

Oregon Clean Energy Pathways Analysis
Executive Summary



July 2, 2021



- Study examined technical and economic implications of accelerating decarbonization in Oregon
- Results informed policymakers during 2021 Oregon legislature
- June 2021 passed clean energy standard with one of fastest timelines for eliminating power sectors in the country



CETI 2022 Programs



2022 Strategic Focus

➤ **Pathways**

- Northwest Deep Decarbonization Pathways Study v.2

➤ **Economics & Equity**

- Regional and distributional impacts of the transition; jobs

➤ **Solutions**

- Building sector decarbonization; industrial process emissions; aviation and marine; natural climate solutions

➤ **Communications**

- Demystifying decarbonization solutions to accelerate action



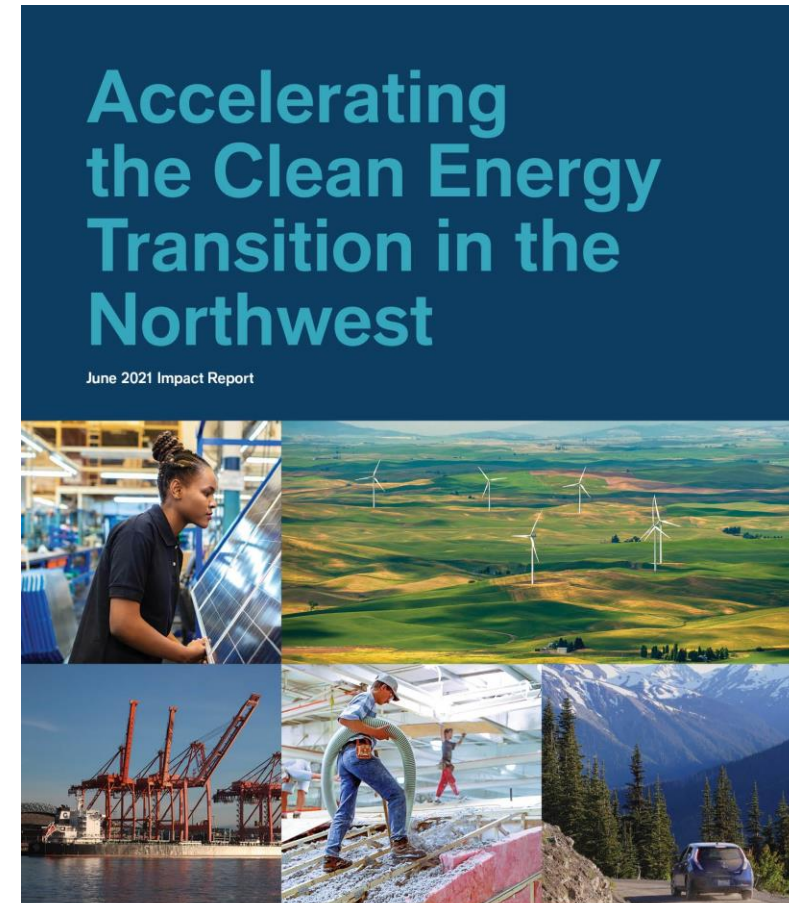
Current Institute Programs

- **Operation 2030**
 - Scaling building decarbonization in Washington state
- **Rural Equitable Building Decarbonization**
 - Research/pilot project equitable rural building decarbonization
- **Northwest Clean Energy Atlas**
 - Interactive dashboard of decarbonization visualizations in the Northwest
- **Claiming Power**
 - Video stories of rural clean energy
- **Clean Industry Summit**
 - Working Groups (Mar-May); Summit (June)



Clean Energy Transition Impact 2018-2021

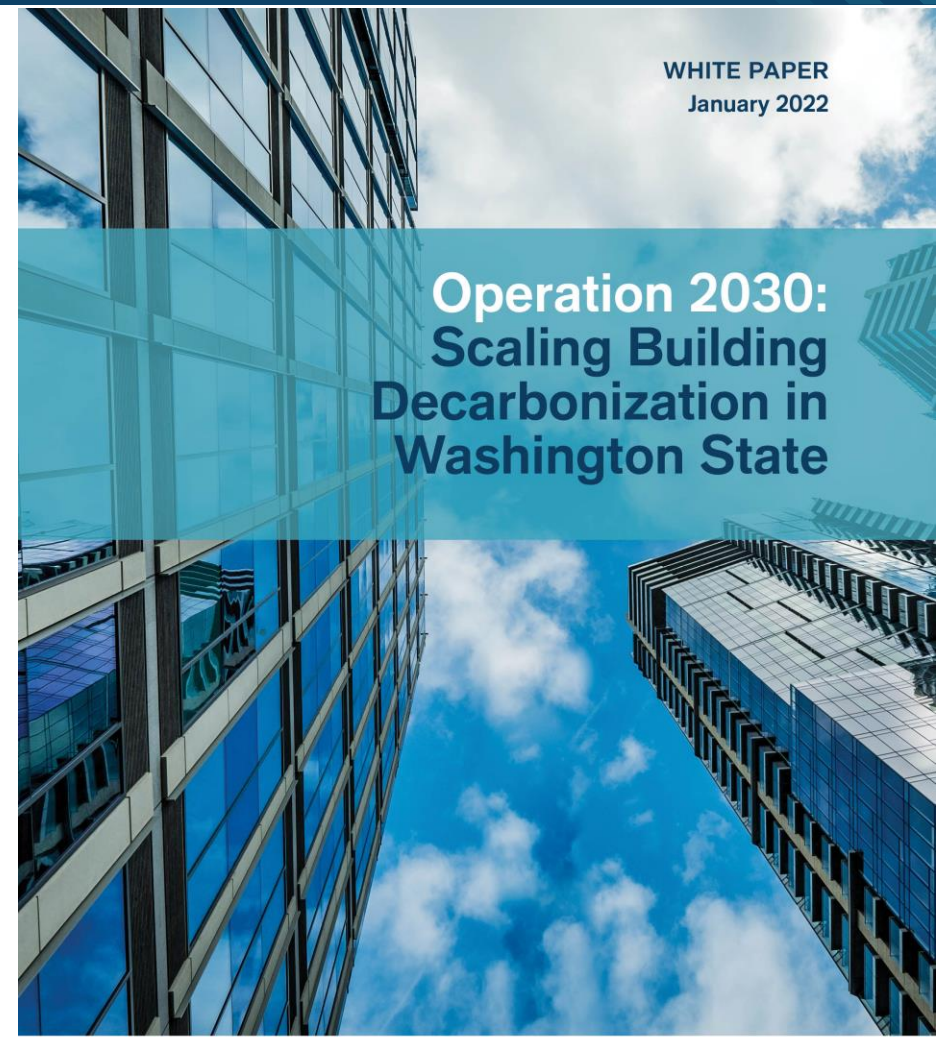
- [Download](#) our Impact Report




Clean Energy
Transition Institute

Operation 2030 Project

- Independent analysis of data from the Washington 2021 State Energy Strategy deep decarbonization modeling
- Focuses on multi-level ramp up required to take building decarbonization to scale by 2030
- White paper
- Forums





Thank you very much

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Clean Energy Transition Institute References

- [Meeting the Challenge of Our Time: Pathways to a Low-Carbon Future for the Northwest \(NWDDP Analysis\)](#)—June 2019
- [Montana Governor’s Climate Solutions Council](#)—September 2020
- [Washington 2021 State Energy Strategy; Chapter B from the WA SES; Deep Decarbonization Modeling Final Report](#)—January 2022
- [Oregon Clean Energy Pathways Analysis](#)—July 2021
- [Washington State Industrial Emissions Analysis](#)—July 2021
- [Operation 2030: Scaling Building Decarbonization in Washington State](#)—January 2022
- [Northwest Clean Energy Atlas](#)—Launching spring 2022
- [Claiming Power: Stories of Rural Communities and Clean Energy](#)—Launching spring 2022
- [Washington State Clean Industrial Economy Summit](#)—June 2022
- [Equitable Rural Building Decarbonization](#)—Launching summer of 2022



Agenda

- Clean Energy Transition Institute
- Deep Decarbonization Pathways
- Northwest Decarbonization
- Questions and Answers



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



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?



- 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



Technical and Economic Analysis for Washington

- 12-member team of experts
- Modeling: Decarbonization & economic impacts modeling
- Equity examined
- Interviewed 150 stakeholders
- 700 studies on buildings, transportation, electricity and industry
- Meta-analysis of decarbonization studies and compendium of Washington state climate and clean energy policies

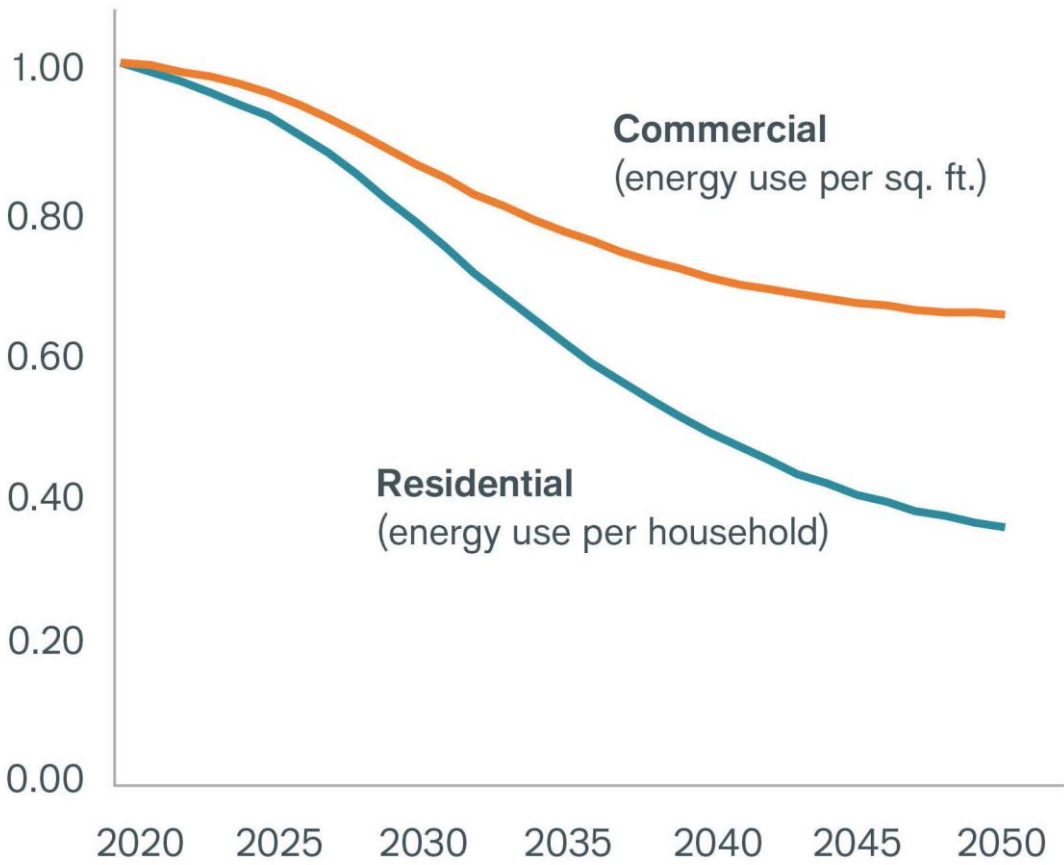


Sector Results and Strategies

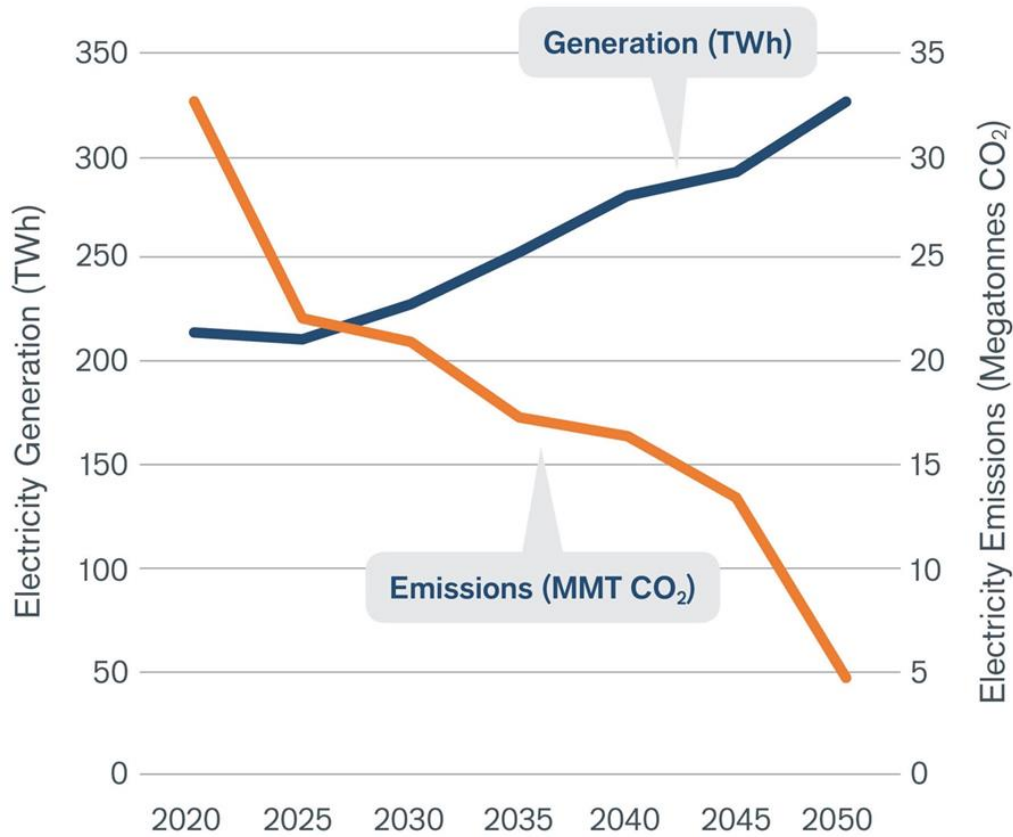


Deep Efficiency & Clean Electricity Fundamental Pillars

Building Energy Intensity (2020=1.0)



Generation increases 53%, emissions decline by 86%.



Clean Electricity

97%

growth in electricity end use demand over 2020 levels by 2050



43%

of electricity imported by 2050



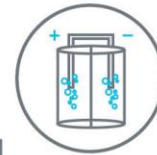
36%

from WY & MT wind



100%

renewable/non-emitting electricity by 2045



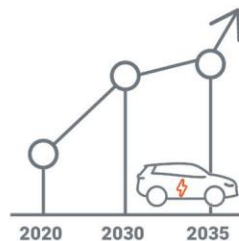
19%

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



**HEAVY DUTY
VEHICLE
STOCKS**

majority electric and hydrogen by 2050

NEARLY 100%

electric vehicle stock by 2050



All transportation fuels

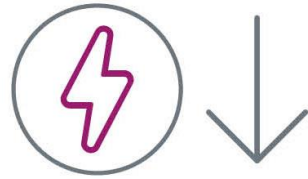
100%

decarbonized by 2050

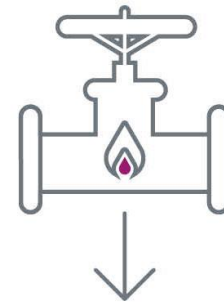
Clean Buildings

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

10% 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:

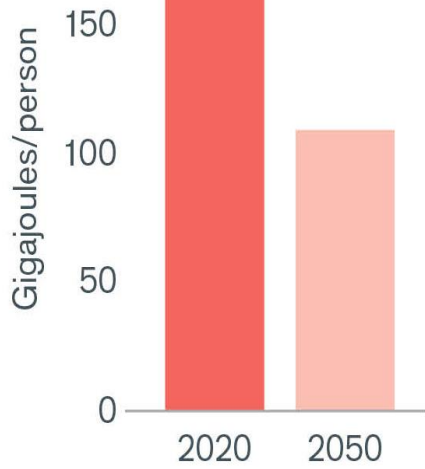
50%  of process heating

100%  of machine drives

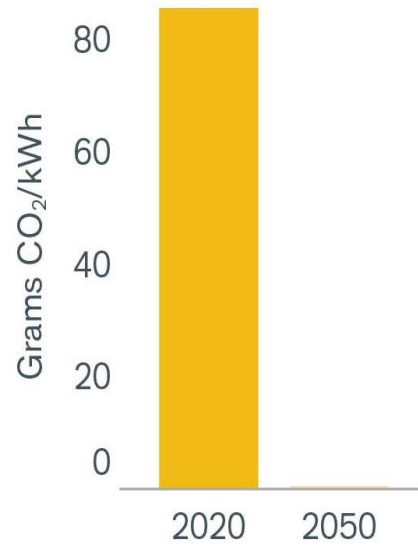
75%   of building heating and cooling in industry

Washington Deep Decarbonization Pathways

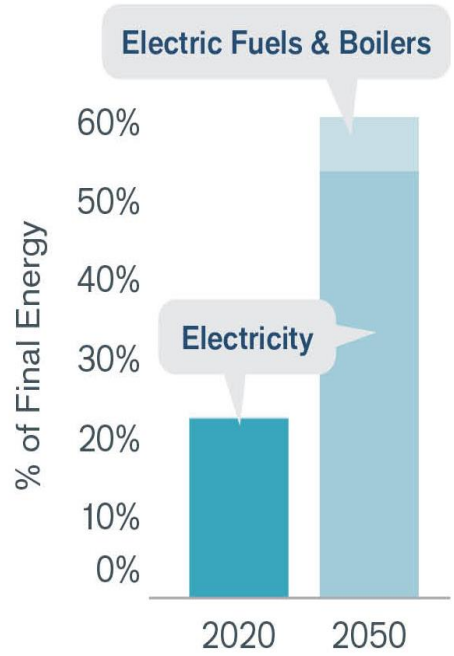
Energy Efficiency
Energy Consumption
(Gigajoules/person)



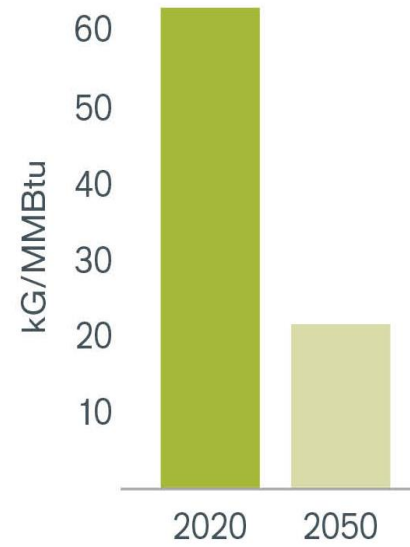
Clean Electricity
Electricity Carbon Intensity
(Grams CO₂ per kWh)



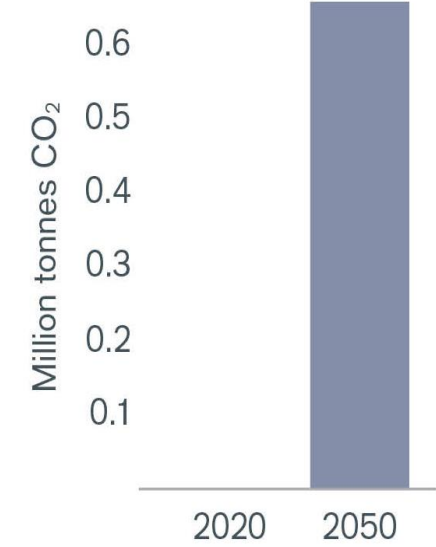
Electrification
Electricity Share of Total Energy
(% of Final Energy)



Clean Fuels
Fuels Carbon Intensity
(kG/MMBtu)

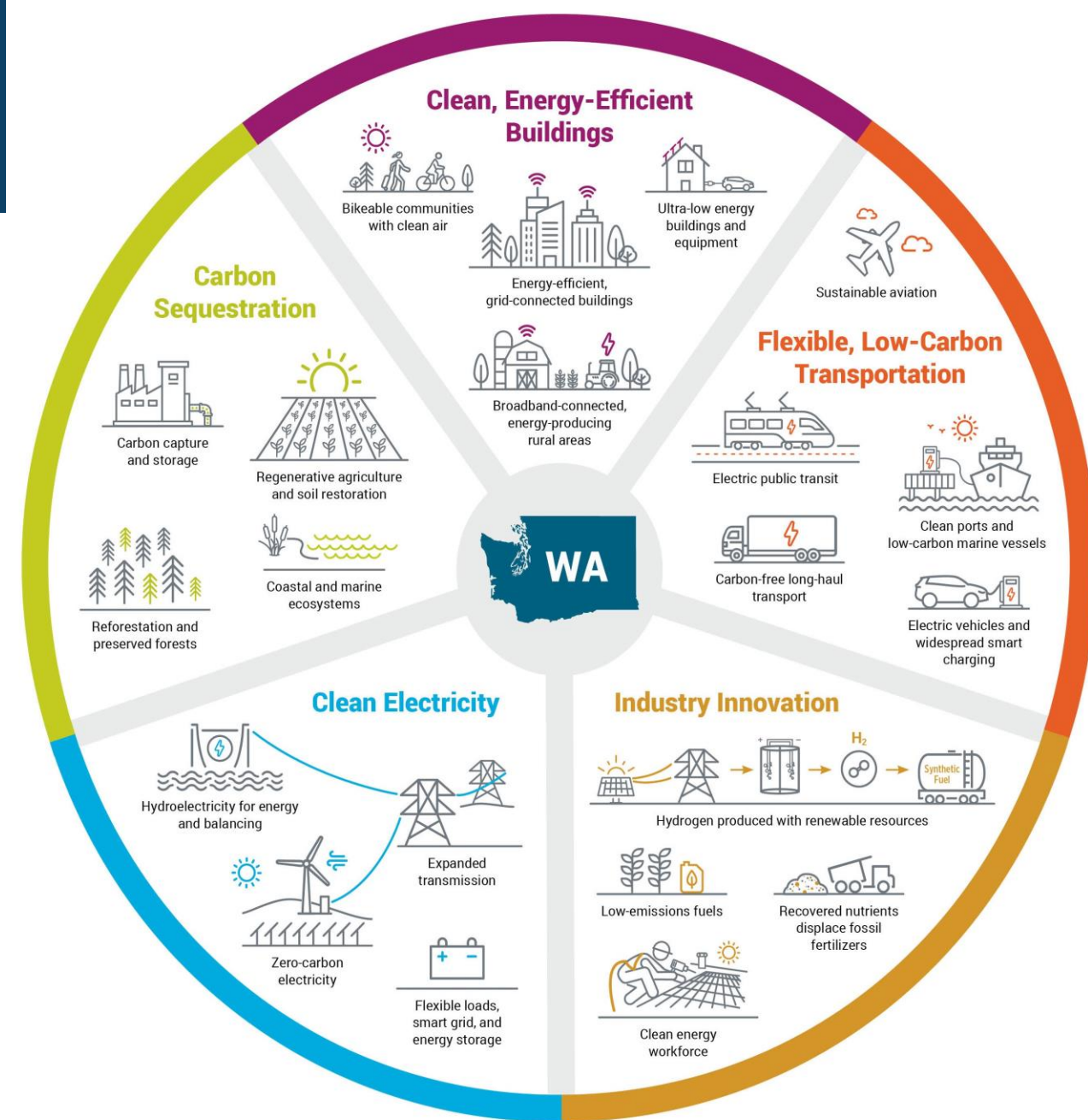


Carbon Sequestration
(Million tonnes CO₂)



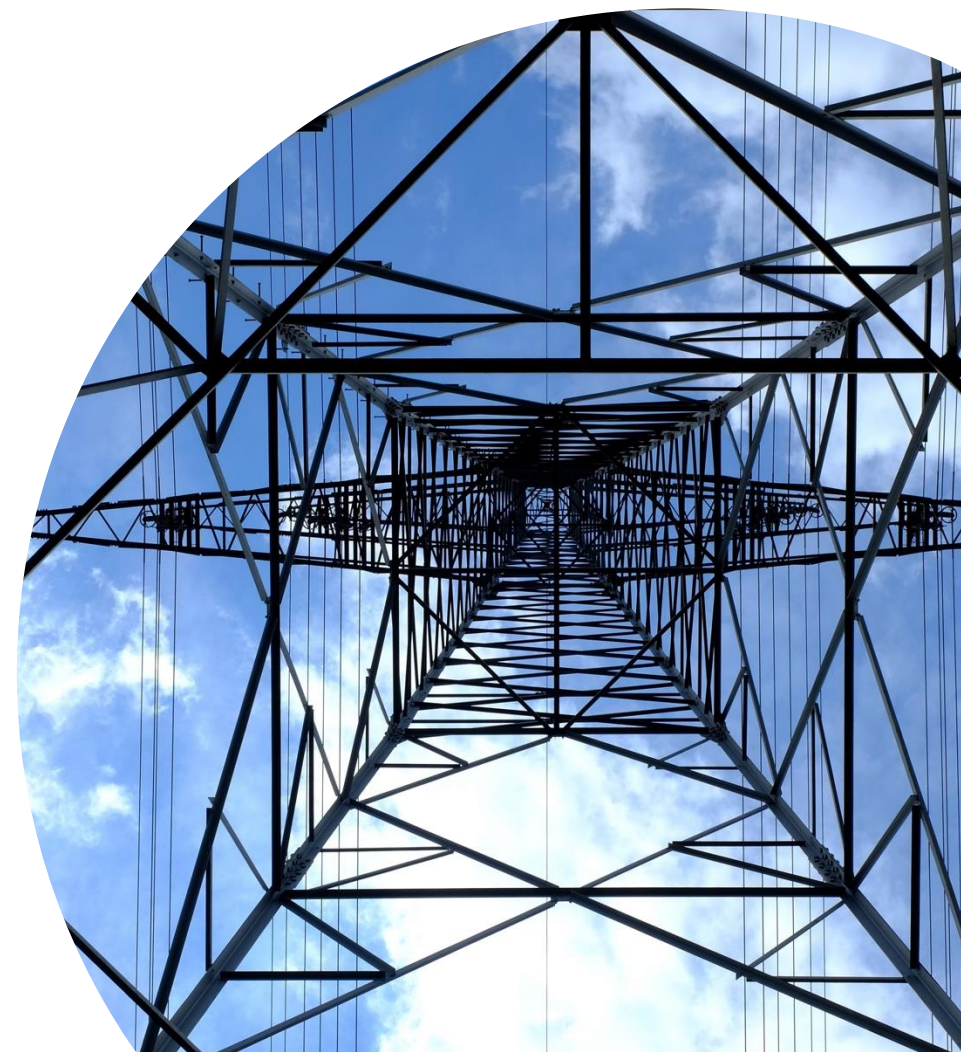
Washington Net-Zero Vision

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.



Oregon Clean Energy Pathways Questions Considered

- What if Oregon had an **economy-wide net-zero emissions** target?
- What if **siting/permitting constraints** limit grid-scale renewables?
- What if existing transmission networks **can't be expanded** in the West?
- What if Oregon had to meet its emissions and clean electricity targets **only with in-state resources**?
- What emissions target could be set to achieve Oregon's climate policy goals while **minimizing economic impact**?





Questions & Answers