# Accelerating an Equitable Decarbonization in the Northwest

## *Northwest Conservation Fellows*

- Eileen V. Quigley—November 29, 2022

# Agenda

- Clean Energy Transition Institute
- Deep Decarbonization Studies
- CETI Programs
- Questions and Answers

# Clean Energy Transition Institute

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

# Northwest Deep Decarbonization Pathways Study—June 2019

# Why Northwest Deep Decarbonization Studies?

**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

# Comparison to Prior Decarbonization Studies

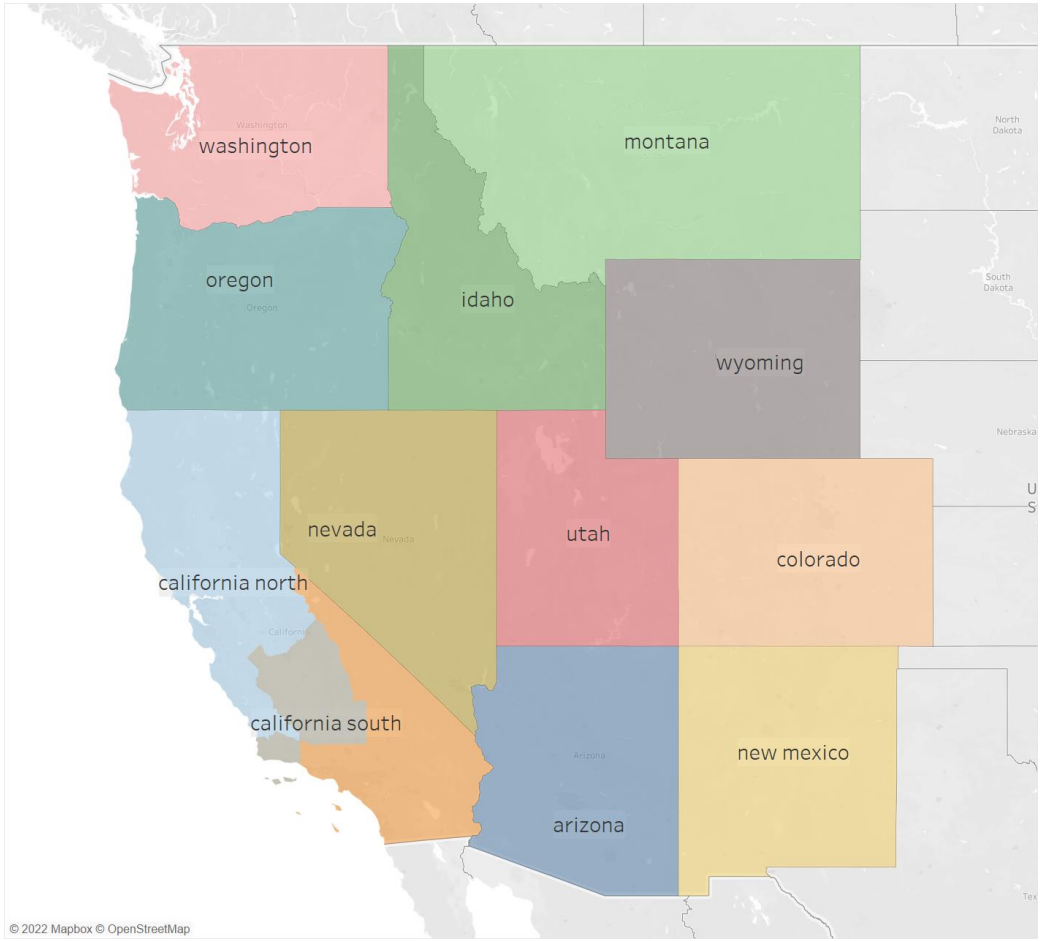
| | | | WA | OR | ID | MT |
|---|---|---|---|---|---|---|
| 2016 | State of Washington Office of the Governor | All sectors | ● | ○ | ○ | ○ |
| 2017 | Public Generating Pool | Electricity sector only | ● | ● | ◔ | ◔ |
| 2018 | Portland General Electric | All sectors | ○ | ◑ | ○ | ○ |
| | Climate Solutions | Electricity sector only | ● | ● | ◔ | ◔ |
| | Northwest Natural Gas Company | All sectors; optimized decisions limited to electricity sector only | ● | ● | ○ | ○ |
| 2019 | Public Generating Pool | Electricity sector only; reliability study | ● | ● | ● | ● |
| | Clean Energy Transition Institute | All sectors; optimized decisions across entire energy supply side | ● | ● | ● | ● |

# What Did We Want to Know?

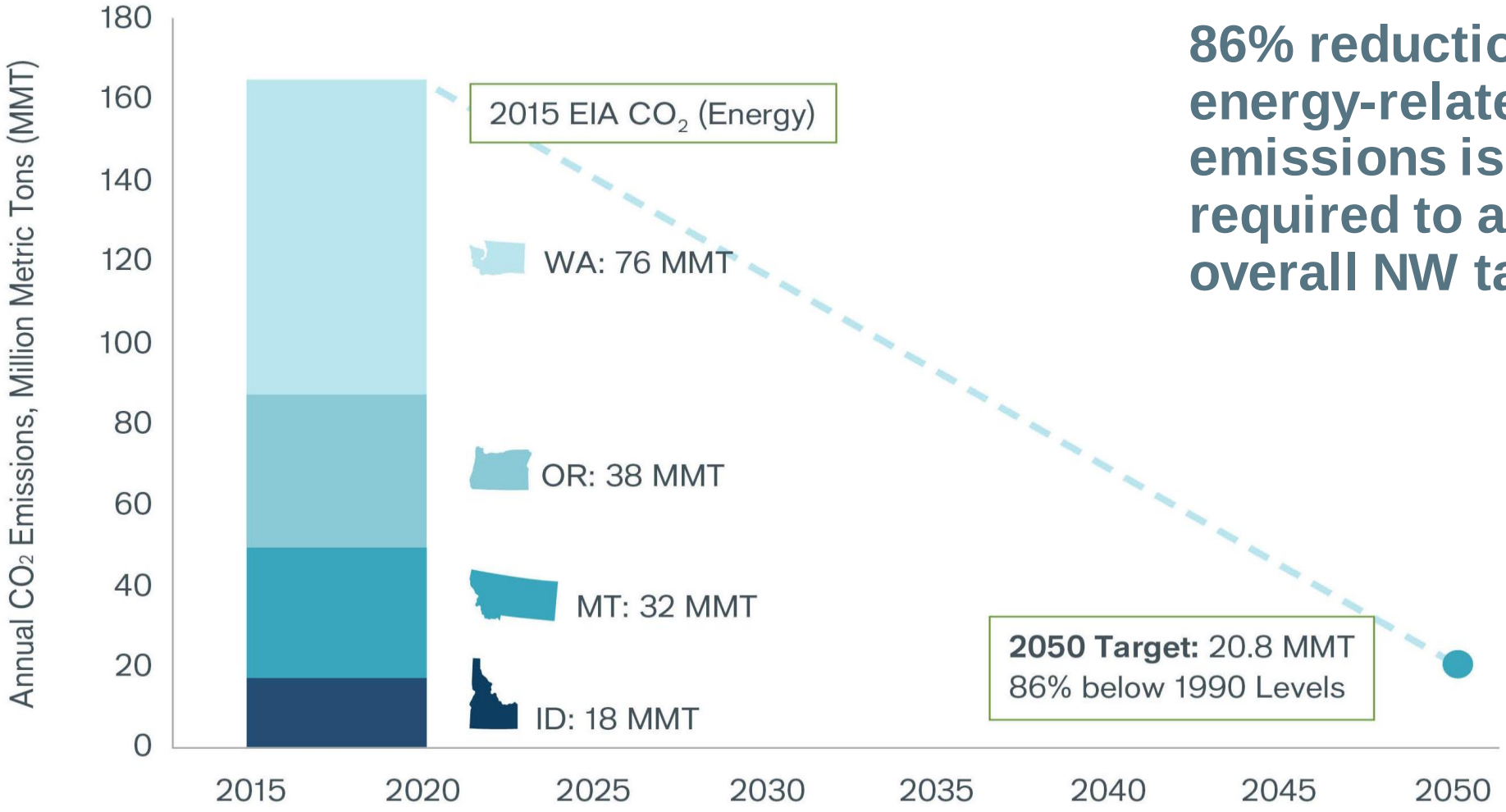
- How do we get to a 100% Clean Grid quickly?
- How do we avoid outages with intermittent supply and changing demand?
- How much and how fast can we electrify?
- How do we manage the cost impacts, overall and for different customers?
- What business and regulatory models and markets are needed?

# 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



# Northwest Deep Decarbonization Target



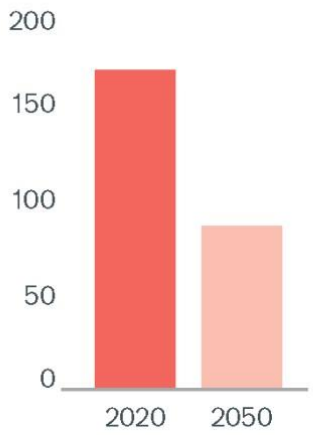

**86% reduction in energy-related $CO_2$ emissions is required to achieve overall NW target.**

# Northwest Pillars of Deep Decarbonization

## 1 Energy Efficiency

**Reducing energy consumed to provide energy services**

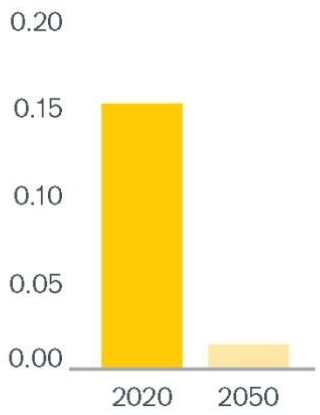
Energy Consumption Per Person (MMBtu)




## 2 Clean Electricity

**Reducing the emissions intensity of electricity generation**

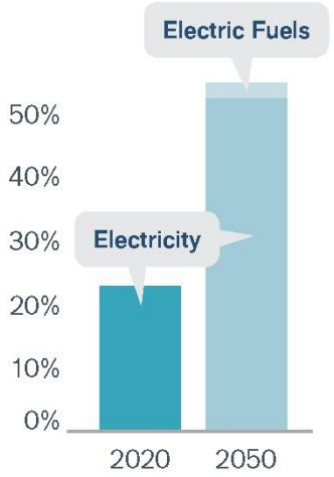
Electricity Carbon Intensity (tonnes $CO_2$ per MWh)




## 3 Electrification

**Switching end uses from fuel to electricity**

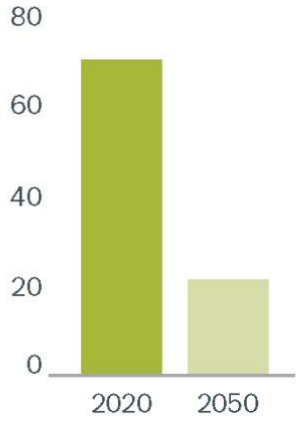
Electricity Share of Total Energy (percentage)




## 4 Low-Carbon Fuels

**Reducing the emissions intensity of liquid and gaseous fuels**

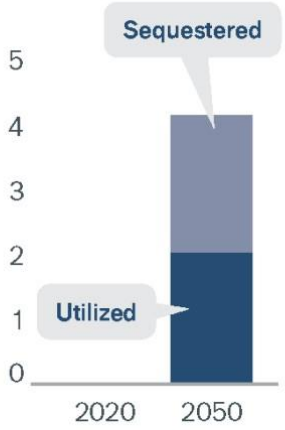
Fuels Carbon Intensity (kg $CO_2$ per MMBtu)




## 5 Carbon Capture

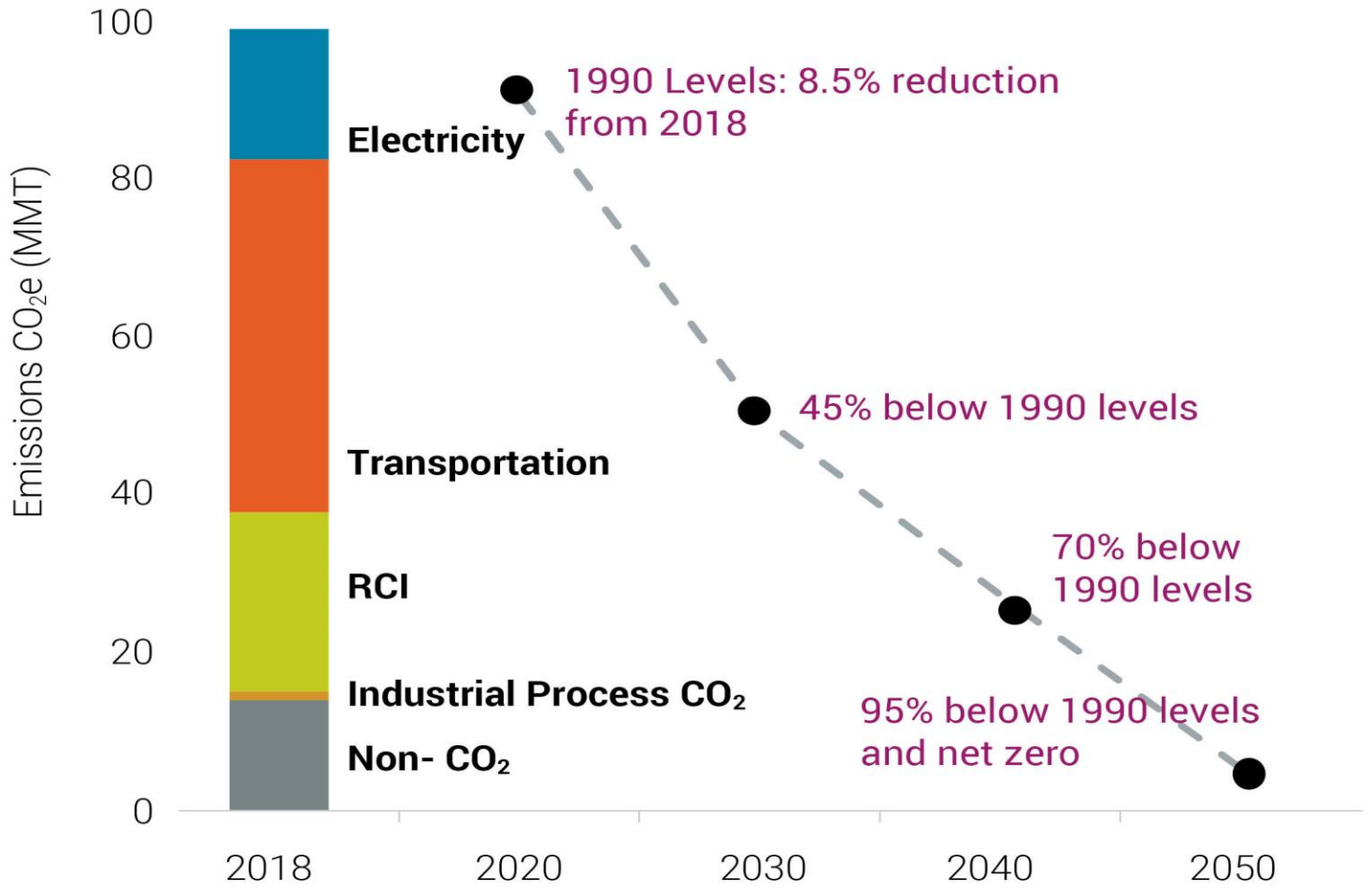
**Capturing $CO_2$ from a facility or removing $CO_2$ from the atmosphere**

Carbon Capture (Megatonnes $CO_2$)



# Washington State Energy Strategy—December 2020

# 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:

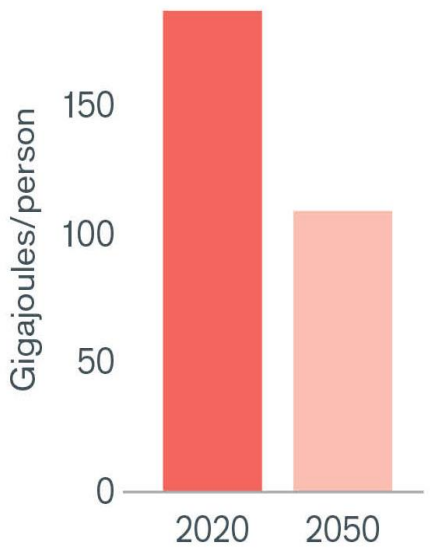
- ***53% Reduction in Emissions in less than a decade***

# What Did We Want to Know?

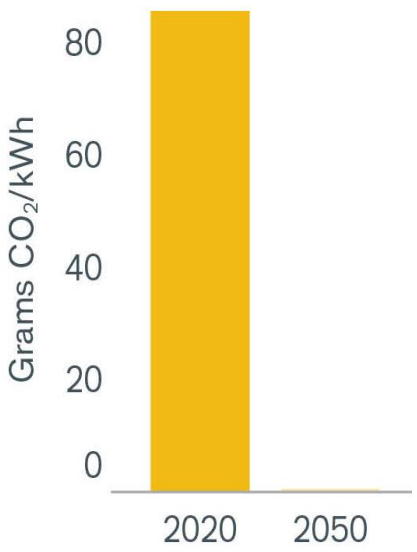
- **What is the impact of rapid and aggressive electrification** of energy systems?
- **What if we don't** electrify transportation as quickly as required?
- **What happens if we retain gas** instead of electrifying buildings?
- **What if transmission expansion is limited** due to siting or permitting?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

# Washington Deep Decarbonization Pathways

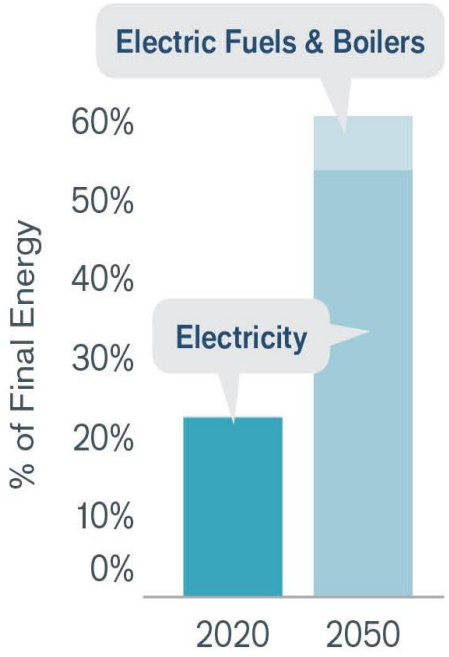
**Energy Efficiency**
Energy Consumption
(Gigajoules/person)



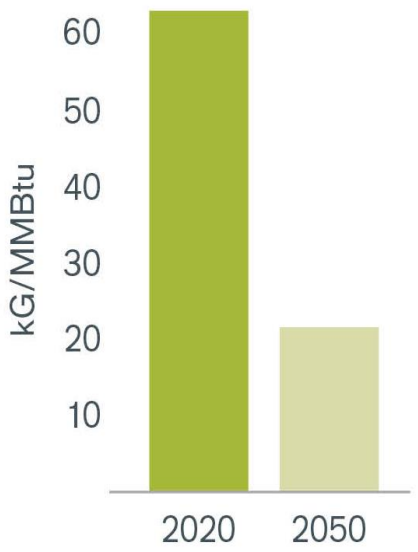

**Clean Electricity**
Electricity Carbon Intensity
(Grams $CO_2$ per kWh)



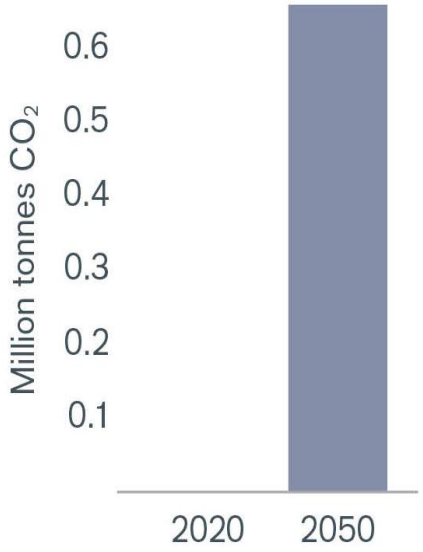

**Electrification**
Electricity Share of Total Energy
(% of Final Energy)




**Clean Fuels**
Fuels Carbon Intensity
(kG/MMBtu)

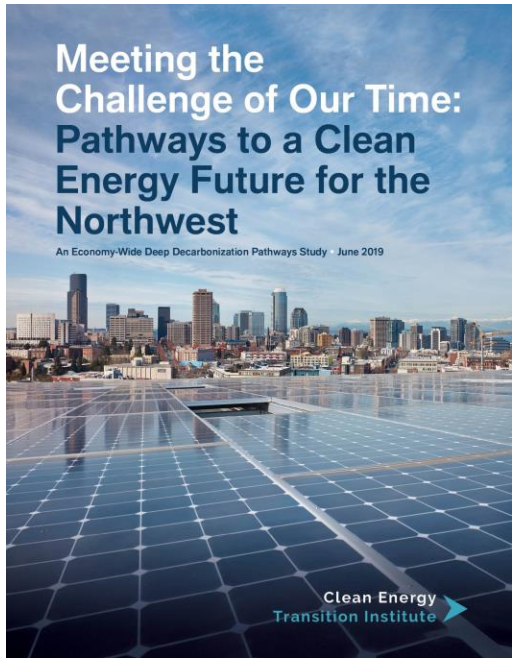



**Carbon Sequestration**
(Million tonnes $CO_2$)

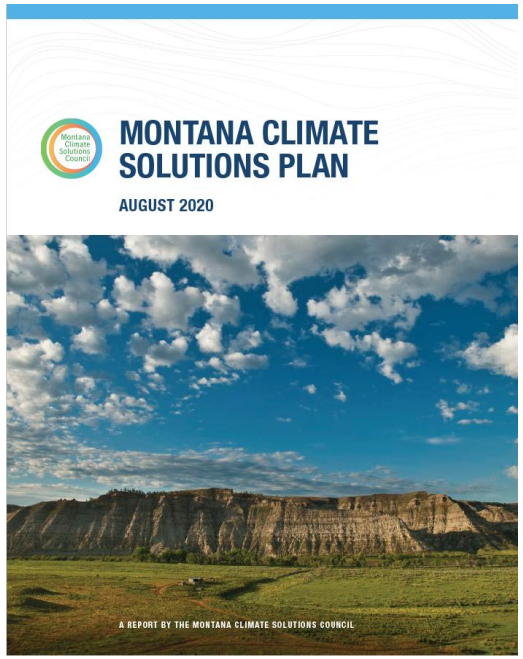


# Decarbonization Pathways Studies 2019-2021

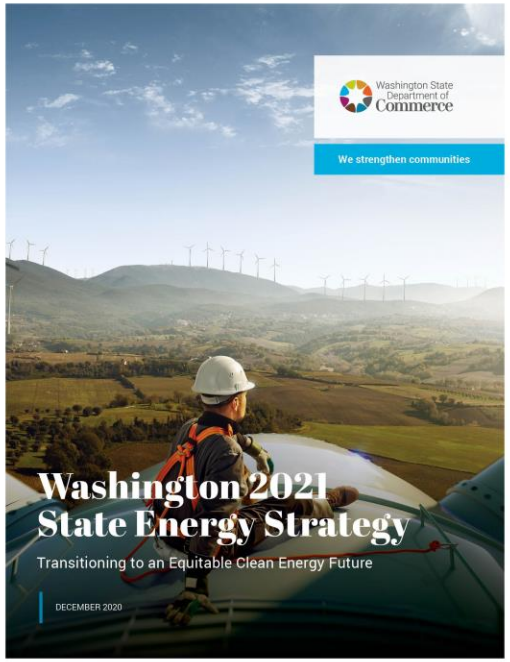
2019



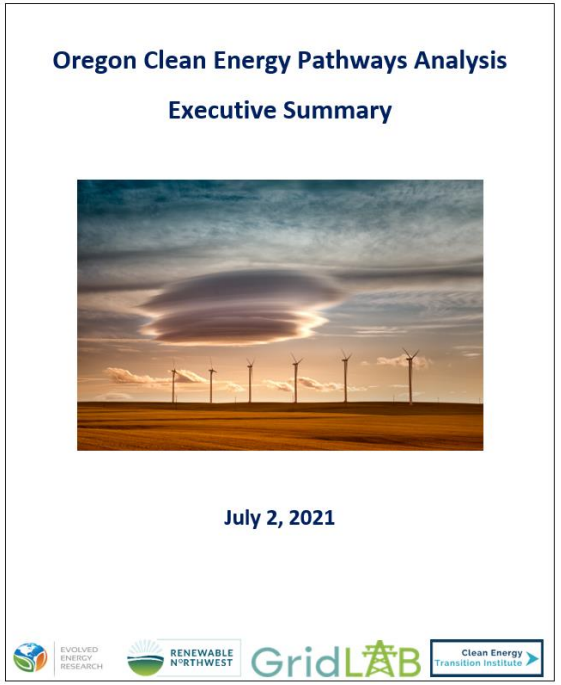

2020




2021




2021



# Common Findings Decarbonization Scenarios

- Greater regional coordination required to facilitate clean energy transfers across the West
- Strengthened/expanded Western grid needed to take advantage of resource and geographic diversity
- Major clean fuels industry developed with biofuels and hydrogen from electrolysis
- Electrification of buildings and transportation is key
- Large build of solar in the Southwest and wind states (MT, WY)

# Net-Zero Northwest

# Net-Zero Northwest Overview

- Key Components
  - Decarbonization pathways
  - Employment/workforce projections
  - Health benefits analysis
  - Incorporates Inflation Reduction Act
  - Focus on actions from now to 2030 to put the region on path to net-zero in 2050

# Preliminary Results

- Significant decrease in energy demand due to efficiency gains as fuels switch to electricity
  - Transportation efficiency gains are the largest contributor to energy demand reductions
- While the demand for electricity doubles from 2021 to 2050, overall economy-wide energy demand drops by 30%
  - New transportation loads drive just over half of all electricity growth 2021 to 2050

# Preliminary Results (cont'd)

- Montana becomes a major hydrogen producer in the long term (40 GW of wind support H2 production and electricity exports)
- Nuclear, electrolysis, direct air capture all built earlier than in prior studies due to IRA incentives
  - Without IRA, the cost of clean fuels was much higher
- 13 GWs of nuclear retrofits of coal and gas plants across the West
  - Cost effective due to IRA incentives

# Tasks to Run November 2022-January 2023

| TASK | SUMMARY | KEY QUESTIONS INVESTIGATED |
|---|---|---|
| **1. Core Case** | **All four states hit net-zero target by 2050** | What resources must be built to meet clean energy demand for different energy sectors in the Northwest by 2030 and 2050? |
| **2. Accelerated/Constrained Transmission** | **Varies transmission expansion potential in six scenarios** | What is the impact of accelerated or constrained transmission expansion across the Western grid? |
| **3. Gas vs. Electrification in Buildings** | **Examines relative costs of gas vs. electricity in buildings** | How does decarbonizing gas compare with electrification as a decarbonization strategy in buildings? |
| **4. Role of Distributed Energy Resources** | **Varies distributed energy (rooftop solar; customer appliance; flexible load)** | What role can distributed energy resources play decarbonization? |
| **5. Pace of Transportation Electrification** | **Varies the pace of transportation electrification** | What is the impact of the pace of transportation electrification on the overall cost of decarbonization for the Northwest? |
| **6. Clean Fuels Tradeoffs** | **Explores impact of pricing for biofuels, synthetic fuels, and hydrogen** | What are the tradeoffs between clean fuels, including biofuels and synthetic fuels/hydrogen? |
| **7. Health Impacts** | **Determines changes in criteria pollutants and their impact on health metrics** | What is the impact on health metrics in the Northwest if criteria pollutants are reduced as a result of decarbonization? |

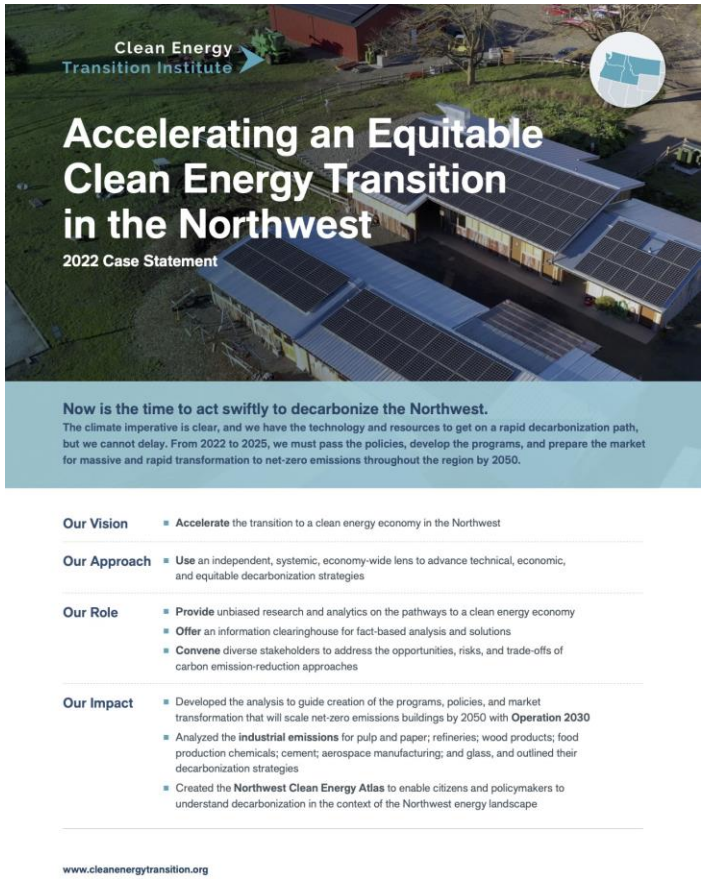
# CETI Program Areas

# Current Institute Programs

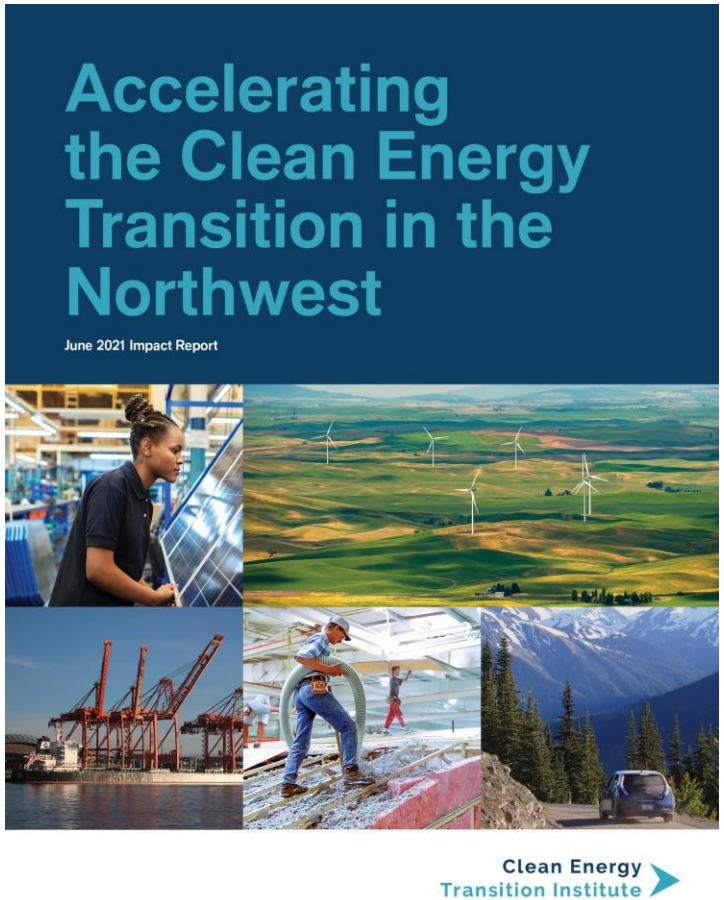
- Building Decarbonization
  - Operation 2030
- Industrial Decarbonization
  - Clean Materials Manufacturing
- Rural & Tribal Decarbonization
  - Community-Defined Decarbonization
  - Claiming Power
- Northwest Clean Energy Atlas
  - Interactive dashboard NW decarbonization visualizations

# Clean Energy Transition Impact 2018-2021

- **Download** our Case Statement




- **Download** our Impact Report



# Clean Energy Transition Institute Releases

- 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 2021
- 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—May 2022
- Washington State Clean Industrial Economy Summit—June 2022
- Rural Community-Defined Decarbonization—September 2022
- Claiming Power: Stories of Rural Communities and Clean Energy—October 2022

# Thank you very much

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# Questions & Answers