Clean Energy Transition Institute

- WBCA—January 25, 2021

Agenda

- Clean Energy Transition Institute
- Washington 2021 State Energy Strategy
- High-Level Results of the Modeling
- Key Policies and Actions
- Questions and Answers

Clean Energy Transition Institute

- Independent, nonpartisan Northwest research and analysis nonprofit organization
- **Mission:** To accelerate the transition to a clean energy economy in the Northwest by advancing economic deep decarbonization strategies
  - Data, analytics, best practices, specific to the Northwest
  - Unbiased information clearinghouse for policymakers
  - Independent, systemic approach to provide informed, economy-wide, low-carbon solutions
  - Convene stakeholders to debate and choose solutions

Northwest Deep Decarbonization Pathways Study

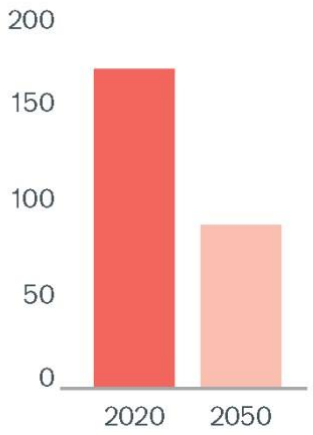
- **Released June 2019**
  - Common set of assumptions to inform decisions about how the clean energy transition could unfold by 2050
- **Context at the Time**
  - Studies 2017-19 had been electricity-sector; one-state; or one-utility only
  - First economy-wide study mapped to the four NW states
  - Examined interconnectivity among energy sectors (grid, transport, built environment)

Five Pillars of Deep Decarbonization

1 Energy Efficiency

Reducing energy consumed to provide energy services

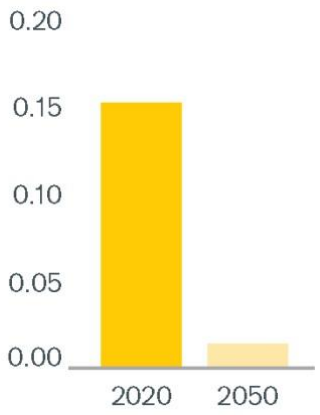
Energy Consumption Per Person (MMBtu)



2 Clean Electricity

Reducing the emissions intensity of electricity generation

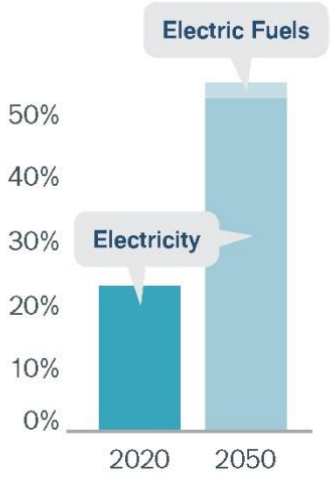
Electricity Carbon Intensity (tonnes CO_2 per MWh)



3 Electrification

Switching end uses from fuel to electricity

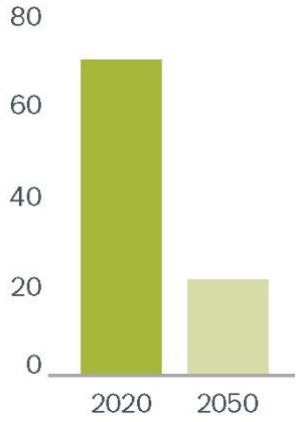
Electricity Share of Total Energy (percentage)



4 Low-Carbon Fuels

Reducing the emissions intensity of liquid and gaseous fuels

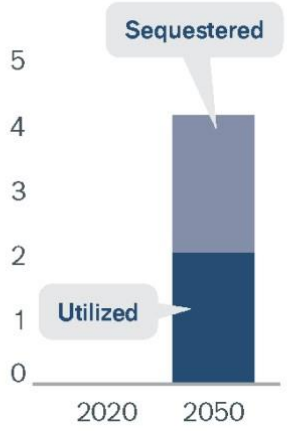
Fuels Carbon Intensity (kg CO_2 per MMBtu)



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

- **Process**
  - 14-member team; March-December
  - Over 700 sources
  - Approximately 180 interviews with experts, agency staff, Advisory Committee members
- **Technical Analysis Deliverables**
  - Deep decarbonization pathways analysis
  - Compendium of all Washington State clean energy policies
  - Economic impacts analysis
  - Technical advisory process: buildings, transportation, industry, electricity

https://www.cleanenergytransition.org/projects/washington-state-energy-technical-advisory-process

Transforming Washington's Energy System

- Washington State's Priorities
  - Equity, affordability, reliability, competitiveness
- Building on a foundation of past studies and efforts in other states
- Transformational rather than incremental change
- Aggressive action needed across all energy sectors

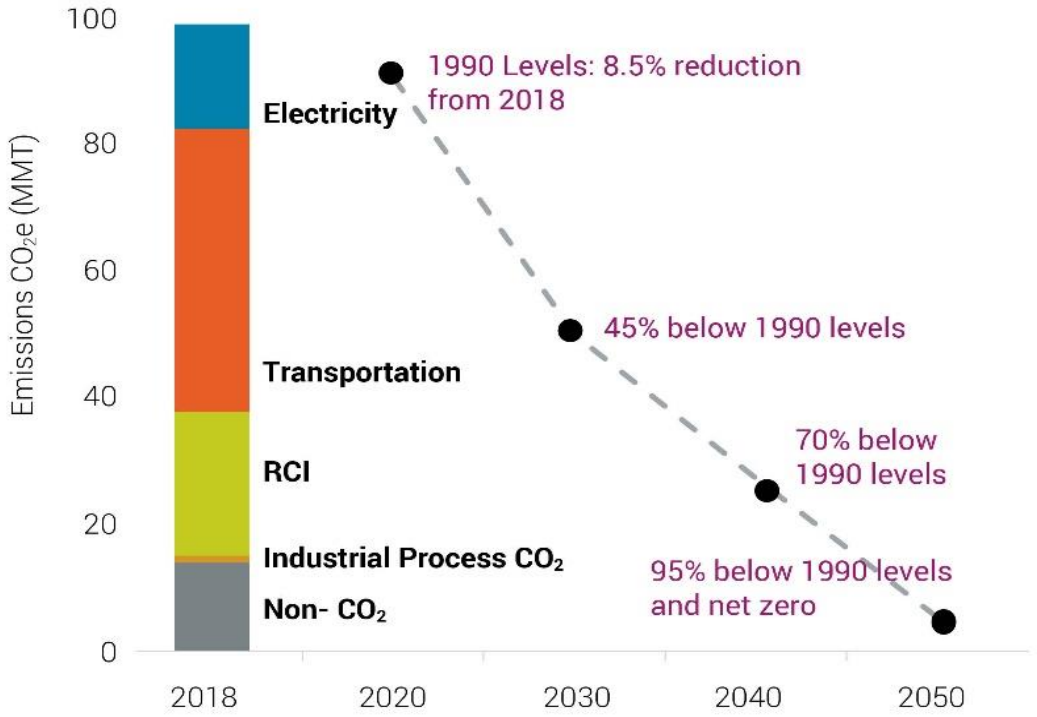
Emissions targets for State Energy Strategy:

2020: 1990 levels
2030: 45% below 1990
2040: 70% below 1990
2050: 95% below 1990
2050: Net zero

The 2030 Challenge: 53% Reduction in Emissions

WASHINGTON STATE 2030-2050 GREENHOUSE GAS EMISSION LIMITS

(Assumes residual 5% of 1990 emissions remaining in 2050 will be offset by biological or geological sequestration)

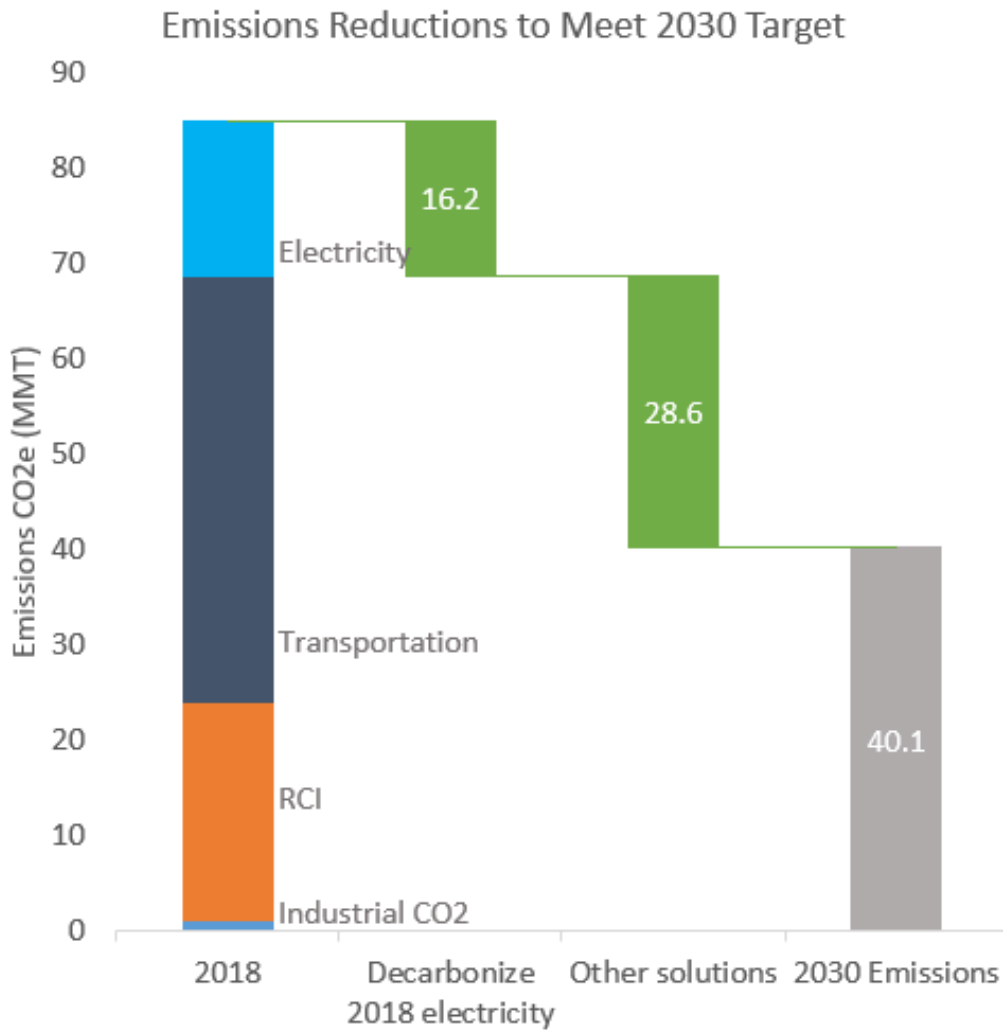


Source: Washington State Department of Ecology and Washington State.[29]

Appendix A – Deep Decarbonization Pathways Modeling Technical Report, December 11, 2020 (p. 15).

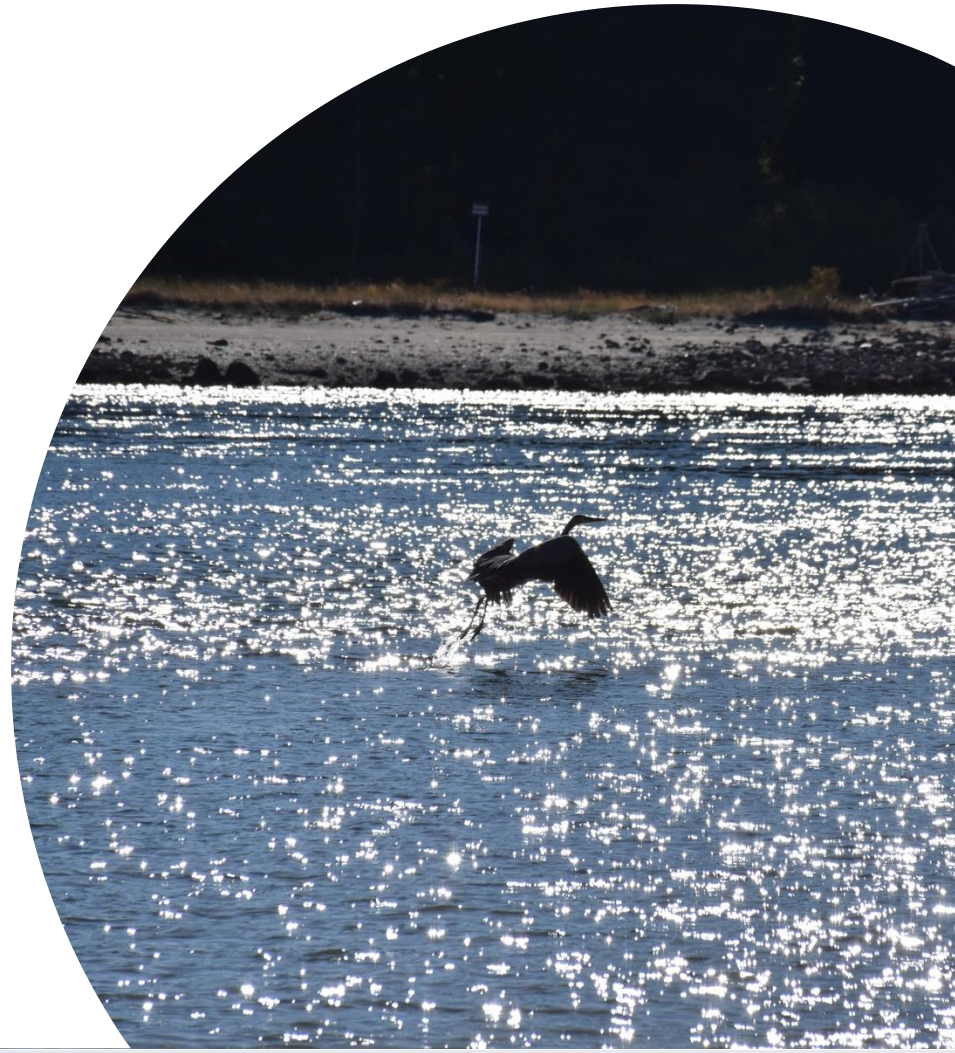
Options and Obstacles to Reaching 2030 Targets

- Decarbonizing all electricity generation from 2018 leaves 28.6 MMT to decarbonize (40% of remaining emissions)
- Options:
  - **Energy Efficiency**: Reduce energy use through more efficient appliances, processes, and vehicles
  - **Electrification**: Electrify end uses and supply with clean electricity
  - **Decarbonize fuels**: Displace primary fossil fuel use with clean fuel
- Obstacles
  - Depends on customers replacing inefficient technologies
  - Stock rollover issues
  - Bio or synthetic fuels technologies not deployed at scale yet



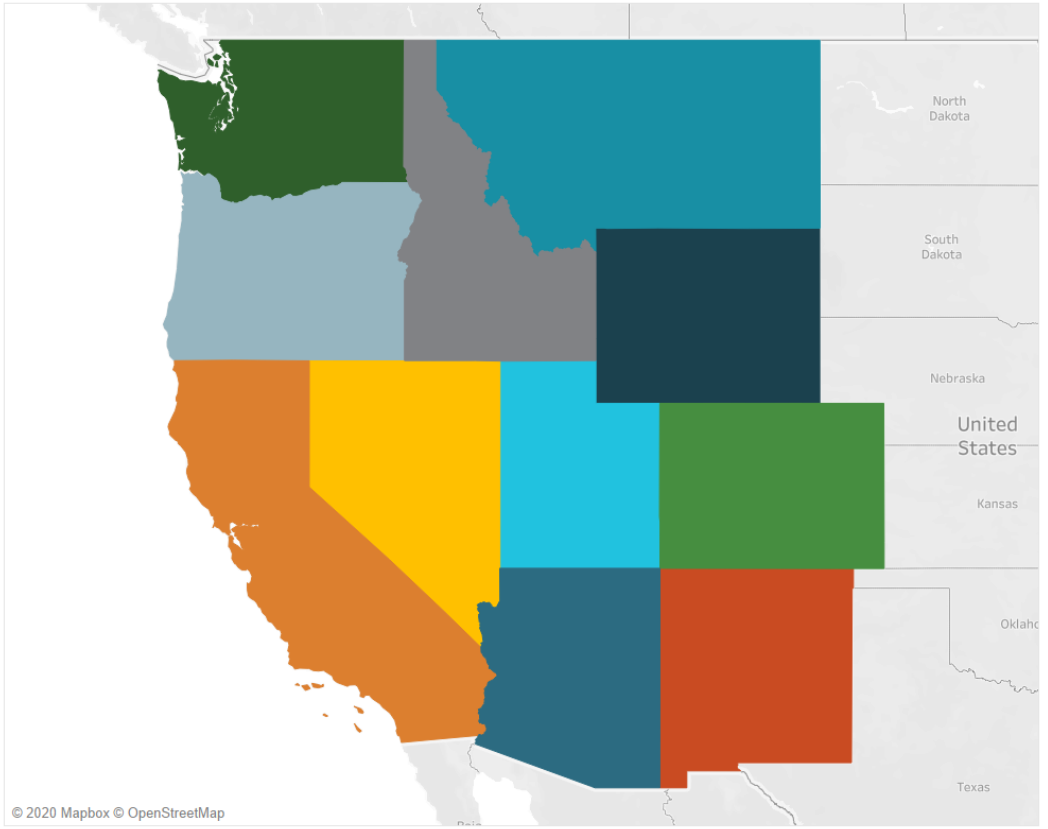
Approach to Modeling Decarbonized Energy Supply

- Deep decarbonization across **all energy sectors** to meet the emissions targets
- **Conservative** assumptions existing technologies, cost projections
- **Optimal investment** in resources with least-cost approach
- **Decarbonizing energy supply** of electricity, pipeline gas, liquid fuels
- Electricity and fuels systems that extend beyond Washington's borders to **capture regional opportunities and challenges**



Washington in the Context of a Western Grid

- Regional Representation
  - Other state's actions impact the availability and cost of solutions
  - State representation in the west captures electricity system operations and load, transmission constraints, biofuel and sequestration potential, and competition for resources as others meet their own targets
- Remainder of the U.S. also modeled to factor in electricity sector dynamics and the availability of renewable resources, biofuels and sequestration



REFERENCE AND FIVE DECARBONIZATION SCENARIOS ANALYZED

Scenario	Summary	Key Questions	Policy Mandates
Reference 	Business as usual	Assumes no emissions target and that current policy is implemented	No constraints on emissions
Electrification 	Investigates a rapid shift to electrified end uses	What if energy systems achieve aggressive electrification and aggressive efficiency, and relatively unconstrained in-state and out-of-state technology were available?	Meets 2050 net zero emissions target
Transport Fuels 	Investigates reaching decarbonization targets with reduced transportation electrification	What alternative investments are needed when larger quantities of primary fuels remain in the economy?	
Gas in Buildings 	Investigates reaching decarbonization targets by retaining gas use in buildings	What is the difference in the cost of decarbonization if gas appliances are retained in buildings?	
Constrained Resources 	Investigates a future that limits potential for transmission expansion into Washington	What alternative investments in in-state resources would Washington make if transmission expansion is limited due to siting/permitting challenges?	
Behavior Changes 	Investigates how lower service demands could impact decarbonization	What if policy-driven or natural behavior changes (i.e., more telecommuting post COVID-19) lower service demands?	

Source: Appendix A – Deep Decarbonization Pathways Modeling Report, December 11, 2020 (p. 21).

Final Results of Five Decarbonization Scenarios

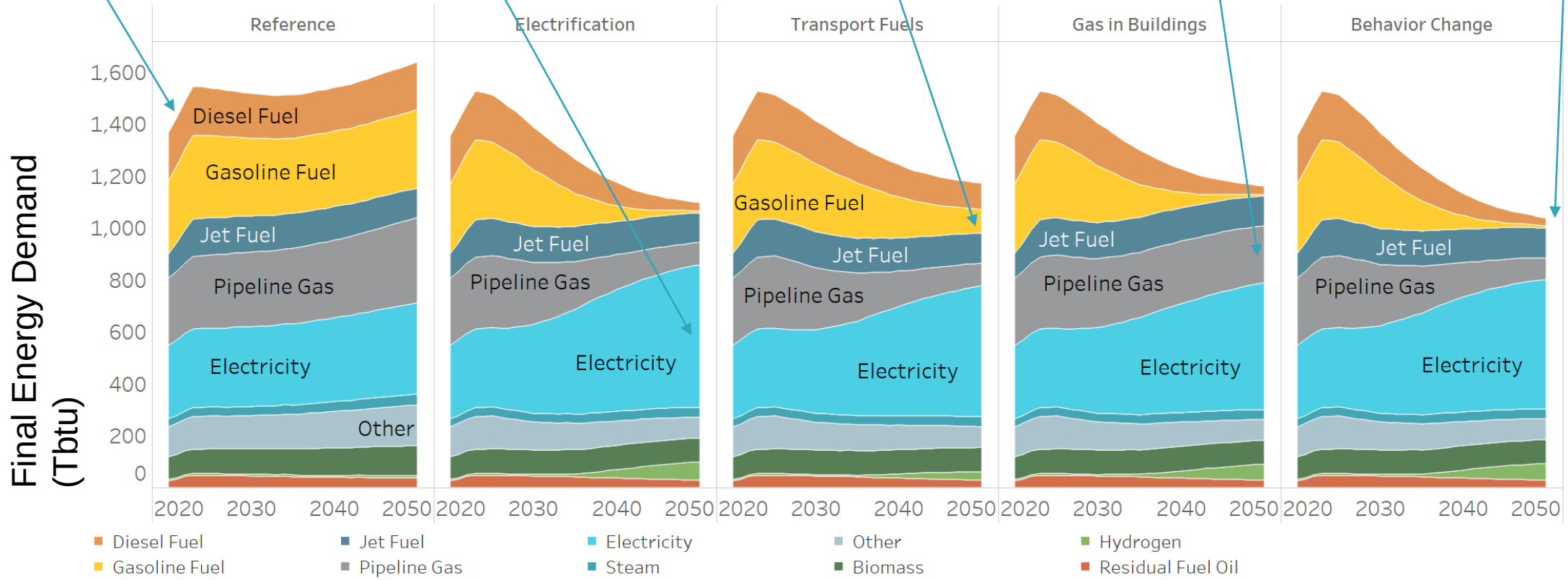
COVID: **10% drop in demand in 2020** due to COVID impact

Electrification**: 90% growth in electricity sector** over 2020 levels, displacing fuels

Transport Fuels: Demand for **fuels remains in 2050**

Buildings: **Higher demand for gas** due to less electrification

Behavior: Fewer energy services **drive demand lower**



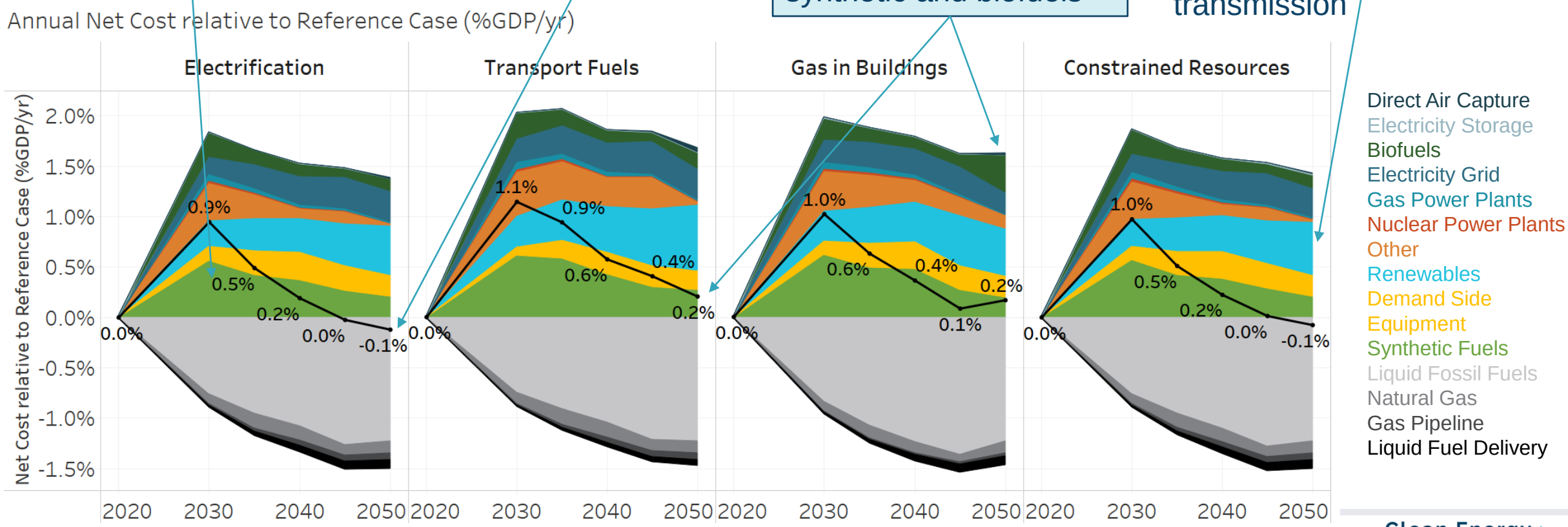
Costs Compared to the Reference Scenario

Cost increases in 2030 driven by demand for clean fuels

Projected technology cost decreases by 2050 result in net savings over reference case

Transport Fuels and Gas in Buildings: greater demand for synthetic and biofuels

Constrained Resources: Greater spend on renewables but reduced investment in new transmission



Common Findings across Decarbonization Scenarios

- Strengthened/expanded Western grid needed to take advantage of resource and geographic diversity
- Large build of solar in the Southwest and wind in the inland states (MT, WY)
- A large clean fuels industry developed based on biofuels and hydrogen from electrolysis

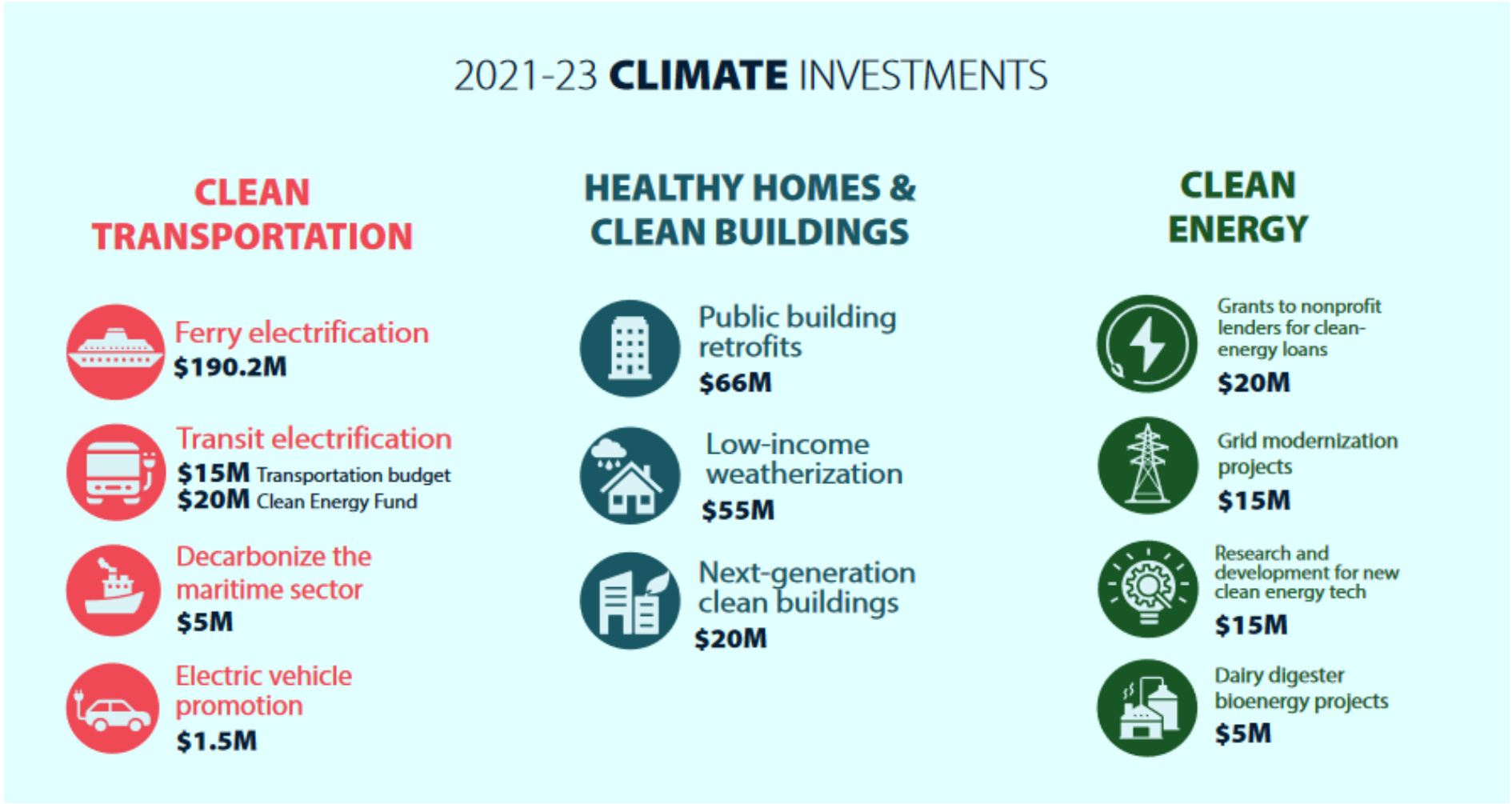
Clean Fuels are Required to Reach Decarbonization

- All liquid fuels fully decarbonized by 2050
- Decreasing fuel consumption over time with electrification and efficiency
- Liquid fuels (gasoline, diesel, jet fuel, others) significantly decarbonized by 2030 with synthetic and biofuels
  - Significant growth in clean fuels industries with few current commercial operations; major challemge
- Hydrogen demand driven by long-haul trucking fleet
- Majority emissions in 2050 from natural gas in primary end uses

Implications of Modeling for Washington State

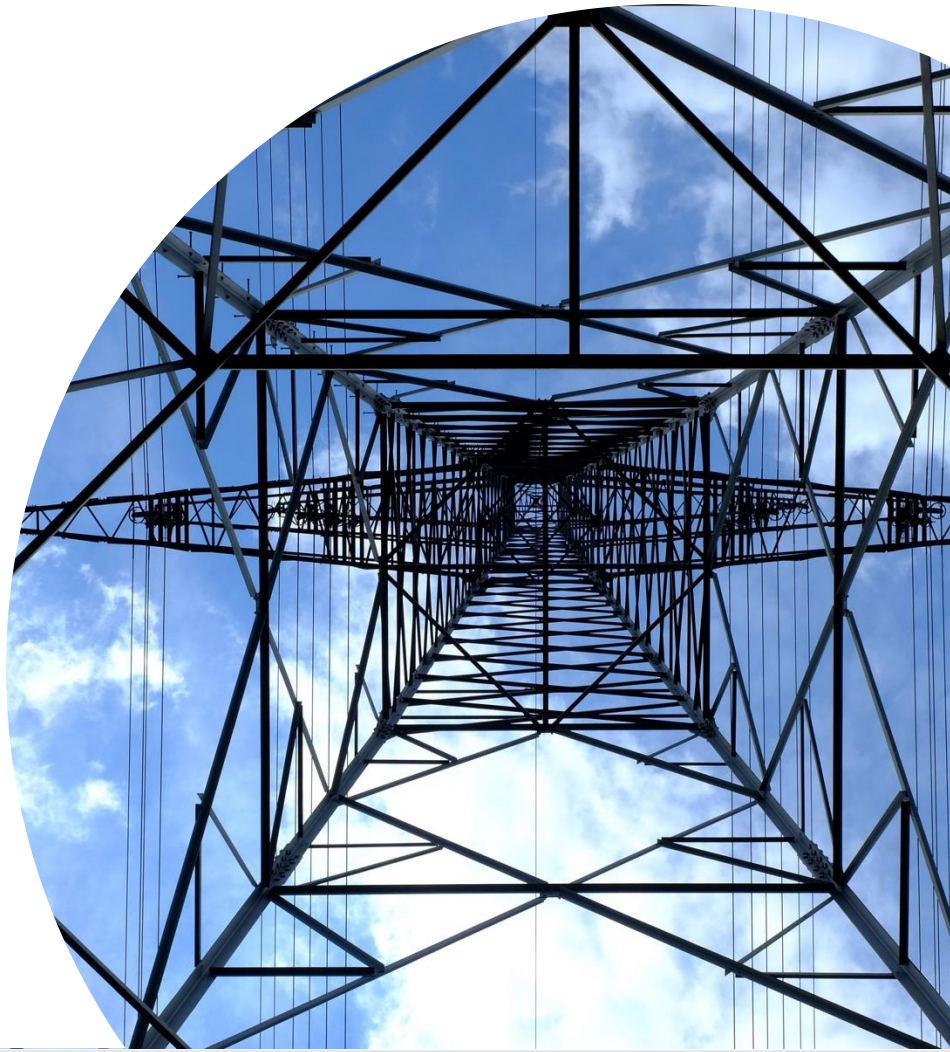
- **To Meet the State's 2030 GHG Targets**
  - Deep energy efficiency to reduce energy use
  - Clean electricity grid by 2030
  - Electrifying as many energy end uses as practical
  - Accelerating clean fuels industry critical

Governor's 2021-23 Biennium Proposal



Many Issues Require Exploration

- Distributed Energy Resources
- Passenger Electric Vehicles
- Fossil Gas
- Liquid Fuels
- Electricity Load
- Economic Impacts
- Innovation Agenda/Clean Energy Industrial Policy



Institute Current 2021 Programs

- Decarbonizing Buildings with Equity Focus
- Mapping Northwest Clean Energy Atlas
- Oregon Clean Energy Pathways Modeling
- Washington Department of Commerce Ongoing Support

Thank you very much!
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