
Clean Energy Transition Institute

Northwest Deep Decarbonization Pathways Study Case Statement



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Northwest Deep Decarbonization Pathways Study

Executive Summary

Climate scientists maintain that humanity has a small window in which to begin significantly bending the curve of greenhouse gas emissions downward—perhaps as little as two years. While the Pacific Northwest possesses several assets that prime it to lead in carbon emissions reductions, it is not yet a model for how to achieve a low-carbon economy. A deep decarbonization pathways study would offer guidance to Washington and Oregon policymakers, advocates, and investors for making decisions about climate policy over the next five years by addressing the question: How does the Northwest decarbonize the built environment, transport sector, and electricity grid between now and 2050 and at what cost?

No holistic analysis exists that examines the most likely decarbonization scenarios when mapped to the economic and institutional realities of the Northwest. Over the past year and a half, four studies were conducted for disparate stakeholders with different assumptions that offer varying insights into pieces of the Northwest's decarbonization puzzle—two economy-wide deep decarbonization pathways studies (Washington State in December 2016 and Portland General Electric in February 2018) and two electricity-grid only analyses (Public Generating Pool in November 2017 and the Northwest Energy Coalition's Lower Snake River Dam Removal study in April 2018).

Each study offers slices of insights in response to assumptions determined by the state, the utility, or the advocacy group that commissioned the study, but none offers a complete picture for the entire region, nor the entire economy. While there is overlap among the four, they do not add up to a collective whole and no one study exists that offers a framework for discussions about issues such as dam removal; the role of nuclear energy, coal, or natural gas on the electric grid; transportation electrification; the optimal uses for biomass; or how geothermal or offshore wind might or might not play a decarbonizing role, to name some of the critical decarbonization opportunities and challenges.

Studies that conclude you can achieve a deep level of grid decarbonization applying renewable energy, such as biogas, only for electricity loads but don't consider the transportation sector in the equation are not only incomplete but can also lead to inaccurate conclusions. A study that applies renewable natural gas to the electric grid to achieve deep decarbonization but does not accurately account for the availability and multiple uses for the biomass that would be the feedstock for that biogas is flawed. Further, studies that focus on the deepest decarbonization of the electricity grid, but don't count the contributions that decarbonizing the transportation sector would make to reducing overall emissions don't offer the complete picture for how decarbonization might unfold across the Northwest economy.

There is a need for an independent study that builds on existing studies that encompasses the whole Northwest and that is economy-wide—not just the electric grid or only for one state or for only one utility—that explicitly identifies what is needed to decarbonize the Northwest economy with a holistic, integrated approach that offers system-wide solutions for buildings, transportation, and electricity in a deeply decarbonized future.

During the 2018 legislative sessions, particularly in Washington State, there was a rigorous and inconclusive debate about the role of natural gas for power generation in the Northwest through 2050, as well as discussions about nuclear energy and whether it is possible for the Northwest grid to become 100% decarbonized.

A Northwest deep decarbonization study can frame how to balance different priorities when choosing among strategies to reduce carbon emissions and the near-term investments and policy trade-offs that should be made to meet longer term climate goals. It would provide the technical and economic context for deciding what needs to be done in the short-term to put Washington and Oregon on pathways to long-term carbon reduction, with an examination of the feasibility and economics of different scenarios. The study will focus on how to achieve climate goals at minimum cost with maximum feasibility and provide valuable findings to inform the debates about:

- The use of fossil fuels in the Northwest energy systems through 2050.
- The role of nuclear energy
- The challenges and opportunities of decarbonizing the transport sector.
- How clean the electricity grid must be for the overall energy systems to become as decarbonized as possible by 2050.
- How the Northwest electricity sector can integrate with other West Coast systems to achieve efficiencies and decarbonization.
- The relative costs of different pathways.
- The economic development opportunities that can flow from deep decarbonization efforts in the region.

Having a more granular analysis of the Pacific Northwest energy system as a whole and showing how systems fit together is intended to help policymakers for whom this is currently opaque devise actionable policy instruments. Individual participants in the energy sectors (electric, transportation, renewable or fossil fuel project developers, etc.) have their own business models to grapple with at a time of momentous economic and technology transition. Public utilities are focused on providing low-cost power; investor-owned utilities must return a regulated return on investment to their shareholders. Policymakers need the analytic support of a systems approach to enable them to elevate the public interest in the debate about how we achieve a deeply decarbonized future.

A key decarbonization question in the West is how California and the Northwest might better collaborate to solve a variety of challenges in achieving a low-carbon economy. Having a plan for balancing energy up and down the West Coast could enable a more efficient approach to decarbonization across the Western grid. A deep decarbonization study would offer guidance for how Northwest policymakers could consider integrating California and Northwest power systems in a way that should lower costs and may help ease the institutional and political barriers to greater market regionalization.

A Northwest Deep Decarbonization Pathways study would provide a common set of assumptions and an analytical roadmap to inform the discussion among Washington and Oregon legislators, advocates, utilities, and businesses to move policy and investment to the next stage in the coming three years. There is a considerable amount of uncertainty concerning the cost and viability of evolving low-carbon technologies. A deep decarbonization pathways study would provide a technical and economic framework through which to examine the feasibility and risks of different pathways to pursue to catalyze conversations that must be had among the key players in the Northwest who are responsible for charting a course of action to achieve a low-carbon economy before it is too late.

Introduction

Humanity has a small window in which to begin significantly bending the curve of greenhouse gas emissions downward. On June 28, 2017, Christiana Figueres, Executive Secretary of the UN Framework Convention on Climate Change (under whom the Paris Agreement was signed) and five colleagues asserted in *Nature* that the world had three years to safeguard the climate, arguing that “if emissions can be brought permanently lower by 2020, then the temperature thresholds leading to runaway irreversible climate change will not be breached.”¹ One year later, an April 25, 2018 *Nature* article argued that despite the significant growth in clean energy, “time is running out to rein in carbon emissions.”²

The Pacific Northwest states of Washington and Oregon have a unique opportunity to lead the United States in blazing a path to deep decarbonization. They share a deep environmental ethic; an abundant supply of clean hydroelectricity; significant investments in energy efficiency and renewable energy; and generally supportive political leadership, including governors who believe that climate change presents an existential threat and clean energy offers economic and environmental benefits.

The Northwest’s close economic and energy linkages to California also make it a critical region to support and expand that state’s pathbreaking efforts. Northwest leadership on deep decarbonization is particularly important given the challenges at the federal level created by a President and Republican party that deny the reality of climate change and eschew clean energy in favor of fossil fuels.

A long-term, regional deep decarbonization pathways study can provide a common framework for developing policies that ensure low-carbon measures work in concert across the region, meeting climate goals at a reasonable cost.

Despite these advantages, the Pacific Northwest is not yet a model for deep decarbonization. Once a policy leader, it has fallen behind California, the Northeast states, and progressive countries around the world in clean energy and climate efforts. There are many reasons for this, but now is the time for Northwest climate and clean energy advocates, policymakers, utilities, businesses, and investors to determine the path to a low-carbon future. A long-term regional deep decarbonization study for achieving deep economy-wide greenhouse gas reductions would provide guidance to Washington and Oregon for developing and implementing decarbonization initiatives, ensuring that low-carbon measures are designed to work in concert across the region and meet climate goals at a reasonable cost.

Situation Analysis

Washington and Oregon legislators and advocates are grappling with developing policies to enable deep decarbonization. How much, if any, gas or coal will be required in 2030, 2040, and 2050 in the Northwest and specifically in Washington and Oregon? Will any new gas generation be needed to balance renewables as we transition off coal? A pathways study could shed needed light on how much

¹Christiana Figueres, Hans Joachim Schellenhuber, Gail Whiteman, Johan Rockstrom, Anthony Hopley & Stefan Rahmstorf. *Nature*. June 28, 2017. “Three years to safeguard our climate”. <https://www.nature.com/news/three-years-to-safeguard-our-climate-1.22201>

² Jeff Tollefson. April 25, 2018. *Nature*. “Can the world kick its fossil-fuel addiction fast enough?” <https://www.nature.com/articles/d41586-018-04931-6>

fossil fuels should be in the mix to ensure that the region doesn't build any more than what is needed. Here are several other decarbonization topics that require examination:

100% Clean Electricity: Advocates are increasingly pushing a 100% clean policy for the electric grid, as well as for the entire economy. A deep decarbonization study will cast important light on several key questions relating to these policies, such as: How close can we get to a 100% clean electric grid, and how long will it take us to get there? What does it mean technically and economically to have a grid powered by 100% renewable energy? Northwest advocates, policymakers, and stakeholders need more information to support efforts to go deeper on cleaning the electricity sector and making renewable portfolio standards a floor and not a ceiling. It is also critical to know the interrelationship between policies and decarbonization efforts in the Western states.

Transportation Electrification: Perhaps the most critical gap is the lack of credible studies that look at the key relationships of decarbonization efforts across all energy sectors. For the transportation sector, how do we make assumptions about how and where to electrify transportation at a realistic pace given consumer habit/purchasing decisions, and the associated grid/infrastructure needs? Do we know the vehicle-to-grid control strategies that utilities will have to make transportation electrification pencil out in the most efficient manner? Can a decarbonization analysis make the case for a clean fuels standard in Washington and for strengthening Oregon's clean fuels standard?

City and County Roles: When it comes to the major population centers in the Pacific Northwest, no blueprint exists for King County Metro in Washington or TriMet in Oregon and the relevant utilities in King/Snohomish/Pierce counties or Multnomah/Clackamas/Washington counties of an integrated playbook, or even a pathway to finding one, for what role the utility infrastructure should play in both the decarbonization and transportation challenges plaguing the metropolitan regions. If all passenger transport is to be electrified, what does that mean for developing the electric vehicle (EV) infrastructure to support charging, and at what level are grid investments required to enable fleet transformation?

Should cities invest in EV infrastructure to enable charging during the day (or offer incentives for large employers to do so), or will car battery ranges be such that drivers will not need to charge at work and will charge up at night? If that is the case, how will the grid handle the load as multiple citizens plug in each night, potentially creating a so-called "dragon curve"?³ What actions should regional transportation agencies and Washington and Oregon be taking now to electrify their fleets? What are the most important infrastructure investments that need to be made in what order?

Utility Challenges: While advocates aim for policies to decarbonize the Northwest as rapidly as possible, the region's utility managers are contending with disruption in their business models, caused by grid decarbonization, the success of energy efficiency initiatives, and non-utility technological advances in energy. A shared regional deep decarbonization pathways framework could be beneficial for the region's utilities as they manage the variety of challenges and opportunities that the low-carbon future presents to them—potentially unlocking new value streams associated with advanced energy services and new loads.

³ David Ferris. E & E News. EnergyWire. April 26, 2018. "Fear the 'dragon curve,' researchers say". <https://www.eenews.net/energywire/stories/1060080137> & http://docketpublic.energy.ca.gov/PublicDocuments/17-ALT-01/TN222986_20180316T143039_Staff_Report__California_PlugIn_Electric_Vehicle_Infrastructure.pdf

West Coast Energy Balancing: A key decarbonization question in the West is how California and the Northwest might better collaborate to solve a variety of challenges in achieving a low-carbon economy. California has embraced an aggressive decarbonization strategy—one that will be impossible to achieve if it cannot determine how to balance a significant increase of intermittent renewable energy on the electricity grid. California’s peak loads tend to be the opposite of Washington and Oregon’s.

Addition of new intermittent generating resources in California and throughout the West have the potential to change both the physics and economics of this historic trading relationship. Hence, having a plan a plan for balancing energy up and down the West Coast would enable deep decarbonization across the Western grid and make a major contribution to reducing the nation’s carbon emissions.⁴ A deep decarbonization study would offer guidance for how to integrate California and the Northwest, in a way that should lower costs and may help ease the institutional and political barriers to greater market regionalization.

Biomass Considerations: Do the various chemical conversion pathways and feedstocks exist for robust, biomass-based solutions for aviation, maritime, and freight/heavy duty vehicles, as well as renewable natural gas to power electricity? While we work out the question of what biomass exists for which use, would a rational strategy for the next decade be to require utilities to only purchase natural gas from producers and pipeline companies that meet key performance specifications for methane emissions throughout the supply chain?

Such a strategy would entail authority for utility regulators (the Washington Utilities and Transportation Commission or the Oregon Public Utility Commission) to dispose of current rate tests and pick the non-least-cost option among natural gas producers in the next decade, while also applying a lifecycle emissions test to their natural gas supplies. No one has looked at how best to organize this transition in a way that makes sense for the climate and water and land use.

Existing Research

Deep decarbonization will require significant transformations of existing infrastructure in buildings, industry, transportation, and electricity. There are multiple models for California⁵ and the two pathways studies that have examined slices of the Northwest (Washington State in December 2016⁶ and Portland General Electric⁷ in February 2018) that provide a platform from which to launch an economy-wide pathways study for the Northwest. However, the Washington study only shed light on one state’s options and the Portland General Electric study’s focus is on only 47% of Oregon, the utility’s territory.

⁴ California (364.76 MMT); Washington (76.12 MMT); and Oregon (38.03 MMT) contributed 7.3 percent of the country’s total greenhouse gas emissions (6,587 MMT) in 2015. Environmental Protection Agency. April 2016. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2015 United States*. https://www.epa.gov/sites/production/files/2017-02/documents/2017_complete_report.pdf & https://www.epa.gov/sites/production/files/2017-09/documents/co2ffc_2015.pdf

⁵ See both G. Morrison, S. Yeh, A. Eggert, C. Yang, J. Nelson, J. Greenblatt, R. Isaac, M. Jacobson, J. Johnston, D. Kammen, A. Mileva, J. Moore, D. Roland-Holst, M. Wei, J. Weyant, J. Williams, R. Williams, C. Zapata. Climatic Change. DOI 10.1007/s10584-015-1403-5. April 2, 2015. *Comparison of low-carbon pathways for California*. & S. Yeh, C. Yang, M. Gibbs, D. Roland-Holst, J. Greenblatt, A. Mahone, D. Wei, G. Brinkman, J. Cunningham, A. Eggert, B. Haley, E. Hart, J. Williams. Energy Strategy Reviews 13-14 (2016) 169-180. October 21, 2016. *A modeling comparison of deep greenhouse gas emissions reduction scenarios by 2030 in California*.

⁶ B. Haley, G. Kwok, R. Jones, J. Williams. Evolved Energy Research and Deep Decarbonization Pathways Project. December 16, 2016. *Deep Decarbonization Pathways Analysis for Washington State*.

http://www.governor.wa.gov/sites/default/files/Deep_Decarbonization_Pathways_Analysis_for_Washington_State.pdf

⁷ Gabe Kwok and Ben Haley. March 23, 2018. *Portland General Electric Decarbonization Study: Summary of Draft Findings*. <https://www.portlandgeneral.com/our-company/energy-strategy/resource-planning/integrated-resource-planning#>

A recommendation coming out of the Washington State study was to perform a pathways study for the region and a conclusion from the Portland General Electric study is that there is a need to also understand mitigation in the rest of Oregon. There is value in having a decarbonization pathways study that solidly makes the case for how Washington and Oregon can be coordinated with a West Coast bloc of climate action from British Columbia to California.

The Public Generating Pool commissioned a study of the Northwest electricity sector that was released in the fall of 2017⁸ that made an important contribution to the debate about how to achieve an 80% reduction of 1990 greenhouse gas emissions levels by 2050. The study was aimed at determining the best policies to support a least-cost approach to reducing carbon emissions and how the Northwest's resource portfolio would be impacted.

The PGP states on its website that "This work focuses on the electric sector, but we are committed to working collaboratively with others to refine the methodology so that an adaptable multi-sector regulatory framework can be developed to guide policy for years to come." A deep decarbonization pathways study that builds on the PGP framework could help start a conversation about how to deal with the Bonneville Power Administration's fiscal challenges, what to do about nuclear energy, and what to do about public power in the region.

The Northwest Energy Coalition recently released a credible study that investigated the technical feasibility of replacing the power and energy services provided by the four Lower Snake River Dams with a portfolio of clean and renewable resources that support a reliable and adequate regional power system while minimizing increases to greenhouse gas emissions.⁹ The study is opening up needed conversations with hydroelectricity producers that have been difficult in the past. A Northwest pathways study would add greater context to the debate about dam removal.

Analysis Leads to Action

An examination of three existing deep decarbonization studies shows how these analyses lead to climate action:

Global. The Deep Decarbonization Pathways Project was formed in 2013 and consists of 16 countries that represent approximately three-quarters of the world's energy-related greenhouse gas emissions.¹⁰ Each country team produced a pathways study demonstrating what is needed to deeply decarbonize each country's energy system. The collection of studies informed the Paris Agreement, specifically the inclusion of article 4, paragraph 19: "[a]ll parties should strive to formulate and communicate long-term low greenhouse gas emission development strategies." The 176 signatories to the Paris agreement must develop long-term plans (pathways) by 2020.¹¹ Another outcome of the analysis is that climate policy discussions moved beyond short-term actions (five years out) to what's needed over the next three decades to meet a long-term (2050) target.

⁸ Public Generating Pool. E3 Carbon Study. <http://www.publicgeneratingpool.com/e3-carbon-study/>

⁹ Northwest Energy Coalition. April 2, 2018. Energy Studies. The Lower Snake River Dam Power Replacement Study. <https://nwenergy.org/featured/lrsdstudy/>

¹⁰ Deep Decarbonization Pathways Project. 2015. *Pathways to Deep Decarbonization 2015 report*, SDSN – IDDRI. http://deepdecarbonization.org/wp-content/uploads/2016/03/DDPP_2015_REPORT.pdf

¹¹ United Nations Climate Change. "Communication of long-term strategies." <https://unfccc.int/process/the-paris-agreement/long-term-strategies>

California. A Deep Decarbonization Pathways Study for four California state agencies looked at alternative pathways to meet the state's goal of 80% below 1990 levels by 2050.¹² This analysis informed Governor Jerry Brown's 2030 GHG target of 40% below 1990 levels, later enacted into law under SB 350.

Washington. In December 2016, Washington State's Department of Ecology conducted a Deep Decarbonization Pathways study to examine whether it was technically and economically feasible for the state to achieve a greater level of emission reductions than what current laws called for. The study showed that the emissions reductions could be achieved in multiple ways, which enabled Ecology to recommend to the state legislature more stringent GHG limits, an increase from 50% to 80% below 1990 levels by 2050.

Stakeholder Affirmation

Interviews with 15 stakeholders reveal a clear need for a common set of facts about the decarbonization pathways for the Northwest that legislators and the advocacy community could agree to. For legislators, there is value in a validated, independent study they can point to in crafting 2019 policy initiatives in Olympia and Salem. For the advocacy community, there is value in the study helping facilitate conversations about various solutions to achieve low-carbon outcomes.

Stakeholders note the intellectual value of an independent study for the Washington Utilities and Transportation Commission and the Public Utility Commission of Oregon that would offer commissioners and staff analysis to rely on when utilities come before them with their decarbonization plans. An independent analysis from a nonpartisan, non-state, non-utility entity, whose mission is focused on climate and achieving as low-carbon an economy as possible as soon as possible would carry weight with these commissions.

Interviews with Oregon stakeholders revealed a significant need to educate policymakers in Salem about what the clean energy transition entails; what the opportunities and barriers are to achieving a decarbonized future; how far the state is from achieving the carbon reductions the climate requires; and how much more ambitious policy is required beyond the state's current clean fuels standard and renewable portfolio standard.

Oregon stakeholders believe that an economy-wide, sector-specific pathways study that explains the technical and economic opportunities and limitations to attaining a truly low-carbon future would be hugely helpful in Oregon heading into the 2019 legislative session, especially if it both paints the picture for how the Northwest can decarbonize across the region and also informs advocates and policymakers about Oregon's specific pathway trajectories.

In Washington State, the failure of the environmental and clean energy advocacy community to agree before the 2018 session about the bills they would push was a huge impediment. Conversations with Washington State legislators reveal that a Northwest deep decarbonization pathways study that helps bridge the divide in the environmental community and potentially get environmental advocates on the same page before the 2019 session would make a significant contribution.

¹² A. Mahone, E. Hart, B. Haley, J. Williams., S. Borgenson, N. Ryan, S. Price. *California Pathways: GHG Scenario Results*. April 6, 2015. http://www.ethree.com/wp-content/uploads/2017/02/E3_PATHWAYS_GHG_Scenarios_Updated_April2015.pdf

Washington clean energy advocates want guidance on what constellation of policies should be pursued to achieve the low-carbon pathways in Washington. Specifically, there was interest in:

1. Modeling transportation demand differently than how it was modeled in the Washington State Deep Decarbonization Study's Innovation case, looking at the impact of a vehicle miles traveled reduction similar to the UC Davis' Three Revolutions in Urban Transportation report¹³ on electricity demand.
2. Modeling different resources, such as offshore and onshore wind, and enhanced (not conventional) geothermal (EGS), as well as nuclear and tidal energy. Does onshore wind from Wyoming and Montana align better with Northwest electricity load peaks than offshore wind? Can tidal energy contribute?
3. Modeling the viability of biogas as a key contributor to achieving a 100% clean grid.

Other regional stakeholders expressed the desire to explore leakage issues across the Northwest to ensure that if some states are strongly restricting carbon emissions that those emissions do not shift to nearby states that have less stringent climate policies. There was interest, as well, in looking at deep integration of renewable energy across the West and solving the Bonneville Power Administration's economic issues. Finally, Renewable Northwest is investing in a Northwest low-carbon grid study and its manager sees a Northwest pathways study that indicates how the electricity sector would need to be further modeled as complementary to a low-carbon grid study.

Study Objective

The objective of an economy-wide Northwest Deep Decarbonization Pathways study (NWDDP) is to model the technical and economic implications of different decarbonization choices for the Northwest from now through 2050 to help Washington and Oregon policymakers, advocates, leaders, and investors make informed policy decisions about how the clean energy transition could unfold regionally over the coming three decades. Looking economy-wide at all energy systems—not just the electricity grid—will yield a better understanding of how the whole energy system works together and how the pathways interconnect.

Study Parameters

The study will model the energy systems of Washington, Oregon, Idaho, and Montana, including a detailed representation of buildings and building equipment stocks; industrial energy demand; and vehicle fleets and transportation demand for freight and passenger transport to attain a full picture of the Northwest energy systems.

The study would model three scenarios, potentially including: (1) increased coordination between the Northwest and California; (2) alternative electricity sector assumptions, such as 100% clean grid or no thermal energy on the grid or various biogas and other renewable energy contributions; and (3) increasing emissions reductions from the energy sector up to 90 percent below 1990 levels.

¹³ Lew Fulton, Jacob Mason, Dominique Meroux. US Davis Sustainable Transportation Energy Pathways. Institute for Transportation & Development Policy. February 2018. *Three Revolutions in Urban Transportation*. <https://steps.ucdavis.edu/wp-content/uploads/2017/05/ITDP-3R-Report-v6.pdf>

The study should explore the value of resource integration with California and with other parts of the West, such as Arizona and Nevada, as well as Montana and Wyoming. As we decarbonize the Northwest energy systems over the next three decades, there is a need to address the energy imbalance and integrate variable renewable energy across the West. As we increasingly power our buildings and vehicles with clean electricity, we need to understand how increased load will be met.

Audience

While encompassing the energy systems of the four Northwest states, the target audience and recommendations are Oregon and Washington policymakers, legislators, businesses, and advocates involved in climate and clean energy:

1. Washington and Oregon governors and legislators involved in climate policy
2. Northwest Utilities and Transportation/Public Service Commission members
3. Washington and Oregon cities that have pledged to decarbonize their cities
4. Washington and Oregon energy, climate, and climate justice advocacy groups
5. Washington and Oregon businesses and business associations incorporating climate change and climate policy into their plans
6. Northwest utilities
7. Northwest funders and investors interested in the low-carbon transition

Study Process

Managing Entity: The Clean Energy Transition Institute (<https://www.cleanenergytransition.net/>) is an independent Washington State-based entity that promotes strategies to accelerate the transition from fossil fuel to clean energy, focusing on accelerating the low-carbon pathways, advancing urban clean energy, and creating a clean energy workforce.

Consultant: The Clean Energy Transition Institute would contract with Evolved Energy Research (EER <https://www.evolved.energy/>) to conduct the study. Over the past eight years, the EER team has been involved in numerous global and domestic deep decarbonization studies and conducted the California, as well as Washington State and Portland General Electric studies so are the logical firm to work with.

Stakeholders: The study will be advised by its funders, a technical advisory group capable of working with the consultant to develop assumptions to define the deep decarbonization cases and different sensitivity analyses, and the key stakeholder who would use the results of the study to advance their climate and clean energy policies and agendas.

Timeline: The study would be conducted from May-August 2018 to produce results by the end of the summer to be helpful to Washington and Oregon policymakers, advocates, and businesses preparing for the 2019 legislative sessions.

Dissemination: A communications and outreach strategy would be developed with the help of the stakeholders ensure that the study is well-received by the audiences for which it is designed. After the study is completed, the Institute will convene a series of meetings to ensure that key policymakers who will be advancing climate policies in the 2019 Oregon and Washington legislative sessions understand its

conclusions. The study could provide the basis for further analysis of specific pathways, as well as multiple opportunities for convening groups around specific recommendations from the study.

Budget

The budget for the Northwest Deep Decarbonization Pathways Study is \$220,000 with \$140,000 for the study, \$50,000 for project management and technical support, and \$30,000 for communications and outreach as follows:

Clean Energy Transition Institute Northwest DDP Study	
INCOME	
<u>Foundations</u>	-
Foundations	172,500
Individual Donors	48,500
TOTAL INCOME	221,000
EXPENSES	
<u>Personnel</u>	0
<u>Contracted Labor</u>	-
Technical Consultant	140,000
Project & Technical Management	50,000
Website Updates	10,000
<u>Subtotal Contracted Labor</u>	<u>200,000</u>
<u>Other Expenses</u>	
Printing & Dissemination	20,000
<u>Subtotal Other Expenses</u>	<u>20,000</u>
TOTAL EXPENSES	220,000
BALANCE	1,000

Conclusion

The imperative of decarbonizing our economy is becoming clearer and more urgent every day. With progress largely stymied at the federal level, the best opportunity for action lies at the state and regional level. Achieving deep decarbonization requires choreographing technological and economic choices among a wide range of actions in energy systems over the next three decades—choices that must be designed for the specific energy and economic conditions of different regions of the country. Having a deep decarbonization pathways study that offers a framework for how the Northwest can decarbonize rapidly over the next three decades and make choices now in 2018-2019 that will set the region on the correct pathways would make a valuable contribution to legislators, advocates, utilities, and funders/investors.

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