Washington Department of Commerce

The Economic Impact of the Deep Decarbonization Pathways

Inputs, Methodology, and Results



Friday, November 6, 2020



Deep Decarbonization Pathway Scenarios

Based on Evolved Energy's models, all Scenarios would hit emissions targets. For the economic impact, the important differences between the Scenarios would come down to their net costs.

- **Reference** = Energy infrastructure and emissions based on current policy
- Electrification = The lowest-cost Scenario, though it relies on a higher quantity of out-of-state electricity generation compared to Constrained Resources
- Transport Fuels = The transportation sector would rely more heavily on synthetic fuels, which are more expensive in comparison with electrifying the sector
- Gas in Buildings = The building sector retains natural gas in the long-term, which would mean higher costs for the relevant sectors in the late 2030s and the 2040s
- **Behavior Change** = Sensitivity analysis around reduced energy consumption
- Constrained Resources = The state relies more on in-state power generation from solar, offshore wind, and onshore wind, which have higher costs than imports



"Phases" of the Economic Impact Analysis

The shape of the net cost curve by Scenario determines the inputs to the economic impact modeling. We have divided the net cost curve into four phases, which we briefly describe below.





Economywide Net Costs of Decarbonization

Costs by component





Benefits and Costs

At the core of the economic impact modeling is the REMI model. With REMI's dynamic structure, we can model both the changes in demand (e.g., for fuels) and supply (e.g., electricity prices).





REMI Structure

REMI is a "dynamic" computable general equilibrium ("CGE") model of regional economies. We mapped outputs from the DDP modeling into input variables for the economic impact analysis.





REMI Software

The screen capture shows the REMI software used for this analysis. This includes simulating each of the Scenarios and updating the underlying economic forecast for the COVID-19 pandemic.

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"Reference Scenario" in REMI Model

The historical data shows the economic upsets of the Great Recession and COVID-19, and the REMI model shows gradual economic and population growth throughout the next three decades.





Population Growth/Demographic Change

Population and GDP will increase in the long term in Washington despite relatively low employment growth because of the aging of the population and increasing technology/labor productivity.





Impact – Employment

Relative to the Reference Scenario, the Scenarios would increase employment during Phase 1, Phase 3, and Phase 4 and decrease employment during Phase 2 because of the increase in net costs.





Employment Forecast

Results from the previous slide are relative to the Reference Case. To illustrate this point further, the chart below shows the REMI employment forecast for the decarbonization Scenarios.





Impact – Employment by Industry

Electrification and Constrained Resources have similar results on an industry-by-industry basis, though **Constrained Resources** has a more positive impact to construction in the **2040**s.





Impact – Gross Domestic Product ("GDP")

GDP shows qualitatively similar results to employment. Investments in Phase 1 would increase GDP before costs in Phase 2 would decrease it. Lower costs in the long-term would then increase GDP.



Discussion

- Transport Fuels has more positive results in Phase 1, but its results for Phase 3 would be the least positive of all Scenarios
 - In the short-term, investments in the production capacity and infrastructure to support clean fuels would benefit the state economy, such as with construction
 - Once this is in place, however, the higher costs of these fuels compared to the other Scenarios would degrade the impact
- Gas in Buildings would have the highest costs in the long-run compared to the others
 - Higher costs translates into higher costs of living and higher costs of production for consumers in the REMI model
 - Reduces real incomes and investments

- Results for Electrification, Behavior Change, and Constrained Resources are similar
 - Electrification is slightly more positive in comparison to Constrained Resources in the short-term, and the opposite is true in the long-term impact results
 - Electrification has lower costs because it relies upon low-cost out-of-state power generation (e.g., wind in Montana)
 - Constrained Resources has higher costs, but it means economic development from in-state infrastructure (a combination of solar, onshore wind, and offshore wind, especially in the late 2040s)
- These two effects roughly "cancel each other out," leading to the very similar results in among these three Scenarios

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