The prospects for I-1631 eliminating 20 million tons of carbon pollution annually by 2035

An LCPI Analysis
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LCPI

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SUMMARY

In this Low Carbon Prosperity Institute (LCPI) analysis, we explore scenarios of carbon reduction investment performance based on the revenue allocation described in Initiative 1631. The initiative, also known as the "Protect Washington Act", imposes a steadily increasing carbon pollution fee on most fossil fuel uses and directs revenue toward projects to reduce carbon emissions, as well as investments in forests, water, community preparedness, and support to displaced workers and people with lower incomes. The measure is intended, but not required, to reduce carbon emissions in 2035 to 25% below 1990 levels, consistent with the state's legislated target.

The initial carbon pollution fee of $15 per ($tCO_2e$) in 2020 increases annually by $2/$tCO_2e$ plus urban-area inflation. As a mechanism to avoid punitive cost increases and reward performance, meeting the state's 2035 target and demonstrating a continued trajectory towards deeper reductions mid-century would trigger a freeze in the rate of fee increase. Meeting the state goal in 2035 will require a reduction of 30 million metric tons of carbon dioxide or equivalent (tCO_2e) relative to current statewide emission levels. LCPI finds that one third of reductions, approximately 10 million tCO_2e, should be expected from current trends and existing policies plus the price-elasticity effect of the fee if I-1631 is enacted. The measure would rely on a robust investment program to achieve the remaining 20 million tCO_2e.

LCPI finds that in order for the investment program to meet its target, the average cost paid to reduce carbon emissions must be between $15 and $45 per tCO2e. Performance within the range is primarily dependent on the actual allocation of revenue, which is to be determined by the appointed governing boards subject to legislative appropriation. While 70% of total expenditures are directed toward "Clean Energy & Clean Air" investments, additional claims on those funds may diminish the amount made available for direct emission reduction activities. LCPI evaluates two scenarios for revenue allocation, one in which two-thirds of total expenditures are directed toward activities which reduce carbon emissions, and another in which one-third is allocated. The results of this analysis have important implications for the design and strategy of investment plans.

Factoring in the impact of a rising fee on investment decisions, this range of necessary investment cost-effectiveness can be compared to what California's Climate Investments from its Cap and Trade proceeds has experienced ($67/$tCO_2e$) or to British Columbia's early experience with carbon reduction investments located within the Province (~$20 CDN / tCO_2e). Given the larger volume of carbon reduction I-1631 would target, the carbon fee investments must at least match the performance of those in California and B.C, a challenge the state is more likely to fail should competing priorities or discretionary shifts in allocation erode the funding made available for carbon reduction.

In an ideal scenario, the priorities I-1631 seeks to address are all achieved within the target investment price range, triggering the fee-freeze and accomplishing multiple aims. In reality, the board is likely to encounter trade-offs and must ably manage tensions if the initiative is to "Clean Up Pollution"[1] to promised levels.

[1] Initiative 1631 defines "pollution" as "the presence of or introduction into the environment of greenhouse gases."

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ANALYSIS

This analysis aims to answer the following central question:

> **What cost-performance must I-1631 investments in carbon reduction achieve in order to meet the state's 2035 emissions target and trigger a freeze in the rate of fee increase?**

To better understand how I-1631 might work to meet its goals, LCPI deployed its Greenhouse Gas Reduction Explorer modeling tool. The Explorer is built upon the state's Carbon Tax Assessment Model (CTAM) and has undergone review by the Washington Departments of Commerce and Ecology. CTAM is the same program used by OFM for the I-1631 fiscal note. Lawmakers and other stakeholders have relied on the Explorer's data-driven approach to evaluate possible policy outcomes of price signals (e.g. the fee) and targeted investments.

Unlike the revenue neutral carbon tax which appeared on ballots in 2016, Initiative 1631 is a carbon pollution fee which generates revenue for investments guided by an appointed board. Of total expenditures, seventy percent is allocated to Clean Energy & Clean Air for projects to reduce carbon emissions, as well as transition assistance for displaced fossil fuel workers and people with lower incomes; twenty-five percent to forest and water projects; and five percent to a category called "healthy communities".[2] While substantially different in implementation, these priorities are largely similar to those seen in other price-and-invest legislative proposals such as SB 6203.

To answer the central question we considered the following factors concerning I-1631:

- **Scope of Emissions Coverage** -- Energy intensive trade exposed (EITE) businesses, which are highly sensitive to the cost of energy, are exempt, as are coal plants under closure agreements, and airplane and maritime fuels.[3] In total, nearly 30 percent of fossil fuel emissions from in-state activities are exempt.[4] LCPI modeling incorporates expected reductions from existing policies into its baseline assumptions, such as the closure of the Centralia Coal Plant. In the absence of I-1631, existing policies and consumption trends are projected to decrease state emissions from 96 million tCO_2e in 2018 to 90 million tCO2e in 2035.
- **Response to Pricing Carbon** -- Businesses and consumers respond to higher prices by buying less fossil fuels or shifting to less carbon intensive products, an effect called "price elasticity". LCPI estimates the price elasticity response to the fee will reduce cumulative statewide emissions by 3 to 5% over the

[2] The share of allocation is after program admin costs, assumed to be 1% of revenues as in the Fiscal Note, and includes both state revenue and fees credited for specific uses to gas and power utilities.
[3] Less coverage generally lowers price signal impacts, unless the changes for those sectors require a much higher price signal.
[4] The categories of exemptions include as a share of otherwise eligible fossil fuel emissions: *aircraft fuels* (10% of eligible emissions in 2020, then 12% of eligible emissions in 2026); *maritime fuels* (4%, then 7% of eligible emissions); *Energy-Intensive Trade-Exposed Industries* (6% to 7% of eligible emissions), *Coal closure facilities*, meaning Centralia's Transalta Power Plant and Montana Colstrip Power Plant Units 1&2 (4%, then none of eligible emissions); Certain classes of agricultural and road transport emissions, including public transportation (1%, then 2% of otherwise eligible emissions).

2020-2035 period, including 4 to 5 million tCO_2e in 2035 (Figure 3: top, green shaded portion). That is enough to decrease projected state emissions in 2035 to 85 or 86 million tCO_2e.

- **Investment Performance within Available Funds** -- Investment plans to purchase projects that certifiably reduce the use of fossil fuels are intended to provide roughly 80% of the ambition required to meet the state's 2035 goal. Project opportunities are constrained by overlay criteria, multi-jurisdictional approval processes, and competition with other priorities for funding. LCPI modeled two scenarios as upper and lower bounds of the revenue made available for carbon reduction projects. More money made available for carbon reduction enables the fund to afford a wider range of projects to meet its 2035 goal.

LCPI analysis does not attempt to project the likelihood of the state being deemed on track to achieve its 2050 goals. The results demonstrate what investment performance would be required for the board to have a reasonable justification for freezing the fee: meeting the state's 2035 emissions target. We assume carbon reductions from investments only occur from the Clean Air & Clean Energy expenditures, which includes retained credits by utilities.

Revenue Generated

The pollution fee is assessed on the use of fossil fuels in increments of one tCO_2e. Assuming no freeze, the fee of \$15/tCO_2e in 2020 would rise to \$45 (USD 2020; \$63 in year 2035 dollars) by 2035, and \$75 (USD 2020) by 2050.

LCPI projects the fee will generate approximately \$12 to \$13 billion through 2035, in addition to \$4 to \$5 billion in utility retained credits (expressed in present day dollars: USD 2017). Of total expenditures, seventy percent is directed toward Clean Air & Clean Energy investments, which includes uncapped and uncertain allocations for worker-transition support programs and the elimination of cost burdens created by the fee on people with lower incomes. Utilities may retain and implement any potential fee obligation, totalling as much as forty percent of Clean Air & Clean Energy expenditures as credits for approved investments. Otherwise, those funds revert to the state treasury within the Clean Air & Clean Energy Account.

The model assumes that reductions through investments reduce the quantity of fossil fuels that will generate revenue for the program. In the extreme, additional fees of \$3 billion (a 20% increase, in USD 2017) would be collected through 2035 if investments accomplish no additional carbon reduction, resulting in both higher emissions and total fee collection than under these projections.

Initiative 1631 Emission Reduction Goals

The initiative tasks investment plans to achieve a reduction consistent with the state's 2035 statutory GHG goal. It provides the following terms under which the pollution fee will freeze:

> *"The pollution fee is fixed and no longer increases, except for annual increases for inflation, when the state's 2035 greenhouse gas reduction goal is met and the state's emissions are on a trajectory that indicates that compliance with the state's 2050 goal is likely, as those goals exist or are subsequently amended, as determined by the board."*

Additionally, it provides this guidance on the expectations of the investment program:

> *"The investment plans must prescribe a competitive project selection process that results in a balanced portfolio of investments containing a wide range of technology, sequestration, and emission reduction solutions that efficiently and effectively reduce the state's carbon emissions from 2018 levels by a minimum of twenty million metric tons by 2035 and a minimum of fifty million metric tons by 2050 while creating economic, environmental, and health benefits. The emission reductions to be achieved under the plan should, in combination with reductions achieved under other state policies, achieve emissions reductions that are consistent with the state's proportional share of global carbon reductions that will limit global temperature increases to two degrees centigrade and preferably below one and one-half degrees centigrade."*

LCPI estimates that a reduction of 20 million tCO_2e in 2035, in addition to the impacts of price elasticity and existing policies, shall place the state in compliance with statutory limits of 25% below 1990 greenhouse gas emission levels, equal to 66 million tCO_2e in 2035.

Available Funds Scenarios

To understand the investment performance required to meet the target, LCPI modeled the following two scenarios as upper and lower bounds of the revenue made available for carbon reduction through the year 2035:

- ***Reduction-centric*:** Nearly all Clean Air & Clean Energy expenditures (70% of total initiative expenditures) are directed toward projects with the primary aim of carbon reduction, with only a small percentage going to worker-support programs.
- ***Reduction-peripheral*:** Roughly half of the Clean Air & Clean Energy expenditures (33% of total initiative expenditures) are directed toward projects with the primary aim of carbon reduction, with a more substantial share used in ways that do not directly reduce carbon emissions, including triple the amount going toward worker-support programs relative to the *reduction-centric* scenario.

Clean Air & Clean Energy expenditures for both available fund scenarios are considered to include any utility retained credits.[5] LCPI did not evaluate a scenario where the goals or investment account allocations themselves are further amended by the legislature or adjusted by the governance board, which would be purely speculative.

The scenario assumptions are based on two potential diversions from Clean Air & Clean Energy Account expenditures to priorities other than carbon reduction as specified in the initiative text.

[5] Section (3)(2)(a): "Seventy percent of total expenditures under this act must be used for the clean air and clean energy investments authorized under section 4 of this act." & Section (4)(6)(o): ""The amount of credits authorized and spent under this subsection counts towards the minimum percentage of investments required by section 3(2)(a) of this act."

1. **Direct bill assistance.** A *minimum* of 15% of Clean Air & Clean Energy expenditures, inclusive of any utility credits, is directed "to prevent or eliminate the increased energy burden of people with lower incomes as a result of actions to reduce pollution, including the pollution fees collected from large emitters in this chapter."[6] We used a range of 0% (*reduction-centric* scenario)[7] to 25% (*reduction-peripheral* scenario)[8] of expenditures going toward bill assistance in the form of cash rebates or payments, which we assume produces no carbon reduction benefit. Such use of funds could actually increase emissions relative to projections as the resulting reduction in energy costs for lower income households would increase the quantity they consume. Refer to Appendix A for more details on these shares of expenditures.

2. **Displaced worker support.** The worker-support program requires $50 million after four years, replenished annually with "additional moneys from the fund if necessary" and no annual maximum. A recent report by the Political Economy Research Institute (PERI) evaluates the worker-support costs of six different policy package combinations and the workers who receive them.[9] The PERI report finds that the average annual wage for the professions most likely to receive worker support is $150,000 dollars. The costs of these six scenarios averaged $80 million per year with a range of $5 million to $294 million per year. Excluding the biggest outlier on each end, the range is $43 million to $114 million per year. We simplify this, ramping up funds after $50 million over four years to reach a 2020-2035 average of $40 million per year for the reduction-centric scenario and $120 million per year for the reduction-peripheral scenario.

Investment Cost-Performance Pathways

Investment costs are measured by the amount paid to certifiably remove one tCO_2e from the atmosphere ($/$tCO_2e$). LCPI projections describe necessary system averages, **net of inefficiencies.** A system inefficiency could include an abandoned or more expensive than anticipated project, or additional costs to administer the account.[10]

[6] See Appendix A for discussion of "lower income" as defined by the Initiative. The Initiative defines four categories of priority, the first of which is "bill assistance programs and other similar programs". The other three categories are for transportation costs ("including public and shared transportation for access and mobility"), household energy consumption ("such as weatherization"), and "community renewable energy projects that allow qualifying participants to own or receive the benefits of those projects at reduced or no cost."
[7] The *reduction-centric* scenario case assumes that either all energy burden reduction occurs via projects that reduce fossil fuel consumption.
[8] The *reduction-peripheral* scenario of 25% assumes that all energy costs are passed through to consumers and all energy burden increases are offset by direct bill assistance. LCPI evaluated the expected share of the population qualifying under I-1631's definition of lower income and found that 40% would qualify. The 40%, i.e. lowest four quintiles, would be exposed to roughly 25% of the cumulative price increase according to research from the Brookings Institute. The 25% of total fee and credits represents 36% of the money in the Clean Air & Clean Energy Account plus credits retained by utilities - which is 70% of total expenditures inclusive of any credits.
[9] The PERI report evaluates a 30.5 million tCO_2e decrease in statewide fossil fuel emissions from 2014 to 2035. LCPI projects a 30.5 million tCO_2e decrease in statewide greenhouse gas emissions from 2018 to 2035 - a comparable level of ambition.
[10] A 1% share to "Clean Up Pollution Fund" administration is already assumed, in line with the Fiscal Note assumptions by OFM. Additional admin costs occurring within the fund sub-accounts has not been explicitly included.

To establish a necessary cost-performance range, LCPI applied potential investment pathways to each scenario. The first pathway is *Deployment-Driven*, which assumes the cost to reduce a unit of carbon increase 5%/year as "low-hanging fruit," is used. The second pathway is *Technology Driven*, which assumes the cost decreases 5%/year with the advent of lower cost technology solutions. In Appendix B are additional results, including a middle cost path which assumes *No-Change* in investment cost-effectiveness over time. For all investment pathways, an average 10-year carbon reduction lifetime for an investment is assumed, such that any capital investments made from 2026 onwards will, on average, still be directly reducing carbon emissions in 2035 (and year 2025 onwards for 2034, etc).[11]

Each investment pathway also leads to a different result in terms of cumulative emissions reductions over the 2020-2035 period. More cumulative reduction is expected under the deployment driven pathway (250-280 million tCO_2e), than under a technology driven pathway (160-170 million tCO_2e).

The scenario results should be viewed in the context of the carbon price impact on the economics of lower carbon opportunities. As the carbon price increases, some projects in non-exempt sectors may become cost effective over their expected lifetime even without additional investment or incentives, while higher cost projects may come into range of what pencils out.

Table 1: Clean Air & Clean Energy Account, Scenario Summary

	Average, *reduction-centric* scenario	**Average, *reduction-peripheral* scenario**
Direct Bill Assistance (share of total fee revenue and claimed credits)	0%	25%
Average annual costs of worker support, 2020-35 (USD 2020)[12]	$40 million	$120 million
Investment performance needed, 2026-2035 average ($/$tCO_2e$, USD 2020)	$41 to $46	$17 to $21

Net of any program inefficiencies, scenario results indicate a range of approximately $15 to $45 / tCO_2e (USD 2020) for investments will be necessary to reach 2035 targets and trigger the fee freeze. The main driver is the amount of monies made available for direct carbon reduction, which ranges from roughly $5.7 billion (USD 2017, of a total $17.4 billion) in the *reduction-peripheral* scenario, to roughly $11.8 billion (USD 2017, of a total $17.8 billion) in the *reduction-centric* scenario (Appendix B for detailed

[11] A shorter average lifetime would deliver reductions closer in time to any project being in-place, corresponding with lower system inertia, while longer average lifetime projects would allow earlier investments to still be contributing reduction later but in smaller annual increments. A longer average lifetime results in full accrual of reductions per unit of capital deployed accumulating later, and a greater degree of system inertia - with less immediate returns on investment.

[12] Includes $12.5M each year 2020-2023, and a higher than average allocation in years 2024-2035.

results). The *reduction-peripheral* scenario requires over 50% cheaper projects than in the more robustly funded *reduction-centric* scenario.

The revenue allocation and emissions trajectory for the *reduction-centric* scenarios and *reduction-peripheral* scenarios are presented below (Figures 1-3). For each scenario the chart presents an average of the investments effectiveness pathways (deployment-driven, technology-driven, and no change).

Figure 1: Fee allocation by category under reduction-centric scenario

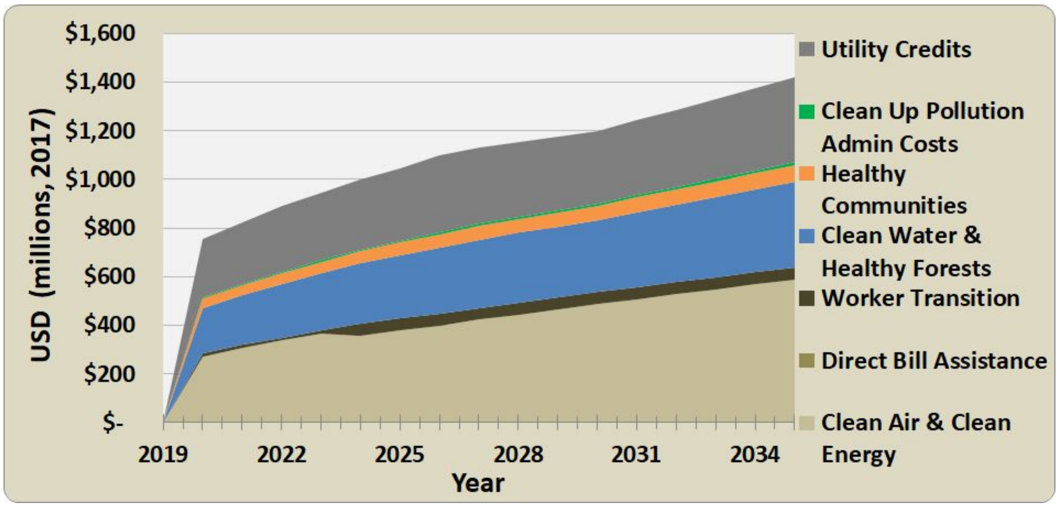


Figure 2: Fee allocation by category under reduction-peripheral scenario

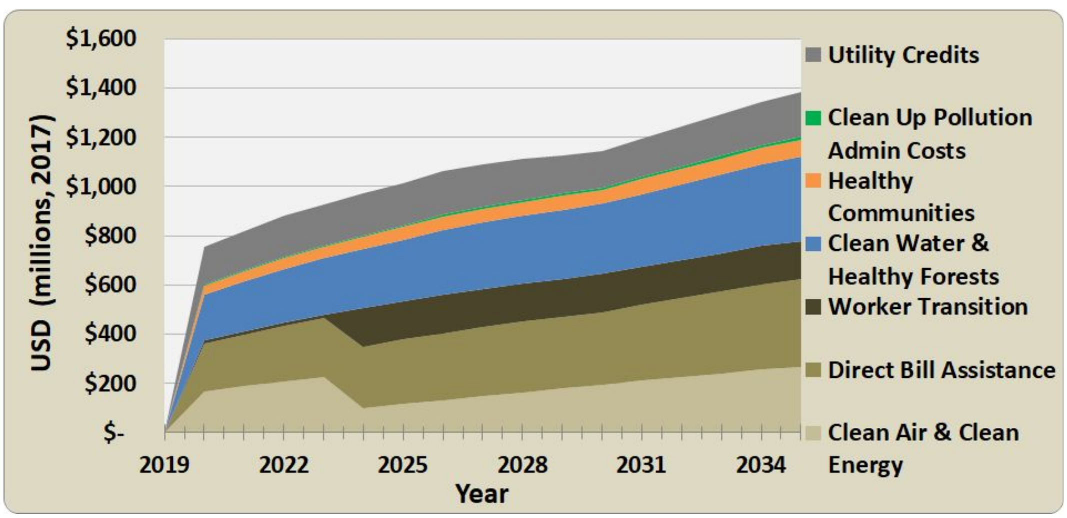
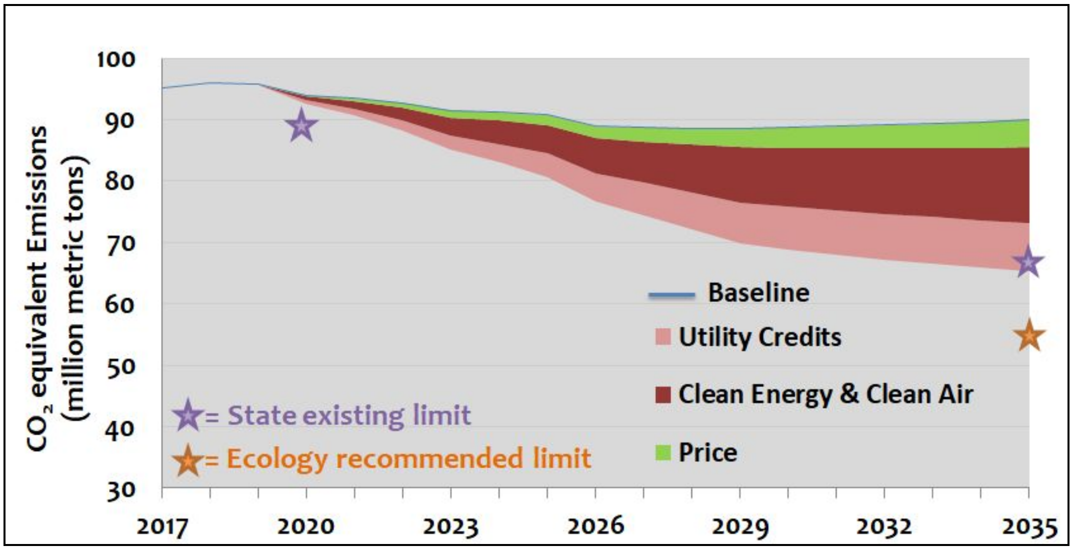


Figure 3: Emissions trajectory under average of both scenarios



Is Required Investment Cost Performance Realistic?

The experience of other jurisdictions, and an overview of reported project costs provides insight into the practicality of investments delivering sufficient reductions within the cost-effectiveness range of $15-$45 / tCO_2e. Marginal Abatement Cost Curve (MAC Curve) analysis provides a useful starting point for assessing projects. MAC Curves visually order the incremental carbon abatement costs and the available volume of emissions across a suite of project types. Such analyses are underpinned by project-level assessments of carbon reduction economics. The range of costs spans negative (may require upfront capital but return net value over time, or are economically favorable but face other barriers to deployment) to positive (do not fully return value and likely require financial support to pencil out). Public money may be spent to unlock cost-negative projects, however the benefit will generally flow to the economy rather than back to the state unless designed to recover costs through profit-sharing arrangements. Utilities may be better positioned to realize these benefits using retained credits, since they tend to have established programs and projects aimed at lower cost-range opportunities, such as Energy Efficiency and switching power dispatch away from coal.[13]

[13] The model does not assume any explicit difference between the Clean Energy & Clean Air Account versus utility retained credits in terms of the cost-performance of investments, although the established programs and outreach channels of utilities may reasonably be expected to allow better carbon return on investment than investments from the state treasury. The utility investments are further constrained by needing either UTC or Commerce approval, and have a more ambitious investment plan guideline of "describing a long-term strategy to eliminate any fee obligation imposed by this chapter on electricity and minimize any fee obligation on natural gas".

Figure 4: Example Carbon Reduction Projects Compared to I-1631 Target

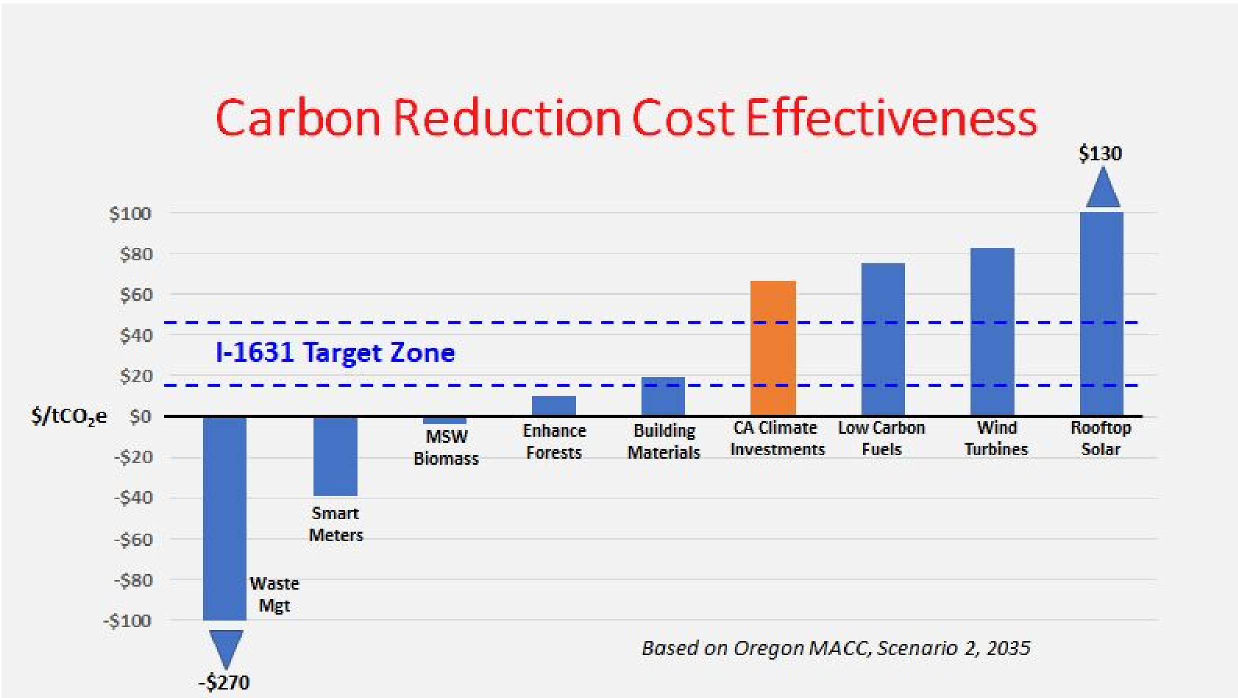


Figure 4 above provides a cost-effectiveness comparison of various project types derived from Oregon, along with California's experience and the range of I-1631 necessary cost-effectiveness. The chart is by no means complete, up-to-date, or specific to Washington state. However, it demonstrates the general approach. With a fee in place, the impact on project economics needs to be factored in as well.

At the program level, California is the largest economy-wide carbon reduction program in the United states, having managed auction proceeds and investments since 2014. California's Climate Investments (CCI) anticipates an average of \$67/tCO_2e with its board implemented funds. That cost-performance is skewed by the most-expensive 10% of reductions, projected at \$160/tCO_2e. Nearly 90% of the best cost-performing investments are projected at \$40/tCO_2e.[14] Similar to I-1631, California's program includes overlay criteria, targeting a significant share of investments for disadvantaged communities[15]

[14] The \$67/tCO2e projection for implemented funds describes the anticipated carbon reduction over the entire project lifetime of all investments and no net present discounting applied. Shortening the investment window (e.g. only 10-year project emissions impact) or applying future discounting would increase the average cost per tCO_2e of to-date implemented CCI funds. We do not include the legislated requirement for high-speed rail funding, which is programmatically separate from board allocation, and with which lifetime emissions reductions averaged across all CCI projects decreases to \$20/tCO2e.

[15] Of implemented funds to date, 72% have been towards projects located in or directly benefiting disadvantaged communities (for the most cost-effective 87% of implemented funds, it is a 54% share, including 29% located in those communities so identified).

while also targeting environmental and economic "co-benefits", such as other air pollutants.[16] Both the cost-effectiveness and available supply of different project types will vary by state, requiring a deep understanding of the applicable regulatory and market conditions that influence costs of abatement.

Another example is the Carbon Neutral Government British Columbia program (formerly Pacific Carbon Trust), which reported 2016 reduction cost performance of $25 CDN / tCO$_2$e following a report after the program's first seven years (2008-2014) of 4.5 million tCO$_2$e of in-province offset programs for $53.4 million ($12 CDN/ tCO$_2$e). The Regional Greenhouse Gas Initiative (RGGI) provides another example. RGGI took effect in 2009 and was recently extended another decade. While RGGI, like California, showed that state-evel actors "could boost economic growth and job creation by imposing a small price on GHG emissions and investing the money to increase energy efficiency and renewables", the lessons of a power-sector only cap in a multi-state region with a different emissions profile from Washington presents a tougher case for comparison.

Regional project examples that are within a budget to achieve the I-1631 fee-freeze could include: capturing methane from waste, smart meters, electrification or biomass fuel switch, organics and recycling programs, cellulosic ethanol, bus fuel efficiency, reafforestation, and heating/cooling upgrades. On the other hand, many popular projects, some of which are referenced as examples in I-1631, may be far more expensive than what investments must return on average. Examples include certain types of low carbon biofuels, wind turbines, home solar panels, urban forestry, and transit and intercity rail. The Yes on 1631 campaign has compiled a list of local investments that are likely representative of those that would be closely considered for funding. These include investment in five categories: wind power, forestry and water, energy efficiency, and public transit including a focus on rural investments.

At a minimum, I-1631 will need to clearly beat California's to-date projected investment performance of $67/tCO$_2$e to achieve the 2035 emissions targets. Working in favor of I-1631 is market pricing. California's cap-and-trade fee ($15 in latest auction) is lower than the I-1631 price signal, which starts at $15/year and escalates $2/year until the target is reached. The market effect of higher carbon pricing allows the same projects that reduce fee exposed-emissions to need less additional stimulus in Washington to be economically favorable.

Washington projects launched in 2026 or later - those most likely to directly contribute to the 2035 target - would have an additional decade of experience relative to investments already implemented in California, and the benefit of technological improvement and carbon price certainty to factor into the decision-making process.[17] On the other hand, the carbon reductions from the CCI funds implemented to date are projected to reduce only a fraction of the roughly 20% of statewide emissions that I-1631 investments are targeting. This is also true for the BC offsets and RGGI investments of auction proceeds.

[16] Section (7)(1)(c) of I-1631 describes "exposure to emissions of air pollutants" under various Revised Code of Washington (RCW) as one of four additional criteria for prioritization "After applying the account-specific criteria in sections 4, 5, and 6".

[17] Since the model assumes a ten-year life for investments, it is investments starting in 2026 that will most directly contribute to the 2035 goal.

That smaller proportional scale may be lower-hanging fruit of cost-effective investments, yet in the case of CCI implemented funding remains more costly than I-1631 needs to deliver.

DISCUSSION & CONCLUSION

I-1631 sets in motion an impressively ambitious program. Lots of eyes will be upon Washington as the second state in the nation to implement a program of this scope. While proponents can point to promising evidence that technology trends and shrewd investment strategies will break in its favor, the initiative leaves little to no room to depart from proposed revenue allocations. To meet its ambitions, investments will need to be managed with the kind of professional high-performance skills seen in commercial investment funds and pursuing co-benefits will need to be carefully considered, if not moderated.

In an ideal world, all of the initiative's priorities would go hand-in-hand. Reality is likely to require a balancing act between greenhouse gas reduction and other priorities, requiring difficult decisions in the face of constraints. The governance board must weigh the importance of reducing carbon emissions with low income assistance with supplemental wage support for displaced refinery workers with mitigating costs for all consumers by triggering the fee-freeze. [18] Managing these competing priorities may mean resisting the pressure to pursue popular projects with too high of cost, and it may require enacting additional accountability tools to maintain adherence to cost-performance over decades of state budgeting cycles.

The development of investment plans will be a critical process step to determine the likelihood of the initiative serving to meet the state's 2035 emissions target and trigger a freeze in the rate of fee increase. Smart strategies will harness emerging and rapidly cost-declining technologies, adeptly manage the impact on project economics of the carbon price, and seek to maximize the leveraging of state investment with private dollars. Only when these plans clarify the revenue allocations among priorities and the terms under which projects will be considered, will it be possible to forecast real world performance.

The Low Carbon Prosperity (LCP) Institute's system design work delivers on the need for technically accurate long-term greenhouse gas reduction strategies to guide policy decisions. We explore the opportunities and complex risk factors associated with creating climate policy from the state level up. Policy makers, citizen groups, businesses and other stakeholders can count on the Low Carbon Prosperity Institute to provide sound data-driven analysis on the future of carbon policy regardless of the outcome of I-1631 at the ballot.

[18] Among jurisdictions that have reported privately leveraged funds for carbon reduction investments, a ratio of roughly 6 to 1 has been reported by California and British Columbia. Leverage ratios can be measured in many different ways - of various quality and relevance to the I-1631 program.

Appendix A: Funding to Offset Increases In Lower Income Energy Burdens

Initiative 1631 directs a minimum of 15% of the Clean Air & Clean Energy Account plus utility retained credits towards:

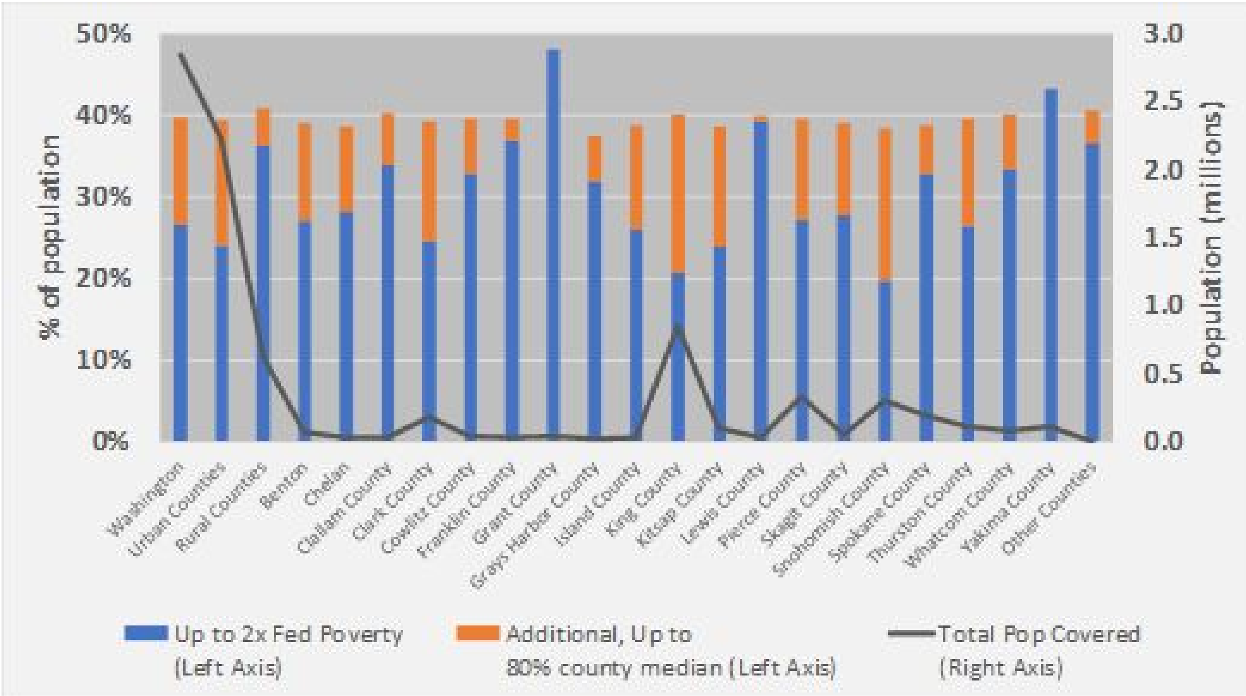
> *"...sufficient investments to eliminate net increases in energy burden of customers that are people with lower incomes as a result of actions to reduce pollution, including the requirements of this act. At a minimum, fifteen percent of credits must be dedicated to investments that directly reduce energy burden on people with lower incomes. Additional funds must be allocated for program development, recruitment, enrollment, and administration to achieve the intent of this subsection."*

There is no maximum threshold set on percentages these "sufficient investments" and "additional funds" can reach. I-1631 defines "people with lower incomes" as:

> *"(a) All Washington residents with an annual income, adjusted for household size, which is at or below the greater of:*
> *(i) Eighty percent of the area median income as reported by the federal department of housing and urban development; or*
> *(ii) Two hundred percent of the federal poverty line; and*
> *(b) Members of an Indian tribe who meet the income-based criteria for existing other means-tested benefits through formal resolution by the governing council of an Indian tribe."*

To project the potential for revenue to be used for relieving the energy burden of people with lower incomes LCPI examined data on median household income by county (American Community Survey (ACS), 2016) and the share by county of income to poverty levels (also from the ACS, 2016). By this method, 39.7% of the populations would be covered by either the federal poverty line or the area median income designation. Including 40.8% in rural counties and 39.4% in urban counties. Of the statewide total, 26.6% of the population would be covered under the federal poverty designation (blue bars in Figure A1) and 13.1% additional population covered under the eighty percent of area median income definition (orange bars in Figure A1). In rural counties, the break-down is approximately 36.2% and 4.6%, respectively, while in urban counties it is 24.0% and 15.4%, respectively. Of a total population eligibility of 2.8 million, roughly 2.2 million are in urban counties and 0.6 million are in rural counties (black line, Figure A1).

Figure A1: Lower Income Qualifying Population and Population Share by County & State



Having established an estimate of 40% of households qualifying for energy burden assistance, we turned to a Brookings Institute research paper on the distributional effects of carbon tax, from which we reproduce Table 6:

Table 6. Share of the Burden by Income Decile

Decile	Burden ($ billions)	Cumulative burden ($ billions)	Percent of total burden (%)	Cumulative % of burden
Bottom	5.0	5.0	5	5
Second	6.5	11.5	6	11
Third	7.0	18.5	7	18
Fourth	8.2	26.7	8	26
Fifth	9.3	36.0	9	35
Sixth	10.0	46.0	10	45
Seventh	11.2	57.2	11	56
Eighth	12.1	69.3	12	68
Ninth	13.9	83.2	14	81
Top	19.1	102.3	19	100

Source: Authors' Calculations. The table reports the total carbon tax burdens to each household income decile, before any tax swaps or other redistribution of proceeds.

Considering the first four income deciles, the cumulative burden of a carbon tax is roughly one-quarter of the total. Therefore, LCPI assumes 26% as the high-end estimate of revenues from the fee that could be allocated to eliminating the energy burden. If this need were met by simply allocating funds to the first listed priority category ("Energy affordability through bill assistance programs and other similar programs;") these funds would not reduce any carbon pollution, and could further dull the price elasticity impact – an effect we make no attempt to model. Alternatively these funds could have a minimal or lower impact on reducing carbon pollution if they proved to be very high-cost approaches to reducing carbon (some analysis has shown certain priority uses of the energy burden elimination funds, such as public and shared transportation for access and mobility; weatherization; and community renewable energy projects could fall into this category).

Appendix B: Detailed Scenario Analysis Results

In this Appendix, we present detailed projections for the two available funds scenarios, each with four investment pathway cases that were the focus of this study:

- The "reduction-centric" scenario in which almost all Clean Air & Clean Energy funds plus utility credits go towards direct carbon reduction projects, and the "reduction-peripheral" scenario in which a substantial portion of Clean Air & Clean Energy expenditures go towards non-carbon reducing priorities. Each scenario is run assuming three different investment pathways
  - *Deployment-driven*: Investments take the cheapest, "low-hanging fruit", first and costs of investments subsequently increase 5% per year;
  - *Technology-driven*: Investments are initially more expensive, but decrease 5% per year as technology learning accelerates;
  - *No-Change*: Investment cost remain unchanged through the 2020-2035 window.
  - *Averaged*: The average of the three above pathways.

Consistent Parameters Across All Scenarios::

- Exemptions range from 27% to 30% of fossil fuel emissions in any given year.
- CTAM price elasticities are used for all scenarios, with modified elasticity of fuel switching for natural gas from coal to capture partial coal resource exemptions through 2025 and full coal resource coverage starting in 2026;
- Investments are in projects with an average lifetime of 10-years for subsequent carbon reductions.
- Program costs ($/tCO_2e$) are net of system inefficiencies including administrative costs and projects that fail to deliver or deliver more expensive than anticipated (or cheaper than anticipate) emissions reductions.
- Investments from utility retained credits go 100% towards reducing otherwise taxed fossil fuel emissions to meet requirement of investment plans that eliminate long-term fee obligation.
- Investments from board-controlled funds reduced other taxed and non-taxed emissions proportional to its share of statewide emissions (46% of emissions reductions associated with board funds reduce emissions from taxed sources).
- 1% of non-retained credits are towards overall administration costs.

Reduction-centric scenarios (Table B1)

- The following parameters are the same for each of the "*reduction-centric*" scenarios:
  - Lower income energy burden increase is counteracted through programs that also reduce energy consumption and carbon. No direct bill assistance;
  - Worker-transition fund averages $40 million per year through 2035, after $50 million total over the first four years ($49M per year from 2024-2035). Values are in constant 2017 USD.

Reduction-peripheral scenarios (Table B2)

- The following parameters are the same for each of the "*reduction-peripheral*" scenarios
  - Elimination of energy burden increase on lower income households requires 26% of carbon fee revenues (equal to 37% of Clean Air & Clean Energy Account and Utility Credits);
  - Worker-transition fund averages $120 million per year through 2035, after $50 million total over the first four years ($156M per year from 2024-2035). Values are in constant 2017 USD.

While total revenue numbers through FY2023 are consistent with OFM fiscal projections for I-1631, our apportionment of revenue follows a close reading of the initiative, notably Sections 3(2)(a) and 4(6)(o).[19] These sections clearly outline that shares of total expenditures should be considered inclusive of utility credits. Our analysis of the OFM Fiscal Note suggests that the retained credits for the utility sector were not assumed to impact the allocation into new accounts under the Clean Up Pollution Fund, which is incorrect. The amount of credits does impact the expected allocation of revenue and therefore must be included to properly tabulate the funds made available to the various purposes as outlined in the initiative.

OFM modeled the initiative such that "following deductions for administrative costs, 70 percent of the balance in the Clean Up Pollution Fund will be deposited into the Clean Air and Clean Energy Account, 25 percent will be deposited into the Clean Water and Healthy Forests Investments Account and 5 percent will be deposited into the Healthy Communities Account."

We believe this approach is incorrect, and leads to overstating the funds made available to the state in the Clean Air & Clean Energy Account, and understating the funds made available to water, forests, and healthy communities.

[19] Section (3)(2)(a): "Seventy percent of total expenditures under this act must be used for the clean air and clean energy investments authorized under section 4 of this act." & Section (4)(6)(o): “"The amount of credits authorized and spent under this subsection counts towards the minimum percentage of investments required by section 3(2)(a) of this act.“

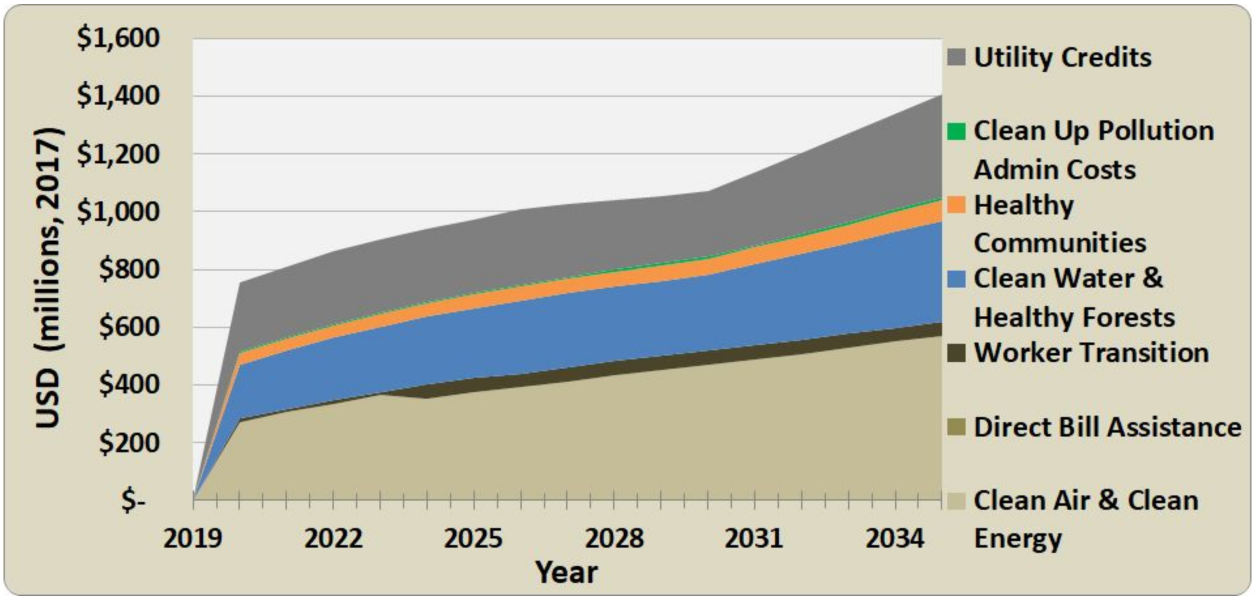
Table B1: Reduction-centric investment, revenue, and emissions outcomes

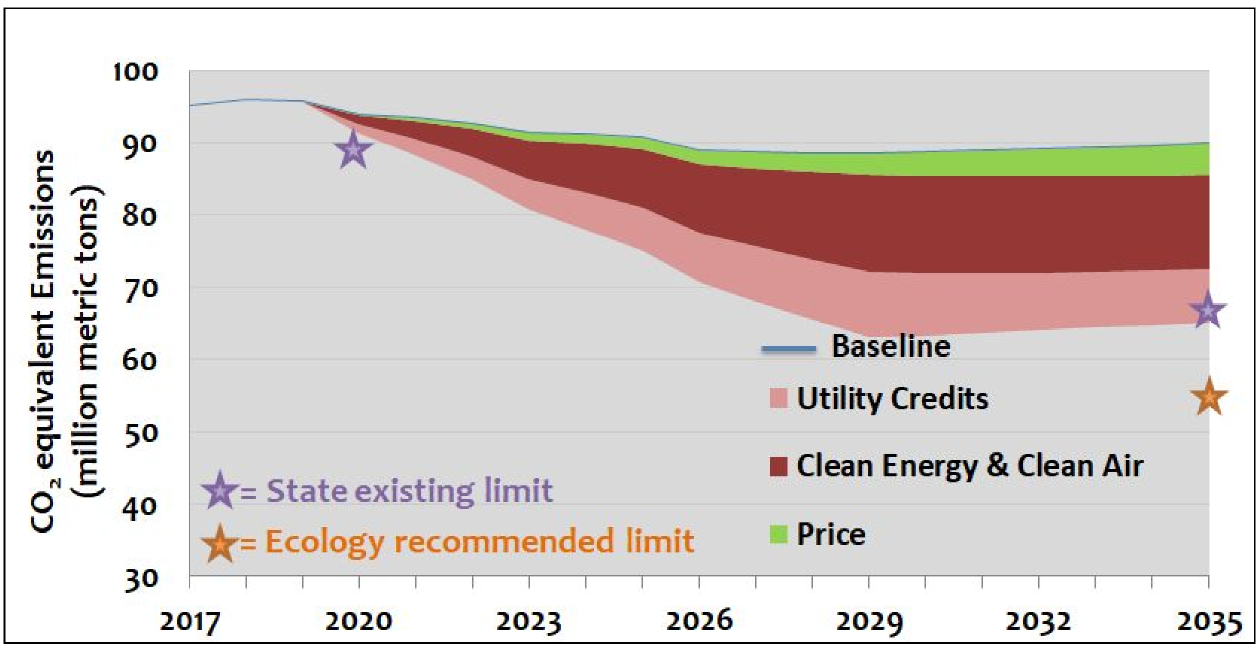
Investment Pathway:	Deployment-Driven	No Change	Tech-Driven	Averaged *10/19 update
2020 investments ($/t$CO_2$e)	$22	$40	$74	$45*
2035 investments ($/t$CO_2$e)	$46	$40	$34	$40*
2026-2035 investment average ($/tCO2e)	$38	$40	$43	$40*
Revenue, through FY 2023 (nominal, corresponding to OFM Fiscal Note coverage), of which:	$3.16 billion	$3.20 billion	$3.25 billion	$3.22 billion
Retained Credits	$0.95 billion	$0.99 billion	$1.01 billion	$0.99 billion
Clean Air & Clean Energy Account	$1.26 billion	$1.26 billion	$1.26 billion	$1.26 billion
Clean Water & Healthy Forests Account	$0.79 billion	$0.80 billion	$0.81 billion	$0.80 billion
Healthy Communities Account	$0.16 billion	$0.16 billion	$0.16 billion	$0.16 billion
Revenue, 2020-2035 (USD 2017), of which:	$16.8 billion	$17.8 billion	$18.5 billion	$17.9 billion
Retained Credits	$4.2 billion	$4.7 billion	$5.2 billion	$4.8 billion
Clean Air & Clean Energy Account, (including $ of worker-support)	$7.4 billion ($0.6 billion)	$7.6 billion ($0.6 billion)	$7.7 billion ($0.6 billion)	$7.6 billion ($0.6 billion)
Clean Water & Healthy Forests Account	$4.2 billion	$4.4 billion	$4.6 billion	$4.4 billion
Healthy Communities Account	$0.8 billion	$0.9 billion	$0.9 billion	$0.9 billion
Year 2035 emissions reductions (million tCO_2e) from investments	20.4	20.2	20.1	20.2
Cumulative emissions reductions from investments (million tCO_2e)	254	196	155	190

Table B2: Reduction-peripheral investment, revenue, and emissions outcomes

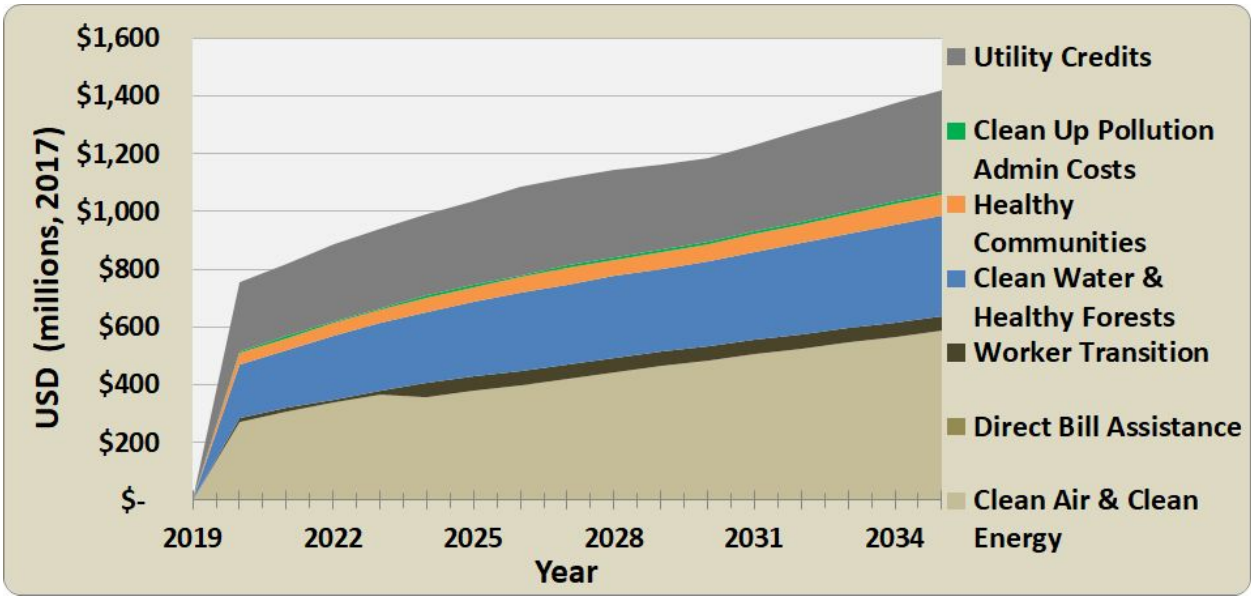
Investment Pathway:	Deployment-Driven	No Change	Tech-Driven	Averaged
2020 investments ($/t$CO_2$e)	$9.5	$18	$34	$21
2035 investments ($/t$CO_2$e)	$20	$18	$16	$18
2026-2035 investment average ($/tCO2e)	$16	$18	$20	$18
Revenue, through FY 2023 (nominal, corresponding to OFM Fiscal Note coverage), of which:	$3.10 billion	$3.19 billion	$3.24 billion	$3.20 billion
Retained Credits	$0.57 billion	$0.61 billion	$0.63 billion	$0.61 billion
Clean Air & Clean Energy Account	$0.77 billion	$0.78 billion	$0.78 billion	$0.78 billion
Direct Bill Assistance	$0.82 billion	$0.85 billion	$0.87 billion	$0.86 billion
Clean Water & Healthy Forests Account	$0.77 billion	$0.80 billion	$0.81 billion	$0.80 billion
Healthy Communities Account	$0.15 billion	$0.16 billion	$0.16 billion	$0.16 billion
Revenue, 2020-2035 (USD 2017), of which:	$16.1 billion	$17.2 billion	$18.1 billion	$17.4 billion
Retained Credits	$2.2 billion	$2.6 billion	$2.9 billion	$2.7 billion
Clean Air & Clean Energy Account, (including $ of worker-support)	$4.8 billion ($1.9 billion)	$4.9 billion ($1.9 billion)	$5.0 billion ($1.9 billion)	$4.9 billion ($1.9 billion)
Direct Bill Assistance	$4.2 billion	$4.5 billion	$4.7 billion	$4.5 billion
Clean Water & Healthy Forests Account	$4.0 billion	$4.3 billion	$4.5 billion	$4.3 billion
Healthy Communities Account	$0.8 billion	$0.9 billion	$0.9 billion	$0.9 billion
Year 2035 emissions reductions (million tCO_2e) from investments	20.2	20.2	20.4	20.5
Cumulative emissions reductions from investments (million tCO_2e)	283	213	166	206

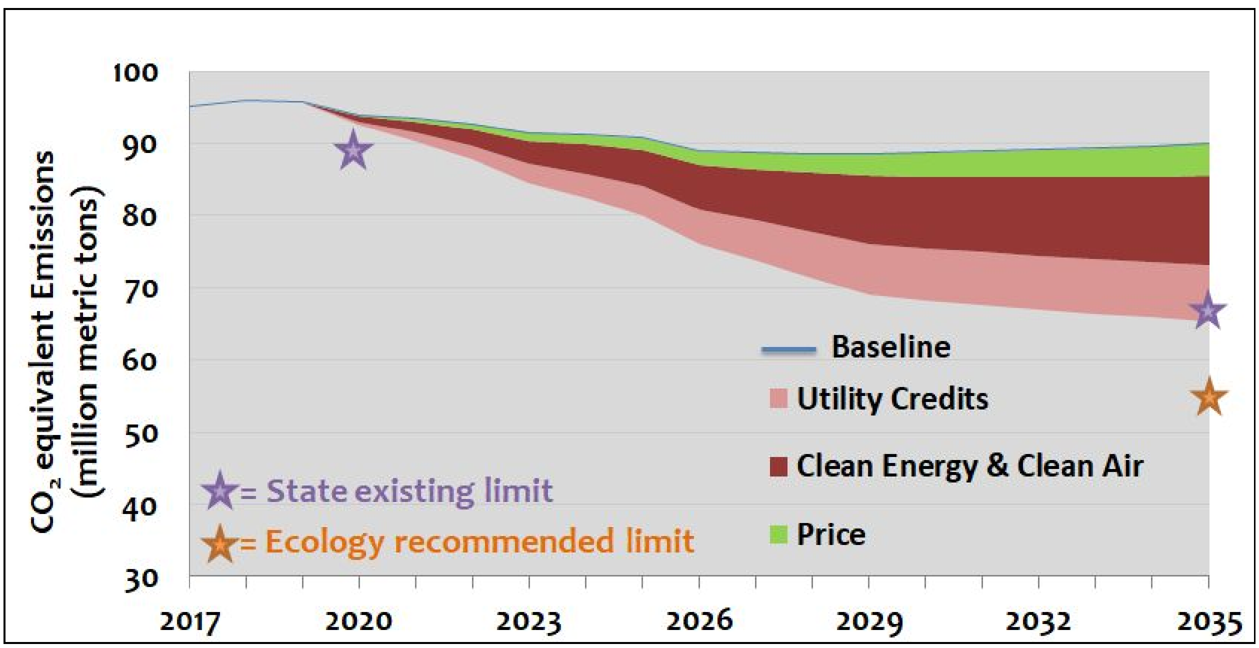
I. Reduction-centric scenario, Deployment-Driven Investment Pathway



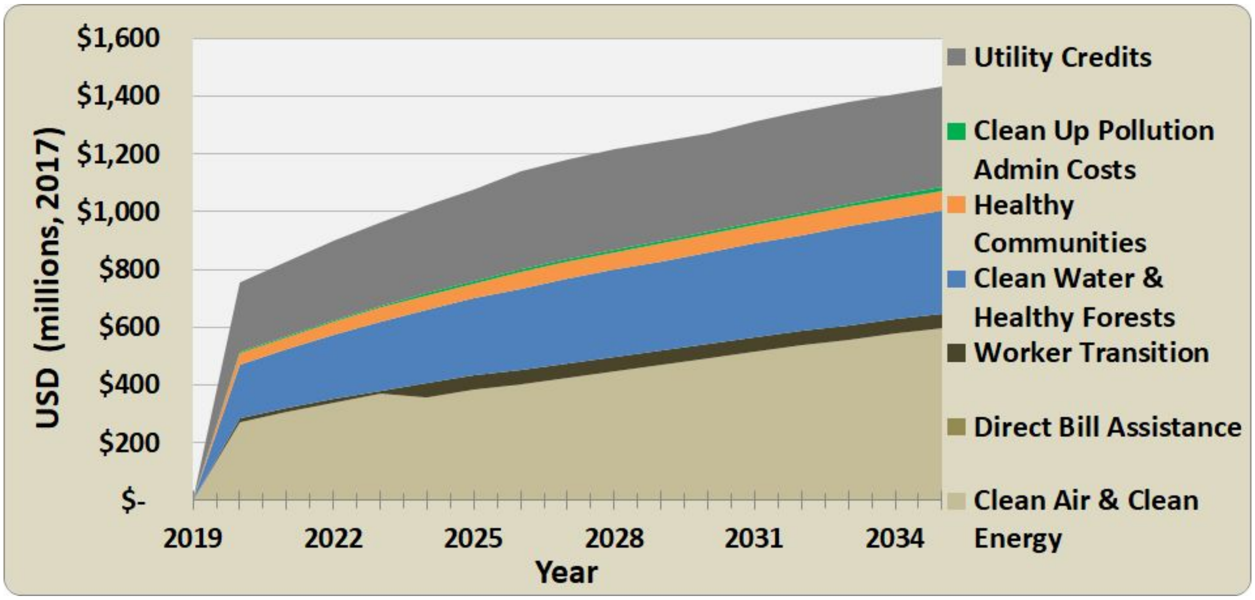


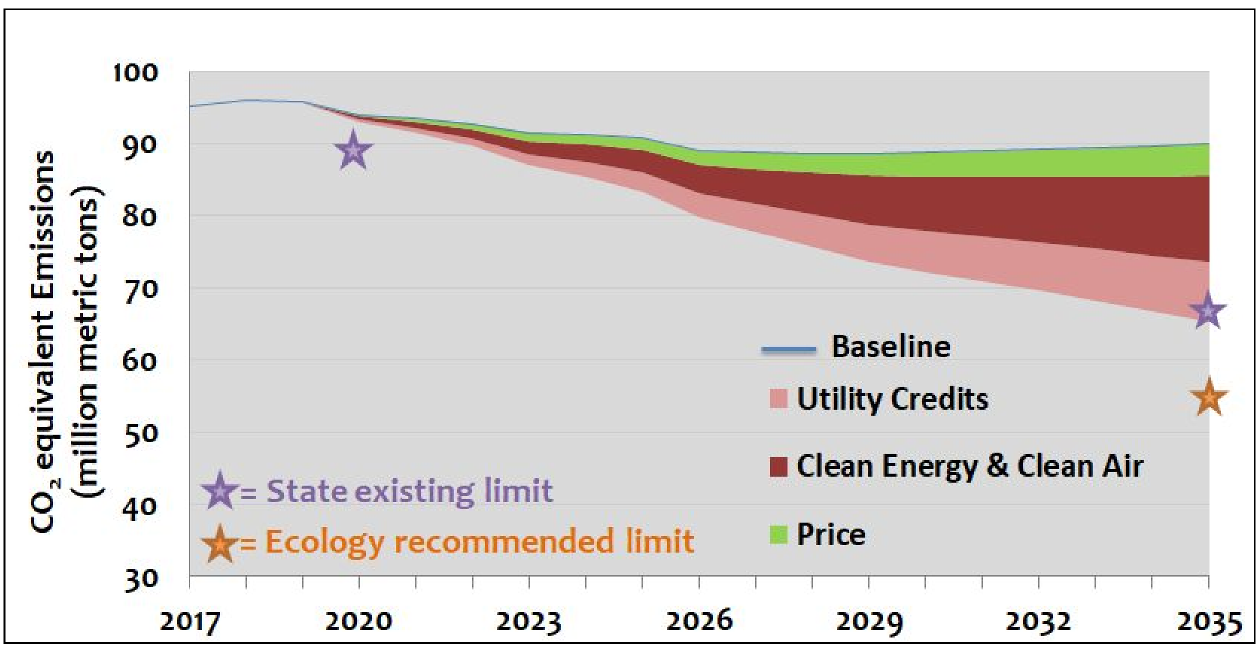
II. Reduction-centric scenario, No-Change Investment Pathway



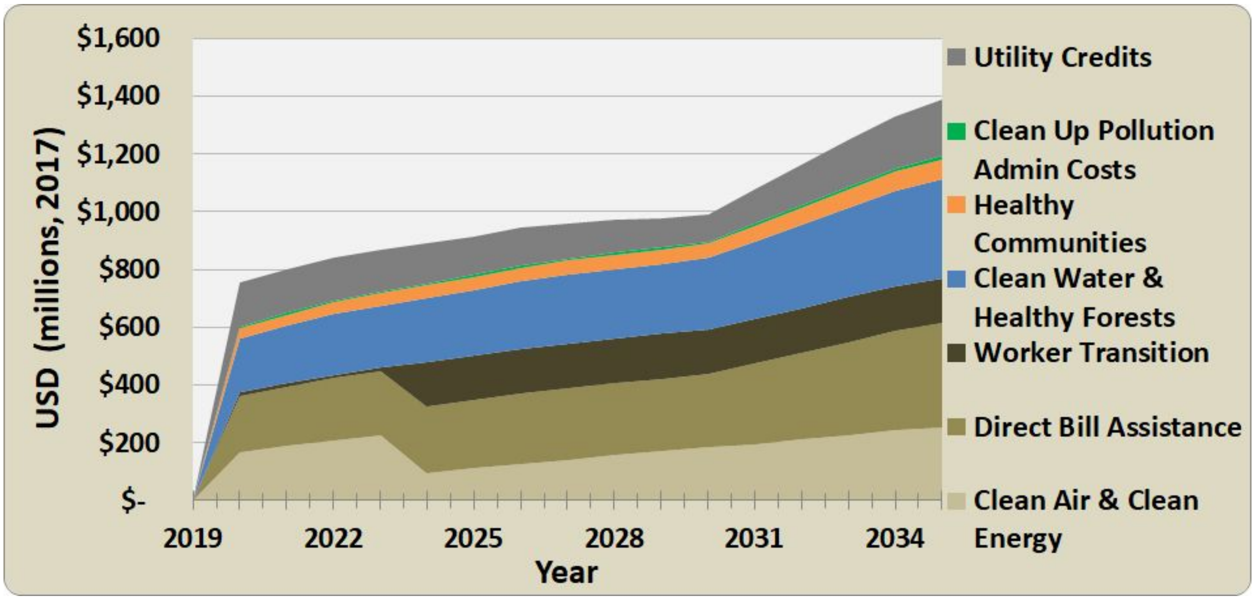


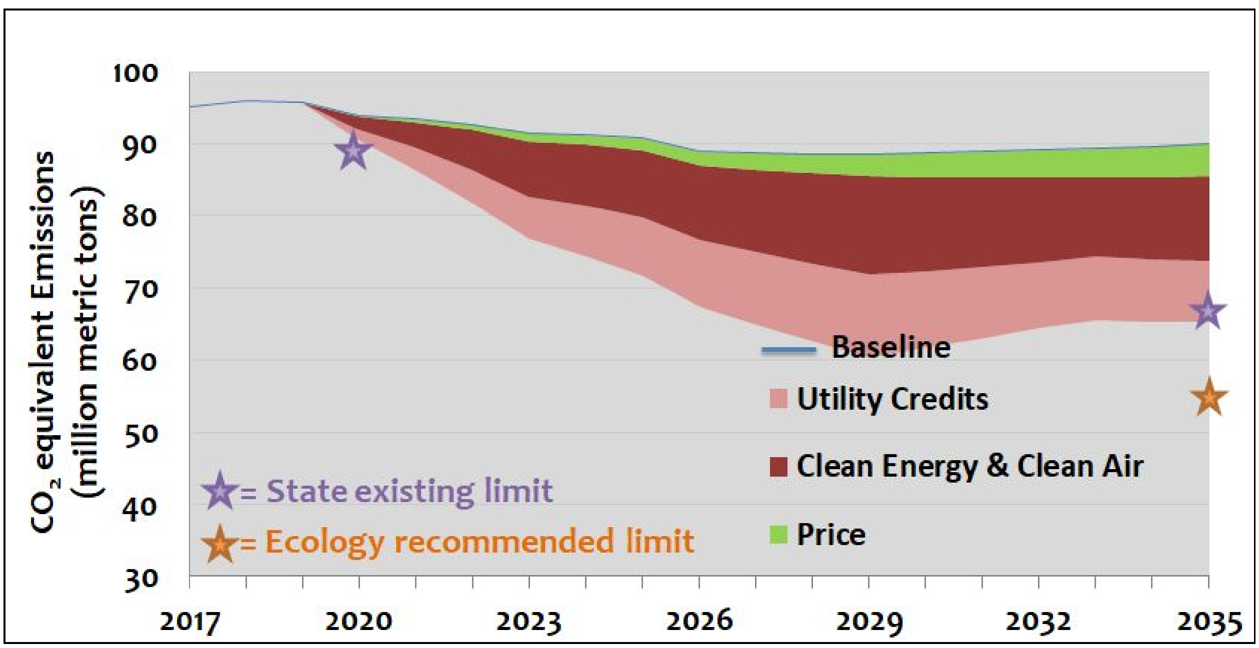
III. Reduction-centric scenario, Technology-driven Investment Pathway



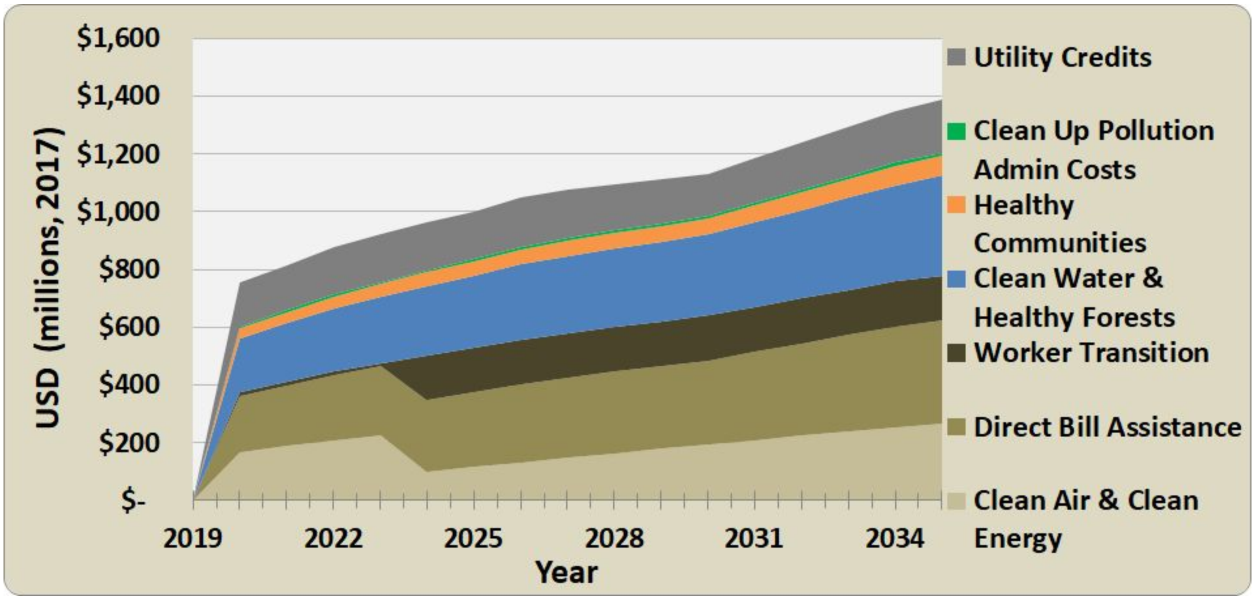


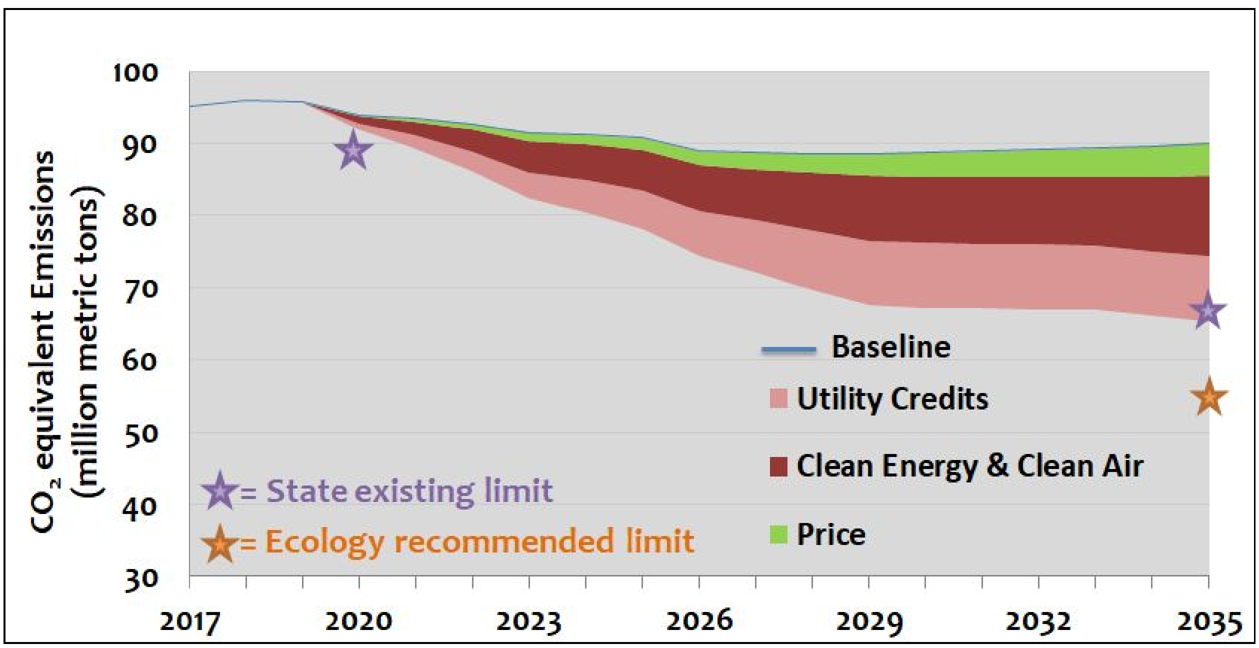
IV. Reduction-peripheral scenario, Deployment-Driven Investment Pathway





V. Reduction-peripheral scenario, No-Change Investment Pathway





VI. Reduction-peripheral scenario, Technology-driven Investment Pathway