



Public Comments on the Report to Legislature on EITE allocation for 2035 - 2050

Public Engagement Period:
May 2025 – September 2025

For the
Climate Pollution Reduction Program

Washington State Department of Ecology
Olympia, Washington

January 2026

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September 3rd, 2025

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RE: Washington Department of Ecology Draft Report – Energy-Intensive, Trade-Exposed (EITE) Compliance and Allocation of No-Cost Allowances Post-2034

Mr. Young:

The Alliance of Western Energy Consumers (AWEC) appreciates the opportunity to provide comments on the Department of Ecology’s (Ecology) draft report to the Legislature regarding long-term compliance obligations and the allocation of no-cost allowances for energy-intensive, trade-exposed (EITE) facilities for 2035–2050.

AWEC represents many of Washington’s largest employers and major energy consumers. Our members operate facilities designated as covered EITE entities under the Climate Commitment Act (CCA). Collectively, these companies provide tens of thousands of high-paying, skilled jobs across critical sectors including agriculture, metals, pulp and paper, air products, and aerospace. These industries are essential to Washington’s economy and play a significant role in supporting the state’s environmental and economic objectives.

AWEC acknowledges Ecology’s effort to prepare this report and appreciates recent discussions highlighting the substantial work that remains to ensure any recommendations are grounded in economic reality, technological feasibility, and legislative intent. We also recognize Ecology’s use of supporting reports, including Rocky Mountain Institute’s (RMI) public comment submitted as “Opportunities for Industrial Modernization in Washington” and Eastern Research Group’s (ERG) Ecology-contracted study, “Environmental Justice and Economic/Market Information on EITE Facilities in Washington.” However, the draft report to the Legislature fails to rely on technical feasibility, sufficiently addressing economic viability, leakage risk, and statutory clarity—issues central to the success of Washington’s climate policy and the continued competitiveness of EITE industries.

Report Timing

Ecology’s decision to issue recommendations on EITE allowance allocation for 2035–2050 more than a year ahead of the statutory deadline raises significant concerns. The Legislature set a deadline of December 1, 2026, under RCW 70A.65.110 to ensure adequate time for comprehensive analysis, stakeholder engagement, and the incorporation of real-world

compliance data from the Cap-and-Invest program. Submitting recommendations early undermines this statutory intent and could result in policy outcomes that are neither balanced nor evidence-based. In addition, the early submission of the report from Ecology could be harmful to EITE covered facilities and stakeholders.

Throughout the current process, industry stakeholders have expressed concerns that an accelerated timeline compresses the opportunity for meaningful engagement with industry, labor, and other stakeholders. This lack of engagement risks overlooking critical economic and technological considerations. Furthermore, additional time could provide clearer understanding on the trends to allowance pricing, leakage risk, and emissions reductions. Submitting early means recommendations are based on an incomplete and less accurate picture.

The Legislature was intentional in providing a long lead time to allow Ecology to conduct an objective and thorough analysis. By issuing recommendations more than a year early, Ecology is missing opportunities for deeper data-driven evaluation. This approach undermines confidence in the integrity of the process as noted below in errors of statutory interpretation, such as Ecology's misrepresentation of RCW 70A.65.110(4)(b) when suggesting a legislative deadline of December 1, 2027, for adopting compliance obligations. Rushing the process increases the likelihood of similar factual or analytical errors being embedded into final recommendations without adequate scrutiny or correction. Moreover, early issuance could lock in recommendations heavily influenced by flawed or incomplete third-party analyses—such as those from RMI and ERG—without sufficient review and response. This creates the risk of legislative decisions being based on biased or untested theoretical assumptions, rather than a full and balanced record.

Additional time allows Ecology to evaluate economic feasibility alongside technological feasibility—an issue that remains unresolved in prior discussions (e.g., HB 1682 – 2022 Session). It also provides an opportunity to incorporate actual compliance cost impacts and explore alternative allocation methods grounded in real program performance, rather than theoretical projections.

This rationale underscores why adhering to the statutory timeline is essential for producing credible, defensible, and equitable recommendations.

Legislative Intent

The Legislature provided unambiguous direction for this report in RCW 70A.65.110(4)(a). Ecology's statutory obligation is to “describe alternative methods for determining the amount and a schedule of allowances for energy-intensive, trade-exposed (EITE) facilities for the compliance period beginning in 2035” and to do so through “a review of global best practices in ensuring against emissions leakage and economic harm.”

This requirement is anchored in the broader legislative intent expressed in the Climate Commitment Act (CCA). The Legislature stated that it “intends to create climate policy that recognizes the special nature of emissions-intensive, trade-exposed industries by minimizing leakage” and further emphasized that “climate policies must be appropriately designed, in order to avoid leakage that results in net increases in global greenhouse gas emissions and increased

negative impacts to those communities most impacted by environmental harms from climate change.” (RCW 70A.65.005(6)).

Taken together, these provisions make the Legislature’s expectations clear:

- Ecology’s task is to present options, and each option should be grounded in best practices for leakage prevention and ensuring against economic harm; and
- The process should maintain a commitment to the core rationale for EITE protection—avoiding leakage and the associated social, economic, and environmental harm.

Despite this statutory framing, the draft report and supporting materials place substantial emphasis on aligning EITE allowance schedules with the statewide cap and annual allowance budgets. For example, Ecology states that recommendations should ensure allocations are “aligned with annual allowance budgets and other applicable program objectives, including supporting the achievement of statewide emissions limits.” (*Document 1: Review of Best Practice Policies for Avoiding Leakage*, May 1, 2025, p. 2).

Similarly, Document 6 structures key recommendations—such as Draft Recommendation 1.1—around legislative guidance to “align no-cost allocation with program objectives, allowance budgets, and emissions limits,” rather than first prioritizing leakage mitigation as directed in statute. The result is a report that risks shifting from an options report to a policy preference report, implicitly endorsing approaches that embed EITEs into the cap trajectory rather than maintaining leakage protection as the primary objective.

This reframing is not a technical nuance; it has fundamental implications:

- **Legislative Role:** RCW 70A.65.110(4)(a) clearly reserves the allocation decision for the Legislature. Ecology is to provide options and analysis, not recommend prescriptive alignment mechanisms that could constrain legislative discretion.
- **Leakage and Competitiveness:** The Legislature recognized that poorly designed post-2034 allocation could increase global emissions (through leakage) and harm Washington communities economically. Ecology’s current framing places those risks secondary to program cap alignment, which is inconsistent with both statutory direction and best practice.
- **Precedent for Policy Drift:** If EITE allocation is treated as a cap-management tool rather than a leakage-mitigation tool, the foundational purpose of EITE protections under the CCA is diluted.

Reliance on RMI and ERG Reports

Although our comments are not primarily focused on the RMI and ERG reports, Ecology’s reliance on these analyses warrants a brief discussion of their significant shortcomings. RMI’s analysis emphasizes hypothetical decarbonization pathways but does not adequately evaluate economic feasibility, capital investment requirements, or global competitiveness impacts. Technical potential does not equate to commercial or economic viability, particularly in industries operating on thin margins and competing in global markets, nor does it equate to technical reality. For instance, while RMI asserts that current compliance requirements for the

EITEs covered in their report are insufficient, its recommendation to reduce free allowances by ~39% starting in 2035 (Exhibit 9, p. 29) is based on assumptions detached from real-world market conditions. The report overlooks recent U.S. electricity demand projections, which show significant new load from electrification (~14,000 GWh annually), and assumes ongoing availability of grants and tax credits that are, in fact, winding down. Additionally, RMI's reliance on technologies such as green hydrogen and point-source CCS—neither of which is currently commercially viable at scale—contradicts its own claim to avoid speculative breakthroughs. Finally, RMI proposes new qualification criteria for EITEs (p. 37) that exceed the scope of the Climate Commitment Act and legislative intent to minimize leakage and protect trade-exposed industries. The report is contradictory to the statutory requirements.

ERG's analysis provides baseline emissions, demographic, and economic data. However, it lacks the necessary granularity and policy-oriented frameworks required to translate environmental justice concerns and economic impacts into allocation criteria. Specifically, it does not:

- Examine how allocation alternatives (e.g., benchmarking, declining free allowances) might affect leakage or facility viability;
- Reflect cumulative burdens across overburdened communities or assess mitigation potential;
- Offer trade-sensitive analysis keyed to Washington's industrial sectors; or
- Demonstrate incorporation of sector-specific stakeholder insight or alignment with the Legislature's objectives.

Should Ecology provide more time, per our previous recommendations and guidance on the legislative intent, stakeholders would be afforded adequate time to further analyze these reports and ensure their respective contributions are founded in real data and application at the facility-level. For instance, with more time Ecology should provide draft scenario allocations for no-cost allowances in the coming months to allow stakeholders to assess potential financial impacts. Currently, based on documents 1–6, there is no visibility into the broader economic consequences of their legislative recommendations because draft allocation adjustments have not been shared. If Ecology is considering changes to the distribution of no-cost allowances, stakeholders need access to draft scenarios to evaluate the impacts. Given Ecology already has complete emissions data, providing these scenarios would demonstrate a collaborative approach and enable informed feedback. Such data would be instructive for policymakers.

AWEC supports the comments submitted by EITE Advisory Group members on the draft Legislative Report, as well as comments from EITEs related to the RMI and the analysis conducted by ERG. We strongly urge Ecology to revisit the concerns previously raised regarding the RMI and ERG work products, particularly the final stakeholder comments, including the *Technical Review of the Eastern Research Group's (ERG) Report: "Environmental Justice and Economic / Market Information on Emissions-Intensive, Trade-Exposed (EITEs) Facilities in Washington"* prepared by Trinity Consultants for the Western States Petroleum Association.

Specific Concerns with Recommendations

- **Recommendation 1.1:** Seeking legislative guidance to “align no-cost allocation with program objectives, allowance budgets, and emissions limits” lacks clarity and risks creating uncertainty for EITE industries. The Legislature has already recognized the unique circumstances of EITEs and should remain the authority on allocation schedules to preserve economic stability and jobs.
- **Recommendation 1.2:** Inclusion of a Carbon Border Adjustment Mechanism (CBAM) raises legal and practical concerns. AWEC and other EITE stakeholders have repeatedly cautioned that CBAM implementation at the state level faces significant constitutional and international trade law barriers. These concerns must be acknowledged rather than overlooked.
- **Recommendations 2.1 & 2.2:** An “objective leakage assessment” is unnecessary and duplicative given the Legislature’s previous designation of EITE sectors based on comprehensive factors. Introducing new assessments could disrupt certainty for industries already planning decades-long capital investments. The Legislature should continue to determine EITE designations and allowance schedules based on jobs, economic impacts, decarbonization costs, and technological realities.

Finally, nearly all recommendations acknowledge that additional work and stakeholder engagement is needed. We strongly encourage Ecology to avoid premature conclusions or implied policy commitments before these critical gaps are resolved.

Conclusion:

AWEC urges Ecology to refine the draft report to:

- Align with clear legislative intent;
- Incorporate a balanced analysis of economic and technical feasibility;
- Recognize the risks of carbon leakage and trade law constraints;
- Provide the Legislature with a transparent depiction of unresolved conflicts rather than prescriptive recommendations.

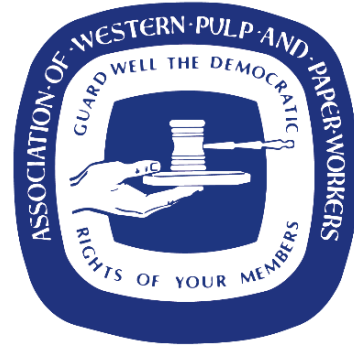
Our members remain committed to constructive engagement on solutions that advance Washington’s climate objectives without sacrificing economic competitiveness, family-wage jobs, or the viability of essential industries.

Sincerely,



Brandon Houskeeper
Alliance of Western Energy Consumers

Adrian Young
Washington Dept. of Ecology
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September 3, 2025

Re: Ecology's Draft Report on Energy-Intensive, Trade-Exposed (EITE) Allowance Allocation for 2035–2050

Dear Mr. Young,

On behalf of the Association of Western Pulp & Paper Workers Union (AWPPW), I appreciate the opportunity to submit these comments regarding the Department of Ecology's draft report on long-term compliance obligations and the allocation of no-cost allowances for Energy-Intensive, Trade-Exposed (EITE) industries.

The AWPPW is proud to have been the only labor representative at the EITE Industries Group table. For more than a year, we participated in discussions with our industry partners and employers to ensure that the perspective of the worker at all levels was included and that the livelihoods and families directly impacted were not ignored. Our members operate the pulp and paper mills across Washington State and the broader Pacific Northwest. These facilities sustain thousands of union-backed, family-wage jobs in communities that have few alternative economic anchors.

In approaching this issue, I speak from lived experience. When the Kimberly-Clark pulp and paper facility in Everett closed, more than 700 direct jobs and thousands of indirect jobs were lost forever. I proudly held one of those jobs. The closure of that facility left a lasting scar on workers and their families, even in a city like Everett where other major employers such as Boeing provided some buffer against the economic shock. In many smaller, rural mill towns across Washington, where no such economic safety net exists, the loss of a mill is devastating on a scale that communities simply cannot recover from.

As I reflect on Ecology's draft report, I can only describe the sentiment this way: "Our industry is under attack, and our jobs are the collateral damage." That is how it feels for me as someone who has lived through a mill closure and seen the lasting consequences. Instead of positioning pulp and paper as part of Washington's climate solution, too much of this process has signaled an intent to phase out our industry altogether. Workers cannot help but feel that our jobs, our communities, and our livelihoods are being treated as expendable rather than as assets worth protecting.

The Economic Importance of Mills and Workers

For generations, AWPPW members have powered Washington's forest products industry—creating jobs, strengthening communities, and driving innovation. As stewards of a sustainable future, we continue to produce essential materials while supporting responsible forest management and economic opportunity for generations to come. Our work not only supports today's economy but lays the foundation for a thriving, renewable industry that benefits everyone.

As you have heard from multiple stakeholders in other comments and throughout this process, Washington's pulp and paper sector provides approximately 4,000 direct union-backed, family-wage jobs. When indirect effects are counted, this number more than triples, given the 3:1 multiplier effect associated with mill operations. The broader forest products sector supports over 42,000 direct jobs and 102,000 total jobs statewide. The pulp and paper segment represents some of the most stable, family-supporting work available in Washington's manufacturing economy.

These are not abstract statistics. In a town like Port Angeles, a single mill closure would erase not just 200–300 union jobs, but the equivalent of 600–900 additional jobs in the local economy. This is not theoretical; it is very real. When the McKinley Paper mill announced its closure, economist Dr. Dan Underwood projected the loss of 193 direct positions worth about \$16 million in annual income, another 151 supply-chain jobs valued at \$11 million, and an additional 73 jobs tied to community spending, worth \$3.2 million. In total, the mill's closure was expected to mean 418 jobs lost and over \$31 million in annual labor income. "It's a lot, it is significant," Dr. Underwood noted.¹

Local governments also faced steep projected losses. The projected direct loss of taxes to Clallam County and the City of Port Angeles was about \$300,000, with another \$500,000 from the supply chain and \$320,000 from the general economy—totaling \$1.1 million per year.

Tacoma faced a similar economic shock when the WestRock mill closed in 2023. The facility represented roughly 7% of Tacoma Water's revenue—the equivalent of water used by 100,000 homes.² Without that large customer, Tacoma Water warned that rates for families would have to rise to make up the gap. Soon after, the utility proposed a 9% increase in monthly residential rates, with 5% tied directly to the mill's closure on top of a previously approved 4% hike.³

¹ Jeff Tozzer, "It's Not a Pretty Picture," *Clallam County Watchdog*, July 3, 2024.

<https://www.ccwatchdog.com/p/its-not-a-pretty-picture>

² "Aroma of Tacoma" fades: WestRock paper mill to close in September," KOMO News, July 11, 2023.

<https://komonews.com/news/local/westrock-company-aroma-of-tacoma-paper-mill-to-close-september-2023-employees-community-impact-high-operating-costs-kraft-pulp-capital-pierce-county-washington-state>

³ Tacoma Water could start charging customers 9% more," KIRO 7 News, Sept. 14, 2023.

<https://www.kiro7.com/news/local/tacoma-water-could-start-charging-customers-9-more/GTHD25SD7BAYNDWDSUETV6WD3I>

This is the reality: mills are not only job sites, they are anchors for local tax bases, utility systems, and community stability. When they disappear, the costs shift onto families, small businesses, and local governments least able to absorb them.

Mill Closures in Washington: The Human Cost

When a mill closes, the impact is immediate and deeply personal. Families who have relied on steady, union-backed jobs suddenly find themselves facing an uncertain future. Paychecks stop, health care becomes uncertain, and parents are left to explain to their children why life at home is about to change.

The closure of the McKinley Paper mill in Port Angeles is a clear example. Nearly 200 workers lost jobs that had supported families and sustained the community for decades. Some families were forced to move away to find work, while others stayed and struggled, relying on already strained safety nets. Local businesses lost customers, schools saw students leave, and the stability of an entire community was shaken.

Union President John Fox described the closure as “a catastrophic event for employees, their families, and the entire community.” That reality is repeated whenever a mill shuts down. The damage goes far beyond economics—it reaches into kitchens, classrooms, and neighborhoods. Friendships forged over years of shared work are disrupted, and communities lose the anchor that kept them whole.

Generations of AWPPW members have powered Washington’s forest products industry with skill and dedication. When a mill closes, the loss is not just a facility—it is the unraveling of futures, the strain on families, and the weakening of communities that depended on those jobs for stability and pride. **The good news is that these closures are entirely preventable—but prevention requires a collaborative approach to policy and a commitment to protect the milling infrastructure we have while we innovate into the future.** It takes a regulatory landscape that does not aim to punish, but instead seeks to partner with us to address decarbonization challenges in a way that preserves both jobs and progress.

Leakage Risks: More Carbon, Fewer Jobs

The Climate Commitment Act (CCA) was written with a clear directive: protect jobs while reducing emissions. Lawmakers understood the danger of “leakage”—when production is driven out of Washington and into regions with weaker environmental standards. That outcome means more global pollution, fewer jobs at home, and lasting harm to the communities that have long relied on this industry.

This isn’t hypothetical. Studies show that shifting just a small share of Washington’s pulp and paper production to Canada would significantly increase greenhouse gas emissions, and moving the same production to China would multiply that impact many times over. The emissions don’t go away—

they simply show up on another country's balance sheet, while Washington workers are left with pink slips and communities with boarded-up storefronts.

The Legislature anticipated this risk and was explicit in directing protections for Energy-Intensive, Trade-Exposed (EITE) industries. RCW 70A.65.005(6) makes clear that climate policies “must be appropriately designed, in order to avoid leakage that results in net increases in global greenhouse gas emissions and increased negative impacts to those communities most impacted by environmental harms from climate change.” RCW 70A.65.110(4)(a) requires Ecology to review global best practices and ensure against emissions leakage and economic harm.

Yet throughout this process, it has felt as though the focus has been weighted heavily toward emissions leakage, while job leakage is acknowledged mostly in concept. **For our members, job loss isn't theoretical—it is immediate, personal, and devastating.** There must be serious and transparent consideration of the real employment impacts when determining allowance allocations and offset strategies. This is why later in this document we call for a comprehensive leakage analysis—one that gives equal weight to jobs and communities as it does to emissions metrics.

Protecting mills from closure and protecting jobs is not just consistent with Washington's climate goals—it is central to them. For workers, leakage means losing family-wage jobs. For communities, it means uncertainty and decline. And for the planet, it means higher emissions. Real climate leadership means keeping production here, under the nation's most rigorous standards, and ensuring these mills are part of the solution—not casualties of poorly designed policy.

Cutting Emissions Without Cutting Jobs

AWPPW members have been driving climate progress for decades. The reductions achieved in Washington's pulp and paper sector are not the result of outside mandates—they come from workers on the floor who run the systems, adapt to new fuels, and constantly look for ways to make their mills more efficient.

That progress is visible in the investments our facilities have made: efficiency upgrades, transitions to cleaner energy sources, and combined heat and power systems that generate lower-carbon energy than the grid itself. These are tangible, worker-led solutions that prove this industry can cut emissions and sustain production at the same time.

But not every decline in emissions has been a success story. Too often, reductions have come from mill closures and production cuts. On a spreadsheet, that may look like progress. In reality, it means lost jobs, lost health care, and communities hollowed out. **That is not climate leadership—it is abandonment. Washington must build on reductions that come from innovation, not closures.**

Looking ahead, additional reductions must be achieved in ways that protect jobs and communities. Technologies like hydrogen fuel and electrified boilers are being explored, but they are not yet viable at the scale needed in U.S. mills—and Washington's power grid is already under strain.

Setting goals that outpace what is technologically and economically possible will not deliver leadership. It will deliver closures.

The path forward must build on the progress already made, continue to invest in innovation, and keep workers central to both the effort and the benefit. Real leadership means cutting emissions while keeping good union jobs in Washington, not sacrificing one for the other.

And while the promise of “clean energy jobs” is often discussed in theory, those jobs have not been clearly defined or realized. They must not be dangled as a replacement for the strong, family-wage jobs that pulp and paper mills already provide. In fact, Washington formally recognized jobs in the forest products industry—including pulp and paper—as “green jobs” in 2010 (Substitute House Bill 2420, Chapter 187, Laws of 2010). The terminology may now lean toward “clean energy,” but the reality has not changed: these existing jobs are already part of the solution, and they cannot be dismissed or traded away for promises that may never materialize.

The Need for Partnership and Respect

The AWPPW entered the EITE process ready to partner. Our members are proud of the fact that pulp and paper is already part of Washington’s climate solution—using renewable biomass, generating clean combined heat and power, and driving decades of emissions reductions. We came to the table with a good-faith commitment to continue innovating and doing our part.

But throughout this process, Ecology’s approach has made workers feel like the objective is not to protect existing jobs, but to gradually eliminate the industry altogether. Draft recommendations emphasize technologies that are not yet viable, timelines that are not achievable, and allowance pathways that put mills at greater risk of closure. To us, this signals that the future of our jobs is seen as expendable. That perception erodes trust and undermines the possibility of partnership.

What stands out in stark contrast is the commitment shown by our industry partners and employers. They have demonstrated their determination to keep jobs and operations in Washington, standing shoulder-to-shoulder with labor to fight for the survival of this industry. As a labor voice in this process, AWPPW has seen firsthand that while labor and employers do not always see eye to eye, on this issue they have stood united in fighting to protect jobs—while Ecology’s current approach too often feels like it is working against them. **That unity should send a clear signal to policymakers: protecting Washington’s pulp and paper jobs is not just a business priority or a labor priority—it is a shared priority that demands equal commitment from the state.**

Workers and communities must be treated as stakeholders of equal importance—not as obstacles to be managed. Until our members see the same level of commitment from policymakers that they already see from their employers, trust in this process will remain fragile. Real partnership requires more than consultation—it requires respect, accountability, and action.

Legislative Mandates on Forest Products

Washington law could not be clearer: the forest products sector—including pulp and paper—is both an economic engine and a vital part of the state’s climate strategy. In 2020, the Legislature passed E2SHB 2528, explicitly recognizing that the entire sector—landowners, mills, bioenergy, pulp and paper, and the harvesting and transportation infrastructure that supports them—must be treated as part of the state’s global climate response.⁴ That recognition was codified in RCW 70A.45.090, which declares the sector a significant net sequesterer of carbon and directs that it must be supported across all of state government to achieve Washington’s climate goals.⁵

These statutory directives are not optional. Any state carbon program must recognize the forest products industry’s contributions and sustain its role as a climate solution. Ecology cannot disregard these mandates or treat pulp and paper jobs as expendable. Doing so not only undermines legislative intent, it contradicts Washington’s own climate policy framework.

AWPPW members power the pulp and paper segment of this sector every day, creating union-backed, family-wage jobs while driving real climate progress. Our expectation is straightforward: Ecology and the Legislature must honor the commitments already made in law and demonstrate the same resolve our employers and members have shown. Protecting pulp and paper jobs is not a concession—it is a legal, economic, and climate imperative.

Comparative Analyses and Best Practices

Other jurisdictions have recognized the need for comprehensive leakage analysis before imposing new burdens. Oregon’s Carbon Policy Office commissioned a Vivid Economics study in 2018, which thoroughly evaluated leakage and economic risk. Washington should do the same.

Likewise, Alberta’s Technology Innovation and Emissions Reduction (TIER) program demonstrates that facility-level benchmarking—rather than arbitrary product-level benchmarks—is a more effective way to capture the diversity of processes in pulp and paper. Without a rigorous, Washington-specific analysis, Ecology’s recommendations risk being speculative, biased, and detached from economic reality.

We also want to highlight and reinforce the comments submitted by the Northwest Pulp & Paper Association (NWPPA). Their call for comprehensive leakage studies, grounded in global best practices and tailored to Washington’s unique industrial landscape, is both reasonable and necessary. AWPPW is fully aligned with NWPPA’s recommendations, and we strongly support their

⁴ E2SHB 2528 (Chapter 120, Laws of 2020)—“Forest Products Sector—Climate Response,” passed by the 66th Legislature and effective June 11, 2020 (see pp. 3–4 describing forest products as a net sequesterer of carbon, and obligations for state support). lawfilesexternal.wa.gov/.../2528-S2.SL.pdf

⁵ RCW 70A.45.090, codified via E2SHB 2528 (Chapter 120, Laws of 2020), RCW 70A.45.090 – *Forests and forest products sector—Climate response*. <https://app.leg.wa.gov/rcw/default.aspx?cite=70A.45.090>

request for thorough analysis before moving forward with policies that could put mills, workers, and communities at risk.

By drawing from lessons in Oregon and Alberta, and by adopting the sound recommendations advanced by NWPPA, Washington has the opportunity to build a framework that achieves climate goals without sacrificing good union jobs or driving production out of state.

Policy Recommendations

The AWPPW urges Ecology to:

1. **Maintain No-Cost Allowances** – This is the primary tool for avoiding leakage and protecting union jobs. The current schedule provides needed stability, and continued allocations are essential to keep mills operating in Washington rather than shifting jobs and emissions elsewhere. AWPPW joins NWPPA and others in urging Ecology to preserve this policy as the foundation for meeting climate goals without sacrificing good jobs.
2. **Honor Legislative Intent and Mandates** – State law explicitly recognizes the forest products sector—including pulp and paper—as a net sequesterer of carbon and a required part of Washington’s climate response. Ecology must uphold this mandate by protecting jobs and communities and by providing the Legislature with options, not prescriptive cap-alignment mechanisms.
3. **Conduct Comprehensive Leakage Analysis** – Model economic and job impacts similar to Oregon’s Vivid Economics study.
4. **Recognize Worker Voices** – Formalize labor’s seat at the table in all future deliberations.
5. **Account for Technological Feasibility** – Acknowledge the limits of electrification, hydrogen, and grid capacity.
6. **Delay Premature Timelines** – Avoid accelerated deadlines that preempt data collection and thorough analysis.
7. **Respect Workers as Partners** – Ensure policy signals that pulp and paper are valued contributors to Washington’s economy and climate goals—not industries to be written off.

Conclusion

The AWPPW strongly supports climate action. But climate action cannot come at the expense of union jobs, family livelihoods, and the survival of Washington’s rural communities. Our members have already proven that emissions reductions can be achieved while sustaining high-wage jobs. Washington can and must continue to lead in this balanced way.

But to do so, Ecology must realign its report with legislative intent, honor worker voices, and ensure that no-cost allowances remain in place as the cornerstone of leakage protection. **As it stands, the**

draft makes workers feel expendable—as though our industry is a problem to be erased, rather than a partner in building solutions.

We are ready to be that partner. But partnership requires respect. It requires policies that value our workforce, protect our communities, and ensure that pulp and paper continues to contribute to Washington's climate and economic goals. Without that balance, Washington will not just lose jobs—it will lose the trust and cooperation of the very people it needs to succeed.

If Washington wants to be recognized as a true climate leader, it must stop exporting both jobs and emissions, and stop kicking our carbon culpability down the road for someone else to deal with. Leadership means protecting family-wage union jobs here, keeping production under Washington's strong environmental standards, and investing in real solutions. These mills are not obstacles to overcome—they are part of the solution, and the workers who operate them deserve to be valued as partners in building Washington's clean energy future.

On behalf of the thousands of AWPPW members, our families, and the communities that rely on our jobs: thank you for your careful consideration of our comments. We urge you to act in alignment with these priorities so that Washington can protect good union pulp and paper, forest products, and manufacturing jobs while leading on climate.

Sincerely,



Joshua Estes

Policy Advisor & Lobbyist OR/WA

Association of Western Pulp & Paper Workers Union (AWPPW)



BLUEGREEN ALLIANCE

WASHINGTON STATE

September 2, 2025

RE: Department of Ecology's draft materials related to the agency's upcoming "Report to Legislature on EITE allocation for 2023-2050."

Dear Mr. Young and the Department of Ecology:

On behalf of the Washington BlueGreen Alliance, thank you for the opportunity to comment on the Department of Ecology's draft materials related to the agency's upcoming "Report to Legislature on EITE allocation for 2023-2050".

As a coalition of environmental groups and labor unions that collaborate to address climate change in ways that simultaneously build a fair and just economy, the Washington BlueGreen Alliance appreciates Ecology's consideration of "complementary measures supporting decarbonization of industry" in Document 6. Preserving the competitiveness of Washington's existing manufacturing base while meeting the state's statutory commitment to a net-zero economy by 2050 requires a proactive and holistic approach.

The Washington BlueGreen Alliance would like to provide feedback on two of Ecology's proposed complementary measures: 1) "Expedite electrical grid enhancements for industrial electrification" and 2) "Leverage state procurement to encourage low carbon manufacturing".

First, the Washington BlueGreen Alliance appreciates Ecology highlighting that lack of access to affordable clean electricity is a major barrier to a thriving, low-carbon industrial sector. Our coalition encountered this difficult reality in 2022 when efforts to retrofit and reopen the Intalco Aluminum Smelter in Ferndale, WA—which would have saved hundreds of union jobs and provided a stable supply of green aluminum—failed because prospective

buyers could not procure 400 MW of competitively priced renewable energy.¹ RMI's recent assessment revealed that access to electricity is also a major barrier for decarbonizing Washington's existing industrial sector.²

However, "[e]xpedite electrical grid enhancements" does more to spotlight the challenge than offer solutions; it is high-level and not easily actionable. WA BGA strongly urges Ecology to be much more granular in its recommendations on "grid enhancements". This will enable the Washington State Legislature to move more swiftly and decisively to get our state's manufacturers access to the clean, reliable, and affordable electricity they need. More specifically, our coalition recommends including:

- 1. Create a state transmission authority to facilitate investment in and development of the most efficient, lowest cost transmission solutions for industrial decarbonization.** Proposed by Senator Shewmake and Representative Ramel during the 2025 legislative session ([SB 5466](#) and [HB 1673](#), respectively) and likely to be reconsidered in 2026, a state transmission authority would bring multiple stakeholders, including utilities, regulators, and impacted communities, to develop the long-term, lowest cost transmission solutions necessary for Washington to meet its climate and economic development goals. Unlike most incumbent Northwest transmission providers, namely the Bonneville Power Administration and investor-owned utilities, a state transmission authority looks across multiple networks of individual transmission operators with the goal of promoting Washington's *overall* transmission adequacy and meeting the most pressing, unmet transmission needs of Washington residents and businesses. A state transmission authority could also help navigate complicated, multi-jurisdictional siting and permitting processes and provide low-cost financing where transmission developers are unwilling or unable to invest on their own.
- 2. Provide a categorical exemption for upgrading or rebuilding existing high-capacity transmission lines from the State Environmental Policy Act to expedite reconductoring projects and maximize Washington's existing grid capacity.** [SB 5466](#) and [HB 1673](#) also provided a narrow categorical exemption for upgrading or rebuilding existing high-capacity transmission lines from the State Environmental Policy Act, which would dramatically expedite reconductoring projects. Reconductoring is the process of replacing the old wires (known as "conductors") on the existing high-voltage

¹ John Stang, "Negotiations to Resurrect Ferndale Aluminum Plant Fall Apart," *Cascade PBS*, December 28, 2022, <https://www.cascadepbs.org/environment/2022/12/negotiations-resurrect-ferndale-aluminum-plant-fall-apart/>.

² Valeriya Azarova et al., *Opportunities for Industrial Modernization in Washington: Technical Pathways, Investments, Policy, and Decarbonizing Options for Emissions-Intensive, Trade-Exposed Industries* (Rocky Mountain Institute, 2025), <https://rmi.org/insight/opportunities-for-industrial-modernization-in-washington/>.

transmission lines with newer, advanced conductors. Reconducting can more than double a line's capacity, typically costs less than half the price of a greenfield line, and requires as little as 18 to 36 months to implement.³ It is important to develop a process to ensure that categorically exempt projects avoid, minimize, or mitigate harm to traditional cultural properties and resources.

Second, having worked for over five years to pass the [Buy Clean and Buy Fair Washington Act](#), our coalition is thrilled that Ecology recognized the importance of "[l]everag[ing] state procurement to encourage low carbon manufacturing" in its draft recommendations and strongly encourage its inclusion in the final report.

Washington, like most states, has focused its climate policy heavily on its territorial or production-based emissions. Focusing exclusively on territorial emissions can promote a race to the bottom in labor and environmental standards that displaces pollution onto vulnerable communities outside of Washington instead of reducing it (i.e., carbon leakage). In contrast, consumption-based or procurement policies like Buy Clean and Buy Fair hold all manufacturers to the same high standard, regardless of where a product is made. This reduces the unfair competition that drives leakage and incentivizes investments in industrial decarbonization.

The Buy Clean and Buy Fair Washington Act was an important first step. The policy creates transparency around building materials purchased for large state building projects and increases industry reporting capacity. The Department of Commerce is currently convening a Technical Work Group to guide its implementation and grow a robust in-state supply of low-carbon materials. The Washington BlueGreen Alliance is excited to continue collaborating with legislators, state agencies, and stakeholders to leverage further Washington's existing state spending to promote the competitiveness of low-carbon manufacturing and make our state a leader in clean manufacturing.

Ecology did not include "Buy Fair" or procurement based on high-road labor standards in its recommendations, which is one of the most exciting aspects of Washington's policy, which is a major gap. Leveraging procurement to promote high-job quality in manufacturing is critical to protecting the long-term competitiveness of Washington's manufacturers. Washington's skilled workforce is one of the state's well-documented competitive advantages in manufacturing.⁴ Maintaining this competitive advantage requires continuing

³ Emily Moore, "The Northwest's Electric Grid Deserves an Upgrade," *Sightline Institute*, September 11, 2024, <https://sightline.org/2024/09/11/the-northwests-electric-grid-deserves-an-upgrade/>.

⁴ Richard Aboulafia et al., *Aerospace Competitive Economics Study 2022* (AeroDynamic Advisory, 2022), <https://choosewashingtonstate.com/wp-content/uploads/2023/02/Aerospace-Competitive-Economics-Study-2022.pdf>.

to attract workers to manufacturing careers, which is hugely impacted by the quality of those careers.

Thank you again for the opportunity to provide feedback and please do not hesitate to be in touch if we can provide any further information or answer questions about our comments. I can be reached at jkoski@bluegreenalliance.org.

Sincerely,

A handwritten signature in black ink, appearing to read "Jessica Koski". The signature is fluid and cursive, with the first name "Jessica" being more prominent than the last name "Koski".

Jessica Koski, PhD
Washington Policy Manager
BlueGreen Alliance

Boeing (Kristin Marshall)

Please see attached comments from The Boeing Company, signed by Kathryn (Katie) Moxley, Director, Remediation and Environmental Policy, Global Enterprise Sustainability.

Please direct any follow-up to Kristin Marshall, whose contact information has been provided in this form.

September 3, 2025

Adrian Young
Cap-and-Invest Industrial Policy Lead
Washington State Department of Ecology
300 Desmond Drive SE
Lacey, WA 98503

Subject: Comments on Documents 1-6 Regarding EITE Allowance Allocation (2035–2050)

Dear Mr. Young,

The Boeing Company appreciates the opportunity to comment on the Department of Ecology’s (Ecology) draft documents reviewing best practices, benchmarking alternatives, assessment criteria, allocation methods, and draft recommendations for allowance allocation to emissions-intensive, trade-exposed (EITE) industries for 2035–2050 under the Climate Commitment Act (CCA) program.

In 2017, we set challenging operations-related sustainability targets to guide our actions. In 2023, Boeing achieved our 2025 greenhouse gas (GHG) and energy targets and began working toward our 2030 goals:

2030 Sustainable Operations Targets

GHG

- Reduce Scope 1 and Scope 2 (market-based) emissions by 30% from 2023 base year performance

Energy

- 100% renewable electricity
- 3% natural gas intensity reduction from 2023 base year performance

Our strategy prioritizes avoiding Scope 1 and Scope 2 GHG emissions in the first place, using four primary strategies to advance sustainable operations:

1. Innovation and engagement

Highlights

- Boeing has embedded sustainability within the Boeing Production System and tied it to Lean practices, encouraging employees to identify efficiency opportunities.
- Programs like Conservation Best Practices, ENERGY STAR Battle of the Buildings, Aerospace Sustainability Foundations Training, and the Environmental Sustainability Leadership Awards are designed to drive employee participation and recognition.
- As an example, in a recent Battle of the Buildings competition, employees performed over one million 60-second sustainable actions at 189 sites in 28 countries, exceeding Boeing’s stretch goal.

2. Efficiency and conservation

Highlights

- In 2023, Boeing completed projects at the Everett Main Factory, converting 73 acres of manufacturing space to high-efficiency LED lighting.
- The company uses energy performance contracting where possible to finance conservation measures with energy savings.
- Boeing has steadily increased renewable electricity procurement, and more than a third is specifically procured as renewable, going beyond any renewables that are default in the electricity grid.

3. Site infrastructure and investment

Highlights

- Infrastructure modernization has focused on efficiency improvements, lifecycle cost reductions, and LEED certification for new projects.
- Investments target extending equipment life, reducing reliance on fossil fuels and lowering resource use. Boeing launched its Global Enterprise Sustainability Fund to reduce energy use and GHG emissions within the company's operations.

4. Resilience and risk management

Highlights

- Boeing integrates climate change risk into its operational and real estate planning, assessing vulnerabilities like extreme weather and disclosure requirements.¹
- Site and operational resilience measures include environmental compliance, protection, and remediation of legacy impacts.
- Resilience planning, including planning for climate risks, is part of Business Continuity Management, with strategies to mitigate risks across the supply chain, infrastructure, IT, and the workforce.

Our efforts include increasing the use of renewable electricity and sustainable aviation fuel (SAF) in our operations as the most direct way to reduce our operational emissions.

We encourage the State of Washington to establish a program that aligns with executive and legislative direction to reach the state's targets while maintaining Washington's competitiveness as a hub for aerospace manufacturing. Our comments focus on preserving the legislative intent expressed in the CCA,² aligning allocation methods with statutory requirements, addressing purchased-electricity issues, updating benchmarking and baselines to reflect actual emissions drivers, mitigating leakage and broader economic harm risks, enabling mechanisms, and report timing.

¹ More information can be found in the company's [TCFD Report](#).

² [E2SSB 5126 \(2021\)](#)

I. Preserving Legislative Intent for Mass-Based Aerospace Covered Entities

Aerospace facilities in Washington face unique growth dynamics that differ from other EITE sectors. While the term “leakage” in the CCA focuses on emissions, it is clear that the legislature means for Ecology to take a broader approach in rulemaking, with the following direction, enacted via E2SHB 2815 (2008) and encoded in 70A.45.005 RCW:

It is the intent of the legislature that the state will: (a) Limit and reduce emissions of greenhouse gas consistent with the emission reductions established in RCW 70A.45.020; (b) minimize the potential to export pollution, jobs, and economic opportunities; (c) support industry sectors that can act as sequesterers of carbon; and (d) reduce emissions at the lowest cost to Washington's economy, consumers, and businesses.

In addition, legislators specified in Section 13 of the CCA that covered EITEs with a NAICS code beginning with 3364 (aerospace) must be allowed to grow in Washington. To reflect legislative intent and ensure fair treatment, Ecology should safeguard growth parity in allocation design. Boeing can continue to engage with the department on how the aerospace-specific approach can be structured.

- Codify a distinct growth mechanism for aerospace (NAICS 3364) facilities on mass-based baselines, using data that connect to emissions.
- Provide a prospective baseline-adjustment option when sustained growth (e.g., greater than 10% above baseline for two consecutive years) is forecast.
- Add “preserves statutory growth parity for mass-based aerospace” as a screening criterion in Ecology’s allocation framework.

II. Cap Alignment and Allowance Decline

Allocation of no-cost allowances must remain consistent with overall direction provided in the CCA, which includes achieving state GHG targets while providing feasible pathways for EITE sectors. To maintain the integrity of the cap-and-trade system while preventing economic harm to EITEs, allocation levels must remain aligned with the overall legislative intent and must be carefully calibrated.

- Support adoption of a cap-adjustment factor post-2034 to keep allocation of no-cost allowances to EITEs aligned with legislative intent.
- Ensure any decline factor explicitly preserves growth parity for mass-based entities.

III. Addressing Purchased-Electricity Issues

Electrification under the CCA or industrial conversions could raise electricity costs disproportionately for EITEs. Even with the Clean Energy Transformation Act (CETA) requiring carbon-neutral and renewable electricity, manufacturing customers may face higher delivered costs, without corresponding emissions benefits, due to regional imports, grid dynamics, or infrastructure constraints. Furthermore, if transmission and distribution capacity lags demand, facilities could be left with reliability challenges or stranded-cost risks, another form of economic harm. Ecology should establish a mechanism to prevent this potential for electricity cost increases.

- Implement a purchased-electricity cost increase mechanism (allowances or credits) linked to verifiable cost pass-through and documented consumption; this safeguard is particularly important where Clean Buildings Act (CBA) compliance or electrification increases industrial electricity demand.
- Guard against regional displacement of emissions during the CETA transition years (2030-2045).
- Recognize grid import dynamics that can undermine the program's global effectiveness.

IV. Benchmarking and Baseline Updates

While product benchmarking may work in certain sectors, it is infeasible for aerospace, particularly with the intensity measures that Ecology adopted in WAC 173-441 Table 050-1 (metric tons of aircraft product and parts produced or square meters of external surface area of aircraft, which are not indexed in a statistically meaningful way to emissions from Boeing Auburn or Everett). This disconnect between emissions and the adopted measures of production in the GHG reporting program is important because it undercuts both fairness and accuracy in allocation.

- Retain facility-specific baselines for aerospace, where product benchmarking is infeasible.
- Explore product benchmarks only where robust, multi-facility data exist and in similar economies.
- Use Best Available Technology (BAT) as an adjustment pathway rather than the primary allocation method.

V. Mismatch Between Product Intensity Bases and Actual Emissions Drivers

As stated above, the current intensity-based metrics in WAC 173-441 for aerospace do not meaningfully correlate with GHG emissions at Boeing Auburn and Boeing Everett. At these sites, reportable emissions are tied exclusively to natural gas use, with statistical association with only heating degree days (HDD)—not to production activity (e.g., number of airplanes or parts produced), labor, facility size, or cooling degree days. Therefore, using production-based metrics to assess emissions would be both inaccurate and inequitable.

This mismatch creates issues of fairness and compatibility, as intensity metrics tied to production volumes or product weights could make facilities appear more or less efficient based on market demand cycles or product mix, even though these factors do not drive emissions. The disconnect could also affect accuracy of emission reduction pathway analysis. Product-based benchmarks suggest that emissions can be reduced through changes in production processes, when in fact the only meaningful lever for a facility might be electrification of heating systems, which can be constrained by utility infrastructure, including regional electrical supply capacity and availability—factors outside of a covered entity's control.

- Ecology should recognize that for certain sectors, including aerospace, absolute baselines or facility-specific intensity metrics are more appropriate than generic

production-based benchmarks. Failure to do so could lead to distorted compliance obligations, leakage risks, and misaligned investment signals.

- Ecology should consider using heating degree days as a facility-specific emissions driver for natural gas use, rather than product output.
- Ecology should allow sector-specific flexibility in benchmarking where emissions are not production-driven.
- Ecology should ensure that allocation methodologies do not penalize facilities for cyclical production changes or business recovery trends following major global events (e.g., the COVID-19 pandemic) unrelated to emissions performance.

VI. Consignment

Consignment can provide a useful flexibility mechanism, but it should not become an added cost without clear reinvestment pathways. We recommend that proceeds from consignment, if pursued, be reinvested in ways that directly support industrial decarbonization and compliance. This ensures the mechanism functions as intended rather than becoming a hidden cost.

- If consignment is pursued, ensure revenues are ring-fenced for on-site decarbonization projects at covered facilities.
- Avoid simultaneous adoption of multiple complex mechanisms that add burden without clear climate benefit.

VII. Interpretation of Economic Harm

Ecology's current framing of "economic harm" appears narrowly tied to competitiveness. This definition fails to capture the broader spectrum of economic impacts that regulated entities and their communities may face. For instance, compliance costs, adjustment costs, and sector-specific transition risks are distinct from direct competitiveness concerns, yet they may still constitute economic harm in a meaningful sense.³

Compliance costs can include capital expenditures for new abatement technologies, retrofits, or reporting requirements. Adjustment costs may also be significant, as the transition to lower-carbon operations often creates short-term disruption, workforce displacement, or reduced margins in individual product lines. These impacts are not strictly "competitiveness" issues, but they can represent real economic harm to businesses, workers, and communities.

Experience in other carbon markets highlights additional risks of leakage, whereby emissions reductions in Washington State are offset by production shifts to jurisdictions with less stringent rules. In such cases global environmental benefit is limited, but local economic harm—through lost jobs, reduced production, or a diminished tax base—is substantial. If Ecology restricts its assessment to competitiveness alone, these harms may be overlooked.

- Ecology should broaden its definition of economic harm to include compliance costs, transition and adjustment costs, risks of carbon leakage, and impacts to local communities.

³ See, for instance, Southern California Edison's [Comments](#) on Allowance Allocation in California.

- This broader framing would better align with economic reality, give legislators and other stakeholders more accurate visibility into the full range of potential consequences, and provide a sounder basis for tailoring allowance allocation, leakage protections, and related program design.

VIII. Enablers

In addition to allowance allocation design, enabling mechanisms will allow Ecology to enhance program effectiveness by achieving emissions reductions while reducing economic harm. These enablers could include the following:

- Supporting public-private partnerships for utility infrastructure upgrades that enable industrial electrification, including support of microgrids and cooperative approaches.
- Prioritizing grant and incubator funding for industrial decarbonization technologies.
- Advancing renewable natural gas (RNG) to boost supply and ensuring RNG is a legitimate pathway to decarbonize and reduce emissions.
- Direct natural-gas utility allowance proceeds toward industrial electrification and efficiency projects that satisfy both CCA and CBA objectives.

IX. Timing of Report Submission

Ecology has indicated that it intends to submit its report to the legislature a full year before the statutory deadline. While we appreciate proactive planning, early submission would foreclose valuable opportunities for additional stakeholder engagement, including consideration by and inputs from the EITE Industries Advisory Group, and technical refinement. EITE industries, including aerospace, continue to recover from global market disruptions and are only now developing the data needed to inform a robust 2035-2050 allocation framework.

We encourage Ecology to use the full period provided under the CCA to complete this work. Additional time would allow for a deeper analysis of leakage and economic harm; testing of allocation methods against real-world production and energy data; and more extensive inclusion of EITE Industries Advisory Group member input. Indeed, more tangible allocation scenarios will help EITEs and other stakeholders build financial models, and those potential financial models can be used to inform both the legislature and the Department. A full deliberative process will better serve both the legislature and success of the program.

Conclusion

The aerospace industry is a key component of Washington's economy, but it operates in a highly competitive global market, making it very sensitive to production cost increases relative to its international competitors. The U.S. aerospace industry is significantly trade-exposed. According to the Aerospace Industries Association, U.S. aerospace and defense exports totaled approximately \$139 billion in 2024, while imports were about \$65 billion. When compared with the Federal Reserve's data showing industry output of nearly \$184 billion, this yields a trade intensity of roughly 82%, meaning that more than four-fifths of the industry's output is directly linked to international trade. This level of trade exposure is far above typical EITE thresholds, underscoring the importance of safeguarding U.S. aerospace competitiveness in a global marketplace.

Boeing supports a balanced allowance-allocation framework that reduces GHG intensity, honors legislative intent, protects competitiveness, and ensures Washington remains a global aerospace leader. We particularly urge Ecology to:

- Codify statutory protections for mass-based covered EITEs with a NAICS code beginning with 3364, preserving growth parity consistent with legislative intent.
- Support cap alignment and allowance decline mechanisms that maintain allocation integrity and fairness.
- Implement purchased-electricity safeguards to prevent disproportionate impacts and GHG increases.
- Retain facility-specific benchmarking and baseline approaches that reflect actual emissions drivers.
- Adopt leakage safeguards that recognize the legislative intent to treat EITEs distinctly while still driving toward the state's emission targets.
- Recognize the multiple potential facets of economic harm beyond competitiveness.
- Allow sufficient time to conduct quantitative leakage and economic harm analyses to inform the legislature and future policy decisions.

We look forward to continued engagement with Ecology as it finalizes its recommendations and subsequent rulemaking.

Respectfully submitted,



Kathryn (Katie) Moxley
Director, Remediation and Environmental Policy
Global Enterprise Sustainability
The Boeing Company



James Verburg
Regulatory Advisor
US Biofuels Value Chain



BP Products North America Inc.
4519 Grandview Rd.
Blaine, WA 98230

September 3, 2025

Adrian Young
Cap-and-Invest Industrial Policy Lead
Washington Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600
VIA Public Comment Portal (<https://ecology.commentinput.com/?id-rapTtFh6V>)

Subject: bp Comment Letter Regarding the Treatment of Energy-Intensive, Trade-Exposed (EITE) Industries in Washington's Cap-and-Invest Program

Dear Mr. Young:

We are writing to provide BP Products North America Inc.'s (bp) comments on Document 6: Draft Recommendations on EITE Allowance Allocation 2035-2050 in connection with Washington's Cap-and-Invest program.

The US is at the heart of bp's strategy – we have roots that go back more than 150 years here. All bp's major businesses are active in the US, where we employ over 30,000 people and invest more than 40 percent of our global capital expenditure (\$6.6b of \$16.2b globally in 2024). bp employs approximately 1,700 people in Washington state at locations such as the Cherry Point refinery, the largest refinery in Washington state, through our operation of the Olympic Pipe Line Company, and through our convenience and mobility outlets including *am/pm* and Travel Centers of America.

bp advocated for the adoption of the Climate Commitment Act (CCA) in 2021. As a company that recognizes the importance of reducing greenhouse gas (GHG) emissions on a global scale, we also acknowledge that EITE industries, including petroleum refining, face unique challenges due to high energy consumption and exposure to global trade pressures. bp has invested heavily in improving energy efficiency, developing lower carbon fuels, and supporting Washington's transition to a low-carbon economy. However, competitiveness is essential for us to continue these investments. If bp's Cherry Point refinery should become uncompetitive, operational curtailments or closures could force fuel supply to shift toward less-regulated sources, potentially increasing global GHG emissions, contrary to the CCA's goals. As Washington state advances its commitment to climate leadership through the CCA, the way free allowances are allocated to EITEs is crucial for the long-term success of the program.

bp urges the Department of Ecology (DOE) to recognize the nuanced realities of refinery competitiveness and the risk of GHG leakage to out-of-state or international producers if free allowances to EITEs are reduced or eliminated after the third compliance period ending in 2034. bp supports maintaining free allowances for refineries beyond 2035. Free allowances help level the playing field, enabling Washington refineries to

maintain production, support jobs, and contribute to local economies – all while advancing GHG reductions. The loss of free allowances after 2035 with currently known deployable, scalable low-carbon technologies and availability of low-carbon grid electricity, would mean a dramatic increase in compliance costs, potentially rendering Washington's refineries uncompetitive as compared to out-of-state and international suppliers.

bp's Cherry Point refinery as part of a multinational company competes for limited capital across assets spanning the globe, and regulatory uncertainty makes it challenging for the refinery to attract new capital projects. Capital investment decisions in our sector are typically considered on a 10 to 20-year time horizon, and regulatory uncertainty could dampen the refinery's ability to attract the capital necessary to enable a lower carbon transition.

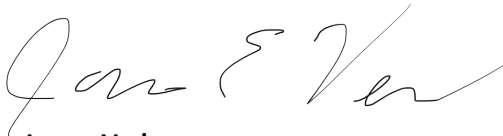
bp encourages the DOE to recommend to the Washington legislature that linkage be made a top priority. We believe linkage contributes to long-term regulatory certainty and stability, which encourages low-carbon investment.

Finally, bp wishes to raise concerns about the inclusion of Carbon Border Adjustment Mechanism (CBAM) in Document 6. We believe this recommendation is likely to face significant legal questions. Instead of eliminating regulatory uncertainty for businesses, the associated legal questions could exacerbate it and CBAM's inclusion may detract from the more achievable outcomes DOE is likely to recommend.

These recommendations aim to balance the goals of reducing GHG emissions, maintaining refinery competitiveness, and ensuring regulatory certainty for long-term investments. bp welcomes the opportunity to work collaboratively with DOE and other stakeholders to advance Washington's climate goals in a way that minimizes carbon leakage, minimizes economic harm to Washington industries, and preserves the vitality and competitiveness of its important refinery sector.

Thank you for your consideration of these comments.

Sincerely,

A handwritten signature in black ink, appearing to read "James Verburg", with a stylized, cursive script.

James Verburg

Regulatory Advisor; Biofuels Value Chain

cc: Andrew Hayes – Cap-and-Invest Policy Section Manager

Joel Creswell – Climate Pollution Reduction Program Manager



September 3, 2025

Adrian Young
Climate Pollution Reduction Program
WA State Dept. of Ecology

Re: Kaiser Aluminum's Written Feedback on Report to Legislature on EITE Allowance Allocations 2035 – 2050 Document 6 Draft Recommendations

Dear Mr. Young:

First and foremost, Kaiser Aluminum (Kaiser) appreciates the opportunity to provide feedback on the Report to the Washington State Legislature on EITE Allowance Allocations 2035 – 2050 Document 6 Draft Recommendations. Carbon is a complex global issue that requires thoughtful, effective and measured approaches taking into account individual EITEs, products and processes to avoid leakage and protect Washington businesses in a global economy, while also requiring EITEs to act responsibly as technologies, processes and products evolve.

Additionally, Kaiser appreciates the Climate Commitment Act's acknowledgement of the need to avoid the leakage of emissions and the potential negative and unintended impacts of leakage. We appreciate that this report recognizes the importance of the conversation regarding leakage of emissions.

Kaiser proposes maintaining the existing structure, while the Department of Ecology and Industry continue to explore technologically viable alternatives and that Ecology and the Legislature retain the no-cost allowance allocation for EITEs that supports responsible growth opportunities post-2035 (based on the currently utilized carbon intensity benchmark methodology).

Kaiser also proposes to recognize that EITEs are manufacturers of various types of products that have an opportunity to reduce both direct (Scope 1) emissions and indirect (Scope 2 and 3) emissions. For example, Kaiser's inventory of greenhouse gas emissions (GHG) includes indirect GHG emissions which are much higher than the direct emissions generated at the site. As compared to the current uncertainty and timeline of technology to further reduce Scope 1 emissions, the technology already exists to significantly reduce Scope 2 and 3 emissions as electrical grids evolve, and we work with our customers to adjust our processes and products to increase our use of scrap aluminum.

Kaiser is providing the following feedback on the Draft Recommendations:

Draft Recommendation 1.1:

*"The legislature should maintain Ecology's authorization to provide no-cost allowances to EITEs from 2035 onwards provided it aligns with program objectives, allowance budgets, and emissions limits. **Note:** All the draft recommendations listed below are contingent on the implementation of this recommendation."*

The state must maintain the opportunity for EITEs to continue responsible growth in their various markets by continuing to provide no-cost allowances while continuing to invest in responsible manufacturing processes, technology and equipment.

It is Kaiser's position that EITEs, which are allowed to remain competitive in the national and global marketplace, will create additional long-term capital investment opportunities in their respective businesses, resulting in parallel reductions in the carbon footprint of their products. The installation of

state-of-the-art/new equipment as it becomes commercially available will result in operational efficiency improvements which result in less carbon per unit of production.

Kaiser maintains that there are unintended consequences with otherwise well-intentioned policies that adversely impact global carbon emissions as a result of carbon leakage to less regulated jurisdictions and countries, EITEs, the state of Washington, the communities where EITEs operate, EITE employees and their families.

Draft Recommendation 1.2:

“Ecology should monitor developments in carbon pricing policies in key jurisdictions and relevant federal policies as part of periodic program evaluations, including developments in carbon border adjustment mechanisms or alternative policies to address leakage risk.”

Kaiser believes carbon border adjustment mechanisms or other alternative policies should be further analyzed to fully understand unintended consequences for EITEs in the marketplace while trying to identify more effective and specific approaches to evolving carbon policies.

Draft Recommendations 2.1:

“Ecology should develop an objective approach for assessing leakage risk for EITEs in Washington and assess the impacts of implementing an assistance factor that targets allowance allocation based on this objective approach.”

Kaiser believes an Assistance Factor is not an effective approach to determine no cost allocation to market participants in a myriad of operating environments and markets. Ultimately, leakage risk, and trade exposure may vary from industry to industry and from time to time making a more objective analysis far less feasible and effective.

Market conditions would dictate EITE status, while those conditions are not always within the control of EITEs in applicable markets. This would increase uncertainty and adversely impact responsible long-term capital planning.

If assistance factors were allowed to step down (75%, 50%) without regard to individual facts and circumstances applicable EITEs, many facilities are at risk of shutting down or shifting production out of state, undermining the economic and environmental goals of an effective carbon policy.

Draft Recommendation 2.2:

“Ecology should assess the implementation requirements and impacts of providing no-cost allowances to EITEs for addressing leakage risk associated with purchased electricity.”

Kaiser recommends Ecology review options for providing no-cost allowances for EITEs' electricity purchases. Ecology should also include no-cost allowances based upon consumption per unit of production (carbon intensity) reductions taking into account Scope 1, 2 and 3 emissions.

Draft Recommendation 3.1:

“Ecology should assess the implementation requirements and impacts of adopting product-based benchmarks or alternative methods for establishing allocation baselines for EITE allowance allocation.”

Kaiser believes that a benchmark approach based solely on products would not be effective in light of the unique characteristics and markets of individual EITEs and would also create a large unnecessary administrative burden for EITEs to be able to accurately allocate the GHG emissions by multiple product lines. In addition, many product lines share common process lines which process each individual product in an alternative manner to achieve the desired customer specifications making a “one size fits all” approach ineffective.

For example, this process would not consider the life cycle impacts of these highly specialized manufactured products. This includes product quality, need for rework and excess waste generated during fabrication processes. Limited external benchmark data would be available.

Draft Recommendation 3.2:

"Ecology should assess the implementation requirements and impacts of using consignment to require EITEs to invest some of the value of their no-cost allowances in decarbonization projects."

Prior to Climate Commitment Act, these opportunities already existed and were realized. For example, Kaiser has made significant long-term capital investments into projects that focused on process efficiency improvement throughout our facility. These efficiency improvements have inherently lowered the carbon intensity of our product lines and have made us more competitive in the marketplace. We expect those dynamics to continue with a thoughtful and well-designed approach to carbon and allowances.

Draft Recommendation 4.1:

"Ecology should assess the policy design requirements and impacts of implementing a cap adjustment factor to ensure EITE allowance allocation aligns with program allowance budgets and net-zero emissions limits."

Kaiser's annual emissions represent only **0.2%** of the total Scope 1 greenhouse gas emissions for the State of Washington (Source: Washington State Greenhouse Gas Emissions Inventory: 1990-2021). Therefore, an adjustment to the cap would not have measurable emission reduction impacts, and other approaches outlined in our comments would be more effective in achieving long-term objectives and goals.

Draft Recommendation 4.2:

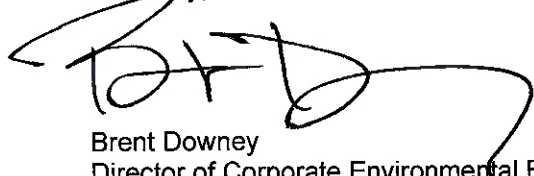
"Ecology should assess at least one alternative policy option that would achieve a similar outcome as a cap adjustment factor."

To potentially achieve the goals of the program, a holistic approach to greenhouse gas emissions reduction should be considered. This approach would include compliance credits for reduction of Scope 1, Scope 2, and Scope 3 emissions and offer compliance pathways for making reductions/improvements in these areas as they apply to individual EITEs.

By way of example, Scope 1 emissions at Kaiser represent approximately only **17%** of the total GHG emissions while Scope 2 and Scope 3 emissions represent **83%** of total GHG emissions. Additionally, the technology to address Scope 1 emissions in our sector is in early stages, while the technology to reduce Scope 2 and Scope 3 emissions is proven and available.

If you have any questions or would like to discuss this further, please feel free to contact me at (509) 990-1327

Sincerely,



Brent Downey
Director of Corporate Environmental Engineering



To: Adrian Young
Cap-and-Invest Industrial Policy Lead

From: Isaac Kastama and Kevin Tempest
Clean & Prosperous Institute

Date: September 3, 2025

RE: Comments on Report to Legislature: No-cost Allowances for Emissions-Intensive Trade-Exposed Industries (EITEs)

Background

In passing the Climate Commitment Act (CCA), the Washington state Legislature requires the Department of Ecology to prepare a report by the end of this year that:

“describes alternative methods for determining the amount and a schedule of allowances to be provided to facilities owned or operated by each covered entity designated as an emissions-intensive, trade-exposed facility from January 1, 2035, through January 1, 2050. The report must include a review of global best practices in ensuring against emissions leakage and economic harm to businesses in carbon pricing programs and describe alternative methods of emissions performance benchmarking and mass-based allocation of no-cost allowances.”

Ecology has indicated that this report will provide information and recommendations on how best to proceed regarding:

- Best practices for avoiding leakage (when EITEs relocate or limit their operations).
- Different approaches for measuring the emissions generated by EITEs per unit of production.
- Opportunities and barriers for decarbonizing EITEs in Washington.
- How to allocate no cost allowance to EITEs from 2035-2050.
- Implications for environmental justice outcomes, local air quality, statewide emissions limits, and revenues generated by cap-and-invest auctions.

CPI Comments

Through six draft documents and public meetings with Policy and Industrial Advisory Groups, Ecology has developed a detailed and informative index for the Legislature. Clean & Prosperous Institute (CPI) appreciates the depth of options and the policy considerations that have been defined for emphasis, including:

- A. Establishing a level playing field for EITEs producing within the jurisdiction vis-à-vis competitors in jurisdictions without comparable carbon pricing policies.
- B. Identifying and targeting assistance to industrial sectors that are most at risk of leakage.
- C. Maintaining incentives for EITEs to invest in decarbonizing their operations and reward efficient production within the jurisdiction.
- D. Aligning with the overarching goal of carbon pricing programs: To reduce emissions in line with jurisdictional (and global) emission reductions targets.

There are two draft recommendations in particular which provide specific and actionable information to the Legislature. These are *Draft Recommendation 3.2* concerning the option of using consignment of EITE allowances and *Draft Recommendation 4.1* concerning the use of cap adjustment factor to align EITE allowance allocations program budgets. Many of the other recommendations are insightful, but involve a more open-ended continued period of study and analysis of a wider array of options.

In this regard, we find a recent report from RMI, *Opportunities for Industrial Modernization in Washington*, to provide a useful template for recommendations.¹ It is particularly helpful to see a distilled set of recommendations in the RMI report, including seven recommended policy approaches for determining allocation of no-cost allowances ranked from “Least Favored” to “Most Favored”, and 18 complementary policies characterized as either “Essential,” “Recommended,” or “Worth Considering.”

There are three key concepts we would like to see clearly communicated and elevated in the report to the Legislature:

- Recognition of the long on-ramp (three compliance periods) of near baseline no-cost allowances, including the value of those allowances, as well as available incentives that position EITE entities to better avoid leakage and deploy lower emissions technologies and processes by 2035. The RMI scenario modeling indicates the potential for 39 percent emissions reductions for EITEs at

¹ <https://rmi.org/insight/opportunities-for-industrial-modernization-in-washington/>

cumulative costs of \$2.94 billion compared to a market-value of no-cost allowances awarded to EITEs of at least \$5.4 billion from 2023 to 2034. It would be useful to include discussion of the comparative obligations and market value of allowances afforded in California and Québec, jurisdictions the state intends to pursue a linkage agreement with. Pending reauthorization and extension of California's program, there are inherent benefits to seeking greater policy alignment across jurisdictions.

- The importance of clear market rules and the role of program revenue and free allocation to motivate investment in decarbonization. Evidence of continued capital investment in facilities is a signal of intent to compete and stay in Washington, inherently mitigating leakage risks. To this end, post-2034 allowances should not penalize early action to reduce emissions in the first three compliance periods (*e.g.* by resetting the baseline to a later time period than 2015-19 thereby lowering no-cost allocations for entities that have reduced emissions below their no-cost allocation). The Legislature taking timely action to clarify the post-2035 program rules sends clear market signals to reinforce capital investment decisions that are considered over a multi-decade time horizon.
- The critical importance of clean energy availability and siting for deep, cost-effective emissions reductions from EITEs - a point raised in the RMI *Opportunities for Industrial Modernization in Washington* report. We recently [submitted comments on the Clean Energy Siting Annual Report](#), and those challenges are relevant to EITE emissions reduction opportunities. The RMI report outlines the growth in power demand from sector-specific technical pathways it evaluates to be 35 percent above baseline power consumption by 2030 and 65 percent by 2050. Given other demand drivers and the clean power shares required by the Clean Energy Transformation Act, this presents a significant hurdle for opportunities to reduce EITE emissions. Further, the state should monitor “new large load” policies being adopted by utilities that could substantially raise the cost and feasibility of timely electrification.

In considering the prioritization of draft recommendations, CPI suggests a focus on:

- **Draft Recommendation 3.2:** Ecology should assess the implementation requirements and impacts of using consignment to require EITEs to invest some of the value of their no-cost allowances in decarbonization projects.

- **Draft Recommendation 4.1:** Ecology should assess the policy design requirements and impacts of implementing a cap adjustment factor to ensure EITE allowance allocation aligns with program allowance budgets and net-zero emissions limits.

While CPI is supportive of the following recommendations, we believe they are likely already captured or required by existing law and administrative code:

- **Draft Recommendation 1.1:** The Legislature should maintain Ecology's authorization to provide no-cost allowances to EITEs from 2035 onwards provided it aligns with program objectives, allowance budgets, and emissions limits.
- **Draft Recommendation 1.2:** Ecology should monitor developments in carbon pricing policies in key jurisdictions and relevant federal policies as part of periodic program evaluations, including developments in carbon border adjustment mechanisms or alternative policies to address leakage risk.

CPI believes the following is consistent with the work that the Legislature has requested Ecology to report on. To that end, we recommend that Ecology continue the work within these recommendations:

- **Draft Recommendation 2.1:** Ecology should develop an objective approach for assessing leakage risk for EITEs in Washington and assess the impacts of implementing an assistance factor that targets allowance allocation based on this objective approach.
- **Draft Recommendation 3.1:** Ecology should assess the implementation requirements and impacts of adopting product-based benchmarks or alternative methods for establishing allocation baselines for EITE allowance allocation.
- **Draft Recommendation 4.2:** Ecology should assess at least one alternative policy option that would achieve a similar outcome as a cap adjustment factor.
- **Draft Recommendation 5.1:** Ecology should assess the environmental justice and economic impacts of the proposed policy options in Draft Recommendations 1.1, 1.2, 2.1, 2.2, 3.1, 3.2, 4.1 and 4.2 and interactions with existing CCA policies.

From the RMI, report CPI supports advancing policies deemed as *Essential*: (1) Expedite electrical grid enhancements for industrial electrification, and; (2) Accelerate permitting procedures for critical decarbonization projects. CPI also supports three of the policies deemed as *Recommended*: (1) Consign EITE no-cost allowances at auction, (2) Increase funding for the Hard-to-Decarbonize Sector Grants Program, and (3) Set up an industrially focused green bank.



September 3, 2025

Adrian Young, Cap-and-Invest Industrial Policy Lead

The Department of Ecology

300 Desmond Dr. SE Lacey, WA 98503

Re: Climate Solutions' comments on the Department of Ecology's draft report to the Legislature on Emissions-intensive, Trade-exposed industries' no-cost allowance allocation for 2035-2050.

Dear Adrian Young,

Climate Solutions appreciates the opportunity to provide comment on the Department of Ecology's Draft Report to the Legislature on Emissions-intensive, Trade-exposed Industries' no-cost allowance allocation for 2035-2050 ("Report"). Climate Solutions is a nonprofit organization working to accelerate clean energy solutions to the climate crisis. The Northwest has emerged as a hub of climate action, and Climate Solutions is at the center of the movement as a catalyst, advocate, and campaign hub.

Climate Solutions advocated for the passage of the Climate Commitment Act ("CCA") in 2021 and we have tracked and engaged in numerous CCA-related public comment opportunities, legislative updates, and rulemakings to ensure the law is implemented effectively and equitably. As part of our work to engage with CCA implementation, we joined the Policy Advisory Group to help inform the Department of Ecology's recommendations to the Legislature on a compliance pathway for Emissions-Intensive Trade-exposed industries (EITEs). Overall, we appreciated the cadence of the advisory group and that Ecology responded to requests to offer more opportunities for the different advisory groups to interact, while maintaining separate spaces for offering recommendations.

We believe that Ecology's draft Report is a useful starting point for the Legislature's exploration of compliance pathways for EITE emissions under the cap-and-invest program. Our comments focus on what we see as the most effective recommendations in the Report for curbing industrial pollution and minimizing leakage, as well as areas that Ecology could continue to strengthen.

I. Underscore that the most critical part of EITE industries' no-cost allowance pathway is ensuring compliance with the cap.

The primary objective of the report and new legislation to address EITE compliance should and must be to maintain the stringency and integrity of the emissions cap under the CCA. We appreciate Ecology's call-out of the import of the cap throughout the Report. For example:

- Ecology's acknowledgement in Document 1 that "the goal of EITE allocation approaches (i.e. to reduce leakage) may come into conflict with other policy objectives for carbon

pricing programs, in particular the need to reduce program caps (and allowance supply) in line with jurisdictional emissions targets.”¹

- Including “Aligns with Ecology’s Cap-and-Invest allowance budgets (and statewide emission limits) and auctioned allowance requirements” as the first screening criteria in the framework for assessing policy options in Document 3.²
- Recognizing that “at least one of the three options from Policy Design Consideration 4 [to align with program cap and emissions limits] needs to form part of the EITE allocation approach for 2035-2050” in Document 5.³

To build on these references, we urge Ecology to clearly communicate that EITE industries, their emissions, and thus, their no-cost allowances, are under the cap – which is intended to drive down emissions to net zero by 2050 to meet requirements under RCW 70a.45.020. Ecology should emphasize in its Report that the primary obligation of any future EITE legislation should be to maintain integrity of the cap while addressing EITE compliance.

II. Recognize decarbonization as rationale for EITEs receiving a majority of their allowances for free in the first 12 years of the program.

The CC also acknowledges that EITEs face unique challenges in decarbonizing and provides these industries with a majority of their allowances for free in the first 12 years of the program to avoid emissions leakage. Avoiding or “minimizing” leakage of emissions, per RCW 70A.65.005(6), is critical and is described in detail in Document 1 as the impetus for EITEs’ current no-cost allowance allocation. However, we recommend that Document 1 also acknowledges that the Legislature’s intent in providing no-cost allowances to industry in the early years of the program is to “encourage [EITEs] to continue to innovate, find new ways to be more energy efficient, use lower carbon products, and be positioned to be global leaders in a low carbon economy” according to RCW 70A.65.005(6). The Legislature intended that with the cost savings from not having to purchase allowances, EITEs would use that time and money instead to innovate, invest in clean energy solutions, and decarbonize. Thus, we urge Ecology to include this intention explicitly in Document 1 and to recommend to the Legislature to clarify that investment in decarbonization is critical for compliance with the CCA.

III. Comments on the Draft framework for assessing methods for EITE allowance allocation in Document 3.

Climate Solutions is generally supportive of the framework offered by Ecology to assess the viability of various policy options. In particular:

- a. Climate Solutions strongly supports “Alignment with allowance budgets and statewide emissions limits” as the first screening criterion.**

¹ P. 5 <https://ecology.wa.gov/getattachment/821f10d5-23f6-4eba-b005-0056aa157d8c/Document-1-Review-of-best-practice-policies-for-avoiding-leakage-May-1-2025.pdf>

² P. 3 <https://ecology.wa.gov/getattachment/391a191d-7b1e-43e5-90dd-cac8be0cbc17/Document-3-Criteria-for-assessing-alternative-options-for-EITE-allowance-allocation-May-29-2025.pdf>

³ P. 8 <https://ecology.wa.gov/getattachment/2b6968bc-4450-4c5f-a9ba-107df8fdde86/Document-5-review-of-methods-for-EITE-allowance-allocation-2035-2050.pdf>

Enforcement of the cap is the primary mandate of the cap-and-invest program, so we were very glad to see it included in the baseline screening criteria.

b. Consider removing or deprioritizing “administrative/implementation costs and technical requirements.”

Administrative costs and complexity are important factors in determining the feasibility of a policy. However, we believe that this should be secondary to the ultimate intent of the law to minimize leakage, maintain incentives for decarbonization, and support market functionality, which are all fundamental to the success of the CCA. We recommend that Ecology weighs this criterion less heavily than the other factors (e.g., on a scale of 1 to -1) or, ideally, removes it from the list and offers a separate, qualitative category for administrative considerations that the Legislature can assess.

IV. Comments on Draft Recommendations.

We believe Ecology has effectively summarized many of the options available to address EITE compliance via the CCA and we are supportive of recommendations listed in Document 6.

a. Draft Recommendation 1.2: We appreciate inclusion of a carbon border adjustment mechanism.

Overall, we support Ecology’s recommendation to monitor policy developments that may be relevant to EITE industries and we appreciate that Ecology specifies the carbon border adjustment mechanism (“CBAM”) as an option in Recommendation 1.2. Climate Solutions would like to see further exploration of a carbon border adjustment mechanism, as it appears to be an effective strategy for minimizing leakage despite posing some implementation challenges.

b. Draft Recommendation 2.1 and 2.2: We support developing an approach for assessing leakage risk and minimizing leakage risk by covering costs associated with purchased electricity.

We are generally supportive of assessing the leakage risk of each facility and/or sector, which mirrors the approach initially envisioned by California’s cap-and-trade program. Given the complexities that California has faced in implementing a leakage assistance factor, additional research seems useful to understand whether this approach is feasible. In the case that the Legislature does pursue a leakage risk factor, Ecology should include in its recommendations that any assessment of leakage risk must be independent, accurate, and reliant on an open process.

Climate Solutions is also interested in determining and addressing leakage risk associated with purchased electricity as a potential incentive for decarbonization. However, we

would recommend that this incentive be paired with a reduction pathway, whether that's a cap adjustment factor, consignment, and/or product-based benchmarking. Furthermore, to ensure market viability and liquidity, it may be prudent to offer this incentive in the form of a credit, similar to California, rather than in the form of no-cost allowances. We recommend including California's current approach as an alternative to no-cost allowances in Recommendation 2.2.

c. Draft Recommendation 3.1: We support use of product-based benchmarks.

Climate Solutions is generally supportive of the use of product-based benchmarks as best practice for measuring emissions and rewarding cleaner, more efficient facilities. As Ecology has noted, product-based benchmarking is used in numerous jurisdictions with cap-and-invest programs including California and Quebec. We appreciate California's approach, which sets the benchmark at the most stringent option between 90% of the average efficiency or best in class facilities. Quebec is a notable example as well given that Ecology cites the limited number of facilities in Washington as a potential barrier to implementing this approach. But given that Quebec's market is roughly the same size as Washington's, it would appear that Quebec would have useful lessons learned for Washington as it considers this approach.

d. Draft Recommendation 3.2: We support use of consignment as a long-term compliance and incentive tool as well as a pre-2034 transitional tool.

We strongly recommend requiring EITEs to consign some portion of their no-cost allowances and to use the resulting revenue for decarbonization. As Ecology notes in the draft Report, this is a method that is already in use for utilities and thus is a relatively straightforward abatement mechanism to implement. Use of consigned revenue would have to be very carefully designed to ensure funds are directed at effective decarbonization and net-zero measures. Ecology should offer recommendations for what this language could entail.

Consignment of no-cost allowances should be implemented after 2034, but we also see this as a policy tool that could be used before 2034 to ease the transition to what will likely be a steep drop-off in no-cost allowances in the later years of the program. For example, Quebec currently requires EITEs in its jurisdiction to consign a small portion (1.7%) of their allowances and to use that revenue for decarbonization. The Legislature should consider requiring that EITEs consign an increasing proportion of their allowances to auction in the next two compliance periods to support near-term investments in emissions reductions projects.

Alternatively or additionally, Ecology should consider the merits of requiring EITEs to consign all of their no-cost allowances at auction before 2034 and to limit the use of that revenue either for purchasing allowances at auction or for decarbonization measures. The New York State Energy Research and Development Authority is considering this option

per its pre-proposal on its cap and invest program.⁴ While EITEs currently have the option to sell their excess no-cost allowances on the secondary market, this approach ensures that the use of that revenue is directed towards decarbonization, efficiency, and compliance only.

e. Draft Recommendations 4.1 and 4.2: We strongly support use of a cap adjustment factor.

Climate Solutions strongly supports the use of a cap adjustment factor on no-cost allowance allocation to mirror potential linked jurisdictions (California and Quebec) and to ensure that EITEs do not exceed the cap and achieve emissions reduction requirements. Sector-specific reduction schedules is an approach that we are also interested in exploring per the Rocky Mountain Institute report, but recognize that there are additional complexities that would come with this approach.

Given that the Legislature is likely to focus on Document 6 as a standalone document, we recommend that Ecology reiterates that “that “at least one of the three options from Policy Design Consideration 4 [to align with program cap and emissions limits] needs to form part of the EITE allocation approach for 2035-2050” in Document 5.”⁵

f. Draft Recommendations 5.1: We support assessment of environmental justice impacts of proposed policy options and recommend assessing the impact of the status quo.

It’s critical to evaluate the environmental justice impacts of the various policy options under consideration and we were glad to see the inclusion of this recommendation. In addition to the pieces of analysis already included in the assessment, we encourage Ecology to assess the impact of maintaining the status quo. What are the environmental justice implications of not passing additional legislation to address EITE compliance and enabling EITEs to receive most of their allowances for free in perpetuity? What are the implications of eliminating any incentive to reduce emissions under the program and potentially risking a situation where there are not enough allowances available for covered entities to comply with the law? The environmental justice impact of the status quo along with the various proposed policy options must help inform Ecology’s recommendations into the future and the Legislature’s decisions on EITE compliance pathways.

.....

Thank you for considering our comments. Climate Solutions’ hopes to continue to be a resource to Ecology as it implements this landmark law and pursues Washington’s emissions reduction mandates.

⁴ <https://capandinvest.ny.gov/Pre-Proposal-Regulations>

⁵ P. 8 <https://ecology.wa.gov/getattachment/2b6968bc-4450-4c5f-a9ba-107df8fdde86/Document-5-review-of-methods-for-EITE-allowance-allocation-2035-2050.pdf>



Sincerely,

A handwritten signature in black ink, which appears to read "Altinay".

Altinay Karasapan
Washington Regulatory Policy Manager
Climate Solutions

Don Steinke

A ten year grace period is enough.

Today, Ford Motors signed a Purchase Power Agreement for 650 Mw of clean electricity.
Microsoft has already signed a PPA for 10,000 Mw of clean electricity.

Don Steinke

Consider offering fewer no-cost allowances. Revise the details over time.



We Feed You



September 3, 2025

Adrian Young
Cap-and Invest Industrial Policy Lead
Washington Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Submitted via the electronic comment platform

**RE: Washington Department of Ecology Draft Report to the Legislature on
EITE Allowance Allocation for 2035 – 2050**

Dear Mr. Young,

Food Northwest appreciates the opportunity to provide comments on the Department of Ecology's (Ecology) draft Report to the Legislature on EITE Allowance Allocation for 2035—2050 (Report).

Established in 1914 and headquartered in Portland, Oregon, Food Northwest is a trade association of food manufacturers in Washington, Oregon, and Idaho. Several of our members operate facilities in Washington that are designated as EITE entities under the Climate Commitment Act (CCA). Washington's food processing EITEs are not just industrial facilities but are foundational pillars of the state's economy and are vital to the well-being of countless communities, especially in rural areas. They are major employers that provide well-paying, skilled jobs and add substantial value to Washington's agricultural production.

Food Northwest shares the State's goal to protect and improve the environment, and the need to reduce GHG emissions. In 2009, Food Northwest was the first industry group in the nation to adopt a goal to reduce industry-wide energy intensity by 25% in 10 years. We determined the energy intensity for all manufacturing facilities and tracked progress toward our goal. We are proud to have been a national leader in this effort. We are currently exploring new and innovative means to reduce greenhouse gas emissions. Through our raw products, food processors are directly linked to the environment and will be impacted by climate change. Responsible stewardship is critical to a sustained food industry.

Food Northwest appreciates the significant efforts of the Ecology staff in developing the materials and presentations, as well as creating opportunities for discussion on the issues. However, much work remains since all recommendations require assessments or analyses. These assessments and analyses must be completed to enable the legislature to make informed decisions on an approach for EITE no-cost allocations. Deciding at this stage risks relying on incomplete information and assumptions that could result in a program that fails to meet expectations. We recommend submitting an interim report and continuing with the assessments and consultations with the EITE Advisory Group, with the goal of submitting the final report in November 2026.

RMI and ERG Reports

Food Northwest has concerns regarding the methodologies and conclusions in both reports, as well as Ecology's reliance on them for its report to the legislature.

RMI's study aimed to determine emissions reduction potential and decarbonization pathways for each industrial sector. It concluded that its proposed pathways are "achievable." However, RMI failed to consider the complexities and challenges associated with these pathways. The critical omission of electric generation and transmission infrastructure from RMI's analysis significantly undermines the real-world feasibility and cost implications. The projected increase in electricity demand for food processing alone (625 GWh by 2030, 1,704 GWh by 2050, as stated by RMI on page 26) necessitates massive investments in new clean energy generation and transmission, which have their own timelines, costs, and permitting challenges. Policymakers must not interpret "achievable" as economically or technically feasible without considering the broader energy and economic context. The "achievability" of decarbonization pathways is intrinsically linked to financial feasibility for industries, ratepayers, and the capacity of the electrical grid. Failing to adequately address these costs and the risks of industry loss and job destruction would not only undermine the competitiveness of Washington's EITE food processors but also cause profound and lasting damage to the very communities and citizens the state aims to protect.

ERG's study aimed to assess EITE's contributions to air quality, health, and environmental impacts on communities, as well as identify economic impacts, and analyze market structure and competitive dynamics. The study, however, lacks the granularity required to support the conclusions. The use of broad and generalized

categories for food processing in Washington is problematic. Treating them as a homogeneous industry or applying a nationwide outlook is a critical analytical flaw that fails to capture the unique competitive dynamics, market conditions, and economic contributions of these distinct sectors within Washington state. A generalized approach risks misrepresenting the actual impacts of policy on these vital industries. Likewise, equating greenhouse gas emissions with criteria air pollutants oversimplifies the complex atmospheric chemistry and localized impacts. A more nuanced analysis of the specific co-benefits of decarbonization for local air quality in overburdened communities is needed.

Comments on the Draft Recommendations

Recommendation 1.1: Maintains Ecology’s authorization to provide no-cost allowances to EITEs from 2035 onward, provided it aligns with program objectives, allowance budgets, and emissions limits.

The legislature has already established the allocation of free allowances to EITEs. However, this recommendation imposes a limit on the allocation of allowances that is not in the statute. RCW 70A.65.110 states that facilities “must receive an allocation of allowances . . . at no cost” if they are classified as an EITE. Furthermore, in RCW 70A.65.070(6), the legislature states its intention to promote a growing and sustainable economy and to prevent leakage, and that these objectives are contingent upon the implementation of RCW 70A.65.110. Allocation of free allowances and “ensuring against emissions leakage and economic harm to businesses” are obligations that must be met in the design of all CCA policies and programs affecting EITEs.

Recommendation 1.2: Monitor developments in Carbon Border Adjustment Mechanisms (CBAM)

Food Northwest urges Ecology to advise against considering CBAM as a way to prevent leakage. We believe there could be substantial constitutional, trade law, and administrative obstacles, as well as practical challenges.

Recommendations 2.1 and 2.2: Develop an objective approach for assessing leakage risk and target allowances based on this approach.

The legislature has classified the industries described in RCW 70A.65.11(1) as EITEs, which, by definition, are at risk for leakage. An objective approach for assessing

leakage risk is not necessary and will be very costly, staff-intensive, and time-consuming. California spent years developing a leakage risk assessment methodology and then years collecting data, calculating, and assigning risk tiers to industrial sectors. They proposed applying an assistance factor whereby EITE industries with higher leakage risks would receive greater allowances than those with lower risks. Initially, the assistance factor for all sectors was 100% and would later be reduced depending on the risk tier. California abandoned this approach to the allocation of free allowances and applied the 100% assistance factor for all EITE industries through 2030. Given California's experience, this may not be a viable approach for Washington.

Targeted allowance allocation to prevent leakage risk associated with purchased electricity is a similar approach and would raise the same concerns. California offers an Industry Assistance Credit for EITEs, providing them with an annual credit on their electric bill. The amount of the credit is determined by carbon efficiency benchmarks and incentivizes facilities to take measures to reduce their GHG emissions. This may require PUC approval, but could be implemented once benchmarks or other baselines are established.

Recommendation 3.1: Assess product-based benchmarks and at least one alternative method for establishing allocation baselines.

Food Northwest supports assessments of the implementation requirements and impacts of adopting product-based benchmarks and alternative methods, such as "best available technology," and comparing them to retaining the existing allocation baselines. Involvement of EITEs and subject matter experts will be essential to these assessments. Food Northwest has identified resources, issues, and concerns that we would contribute during the evaluation process.

Recommendation 3.2: Assess the implementation requirements and impacts of using consignment of a portion of no-cost allowances.

Food Northwest supports assessing the implementation requirements and impacts of consigning a portion of no-cost allowances and using the proceeds to decarbonize operations. While the proposed option is mandatory, an optional consignment should also be explored.

Recommendations 4.1 and 4.2: Assess the requirements and impacts of implementing a cap adjustment factor and at least one alternative policy option.

Food Northwest supports an assessment of the cap adjustment factor and an alternative; however, we urge Ecology to explore accommodations (waivers, adjustments, etc.) for the timelines needed to implement decarbonization projects, as well as the technical and economic infeasibility of implementing decarbonization technologies. For example, the electrification of food processing facilities and other industrial sectors is currently not feasible and is unlikely to be an option for the foreseeable future. Food processors have been told by their utilities that the electric supply can't support industrial electrification. New large electrical loads placed on utilities will be required to pay for the generation, distribution, and transmission upgrades. These costs are substantial and will likely result in leakage. The outlook for industrial electrification is uncertain. An independent Advisory Group that reviewed NW Natural's IRP stated that "the electric future transition will be harder, slower, and more expensive than the scenarios we were presented even without electrifying current natural gas use." See attached *Statement of the Independent Advisory Group Regarding NW Natural's Integrated Resource Plan and Electrification of Current Gas Loads (IRP)*.

Complementary Policies and Strategies

Complementary policies and strategies that offer incentives, grants, tax credits, and low-interest loans for EITE decarbonization are vital additions to any carbon reduction program aimed at preventing leakage. Food processors operate on thin margins. In its Industrial Decarbonization Roadmap, the U.S. Department of Energy identifies the low margins of food and beverage companies as a limiting factor to upfront capital investments in decarbonization. CCA compliance costs, higher electricity and fuel prices, commodity cost increases, and the expenses of new energy infrastructure could threaten their profitability. Such policies and strategies could reduce the financial burden and accelerate the deployment of decarbonization efforts and projects.

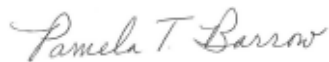
California has a grant program focused on food processing. The [Food Production Investment Program](#) was established to receive funds from cap and trade revenues, providing support for updating and improving food production facilities with energy-efficient and/or renewable energy technologies. This initiative aims to reduce operating costs and greenhouse gas emissions. The state declared that "This could help ensure California's food processing industries remain competitive and operational, and the jobs associated with food production remain in California."

Food Northwest supports the following Complementary Measures from Appendix 1 of Document 6:

- Expedite electrical grid enhancement for industrial electrification
- Incentivize the electrification of process heat equipment
- Increase funding for the Hard-to-Decarbonize Sector Grants Program
- Introduce state-level tax credits for emissions-reducing equipment
- Set up an industrially focused green bank
- Energy efficiency subsidies
- Provide voluntary efficiency audits for industrial facilities [additional funding]

Food Northwest thanks the Department of Ecology for the opportunity to participate in the Phase 2 process and to provide these comments on the draft recommendations. We look forward to continuing our collaboration with Ecology to develop and implement an approach to EITE no-cost allowance allocation that protects the viability of Washington food processing EITEs and other EITEs, while achieving the objectives of the CCA.

Sincerely,

A handwritten signature in cursive script that reads "Pamela T. Barrow".

Pamela Barrow

Vice President, Food Northwest

**Statement of the Independent Advisory Group Regarding NW Natural's
Integrated Resource Plan and Evaluation of Electrification of Current Gas Loads (IRP)**

Independent Advisory Group Members:

Mr. Lee Beyer (1)

Mr. Stefan Bird (2)

Ms. Debra Smith (3)

Mr. Stephen Wright (4)

February 2025

Executive Summary:

The four-member independent Advisory Group (AG) provides this statement on the elements of NW Natural's IRP (IRP) we were asked to review. This IRP examines different scenarios related to electrification of natural gas loads currently served by the local distribution company, NW Natural. Our engagement was to focus on key assumptions that would affect cost, reliability and carbon emissions on the electric system of the Pacific Northwest (PNW) and particularly those electric systems that overlap with NW Natural's service territory.

The AG was presented an initial set of three supply-side scenarios and four demand-side scenarios. The AG focused on the supply-side scenarios. These initial scenarios had different assumptions about the future development costs, location, timing and availability of different supply-side generation resources and transmission expansion throughout the PNW region. These kinds of resources would be needed for normal electric load growth and these three supply-side resource scenarios also are used in the IRP to meet the varying degrees of load growth assumed in the four demand-side scenarios. We understand that these four demand-side scenarios are driven by different assumptions about electrification of loads currently served by natural gas and not fundamental differences in "base load" electric demand growth. Although we did not review the demand-side scenarios in detail, this statement does express a concern about the "base load" forecast possibly underrepresenting electric load growth based on current trends.

We found the initial three supply-side scenarios presented to the AG to be overly optimistic by assuming base assumptions that would result in electrification of current gas loads being easier, faster and cheaper than our own experience and judgment. Even the least optimistic scenario was not consistent with our view of current reality facing the PNW energy system. Our collective feedback was that the electric future transition will be harder, slower and more expensive than the scenarios we were presented even without electrifying current natural gas use.

NW Natural then developed a revised set of supply-side scenarios with one scenario called "Current Trends" that reflected the most change from the original three scenarios. The other two scenarios moved somewhat, but our judgment is they remain too reliant on overly favorable

assumptions. It is the AG's view that the electric system will be greatly challenged to meet the existing policy prescriptions and planned load growth even without taking into account electrification of the natural gas system.

As an overall observation, we think the electric systems are already being pressed against the edges of their capabilities and electric systems are experiencing more "close call" events such as in January 2024 in the PNW. The electric systems of the region are also relying heavily on the gas systems for electric generation for peak load service. For example, the PNW electric system was in severe emergency conditions last January. Without record electric imports from the Southwest and Rocky Mountain states, the Pacific Northwest could have experienced rolling blackouts of a magnitude that would be unprecedented in our region.

The AG expressed views about future supply side additions, load forecasts, and electric system planning for uncertainty. The AG also added thoughts about the need for better gas-electric integrated system planning in the future although not achievable in this study.

The AG noted the following about future supply side additions:

1. The biggest unknown about the cost of future supply is estimating the availability and cost of zero emission load following resources. There are substantial federal research and development dollars currently authorized, but it is unknown how effectively these will be deployed. The current very high cost of maintaining reliability under stress conditions without carbon-emitting load following resources (the status quo) should be a scenario that is analyzed. The AG recommends maintaining the availability of natural gas-fueled generation capability, which will increasingly operate at lower dispatch factors as more zero fuel cost renewable energy becomes available, until cost-effective, longer duration, zero emitting load following resources can make more advances.
2. Battery costs have been decreasing and are increasingly being adopted in the market. Currently cost-effective batteries, however, are limited to four hour duration. Longer duration batteries such as 100 hour iron-air batteries are on the horizon, but it is unclear how long they will take before they achieve widespread commercialization. Other proven technologies such as pumped hydro storage may be available in limited geographical locations but are historically higher cost and face more challenging permitting timelines. Longer term storage is necessary to maintain reliability in a system with increased reliance on variable resources and even more so without carbon-emitting dispatchable generation.
3. New standardized modular nuclear reactors are an option for both energy and peaking capability, but the technology currently carries an extraordinary array of risk in terms of cost and timeframe to be in place.
4. Demand side options hold tremendous potential but there are limits to the amounts of firm energy and capacity that can be assumed to be available in the most difficult circumstances due to consumers willingness to sustain demand reductions under stress temperature conditions.
5. The transmission assumptions we were presented are based on current planned schedules. For transmission upgrades that do not require new right of way the assumptions are likely reasonable. The increasing resistance to new transmission nationwide suggests caution with respect to schedules for new transmission that requires new right-of-way. The ability to

meet Western states' emission reduction targets with current load forecasts, let alone under more aggressive data center expansion and or more aggressive natural gas-based electrification assumptions, will require expansion of the transmission grid to access and deliver energy reliably from new remote renewable resources and new load following resources. Historically long timelines to permit new transmission lines, particularly across federal lands, as well as concerns about customer rate pressure, suggest caution with respect to the assumed speed of development of new transmission lines.

6. The accredited capacity for wind appears high relative to the capacity attributed to wind in regions using an established ELCC methodology. Offshore wind, which has received opposition by the new federal administration, is also limited by available transmission on the coast, which is generally weak due to small coastal loads. More sizable offshore wind resources will require new network transmission to be permitted and constructed to intertie to bulk transmission that can access large load centers, which adds to the timing risk and uncertainty.
7. There has also been a trend across the country to derate accredited capacity for thermal resources due to operational challenges occurring during extreme temperature conditions. There are a variety of reasons including inadequate weatherization of equipment and fuel supply disruptions. We recommend consideration as to whether the capacity factors for thermal units should be modified. The Western Power Pool may be able to help with this assessment.
8. There is substantial evidence that the cost of the clean electricity transition increases steadily over time, with rapid increases after 80% renewables is achieved, if there are not adequate cost-effective zero-emitting load following resources available.¹ Today, we are likely still on the upward slope prior to achieving 80%. This projected increase in costs translates into rate impacts. Utilities are increasingly seeing push back from customers on rate increases, mostly related to new resource capital expense. Oregon's House Bill 2021 – 100% Clean Energy for All - that was passed into law includes consumer protections for both affordability and reliability in the form of regulatory off-ramps. In addition, the physical siting of these resources is experiencing strong opposition from many customers. This raises concerns about the industry's ability to bring new resources online in a timely manner. A feedback loop is needed to recognize that if rates increase dramatically and quickly, or if permitting processes do not evolve to address siting concerns, there will be consequences for the rate at which the clean electricity transition can occur.

It is also important to understand that current and long-term concerns about product affordability are based on resource adequacy, as well as a myriad of other factors also putting pressure on forward rate trajectories. Although this work only deals with the rate impacts of acquiring sufficient resources within the regulatory framework established by each state, rate impacts are cumulative and customers generally do not look at individual drivers such as wildfire mitigation, system resiliency, grid modernization or general capital investment. Instead, rate actions associated with resource adequacy must be examined in the context of all other rate pressures.

¹ 2019 Resource Adequacy Study in the Pacific Northwest on the Public Generating Pool website.

As a result, we have concerns about the achievability of the supply side assumptions even in the “Current Trends” scenario.

For the demand side, the “base load” demand forecast was standardized across the demand scenarios using current load forecasts. Like locking down other variables so that the policies and rates of electrification could be examined as the changing variable, we understand the purpose of a single “base load” forecast. However, we remain concerned that this forecast likely underrepresents the potential electric load increases being driven by factors other than electrification of gas load. Regional electric load forecasts have increased in an unprecedented fashion in the last two years, and we expect the forecasts to continue to increase. Specifically, data centers and AI have become large swing short-term variables and vehicle electrification is a long-term driver.

Planning Reserve Margin (PRM) is a key assumption in this analysis that addresses uncertainty in electric utility planning. We have already seen upward pressure on PRMs around the country due to the increased use of energy and dispatchability limited resources, load growth uncertainty and the capability of resources to deliver capacity during temperature related stress events, a challenge which has been exacerbated by extreme weather events. We also expect there will be an increasing effort to address the duration and magnitude of reliability risk (through tools like expected unserved energy or EUE) in addition to the standard probabilistic assessment of the frequency of electric outages. The emerging long duration, high magnitude outages during extreme weather events, as experienced in Texas and California, present high level human health and safety issues. In addition, the PNW is in the midst of a transition from being an energy constrained to a capacity constrained system and systems need to evolve as well. Electrification of natural gas uses will have the biggest impact at the times which are becoming the most challenging for the electric system. All these factors point toward the use of higher than historical levels of planning reserve margin to maintain the level of reliability PNW consumers have come to expect from their electric power system.

Moreover, the AG thinks the study should also consider the reality of periodic severe ice or windstorm events as we have experienced in recent years. Such events have resulted in multi-day electric distribution grid outages disrupting electricity supply to thousands of customers until electric distribution grid damage is repaired and power is restored. If natural gas winter heating capability is fully displaced by electric heating without auxiliary/hybrid natural gas heat pump capability, or without extraordinary levels of storage at the local retail user level, there will be substantial public safety and economic impacts. It is possible to underground electric distribution but only at significant expense, over a lengthy time period and requiring increased maintenance. The AG encourages that this risk receive attention in discussion of electrification.

Finally, we note that the AG believes there is potential for consumer value to be generated through increasing coordinated/joint planning and/or coordinated operations between gas and electric systems where there are overlapping service territories. Building on recent efforts to build collaboration in the PNW, it is recommended that synergies be unlocked that can reduce cost, improve reliability and decrease carbon emissions through consideration of coordinated and/or joint integrated resource planning, investment and operations for options from supply source to consumer use of the gas and electric systems.

Our specific recommendations regarding assumptions are included in the “Detailed Recommendations” section that follows below.

Detailed Recommendations:

The AG recognizes there is never a perfectly accurate single point forecast for the future. The IRP’s goal of evaluating the impacts of possible future scenarios to help inform policy and strategy is reasonable, as long as the probability is not evenly weighted between the various scenarios currently being utilized. Our collective view is that, of the scenarios NW Natural is studying, the “Current Trends” supply side scenario most accurately reflects current reality now and for the foreseeable future. However, we continue to have residual concerns that the reasonable risk to electric system reliability is outside the range of the scenarios to be studied. This is due to supply, demand and uncertainty assumptions embedded in the study. We recommend addressing these concerns through sensitivity analysis to better understand load and resource uncertainty.

- The Current Trends scenario includes near-term increase in costs for wind, solar and batteries that best reflects current reality for the supply side in electricity markets. The causes for these increases would best be described as driven by high demand, supply chain challenges, import tariffs and permitting issues, driving costs up in the near term while technological improvements are driving costs down over the longer term. The other two scenarios follow more traditional NREL cost forecasting. The AG also noted there is an interaction between load and costs for supply. Higher loads lead to more stress on generation and transmission supply chains lead to higher costs. A scenario that assumes costs of all resources are higher when load growth is high is within the realm of reason and should be considered for scenario analysis purposes.
- The AG has suggested use of a sensitivity analysis approach that would vary the base load forecast using a higher growth rate. Although we do not have a specific numerical recommendation, we have suggested using the trends from the last two years as a basis for assuming a corresponding increase for at least one additional year at the beginning of the forecast period.
- The single planning reserve margin (PRM) that is based on PNUCC’s short-term PRM of 16% is reasonable in the short term. However, consistent with comments above, the AG believes this PRM is likely understated in long-term studies that assume increasingly higher percentages of variable generation resources over time. Electric system planning in this new long-term environment will require more sophisticated modeling techniques to ensure reliable service in all 8,760 hours of the year and not just the peak hour. In-lieu of deployment of these more sophisticated modeling techniques, the AG recommends consideration of an approach that would increase the PRM in relationship to increasingly higher percentage reliance on zero-emitting variable generation resources that is supported by review of other expert sources, or alternatively consider a sensitivity scenario with a gradually increasing PRM to provide an indicator of potential cost and risk impact. Potential sources of this PRM insight are information emerging in the work performed by the Electric Systems Integration Group (ESIG), Pacific Power’s current 2025 IRP process, and PRM analysis performed by RTO/ISOs across the nation. In the future, the AG’s recommendation

to pursue coordinated joint planning between the electric and gas utilities would support a more informed set of assumptions including PRM and improved quality of analysis.

- There has been a trend across the country to derate accredited capacity for thermal resources due to operational challenges occurring during extreme temperature conditions. There are a variety of reasons including inadequate weatherization of equipment and fuel supply disruptions. We recommend consideration as to whether the capacity factors for thermal units should be modified. The Western Power Pool may be able to help with this assessment.
- With respect to reliability and the issues of moving from a “dual fuel” (electric and gas) system to a “single fuel” (electric system) we have raised numerous concerns about assuring that the IRP analysis carefully assess issues around resulting system reliability and the potentially profound public health and safety issues of relying on a single fuel (electric) system. NW Natural’s IRP process examines its own gas system but is also attempting to evaluate the electric systems of the PNW which is a reason we were asked to serve on the AG. What is lacking, not just in this study but in all current integrated resource plans across the country, is an integrated systems perspective incorporating the gas and electric systems. The risk of reliance on one fuel is increased due to the exposure of the electric distribution system to ice and wind events. Recent storms in Oregon have displayed that multi-day electric outages while distribution systems are repaired would create a substantially greater human health and safety risk following electrification of the natural gas system. While this risk is difficult to address in this study, we recommend at least addressing qualitatively. Ultimately, these critical issues should be addressed through regional joint system planning (gas and electric).

Independent Advisory Group Members Bios:

- (1) **Lee Beyer**: Lee Beyer was a member of the Oregon Legislature for 22 years serving in both the House and State Senate. From 2001 until 2010 he served as a member and Chair of the Oregon Public Utility Commission. He also served for many years as a board member of the Western Electric Coordinating Council, as a member of the EPRI Advisory Council and member and Vice-Chair of the NARUC Electricity Committee. During his time in the Legislature, Beyer chaired the committees with oversight of energy policy and was directly involved in the drafting and sponsorship of much of Oregon's recent energy legislation.
- (2) **Stefan Bird**: Stefan Bird previously served as CEO of Pacific Power, a division of PacifiCorp, senior vice president, commercial and trading, PacifiCorp Energy, CEO of CalEnergy, an independent power producer, and vice president of acquisitions and project development for Berkshire Hathaway Energy. During his 17-year tenure at PacifiCorp, among other activities, Bird led the dramatic expansion of PacifiCorp's renewable energy portfolio and interstate transmission grid, western electricity market transformation and engagement in Oregon energy legislation.
- (3) **Debra Smith**: Deborah (Debra) Smith served as CEO of Seattle City Light, General Manager of Central Lincoln PUD (serving the Oregon coast), and various roles at the Eugene Water & Electric Board. During her 30 years in the electric utility industry, Deborah prioritized customer responsiveness, collaboration across the region, and electrification/decarbonization. Deborah also served as the first female chair of the Public Power Council, as well as on the boards of the Smart Energy Provider's Alliance, the Electric Power Research Institute EPRI, and the American Public Power Association. She remains active on the Pacific Northwest National Lab advisory committee, as well as the Western Transmission Consortium.
- (4) **Stephen Wright**: Steve Wright began his career developing energy efficiency supply curves and integrated resource plans. He served as Administrator/CEO of the Bonneville Power Administration from 2000-2013, CEO of Chelan Public Utility District from 2013-2021 and is now a member of the Southwest Power Pool Board of Directors as well as the Interim Markets+ Independent Panel. He has served on the boards of the Alliance to Save Energy, Electric Power Research Institute and American Public Power Association.



October 7th, 2025

VIA EMAIL TO: Isabel.Hanify@ecy.wa.gov

Isabel Hanify
Cap-and-Invest EITE Policy Planner
Washington State Department of Ecology
300 Desmond Drive SE
Lacey, WA 98503

Dear Isabel,

This letter is submitted by Front and Centered, a diverse coalition of community-based organizations across Washington State working to advance climate and environmental justice.

Thank you for the opportunity to comment on the Department of Ecology's draft report to the legislature on EITE allocation for 2035-2050. We would like to submit our 2022 report, "Exposing False Solutions: How Washington's Cap and Trade Program Gives Industrial Polluters a Free Pass," for your consideration. The report discusses the inherent limitations of carbon trading policies by prioritizing incremental change rather than structural change in EITE industries. It also explores potential environmental justice and climate impacts of EITE policies.

Our main findings suggest that without direct emission reduction standards, climate and environmental justice impacts will continue to burden frontline communities near EITE facilities. No-cost allowances prolong exposure to environmental hazards by not accounting for toxic greenhouse gas co-pollutants. Further, if in-state demand for polluting products declines, industries can export. Our report demonstrates that statewide exports of EITE industries have increased, leading to an increase in both carbon dioxide emissions and co-pollutants in communities near EITE-designated facilities, a trend that the EITE policy could continue without additional direct emission reduction standards.

Please review the enclosed report for a full analysis of the impacts of the EITE policy on frontline communities and on the state's greenhouse gas emission reduction goals.

Sincerely,

Maiko Patschke
Environmental Justice Analyst, Front and Centered

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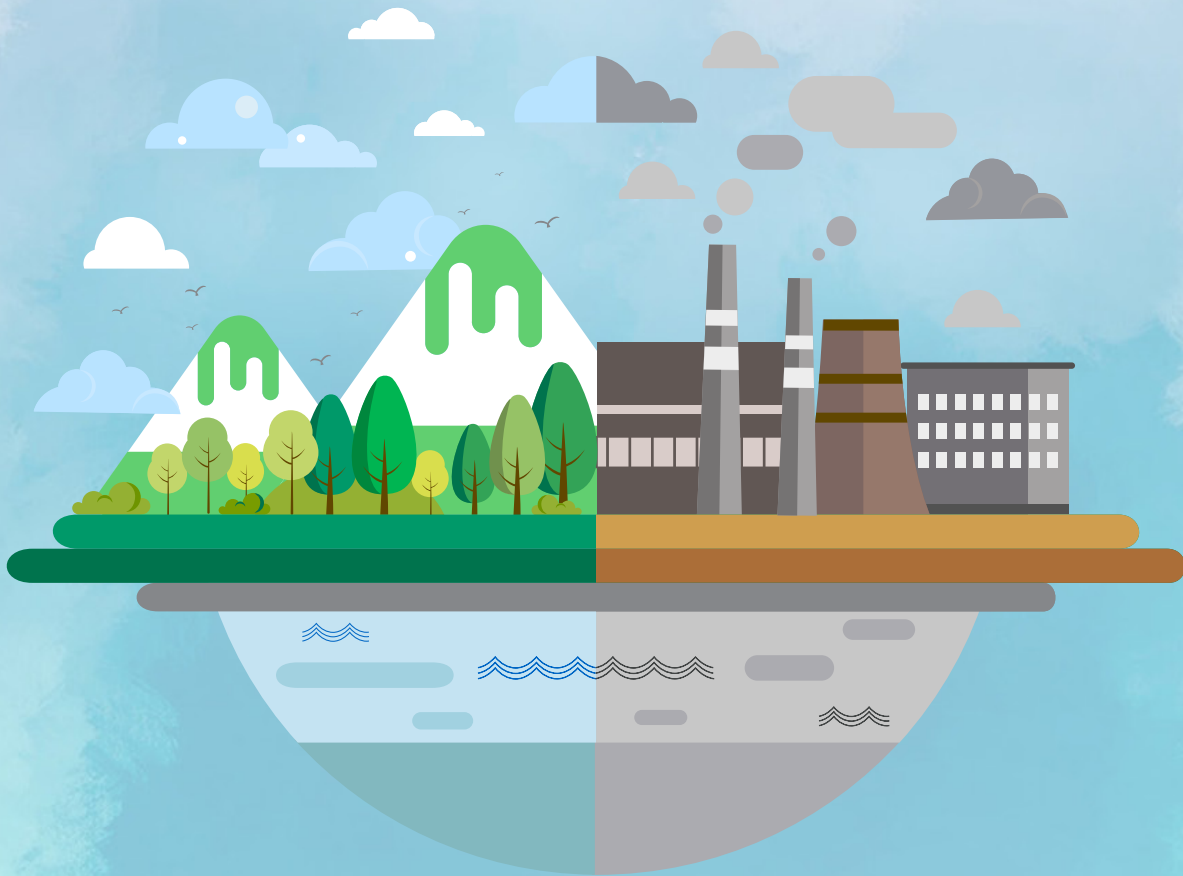
📄 EIN number 84-3336800

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Exposing False Solutions

**How Washington's Cap and Trade Program
Gives Industrial Polluters a Free Pass**



JUNE 2022



A Front and Centered Report

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OVERVIEW

This report looks into the “emissions-intensive [and] trade-exposed” (EITE) policy that the State of Washington plans to implement as part of its cap-and-trade scheme. The policy would give industries in the state that use carbon intensive technologies and compete in global products markets no-cost allowances to emit carbon, measured as carbon dioxide equivalents (CO₂e).¹

An “allowance” is a permit to emit one metric ton of carbon (CO₂e). The carbon trading scheme that the state plans to launch next year generally requires polluters that do not cut emissions to buy allowances from those that do cut emissions, under a declining statewide emissions cap. No-cost allowances for industries deemed EITE are exemptions from this requirement.

Stated reasons for such exemptions are coded in jargon; “to create a climate policy that recognizes the special nature of emissions-intensive, trade-exposed industries by minimizing leakage and increased life-cycle emissions associated with product imports ... and avoid leakage of emissions from manufacturing to other jurisdictions.”² Decoding the jargon, the emissions-intensive, trade exposed industrial policy reflects *inherent* limitations of carbon trading.

Carbon trading prioritizes incremental change, not structural change in carbon-intensive industries. This is by design. Creating a market that trades in carbon emissions requires ‘commodifying’ the emissions at a price lower than some polluters will pay to clean up their own acts, if the trading is to occur at all. Then, since buyers seek the cheapest allowances, structural change—such as tearing down a profitable coal plant to build a zero-emission solar powered hydrogen plant—is not even on the table at the carbon traders’ auction. Owners of the emissions-intensive industrial infrastructure that this leaves in place then seek to further minimize their costs.

Carbon trading also exports emissions. Where emissions-intensive technologies make products traded globally, carbon trading leaves these technologies in place, which favors exports of those polluting products from the carbon trading jurisdiction hosting the emissions-intensive production. Thus, the intent to minimize emissions associated with product imports² by giving no-cost allowances to emissions-intensive industries that export to other states and nations reflects inherent limitations in carbon trading, and aligns with minimizing ‘home’ industry costs.

¹ SB 5126 (2021) §§ 1(6), 8(2)(k), 13; SHB 1682 (proposed, 2022); WAC Chapter 173-446A (proposed, 2022).

² SB 5126 (2021) §§ 1(9), 9(5).

1 A THREE-PART LOOPHOLE

Industries deemed emission-intensive and trade-exposed (EITE) would first get allowances for some 97 percent of their emissions at no cost, for at least twelve years. Second, they could increase emissions at no cost by increasing production rates. Third, *if*—as is predictable—switching to a structurally cleaner technology will be the only feasible way to make deeper cuts in their emissions, they may continue to seek no-cost allowances for uncut emissions, potentially for an indefinite time. Table 1 lists the industries already deemed EITE and those which may apply for EITE status.

TABLE 1. Washington State Industries with Proposed & Open Emission Intensive Trade Exposed Status

Status ^a	Sector Description	NAIC ^b	Facilities ^c
EITE	Paper products; pulp, paper & paperboard mills	322XXX	13
EITE	Petroleum refining, including asphalt production	324XXX	6
EITE	Metals: aluminum, iron, steel, smelting, except forging	331XXX	4
EITE	Wood Products: sawmills, softwood veneer and plywood mfg.	321XXX	17
EITE	Minerals: Glass, cement, concrete & gypsum mfg.	327XXX	7
EITE	Food products: fruit, potato, dairy, meat, other mfg.	311XXX	20
EITE	Chemicals: fertilizer, other organic & inorganic chemical mfg.	325XXX	7
EITE	Aerospace: aircraft and aircraft parts & auxiliary eqpt. mfg.	3364XX	7
EITE	Semiconductor & related device mfg.	334XXX	3
OPEN	Solid waste collection & landfills	562XXX	14
OPEN	Government: education, admin., national security & airport ops.	61, 92, 488119	10
OPEN	Cattle feedlots	112112	5
OPEN	All other nonmetallic mineral mining	212399	1
OPEN	Carbon and graphite product mfg.	335991	1
OPEN	Iron and steel forging	332111	1

a. EITE: sector is designated as Emissions-Intensive, Trade-Exposed. Open: facilities in other sectors may petition for EITE status. see SB 5126(2021) § 13: SHB 1682 (proposed, 2022) § 1; WAC Chapter 173-446A (proposed Dept. of Ecol., 2021).

b. NAIC: North American Industrial Classification. Example: the three-digit NAIC 324 (324XXX) includes the petroleum refining subsector (324110) as well as the asphalt paving mixture and block mfg. subsector (324121). **c.** The number of facilities in a sector during 2019 in the detailed greenhouse gas emissions inventory published by the WA Dept. of Ecology: <https://data.wa.gov/Natural-Resources-Environment/GHG-Reporting-Program-Publication/idhm-59de/data>

³ SB 5126 (2021) §§ 13(2), 13(3)(a), 13(3)(b); SHB 1682 (proposed, 2022) §§ 1(2), 1(3)(a), 1(3)(b), 1(3)(e); WAC Chapter 173-446-220 (proposed, 2022) §§ 1(b), 2(a).

1.1 BASELINE PERMITS TO POLLUTE THROUGH 2034

Each industrial facility deemed EITE that emitted in the period from 2015 through 2019—some 84 facilities or more (Table 1)—would be given no-cost allowances for a percentage of its 2015–2019 baseline emissions.³ Allocations would occur in four-year periods: 2023–2026, 2027–2030, 2031–2034, etc.³ The percentages of their total baseline emissions that EITE facilities would be allowed to emit at no-cost would not be lower than 100 percent in the first period, 97 percent in the second, and 94 percent in the third four-year period.³ Averaged over those twelve years, these industries would be allowed to emit at no less than 97 percent of prior rates at no cost through 2034.

Thus, emissions-intensive, trade-exposed (EITE) industrial facilities that keep emitting as much carbon as they did during 2015–2019 would be required to buy emission allowances for no more than three percent of their emissions during 2023–2034.

1.2 EMISSIONS ADDER FOR PRODUCTION GROWTH

EITE facilities would be allowed, and encouraged, to use their emission *intensity*—emissions per unit of production—as their baseline for calculating no-cost allowances.⁴ This means that their no-cost allowances could increase if and when their production increases.⁴

For example, an oil refinery that refines three percent more crude during the period from 2027–2030 than it refined in the period from 2023–2026 could get the same number of no-cost allowances in the second four-year period as it did during the first four-year period. The three percent reduction in baseline no-cost allowances, from 100 to 97 percent, would be canceled out by the three percent increment of its production increase, in this example.

1.3 THE BEST AVAILABLE TECHNOLOGY FOR WHAT?

After 2034 EITE industries would get no-cost allowances in substantial, or very substantial, amounts, depending on whether a switch from inherently polluting to inherently cleaner technology is required. Legislative proposals in February 2022 range from setting the 2035–2050 no-cost allowance schedule now to studying it for future legislative action, but either way, EITE facilities could seek additional no-cost allowances based on future determinations of what is the “best available technology.”⁵

⁴ SB 5126 (2021) §§ 13(2), 13(3)(a), 13(3)(b), 13(3)(c), 13(3)(d), 13(3)(e); SHB 1682 (proposed, 2022) §§ 1(2), 1(3)(a), 1(3)(b), 1(3)(e); WAC Chapter 173-446-220 (proposed, 2022) §§ 1(b)(v)(A), 2(b).

⁵ SHB 1682 (proposed, 2022): Substitute House Bill §§ 1(3)(b), 1(3)(e), 1(3)(f); Proposed Second Substitute House Bill §§ 1(3)(f), 1(4)(a).

State climate law appears to define “best available technology” (BAT) in reference to “the fuels, processes, and equipment used in the facilities ... while not changing the characteristics of the good being manufactured.”⁶ Is the BAT determination for an EITE facility limited to incremental improvements in the inherently polluting technology it already built, or will BAT require switching to inherently cleaner technology which has been proven in an analogous setting to be feasible?

This is, at least in part, a question for legal analysis that is beyond the scope of this report. As a factual matter, however, in other contexts BAT has been ‘applied’ for decades while solar and wind power did not replace on-site industrial electricity generation from fossil fuels. In effect, BAT has been used for incremental improvements to fossil-fueled technologies, not switching to inherently cleaner non-fossil technologies. There is a loophole in applying BAT that has not yet been closed.

For these reasons, EITE industries might get very substantial no-cost allowances through 2050.

⁶ SB 5126 (2021) §§ 2(10).

2 CLIMATE DANGERS

Climate impacts that could result from the emissions-intensive, trade-exposed (EITE) policy include, at a minimum, impacts from (1) direct industrial emissions, (2) risky reliance on deeper emission cuts in other sectors, and (3) systemic emissions associated with production for export. This chapter reviews these potential impacts based on plausible assumptions about the future that should be noted when interpreting results of the analysis:

Collective EITE industry emissions remain unchanged.

This assumption is plausible since no-cost allowances incentivize no change, facilities could buy allowances more cheaply than rebuilding for inherently cleaner technology, and production growth could offset incremental carbon cuts. Allowances will likely be cheaper than replacing already-built industrial technologies due to the limitations of carbon trading (Overview). And without that structural change, further incremental cuts would likely be small as 'mature' fossil fuel industrial technologies already have approached their theoretical maximum efficiencies. Indeed, this no-increase assumption may be conservative since production growth might increase industry-wide emissions before 2050.

Unconstrained exports.

This assumes that limits on exports will remain beyond the state's jurisdictional control, is consistent with the functional intent of the EITE policy, and is factually demonstrated in the oil sector example reviewed herein (CBE, 2020; CEJA, 2022).

A carbon-trading-only approach to industrial climate policy.

This assumption, while it may be true for manufacturing industries in the state at present, does not apply to other sectors wherein the state is using direct emission reduction measures. Further, it is not recommended herein as it clearly conflicts with the 'all the tools in the toolbox' approach that is warranted for grappling with our climate crisis. Rather, for purposes of this chapter's analysis, this assumption allows us to focus on EITE impacts separately from potential effects of direct industrial emission reduction measures. Importantly, it thus helps to clarify the extent to which direct measures, which are excluded from carbon trading and EITE policies, are needed.

2.1 INDUSTRY-WIDE EMISSIONS

Table 2 summarizes state data for carbon (CO₂e) emissions from industrial sectors that are designated EITE or might petition for EITE status. Emissions from 2015–2019 are shown.

TABLE 2. CO₂e Emitted by Manufacturing Industries in the State of Washington, 2015-2019

Mt: Megaton; 1 million metric tons		NAIC: North American Industrial Classification			
Status ^a	Sector Description	NAIC	Emissions (Mt CO ₂ e/yr)	Industries CO ₂ e percent	
				(sector)	(cumulative)
EITE	Pulp, paper & paperboard mills	322XXX	7.157	35.88%	35.9%
EITE	Petroleum refining	324XXX	6.292	31.54%	67.4%
EITE	Metals mfg. except forging	331XXX	1.549	7.76%	75.2%
EITE	Wood Products mfg.	321XXX	1.240	6.21%	81.4%
EITE	Glass, cement, concrete & gypsum mfg.	327XXX	0.705	3.53%	84.9%
EITE	Food products mfg.	311XXX	0.688	3.45%	88.4%
EITE	Chemicals & fertilizer mfg.	325XXX	0.426	2.13%	90.5%
EITE	Aircraft and aircraft parts mfg.	3364XX	0.233	1.17%	91.7%
EITE	Semiconductor & related mfg.	334XXX	0.162	0.81%	92.5%
OPEN	Waste collection & landfills	562XXX	0.997	5.00%	97.5%
OPEN	Government facilities	61, 92, 488119	0.364	1.82%	99.3%
OPEN	Cattle feedlots	112112	0.102	0.51%	99.8%
OPEN	Other nonmetallic mineral mining	212399	0.020	0.10%	99.9%
OPEN	Carbon and graphite product mfg.	335991	0.009	0.05%	100%
OPEN	Iron and steel forging	332111	0.004	0.02%	100%

Data from Washington Department of Ecology detailed greenhouse gas emissions inventory reporting publication; <https://data.wa.gov/Natural-Resources-Environment/GHG-Reporting-Program-Publication/idhm-59de/data>

^a **EITE:** Designated as emissions-intensive, trade-exposed (Open; facilities in other sectors may seek EITE status). Electric and gas utilities excluded based on SB 5126 (2021) § § 13, 14, 15. Figures may not add due to rounding.

Emissions from these industry sectors totaled approximately 19.95 million metric tons/year (Mt/yr), according to the data shown in Table 2 (WSDE, 2022). Energy-intensive, trade-exposed (EITE)- designated sectors account for 18.45 Mt/yr (92.5%) of this industrial emissions total. *Id.*

Some sectors emit much more than others, and EITE-designated sectors top the very high-emitters list. Just four sectors—pulp and paper mills, petroleum refining, metals manufacturing, and wood products manufacturing—account for more than 81 percent of industrial emissions. *Id.* Only two sectors, pulp and paper and oil refining, emit more than 67 percent of industrial emissions. *Id.*

Overall, as measured by direct emissions impact, the EITE policy could give industries responsible for at least 18.45 Mt/yr, fully 92.5 percent of industrial emissions, no-cost permits to pollute.

2.2 RELIANCE ON DEEPER CUTS IN OTHER SECTORS

Achieving the same total emissions cut when some polluters do not cut emissions forces deeper cuts from others. The EITE policy thus increases the risk of climate protection failure. The inescapable math behind this risk may best be illustrated by examples pegged to Washington’s statewide all source carbon emission limits of 50 Mt in 2030, and 5 Mt in 2050.⁷ Achieving the 2030 limit will require cutting statewide emissions approximately 49 percent from a pre-COVID 2015–2018 baseline, as estimated by the state, of 97.91 Mt/yr. (WSDE, 2021a.)

What if electric utilities make deeper cuts to compensate for uncut EITE industry emissions through 2030? The state estimates Washington electricity emissions of 17.18 Mt/yr during 2015–2018, on a net power consumption basis. *Id.* Cutting that 17.18 Mt in proportion to the 49 percent statewide emission cut needed, the state’s electricity emissions in 2030 would fall to approximately 8.8 Mt. But without such a cut in EITE industry emissions (49% of the 18.45 Mt/yr in Table 2), approximately 9.0 Mt of uncut EITE industry emissions would need to be cut elsewhere to meet the 2030 limit. Thus, assuming that the state-reported emission estimates are correct, achieving zero-emission electricity by 2030 would not quite be enough to make up for uncut EITE industry carbon.

What if EITE industry emissions remain uncut through 2050? EITE industry emissions of 18.45 Mt in 2050 *alone* would far exceed the 5 Mt statewide emissions limit in 2050. Moreover, cutting industrial emissions from 18.45 to below 5 Mt/yr would almost certainly require phasing out and replacing inherently polluting industrial technologies which the EITE and carbon trading schemes, by themselves, risk locking in place.

2.3 SYSTEMIC EMISSIONS AND CARBON LOCK-IN

Emissions-intensive manufacturing technologies are linked to raw materials and products supply chains. The components of these supply chains are mutually interdependent. This makes them mutually reinforcing systems. Here, EITE-designated industries’ supply chains have global scope. Thus, if climate

⁷ RWC 70A.45.020 § 1(a)

policies reduce in-state demand for polluting products, instead of phasing down production, industries here can export. Supporting their role in trade while leaving their carbon intensive technologies in place, the EITE policy could reinforce this systemic carbon lock-in.

Consider the petroleum fuel chain, for example. Washington refineries are net exporters of gasoline, and especially jet fuel and diesel-distillates (EIA, 2015). Besides supplying most of the regional domestic transportation fuels market in Oregon as well as Washington, refineries on Puget Sound exported ten percent of their gasoline, 28 percent of their jet fuel, and 32 percent of their distillate diesel production in 2013. *Id.* The estimated value of total refined product exports from the state to other nations averaged \$3.11 billion per year during 2011–2019, more than double the \$1.34 billion per year average during the prior nine years (U.S. Census trade data). Crucially, declining domestic demand for petroleum fuels across the U.S. West Coast—Alaska, Arizona, California, Hawaii, Nevada, Oregon, *and* Washington—is a major driver of this refining for export.

West Coast demand for total refined products fell by 15 billion gallons in the decade ending 31 December 2019 compared with the decade before (EIA, Supply and Disposition data). Instead of ramping down production, the refiners bumped it up a bit; West Coast exports of total refined products rose by 15.5 billion gallons in the decade ending 31 December 2019 compared with the decade before. *Id.* This is crucial because cutting refined fuels demand here while leaving refineries here alone may only shift more and more fuel combustion emissions to growing export markets across the Pacific Rim. Those transportation fuel emissions are very large (WSDE, 2021a). And refining is but one of eight EITE industries increasing its exports (U.S. Census, trade data).

3 ENVIRONMENTAL INJUSTICE

Environmental harms of industrial technologies disproportionately befall Black, Brown, First Nations, and poor people. That is widely known. This chapter reviews three mechanisms by which coupling the emissions-intensive, trade exposed (EITE) policy with carbon trading could prolong and worsen environmental injustice in the State of Washington.

3.1 TOXIC CO₂e CO-EMISSIONS

Despite many decades of air pollution control effort, toxic and smog-forming pollutants still emit from fossil-fueled industrial technologies in significant amounts along with their major combustion co-product by mass, CO₂. Table 3 presents estimates for how much of even the longest-regulated “criteria” air pollutants co-emit with each million tons of CO₂e from EITE industries statewide. No-cost allowances would contribute to prolonging this health-threatening exposure to greenhouse gas co-pollutant emissions in communities near EITE industries.

TABLE 3. Estimated CO₂e co-emission factors for six criteria air pollutants and seven EITE industrial sectors based on available State of Washington data^a

<i>in tons of co-pollutant per Mt of CO₂e</i>	t (ton): metric ton	Mt (megaton): 1 million metric tons					
	Co-emissions of pollutants (t/Mt CO ₂ e)						
	NAIC	PM ₁₀	PM _{2.5}	SO ₂	NO _x	VOC	CO
Pulp, paper & paperboard mills ^b	322XXX	150	139	198	849	168	922
Petroleum refining ^c	324XXX	70	69	131	842	413	222
Metals mfg. except forging ^d	331XXX	521	513	2,570	306	307	19,370
Wood Products mfg. ^e	321XXX	269	172	49	627	757	843
Glass, cement, concrete & gypsum mfg. ^f	327XXX	232	452	2,400	2,300	94	1,990
Chemicals & fertilizer mfg. ^g	325XXX	50	47	17	399	135	156
Aircraft & aircraft parts mfg. ^h	3364XX	99	87	7	1,270	5,140	613

a. Data from WSDE (2021b) and WSDE (2022). Data coverage for the food products and semiconductor sectors was judged insufficient for these estimates. **Notes b-h** give coverage for sectors shows as % of facilities (year or years) by copollutant. **Particulate matter (PM₁₀):** **b.** 77%(2019); **c.** 100% (2019); **d.** 50% (2017-2019); **e.** 71% (2019); **f.** 71% (2017-2019); **g.** 71% (2019) and 57% (2018); **h.** 71% (2018) and 14% (2017). **(PM_{2.5}):** **b.** 77% (2019); **c.** 83% (2019); **d.** 50% (2017-2019); **e.** 65% (2019); **f.** 71% (2017-2019); **g.** 71% (2019) and 57% (2018); **h.** 57% (2019) and 14% (2018). **Sulfur Dioxide (SO₂):** **b.** 77% (2019); **c.** 100% (2019); **d.** 75% (2017-2019); **e.** 65% (2019); **f.** 57% (2017-2019); **g.** 57% (2019) and 43% (2018); **h.** 71% (2018) and 14% (2017). **Nitrogen oxides (NO₂):** **b.** 77% (2019); **c.** 100% (2019); **d.** 75% (2017-2019); **e.** 85% (2019); **f.** 71% (2017-2019); **g.** 71% (2019) and 57% (2018); **h.** 57% (2019), 71% (2018) and 43% (2017). **Volatile organic carbon (VOC):** **b.** 77% (2019); **c.** 100% (2019); **d.** 75% (2019) and 50% (2017-2019); **e.** 71% (2019); **f.** 57% (2018-2019) and 71% (2017); **g.** 71% (2019) and 57% (2018); **h.** 71% (2017-2019). **Carbon Monoxide (CO):** **b.** 77% (2019); **c.** 100% (2019); **d.** 75% (2017-2019); **e.** 65% (2019); **f.** 71% (2017-2019); **g.** 71% (2019) and 57% (2018); **h.** 29% (2019, 2017) and 43% (2018).

3.2 HEALTH RISK TRADING

Review of Table 3 also reveals that some industries emit more tons of various co-pollutants with each million tons of CO₂e emitted than others emit. The high carbon intensities of EITE-designated industries further amplify these high emissions per million tons carbon emitted (compare tables 2, 3). Allowances to emit carbon are traded without accounting for the additional toxic co-pollutants. However, in effect, carbon trading is also trading in *where* CO₂e co-pollutant emissions will create disparately severe health risks—and no-cost allowances tip the scales toward more disparately severe health risks in communities near emissions-intensive EITE-designated industries.

3.3 TOXIC PRODUCTION FOR EXPORT

Doubling down on this toxic injustice, more co-pollutants emit along with CO₂e when industries increase production for export. Their emissions of both CO₂e and its co-pollutants increase when their production rates increase. Thus, no-cost allowances that help industries here to maintain or increase export sales using emissions-intensive technologies could prolong, and worsen, the environmental injustice here from producing exports which people here do not, in fact, need or use. Statewide exports by EITE-designated industries *have* increased, as shown in Table 4—a trend that the EITE policy could help to continue, and may help to accelerate.

TABLE 4. Exports from EITE-designated Industries in the State of Washington, 2002-2019

Mt (megaton): 1 million metric tons	MM : million	NAIC : North American Industrial Classification		
	NAIC	Vessel exports (Mt/year)		Growth (%)
		2002-2010 mean	2011-2019 mean	
Pulp, paper & paperboard mills	322XXX	0.891	1.024	15%
Petroleum refining	324XXX	3.055	4.653	52%
Metals mfg. except forging	331XXX	0.044	0.091	105%
Wood Products mfg.	321XXX	0.626	0.669	7%
Glass, cement, concrete & gypsum mfg.	327XXX	0.059	0.152	156%
Food products mfg.	311XXX	1.784	2.862	60%
Chemicals & fertilizer mfg.	325XXX	0.189	0.323	71%
Aircraft & aircraft parts mfg.	3364XX	<0.001	0.001	53%
Semiconductor & related mfg.	3344XX	<0.001	<0.001	31%
	NAIC	Total exports (MM\$/year)		Growth (%)
		2002-2010 mean	2011-2019 mean	
Pulp, paper & paperboard mills	322XXX	918	1,157	26%
Petroleum refining	324XXX	1,354	3,106	131%
Metals mfg. except forging	331XXX	864	1,237	43%
Wood Products mfg.	321XXX	411	662	61%
✓ Glass, cement, concrete & gypsum mfg.	327XXX	148	235	59%
Food products mfg.	311XXX	1,956	3,342	71%
Chemicals & fertilizer mfg.	325XXX	805	1,127	40%
Aircraft & aircraft parts mfg.	3364XX	21,599	40,461	87%
Semiconductor & related mfg.	3344XX	723	692	-4%

Data from U.S. Census, trade data. State Exports by NAICS: State of Washington; U.S. Census Bureau, Economic Indicators Division, USA Trade Online. <https://usatrade.census.gov/data/Perspective60/View/dispxview.aspx>

In fact, the data in tables 3 and 4 indicate that emissions from industrial production for export have worsened environmental justice impacts in Washington. Communities near the exporting industrial facilities were exposed to additional air pollution caused by increased production for export.

Now the same communities face the prospect of prolonged environmental injustice—even when demand reduction measures reduce in-state demand for polluting industrial production. In an absence of direct emission reduction standards, industries that use emissions-intensive technologies which EITE carbon trading leaves in place would be incentivized to increase export sales when those measures reduce their in-state sales. Emissions from production for export could grow substantially.

The opportunity to protect trees and forest carbon sinks by speeding the shift from paper to paperless technologies, such as those which allow reading this report on-line, is one example. What if in-state paper use declines in line with statewide emission limits? Pulp and paper mills could then meet in state demand while cutting their particulate matter (PM_{2.5}) emissions by approximately 450 tons per year (49%) from 2019 to 2030.⁸ But in the absence of direct emission reduction standards, the mills could maintain 2019 production rates by increasing exports, and that 450 tons/yr could continue to emit into nearby communities.

Production for export could increase PM_{2.5} emissions from pulp and paper mills into communities here by approximately 450 tons during 2030, in this example.

Another example: What if needs to cut transportation emissions and opportunities to expand public transit and electric vehicles cut in-state petroleum fuels use in line with statewide emission limits? Petroleum refineries could then meet in-state demand while cutting their emissions of nitrogen oxides by at least 2,680 tons per year (49%) from 2019 to 2030.⁹ But without direct emission reduction standards, the refiners could maintain 2019 rates to protect their otherwise stranded oil refining assets by increasing production for export. Then, exposures of nearby communities to that 2,680 tons per year of NOx could continue in 2030.

Production for export could increase NOx emissions from oil refineries into communities here by approximately 2,680 tons per year during 2030, in this example.

⁸ Pulp and paper mills emitted an estimated 924 metric tons of PM_{2.5} in 2019 (WSDE, 2021b). See Chapter 2 for documentation of the 49% in-line cut to the statewide emission limit from 2019–2030.

⁹ Refineries emitted an estimated 5,473 metric tons of NOx in 2019 (WSDE, 2021b). The 49% in-line cut while meeting in-state demand is an undercount that does not account for existing refining for export (Chapter 2).

4 COMPARISON DATA

Can the emissions-intensive, trade-exposed industrial carbon trading policy be fixed? How does the EITE policy compare with directly applying emission standards to industrial sectors and facilities? Several comparisons may help to define underlying causes of the problems with the EITE policy that inform how best to fix them: comparisons with the limitations of carbon trading, approaches to other sectors in Washington, and outcomes to date in California.

4.1 USE ALL OF THE TOOLS IN THE TOOLBOX

To ensure the deep emission cuts state climate goals require, industries that are emissions-intensive, the “EI” in EITE, generally must switch to decarbonized electricity or hydrogen made from it by splitting water, or phase down and be replaced by alternative technologies now proven in practice. This switch from already-built fossil fuel and combustion technologies requires *structural* change. But as described in our Overview and Chapter 2, carbon trading is inherently limited to incremental rather than structural change, and the EITE policy reflects this limitation of carbon trading. Even if required by carbon trading rules to do so, the owners of already-built paper mills, oil refineries, and other EITE industries could buy cap-and-trade allowances as long as that remains the most profitable use of those capital-intensive assets—which could be as long as it takes for most other emitters statewide to make very deep cuts that deplete all cheaper allowances. Thus, carbon trading alone locks in EITE emissions. Therefore other, and different, policy tools will be needed as well.

Further, their trade exposure, the “TE” in EITE, allows emissions-intensive industries to export rather than phase down in response to reduced in-state demand for their products that may result from carbon trading here. While EITE policy reflects and amplifies it, this is another inherent limitation of carbon trading. Applying direct emission standards to industrial facilities here does not have this limitation.

The question about technology-forcing standards raised in Chapter 1 may be pivotal. Defining “best available technology” in reference to clean electricity and hydrogen as industrial fuels and, in energy sectors, as manufactured products—and in the context of what can be done to meet each sector’s and facility’s emissions limit—could leverage the needed technology change. In contrast, answering the ‘best available technology *for what?*’ question in reference to existing, inherently-polluting industrial technologies, in the context of policy to protect their trade positions, may lead to the opposite result. Again, direct emission reduction standards address key limitations of EITE carbon trading policy.

4.2 WASHINGTON USES OTHER TOOLS IN OTHER SECTORS

In addition to its carbon trading measures,¹⁰ the state of Washington is applying direct technology forcing measures in its utility and transportation sectors. The state requires utilities to first replace coal-fired, then fossil gas-fired, electricity with renewables, and uses the equivalent of power plant emission limits—expressed in megawatt-hours of fossil fueled generation—to backstop the coal fired, then gas-fired, electricity generation phaseout.¹¹ Its transportation sector measures include tailpipe emission standards, direct zero-emission vehicles growth measures, and requirements for utilities that can target funds toward electric vehicle charging infrastructure growth.¹²

These direct technology-forcing measures are to be applied regardless of and along with its cap-and-trade scheme and Low Carbon Fuels Standard. Accordingly, the state's approach to its manufacturing industries appears to be the anomaly, rather than the norm, in its climate policy. In any case, the state's use of them in other sectors further supports considering direct measures to address the limitations of EITE industrial carbon trading.

4.3 RELEVANT OUTCOMES TO DATE IN CALIFORNIA

California is not Washington. And yet there is something to be learned. California is the nearest U.S. jurisdiction to implement a cap-and-trade scheme. It shares electricity, petroleum fuels, and other markets with Washington as well as other West Coast states. Like Washington, it has adopted a Low Carbon Fuels Standard; a direct measure like Washington's to phase out fossil fueled electricity through its Renewables Portfolio Standard; a separate power plant emissions limit to, in effect, phase out coal-fired electricity (CEC, 2006), and similar direct measures to phase out petroleum vehicles and phase in zero-emission vehicles (ZEVs).¹² Moreover, the California cap-and-trade scheme gives free-of-charge allowances to many of its major industries. In some ways, the big difference is that except for its more recent ZEV standards, the state of California has been implementing all of this for many years.

What happened there? During the period from 2013, when California's cap-and-trade scheme launched, through 2019, the year before the COVID-19 pandemic disrupted energy, economic and emission conditions, four factual points stand out:

First, structural change began to cut emissions in the electricity sector. As renewables began to squeeze out coal and gas-fired power, electricity generation emissions fell by approximately 32.5 Mt/yr from 2013 to 2019. (CBE, 2020, see Chapter 5; CEJA, 2022, see Supporting Material.)

¹⁰ Cap-and-trade, and the Low Carbon Fuel Standard, which uses a separate emission credit trading market.

¹¹ SB 5116 (2019). See esp. §§ 1(1), 3, 4, 9.

¹² WAC 173–423; SB 5116 (2019) §§ 2(18)(b)(ii), 4(1)(b).

Second, emissions from manufacturing industries were not cut overall. Instead, total emissions in California from industries that Washington would designate as emissions-intensive, trade-exposed (EITE) increased slightly. See Table 5.

TABLE 5. Emission in California from Industries the state of Washington would designate EITE

	Mt (megaton): 1 million metric tons	NAIC: North American Industrial Classification		NR: Not Reported		
	NAIC	No-Cost allowances		Emissions (Mt CO ₂ e/yr)		
		CA	WA	2013-2015	2017-2019	Change
Total for sectors below	—	—	—	49.25	50.31	+1.06
Petroleum Refining	324XXX	Yes	Yes	31.67	32.21	+0.54
Glass, cement, concrete & gypsum mfg.	327XXX	Yes	Yes	8.65	9.01	+0.36
Chemicals & fertilizer mfg.	325XXX	Yes	Yes	3.64	3.94	+0.30
Hydrogen mfg. subsector	325120	Yes	Yes	3.14	3.29	+0.15
Food products mfg.	311XXX	Yes	Yes	2.32	2.20	-0.12
Wood Products mfg.	321XXX	NR	Yes	1.35	1.53	+0.18
Pulp, paper & paperboard mills	322XXX	Yes	Yes	0.93	0.81	-0.12
Metals mfg. except forging	331XXX	Yes	Yes	0.53	0.49	-0.04
Aircraft & aircraft parts mfg.	3364XX	Yes	Yes	0.11	0.09	-0.02
Semiconductor & related mfg.	334XXX	NR	Yes	0.04	0.04	+<0.00

Data from CARB, 2021. The first three years from the launch of carbon trading under California's cap-and-trade scheme in 2013 are compared with the last three years before the COVID-19 pandemic. Refinery emissions shown exclude those from hydrogen production used by refineries from adjacent third-party hydrogen plants, which are broken out as NAIC 325120 in the table.

Table 5 compares the first three years after the launch of California's cap-and-trade scheme, 2013–2015, with the last three years before the COVID-19 pandemic hit the U.S. West Coast, 2017–2019. Total CO₂e emitted in California by industries Washington would designate as EITE increased by approximately 1.06 Mt/yr (Table 5). Larger increases from high-emitting EITE industries there exceeded smaller decreases from some of the lower-emitting ones to drive this net increment (*Id.*).

Third, exports of petroleum fuels refined in California increased (CBE, 2020; CEJA, 2022). Again, we compare the periods from 2013–2015 and 2017–2019. Excluding jet fuel, much of which is 'exported' via fueling interstate and international flights, California-refined fuels exports increased by nearly 18 percent (CEJA, 2022). Burning that 18 percent increment in other states and nations emitted approximately ten million tons of CO₂e annually (*Id.*). Including jet fuel, emissions from end-use combustion of total California refinery exports increased by approximately 13 Mt/yr (*Id.*).

Fourth, total in-state burning of petroleum fuels did not decrease. Instead, it rose slightly, from 50.6 million gallons per day during 2013–2015 to 51.3 million gallons per day during 2017–2019 (CEJA, 2022). Note that while California's cap-and-trade scheme and Low Carbon Fuel Standard were in effect from 2013–2019, its more recent zero-emission vehicle standards were not yet in effect then.

Among other things, these factual observations are real-world results of a climate policy experiment. Direct emission reduction standards and structural transformation measures were effective in the electricity sector. In contrast, carbon trading alone *without* direct emission reduction measures was not effective. Without sectoral or facility-specific carbon emission standards, major industrial emitters increased their direct emissions and emitted still more by increasing inherently polluting exports. These results further support the need to apply direct emission standards to industrial facilities.

This need for direct emission standards was evident in California communities that host power plants and refineries—and was raised by environmental justice groups there—before California launched its carbon trading programs. Importantly, the state's Emission Performance Standards for power plants (CEC, 2006) and technology-forcing Renewables Portfolio Standard for electricity were first adopted before 2013, when its cap-and-trade scheme launched. But then, as analysis for the California Environmental Justice Alliance describes:

A bias against using all the tools in the toolbox in our climate crisis crept into state policy since carbon trading, which has not cut oil refining rates, launched here in 2013. [The California Air Resources Board] prioritized its cap-and-trade scheme over direct emission reduction measures. By mid-2017, when this bias was codified in a political trade-off between cap-and-trade and direct emission reduction, no refinery in the state had an enforceable limit to cut its carbon emissions. AB 398 (2017) constrained, and is interpreted by many to prohibit, direct emission reduction measures at refineries under cap-and-trade. *CEJA, 2022*.

In fact, California's continued use of a carbon-trading-only approach to oil refining even after the state's own data showed it was not working (CBE, 2020) does reflect a policy bias. Ominously for the state of Washington, this bias itself exemplifies the type of institutional path dependence that reinforces carbon lock-in (Seto et al., 2016). Thus, outcomes to date in California may serve as a warning that the time for direct industrial carbon emission standards in Washington is now.

FINDINGS AND TAKEAWAYS

FINDING 1

The State of Washington's carbon trading policy provides "emissions intensive, trade-exposed" industries cap-and-trade allowances at no cost, allowing at least nine-tenths of total current industrial carbon emissions to continue free of charge through 2034.

TAKEAWAY

These permits to pollute free of charge let owners of inherently polluting industrial technologies delay the essential switch to low-carbon technology during the critical period when now-feasible paths to climate stabilization could be irreversibly foreclosed.

FINDING 2

Designed to protect Washington industries from imports, this policy further increases no-cost allowances for emissions-intensive industries that increase production, without protecting communities here from emissions caused by increasing industrial production for export.

TAKEAWAY

Under this policy toxic carbon co-emissions from industrial production for export of products that Washingtonians do not need or use can be expected to prolong and worsen environmental justice impacts in communities near emissions-intensive industries here.

FINDING 3

This policy has failed to reduce industrial emissions elsewhere. Carbon trading with industrial allowances provided free of charge has resulted in emission increases from petroleum refining; glass, cement, and gypsum manufacturing; chemical and fertilizer manufacturing; wood products manufacturing; semiconductor and related device manufacturing—and from emissions-intensive, trade exposed industries overall.

TAKEAWAY

Another, and different, policy tool will be needed to ensure climate stabilization and environmental justice.

Facility-specific emissions standards, tailored to switch from existing to low-carbon technology portfolios in specific sectors, have achieved deep emission cuts. Emission performance standards and renewables portfolio standards for electric power generation have cut electricity emissions by 32.5 million tons per year in California—a mass emissions cut equivalent to one third of total carbon emissions in Washington—over seven years.

TAKEAWAY

Having applied this approach in its electricity sector, the State of Washington should consider using this ‘all the tools in the toolbox’ approach in its manufacturing sectors as well.

Direct industrial emission standards will be necessary to ensure that state climate and environmental justice goals may be achieved.

REFERENCES

CARB, 2021. *Mandatory Greenhouse Gas Reporting Data*; data for multiple years as revised and reported in 2021. California Air Resources Board: Sacramento, CA. <https://ww2.arb.ca.gov/mrr-data>

CBE, 2020. *Decommissioning California Refineries: Climate and Health Paths in an Oil State*; Communities for a Better Environment (CBE): Huntington Park, Oakland, Richmond and Wilmington, CA. Prepared by Greg Karras, Community Energy reSource. Includes Supporting Material Appendix. www.energy-re-source.com/decomm

CEC, 2006. *SB 1386 Emission Performance Standards*; Baseload electric power plant limit of 1,100 pounds CO₂/MWh. California Energy Commission: Sacramento, CA; and California Public Utilities Commission: San Francisco, CA. www.energy.ca.gov/emission_standards

CEJA, 2022. *Climate Pathways in an Oil State–2022*; A California Environmental Justice Alliance (CEJA) report. Prepared by Greg Karras, G Karras Consulting, Community Energy reSource. (February 2022).

EIA, 2015. *West Coast Transportation Fuels Markets*; U.S. Energy Information Administration: Washington, D.C. PADD 5 Transportation Fuels Markets. September 2015. Available from: <https://www.eia.gov/analysis/transportationfuels/padd5>

EIA, Supply and Disposition data. *Supply and Disposition: West Coast (PADD 5)*; Finished Petroleum Products data. U.S. Energy Information Administration: Washington, D.C. Downloadable database. https://www.eia.gov/dnav/pet/pet_sum_snd_d_r50_mbbbl_m_cur.htm

Seto et al., 2016. Carbon lock-in: Types, causes, and policy implications. *Annual Review of Environment and Resources* 41: 425–452. <https://www.annualreviews.org/doi/abs/10.1146/annurev-environ-110615-085934>

U.S. Census, trade data. *State Exports by NAICS: State of Washington*; U.S. Census Bureau: Washington, D.C. Economic Indicators Division, USA Trade Online. Data as of 16 Feb 2022. <https://usatrade.census.gov/data/Perspective60/View/disview.aspx>

WSDE, 2021a. *Washington State Greenhouse Gas Emissions Inventory: 1990–2018*; Washington State Department of Ecology: Olympia, WA. January 2021, Publication 20-02-020. Available at: <https://apps.ecology.wa.gov/publications/SummaryPages/2002020.html>

WSDE, 2021b. *Washington Reported Point Source Emissions (2009–2019)*; Washington State Department of Ecology: Olympia, WA. Last updated Jan 2021. Spreadsheet in short tons per year at: <https://ecology.wa.gov/Air-Climate/Air-quality/Air-quality-targets/Air-emissions-inventory>

WSDE, 2022. *Greenhouse Gas (GHG) Reporting Program Publication*; Washington State Department of Ecology: Olympia, WA. Dataset contains data reported to WSDE as of 12 January 2022. Includes preliminary data that have not been fully verified by the Department. <https://data.wa.gov/Natural-Resources-Environment/GHG-Reporting-Program-Publication/idhm-59de/data>

Josh Johnson

1. Allow participants that resist leakage (and closure) to sell no-cost allocations after 2034. This could help them fund the very large loans most participants will need to decarbonize. This is a simple solution at no-cost to WA State. Sure, some potential new revenue might be lost, but does anyone believe IMPLAN's prediction of only 248 jobs lost statewide if EITEs are unable to pass-through estimated CCA compliance costs or reduce emissions ?
2. Give ECY more discretion to enforce the CCA (and/or add a clear appeal process). This is a simple, no-cost save for WA-State. How many EITE's for example, despite attentive management, saw their third-party verification process come uncomfortably close to the CCA's almost existentially punitive, inflexible deadline ? One hiccup could spell the end for an employer.
3. Increase use of CCA proceeds for decarbonization. This could allow participants to take partial credit for participation in the program when calculating thier carbon footprints. As is, Cap and Trade harms WA's fiscal competitiveness without providing a commensurate market-distinguishing reduction in carbon footprint. [WA employers are required to pay for carbon allowances while competitors are paying for offsets or using equivalent funds for their own carbon reduction / energy projects.] Ideally, CCA-funded carbon reductions would be independently verified, for this purpose.

J.R. Simplot Comapny (Dedra Williams)

The attached comments are on behalf of the J.R. Simplot Company regarding EITEs regulated under the Climate Commitment Act (CCA).



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September 3, 2025

SUBMITTED ELECTRONICALLY VIA: <https://ecology.commentinput.com/?id=rapTtFh6V>

Mr. Adrian Young
Cap-and-Invest Industrial Policy Lead
Climate Pollution Reduction Program
Washington Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Mr. Young:

The Washington Department of Ecology (Ecology) has been tasked with preparing a report on how Emissions-Intensive, Trade-Exposed” industries (EITEs) should be regulated under the Climate Commitment Act (CCA), including allocation of allowances, opportunities and barriers for decarbonization, and implications for environmental justice concerns. The recommendations that will inform the report being prepared by Ecology for the legislature are now available for review and comment by the public.

The J.R. Simplot Company (Simplot) is a privately held, vertically integrated agribusiness with headquarters in Boise, Idaho. The company has substantial operations in the State of Washington, including two potato processing plants that are subject to the CCA. Simplot has provided prior comments to Ecology on the regulations associated with the CCA. Simplot has also been involved in discussions with Ecology and the consultant RMI engaged by Ecology to prepare the EITE decarbonization pathway report.

Based on the information that has been presented and discussions had during the meetings held with the EITE Industry Advisory Group over the two phases of this policy development process, Simplot has a number of concerns and specific comments about the recommendations presented in the six draft documents.

Ecology Should Use Additional Time to Improve the Report.

Ecology has stated their intent to provide this report to the legislature a full year earlier than is required so as to provide more time for legislators to consider the report recommendations. There is concern though over not using the full time allowed to thoroughly research and prepare this report. As described in these comments, this report has a number of deficiencies which need to be addressed. If Ecology wants to provide this report early to the legislature, we recommend that the report be labeled “*Draft*,” and that Ecology use the next 12 months to gather further information to address these deficiencies. This would allow legislators

more time to understand what has been learned so far by Ecology from their research into different systems used in other jurisdictions and to consider current concerns from industry. Ahead of the December 2026 deadline, Ecology would continue with more in-depth research on the draft recommendations before preparing the final report. This could alleviate concerns by EITEs over submitting the report earlier than necessary while also presenting legislators with the information that is ready now that Ecology wants to make available sooner rather than later and leaving additional time for a thorough analysis of the recommendations.

Deficiencies in the RMI Report

There are a number of concerns with the conclusions and recommendations made in the RMI report. Specifically:

- The actual feasibility to electrify large scale (MW+ sized) equipment due to the well-known grid capacity limitations in Washington state in addition to the significant associated costs and time horizons for expanding the necessary generating capacity and transmission infrastructure.
- Permitting timelines that slow down the process of installing new technologies or modifying existing equipment and processes where these projects represent decarbonization opportunities.
- Lack of consideration for the financial challenges and economic impact on a facility to replace existing equipment in order to achieve decarbonization where that equipment still has decades of serviceable life and represents a major capital investment that has been made already.
- The unrealistic technical feasibility of certain suggested decarbonization pathways such as:
 - Fuel switching to biogas where no nearby source exists or where this would require a major investment to generate biogas onsite.
 - Fuel switching to hydrogen where no local source already exists or where electrolysis technologies would require electrical power that the local grid cannot provide.
 - Carbon capture and usage or sequestration that requires a local market to utilize the captured CO₂ as a feedstock or suitable geologic storage for long term sequestration of the CO₂.

Comments on Document 6 Recommendations

Additional free allowances to support electrifying (**Recommendation 2.2**) a facility would be beneficial, however this won't address the current lack of available generation and transmission capacity. It could then appear that entities are not taking advantage of this supporting mechanism when in fact there is actually an

underlying roadblock that prevents them from doing so.

Product-based benchmarks for allowance allocation (**Recommendation 3.1**) could be beneficial where the variety of products a facility makes has significantly changed since the baseline time period, especially if it now makes a larger variety of more emission-intensive products, but this method could also be very cumbersome for that same reason. The other option (BAT assessment) would need to be supported by proper technical evaluation that fully understands what is actually technically and economically realistic for F&B processing facilities in different parts of Washington state. An alternative to re-baseline a facility would not address a scenario where that facility's mixture of products continues to change over time from lower emission intensity products to higher emission intensity products.

Mandatory consignment of free allowances (**Recommendation 3.2**) into the quarterly auctions could provide a meaningful way to support decarbonization projects if the proceeds are ring fenced for decarbonization projects, but there would need to be a degree of flexibility in spending the money depending on the scale of auction proceeds versus the cost of decarbonization projects and the timelines for actually implementing a project (e.g. using auction proceeds to electrify boilers but having to wait for the grid capacity to catch up first).

As a variation to the concept proposed in Recommendation 3.2, Ecology could maintain free allocation levels to EITEs post-2034 at or near 94% on the condition that each entity must produce a decarbonization roadmap to demonstrate how a facility would achieve decarbonization over time including how proceeds from selling the free allowances would be applied to support decarbonization projects at a specific facility. This could be a method for supporting and rewarding efficient production and continued decarbonization.

Other Suggestions

If Washington state really wants to prioritize the decarbonization pathway of process electrification to displace natural gas, then prioritizing connection capacity for EITE industries over data centers or other new large loads that are competing with the EITEs should be considered.

Summary

Simplot's comments to 2022 rulemaking establishing the CCA stated the following:

"Simplot's overarching interests in this rule making are for Ecology to adopt a rule that provides compliance flexibility that enable meaningful, and affordable reductions of GHG, protects the economy from allowance price volatility, contains compliance costs, and does

not undermine the competitiveness of our Washington businesses. The EITE provisions of the Proposed Rule are especially important to maintaining the competitiveness of our Washington businesses.”

As the earlier comment stated: *“the EITE provisions of the Proposed Rule are especially important to maintaining the competitiveness of our Washington businesses.”* Thus, it is very important that Ecology take the time to prepare a report to the legislature on EITEs that **accurately reflects** the potential costs, the significant challenges, and ability of Washington’s industries to make the major change in their energy systems that the CCA is requiring.

We appreciate the Departments careful consideration of these comments.

Sincerely,



Alan L. Prouty

Vice President, Environmental & Regulatory Affairs

CC: AVEC
Food Northwest
Perry Hanson, J.R. Simplot Company



Northwest Pulp & Paper ASSOCIATION

September 3, 2025

Submitted Via <https://ecology.commentinput.com/>

Adrian Young
Washington Dept. of Ecology
300 Desmond Dr SE
Olympia, WA 98504

Dear Adrian,

Thank you for the opportunity for the Northwest Pulp & Paper Association (NWPPA) to provide comments on Ecology's report to the Legislature on EITE allocation for 2035-2050.

Introduction

NWPPA is a 69-year-old regional trade association representing 11 member companies and 13 mills in Washington, Oregon, and Idaho, seven of which are located in Washington. Our member mills in Washington provide approximately 4,000 union-backed, family wage jobs in some of Washington's more rural, economically distressed communities. Mills provide a 3:1 job multiplier and are often the single largest taxpayer in these communities, a large portion of which is distributed as funding for schools and emergency services. Our members are also state and federally recognized essential businesses who keep vital paper products available across the United States and abroad.

Washington's pulp and paper mills have long been seen as an integral part of the state's greenhouse gas (GHG) reduction strategy. HB 2528, passed in 2020, recognizes the state's forest products sector – from working forest lands to finished forest products like pulp and paper – as a part of the state's global climate response. Additionally, the state's climate response strategy under RCW 70A.45.090, formally recognizes Washington's forest products sector, including landowners, mills, bioenergy, pulp and paper, and related harvesting and transportation infrastructure, as providing significant net carbon sequestration benefits. The energy generated and finished products manufactured at mills in Washington have been and will continue to be crucial in helping the state work toward achieving its ambitious GHG reduction goals and Ecology's policy recommendations should reflect this for our sector.

NWPPA has appreciated being included in Ecology's report development process over the past year. The comments below reflect feedback that has been shared over the course of Ecology's stakeholder engagement, as well as document specific comments.

General Comments

Legislative Intent

An expressed intent of the legislature in SB 5126, the enacting legislation of Washington's Cap and Invest Program (program), is to "(a) limit and reduce emissions of greenhouse gas consistent with the emission reductions established in RCW 70A.45.020; (b) minimize the potential to export pollution, jobs, and economic opportunities; (c) support industry

sectors that can act as sequesters of carbon; and (d) reduce emissions at the lowest cost to Washington's economy, consumers, and businesses." This intent aligns with the design of current EITE provisions and treatment under the program. It also makes clear that the design, implementation, and evolution of the program, including the treatment of EITE industries, must not only maintain the objective of reducing GHG emissions but must also of minimizing the export of pollution, jobs, and economic opportunities. This is one of the primary reasons that Ecology's directive in RCW 70A.65.110 (4)(a) specifically addresses methods and a schedule for the continued provision of no-cost allowances to EITEs, as well as best practices for ensuring against leakage and economic harm.

Leakage and Economic Harm

As is the case for many EITEs, Washington's pulp and paper mills are highly susceptible to leakage. This occurs when production and the associated emissions shift to another jurisdiction, particularly ones without Washington's stringent regulatory landscape, thus resulting in an increase in total GHG emissions. For example, if just 5% of Washington's pulp and paper production shifted to Canada, it is estimated that annual GHG emissions from purchased electricity would increase by 34,000 mt CO_{2eq}. If shifted to China, it is estimated that annual GHG emissions from purchased electricity would increase by 260,000 mt CO_{2eq}.

It's also important to note that leakage is market driven, and for NWPPA's members can occur in a variety of ways. Several members are part of large integrated companies, which means that in addition to the sector-level risk of domestic and international leakage, there is a risk that production from a facility in Washington can fairly easily be shifted to another facility within the same company. With this in mind, further consideration should be given to the conflicts that exist between the state's GHG reduction goals and the Legislature's objective of avoiding the export of pollution, jobs, and economic opportunities

In addition to emissions leakage, shifting production to other states and countries has significant economic implications for the communities in which these mills operate. As is noted in the report commissioned by Ecology from the Eastern Research Group (ERG) on market impacts and environmental justice concerns, there are three layers of economic impacts – direct, indirect, and induced. Going beyond just jobs and spending, these facilities are often large utility customers in these communities and facility closures can, and have, resulted in increased utility costs for residential, commercial, and other industrial rate payers.

Many EITEs have addressed this during advisory group meetings, but it's important to note that while statute classifies leakage fairly narrowly as emissions shifted to other jurisdictions, there are numerous other impacts to these communities. Six pulp and paper mills have closed in Washington since 2015 – costing these communities dearly. The closure of a single mill can cost a community tens to hundreds of millions of dollars per year in lost revenue and spending.

While the ERG report does cover some of the economic impacts, it does not fully capture the value of these facilities. A comprehensive leakage analysis, similar to the one done by Vivid Economics in 2018 for the Oregon Carbon Policy Office, should be conducted prior to any new policy development or implementation.¹

No Cost Allowances

It's important to note that the need for consistency and predictability is an ongoing concern NWPPA members. The allowance schedule that has been implemented through 2034 has done just that – offered covered entities a predictable roadmap for the first few compliance periods.

As is noted throughout the six documents, continuing to provide no cost allowances to EITEs is the primary best practice for avoiding leakage. NWPPA agrees that continuing to provide Washington EITEs with no cost allowances is imperative

¹ See: https://www.nwpulppandpaper.org/_files/ugd/382624_718723b43ae6401881825e3fea9ee11a.pdf

to avoid leakage. Additionally, it is important to continue the predictability and consistency associated with a reasonably achievable schedule in the reduction of allowances allocated for EITEs.

Decarbonization

A key concern for Washington's pulp and paper sector is that many of the critical processes within a mill are considered hard to decarbonize. Many of Ecology's proposals are intended to increase and expedite decarbonization efforts for EITEs. However, it is important to note that, prior to any legislative or regulatory mandate, the pulp and paper sector has achieved notable emissions reductions. In a study by NCASI², historical energy and production data for the United States pulp and paper industry were synthesized from several public and industry datasets to calculate greenhouse gas (GHG) trends for the industry on intensity (mass of GHG emissions per unit of production) and absolute (mass of GHG emissions) bases. Since 1990, reductions in direct emissions for the industry have been approximately 50% on both absolute and intensity bases. Reductions in GHG emissions attributed to purchased electricity have been approximately 44% on an intensity basis and 48% on an absolute basis, and reductions have accelerated with accelerated greening of the electricity grid since 2008. Since 2005, the reductions in direct and indirect emissions have been 31% and 37%, respectively. GHG reductions for the industry have been driven by reductions in facility energy intensity over time, fuel switching from more GHG intense fuels to less GHG intense fuels, and, since 2000, production reductions within the sector.

Technology Availability

Washington's pulp and paper mills have spent hundreds of millions in capital investments on technologies to increase efficiency and reduce emissions. Many of the policy options considered by Ecology fail to take into consideration which sectors have already achieved many of the reasonably implemented reduction technologies.

Combined heat and power (CHP), also known as cogeneration, is a widely used energy efficient method of steam and electricity generation in the pulp and paper sector. One advantage associated with CHP is that onsite power generation through the use of biomass offers a cleaner, more transparent GHG emissions profile than a facility could obtain through purchased electricity. Another added benefits of CHP is that it reduces grid dependency, particularly during power disruptions or outages.³ Unplanned power outages can create catastrophic environmental and safety consequences on a mill site, particularly as it relates to air and water treatment systems.

According to the American Forest and Paper Association (AF&PA), in 2022, 57% of the electricity needs to power AF&PA member processes was self-generated. Additionally, 43% of member mills generated more than half of their needed electricity and 20% of member mills sold excess power – much of it renewable – to the grid. Additionally, an analysis published by the Rocky Mountain Institute (RMI) estimates that the expansion of biomass cofiring in auxiliary boilers could reduce process and fossil CO₂ by an additional 15%-30%.⁴ This emphasizes the fact that Washington's pulp and paper mills are currently utilizing a technology that aligns with Washington's GHG reduction goals.

Shifting focus to electrification technologies, RMI's analysis identifies electrification of low-and-medium pressure steam generation as a medium-term opportunity for pulp and paper. We believe that this timeline is overly optimistic for availability and deployment of electrification technologies in the U.S. pulp and paper sector. The leading electrode boiler technologies currently being developed in Europe have not yet been certified by the American Society of Mechanical Engineers (ASME), especially at the capacities, steam pressure and temperature levels needed in the pulp and paper sector. The GHG benefits of electrification assume that fossil fuels used for steam generation are being displaced by zero carbon electricity such as hydro-electric, nuclear, solar, or wind for

² See: <https://www.ncasi.org/resource/greenhouse-gas-reductions-for-the-us-pulp-and-paper-industry/>

³ See: https://www.ncasi.org/wp-content/uploads/2024/09/NCASI_FS-24-05_Forest-Products-Industry_9.2024-1.pdf

⁴ See: <https://rmi.org/insight/opportunities-for-industrial-modernization-in-washington>

steam generation (McKinsey & Company 2018)⁵. Since the pulp and paper sector utilizes predominantly low GHG and energy efficient biomass-based combined heat and power systems to generate steam and electricity, electrification of pulp and paper energy systems may not achieve GHG emission savings, even in locations like Washington where the electrical grid is primarily supplied by hydro-electric power.

Lastly, another medium-term opportunity identified by RMI is blending lower carbon fuels for use in lime kilns and auxiliary boilers. In addition to process technology concerns relative to the use of these fuels, alternative fuels such as green hydrogen are not currently available in the necessary volumes to meet regional demand. The use of gasified biomass residuals to replace fossil fuels within lime kilns appears to be the most promising substitution technology to replace fossil fuels within pulp and paper industry lime kilns⁶, but would require substantial capital investments to install within Washington chemical pulp and paper mills.

Grid Capacity

Throughout the stakeholder process, NWPPA has expressed concern regarding available electricity, grid capacity and the region's growing demand for clean energy. Washington's annual electricity demand is expected to increase by 20.4% over the next ten years.⁷ This is attributable to things like residential and commercial building electrification, vehicle electrification and charging stations, new data centers to compete with the growing demand for AI, crypto mining, decarbonization policies for manufacturers, etc.⁸ Even if electrification technologically eventually becomes available on a large scale for the pulp and paper sector, in Washington, there may not be sufficient baseload electricity generation available in the Western U.S. to move to electrification of industrial facilities like pulp and paper mills.

It is estimated that sector-wide adoption of the pulp and paper electrification recommendations in RMI's analysis would increase annual electricity demand for the sector by 3,574 GWh by 2050⁴. This demand would create an even greater strain on a system that is already struggling to keep up with regional growth and other climate-related policies. While we do not believe that boiler electrification for the pulp and paper sector is a near or even medium-term technology, we agree with Ecology's inclusion of a complimentary measure in Document 6, Appendix 1 to expedite electrical grid enhancements to meet growing regional demand and to prepare for future opportunities in industrial electrification.

Document 1-6 Specific Comments

Document 1: Best Practices for Avoiding Leakage

NWPPA members are highly susceptible to leakage, both domestically and globally, to states and countries that do not have the same rigorous regulatory standards as Washington. While we understand that for the purpose of this report, Ecology has elected to adhere to fairly narrow definitions of leakage and economic harm, it is important to note that the two are inherently linked together and tied to a number of other factors. The closure of a facility in Washington not only risks emissions leakage to jurisdictions with less rigorous regulatory standards but also removes economic activity from those communities, which can ripple throughout a region.

The purpose of EITE assessments is to determine if facilities within a sector may be at risk of leakage due to carbon policy. Leakage risk can be determined through either energy intensity or emission intensity. When cap and trade was

⁵ See: McKinsey&Company. June 2018. Decarbonization of industrial sectors: the next frontier. <https://www.mckinsey.com/~media/McKinsey/Business%20Functions/Sustainability/Our%20Insights/How%20industry%20can%20move%20toward%20a%20low%20carbon%20future/Decarbonization-of-industrial-sectors-The-next-frontier.ashx>

⁶ See: <https://www.ncasi.org/resource/toward-a-net-zero-future-in-the-forest-products-industry-wp-23-04/>

⁷ See: <https://feature.wecc.org/wara/>

⁸ See: <https://www.pnucc.org/wp-content/uploads/2025-PNUCC-Northwest-Regional-Forecast-final.pdf>

being considered at the national level⁹, emission intensity **OR** energy intensity, in addition to a measure of trade exposure, was used as the metric to assess EITE exposure. The pertinent language on EITE criteria from the US Government's inter-agency report is extracted below:

H.R. 2454 considers an industry to be “presumptively eligible” for emission allowance allocations (or “rebates”) to “trade-vulnerable” industries if the industry’s energy intensity or its greenhouse gas intensity is at least 5 percent, and its trade intensity is at least 15 percent. An industry’s energy intensity is defined as its energy expenditures as a share of the value of its domestic production. An industry’s greenhouse gas intensity is defined as its total greenhouse gas emissions (including indirect emissions from electricity consumption) times \$20 per ton of emissions, divided by the value of the industry’s domestic production. An industry’s trade intensity is defined as the combined value of its exports and imports as a share of the value of its domestic production and imports.

In Document 1, on pages 5 and 9, Ecology notes that leakage risk is generally assessed with metrics tied to emissions intensity and trade exposure, but the pulp and paper sector is uniquely characterized as energy intensive and trade exposed due to the biogenic emissions associated with the use of biomass. It’s essential that any method for assessing leakage risk for pulp and paper contains a metric for energy intensity, in addition to emissions. As such, we would agree with ICAP’s conclusion, noted on page 11, that a more nuanced approach that reflects leakage risk on an industry-specific basis is necessary.

Document 2: Methods for developing greenhouse gas benchmarks

Establishing benchmarking protocols for the pulp and paper sector will be a challenge. Ecology’s expressed purpose for establishing benchmarking under the CCA is to “reward the most efficient facilities within the jurisdiction and maintain abatement incentives.” It’s important to note that this objective is highly likely to create a scenario in which there are “winners” and “losers” within a given sector, thus creating an additional leakage risk for highly trade exposed sectors, such as pulp and paper.

At a high level, due to the wide range technical and operational differences at each of the six Washington mills covered by the CCA, establishing sector level benchmarking is not an option. Any benchmarking protocols established for pulp and paper will need to be done at the individual facility level – most likely using a process-based benchmarking methodology. Additionally, product-based benchmarking is also likely to be a challenge for pulp and paper. This is due to the fact that it is possible to have a similar product manufactured with two very different processes, such as mechanical versus chemical pulping.

The forest products sector produces a variety of products using multiple different processes. The US pulp and paper sector is a diverse industrial sector producing products such as packaging material, tissue and towel products, printing and writing paper, newsprint, and specialty papers. These products are made using a variety of different processes based on chemical, mechanical, and recycled pulp production. The US wood products sector also produces a variety of products such as lumber, plywood, veneer, particleboard, oriented strand board, hardboard, fiberboard, medium density fiberboard, laminated strand lumber, laminated veneer lumber, wood I-joists, and glue-laminated beams. These products are made from a variety of different wood types. Because of the diversity of products and processes, rational sector-specific benchmarking is particularly challenging for the forest products sector. The facility specific approach is the preferred methodology for benchmarking and allowance allocation in the forest products sector. With this approach, a facility is compared to its past performance, or baseline benchmarking year. The facility specific approach is

⁹ See: The Effects of H.R. 2454 on International Competitiveness and Emission Leakage in Energy-Intensive Trade-Exposed Industries. https://www.epa.gov/sites/default/files/2016-07/documents/interagencyreport_competitiveness-emissionleakage.pdf

used in the province of Alberta in their Technology Innovation and Emissions Reduction (TIER) regulation¹⁰, and is the current approach being used by Washington for allocation of allowances to EITE sectors within the CCA.

Lastly, while it is understandable to use programs in New Zealand the EU as examples for benchmarking, it's important to note that manufacturing processes in these countries can vary dramatically from those in the United States, and Washington State. It's also important to note that for pulp and paper, there are no longer chemical pulp mills operational in California and therefore it is also a challenge to assess those benchmarking protocols for some mills in Washington.

Document 3: Framework for assessing methods for EITE allowance allocation

NWPPA does not have any feedback on the criteria for identifying viable alternative methods (step 1) or comparing viable alternatives (step 2).

Document 4: Potential methods for allocating allowances to EITEs

As we noted earlier in our comments, the development of an objective approach for assessing leakage risk for pulp and paper will have to contain a metric for assessing energy intensity to capture sector-specific risks.

Additionally, product-based benchmarking may not be the most suitable for all sectors, so transitioning all EITEs to product-based benchmarking may not be an appropriate objective. A more appropriate objective may simply be to establish benchmarking for all existing EITEs by 2035.

Proposing to require consignment of EITE allowances to fund decarbonization projects without adequately funding the existing "hard-to-decarbonize industries" grant program or increasing the allocation of CCA revenue for projects at EITE facilities is not a sustainable solution. As has been discussed in multiple stakeholder meetings, many of these technologies do not meet the return on investment (ROI) criteria for many companies. Requiring consignment of allowances only increases the economic challenges of decarbonization projects. We are happy to work with Ecology and the legislature on ways to increase the use of CCA funds for decarbonization projects within Washington's pulp and paper sector.

In terms of aligning with the program cap and emissions limits, Washington State has very ambitious GHG reduction goals and implementing a cap adjustment factor (CAF) alongside these goals will negate the results of any leakage analysis and override any mitigation approach. It is likely that a CAF would act counter to the desired effect and pose an increased risk of leakage.

Document 5: Review of options for allocating allowances to EITEs for 2035-2050

Regarding net-zero industry prioritization, it is unclear how Ecology would propose to prioritize allowance allocations for industries manufacturing products that are consistent with statewide net-zero emissions limits, and which industries or products would qualify. Washington's pulp and paper industry would seemingly fit into this category based on the use of biomass for power generation and the use of recycled content and sawmill residuals as raw materials. However, it is difficult to evaluate this option without additional details.

Document 6: Draft recommendations (including Appendix 1)

NWPPA does not have any comments on Draft Recommendations 1.1, 1.2, 2.1, or 2.2.

NWPPA appreciated the inclusion of alternative methods for establishing allocation baselines in Draft Recommendation 3.1, as we do not believe that product-based benchmarking is the most suitable for pulp and paper.

¹⁰ See: <https://open.alberta.ca/dataset/0cba733c-5038-4503-a2ef-33edb14bae3/resource/e214e001-22fa-4a0c-8429-5482e512b0be/download/epa-tier-standard-developing-benchmarks-version-2-4.pdf>

Additionally, we refer to our previous concerns around required consignment in Draft Recommendation 3.2. This recommendation alone does not solve some of the economic impacts driving leakage risk. Without increased funding through Washington's Hard-to-Decarbonize Sectors Grants Program, this requirement would worsen the problem.

As previously noted, NWPPA has concerns around Draft Recommendation 4.1 and how a CAF would act counter to Ecology's directive to mitigate leakage. However, we appreciate the inclusion of an alternative option that would achieve a similar outcome in Draft Recommendation 4.2.

NWPPA does not have any comments on Draft Recommendation 5.1.

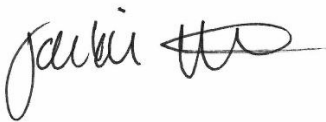
In reference to the list of complimentary measures to support decarbonization of industry in WA in Appendix 1, NWPPA would be supportive of the consideration of several of the complimentary measures listed. In particular, expediting electrical grid enhancements, accelerating permitting procedures for critical decarbonization projects, increased funding for the Hard-to-Decarbonize Sector Grants Program, and R&D support mechanisms. That said, some of these complimentary measures may not align with other program or permitting objectives, which would need to be addressed.

Conclusion

We appreciate Ecology's expressed goal of including technical feasibility and economic impacts wherever possible. In its final report to the Legislature, Ecology must provide an accurate and realistic assessment of carbon reduction opportunities for Washington's pulp and paper sector. One of the items that should be included is a comprehensive analysis of potential GHG and jobs leakage for mills in Washington. These two pieces are essential to inform a reasonably achievable allowance reduction schedule for our sector from 2035-2050 that maintains economic competitiveness with mills outside of Washington State. A schedule that not only supports the state's GHG reduction goals but also reflects the Legislature's objective of avoiding the export of pollution, jobs, and economic opportunities, supporting sectors that sequester carbon and reducing emissions at the lowest cost to Washington's economy, consumers, and businesses.

As you've heard us say before, many of our members, and much of the EITE community in Washington, are facing circumstances where the changing regulatory landscape and constraints of compliance are forcing them to rethink whether they will be able to continue operating at the same levels in Washington, or whether their efforts are better focused elsewhere. Our objective is to continue working with Ecology to help shape policies that mitigate the economic and leakage risks associated with the pursuit of Washington's GHG reduction goals. Thank you for the opportunity to provide feedback. Please let me know if you have any questions.

Sincerely,



Jackie White
Director of Regulatory and Technical Affairs, NWPPA

**WASHINGTON FOREST PRODUCTS COALITION
COMMENTS ON DEPT. OF ECOLOGY'S CCA/EITE
REPORT TO THE LEGISLATURE
SEPTEMBER 3, 2025**

Submitted via: <https://ecology.commentinput.com/>

Adrian Young
Washington Dept. of Ecology
300 Desmond Dr SE
Olympia, WA 98504

RE: Ecology's report to the Legislature on the allocation of no-cost allowances to EITEs from 2035-2050

Dear Mr. Young,

Thank you for the opportunity to comment on Ecology's report to the Legislature on the allocation of no-cost allowances to EITEs from 2035-2050.

The Washington Forest Products Coalition was formed in 2024 to promote and protect the use of wood, wood products and sector-related jobs in Washington; protect and develop markets for the state's wood and wood products; and to educate policymakers on how crucial the inter-dependency is within the state's forest products supply chain. Several members of the coalition are classified by North American Industry Classification System (NAICS) code as EITEs under RCW 70A.65.110 – NAICS codes beginning with 321 or 322 respectively.

As members of this coalition, we believe that Ecology's report to the Legislature on EITE no-cost allowance allocation will have significant implications for Washington's entire forest products sector. Many of the proposals in Ecology's draft materials are likely to result in significant capital demand and create undue burden on EITEs in our sector. As such, we submit the following comments for your consideration:

Numerous legislatively enacted policies, agency rules and guiding documents recognize the critical role that forestry and wood products play in advancing the state's carbon reduction and natural climate solutions goals. For example, HB 2528, passed in 2020, recognizes the state's forest products sector – from working forest lands to finished forest products, as an important part of the state's global climate response. Additionally, the state's climate response strategy under RCW 70A.45.090, formally recognizes Washington's forest products sector, including landowners, mills, bioenergy, pulp and paper, and related harvesting and transportation infrastructure, as providing significant net carbon sequestration benefits.

Both of these policies align with the expressed intent of the legislature in SB 5126, the enacting legislation of Washington's Cap & Invest Program, which is to **"(a) limit and reduce emissions of greenhouse gas consistent with the emission reductions established in RCW 70A.45.020; (b) minimize the potential to export pollution, jobs, and economic opportunities; (c) support industry sectors that**

can act as sequesters of carbon; and (d) reduce emissions at the lowest cost to Washington’s economy, consumers, and businesses.”

One of the cornerstones of Ecology’s directive in RCW 70A.65.110 (4)(a) is best practices for ensuring against leakage and economic harm. Two key sources of leakage for Washington’s forest products sector are reduced harvests or harvest deferrals; the other is decreased demand for residuals or byproducts like wood chips and biomass, when milling infrastructure is rendered economically inoperable. Washington’s forest products supply chain is already contending with leakage risks associated with reduced harvests. Additional leakage associated with supply chain impacts is a risk that the larger forest products sector cannot sustain. Studies indicate that leakage in the forestry sector is high, particularly in the Pacific Northwest. A meta-analysis conducted by Pan et al. found that the average carbon leakage in the forestry sector was about 40%¹.

In addition to sequestering carbon, much of Washington’s forest products sector is engaged in the supply or use of biomass as a fuel source Ecology’s draft materials largely ignore how existing supply chains and technologies can serve as part of the plan to reduce emissions while avoiding leakage. Our sector is highly market-driven. We gain tremendous value from the commoditization of process residuals, such as biomass, and believe that this misses the mark at addressing SB 5126 intent language (b) and (c) above by focusing solely on (a). This is a consequential error. Many of Ecology’s proposals are intended to increase and expedite decarbonization efforts for EITs through electrification or lower carbon fuels. However, this emphasis undercuts the role that the forest products sector has and will continue to play in helping achieve statewide GHG reduction goals.

Lastly, shifting resource demand due to reduced harvests or shuttered infrastructure in the supply chain to other states and countries has significant economic implications for rural communities in Washington. As is noted in the report commissioned by Ecology from the Eastern Research Group (ERG) on market impacts and environmental justice concerns, there are three layers of economic impacts – direct, indirect, and induced. In 2020, Washington’s forest products industry supported 42,122 direct jobs and 102,345 total jobs – nearly 2.5 indirect or induced jobs for every direct job. Facilities covered under NAICS codes 321 and 322 also provide the highest numbers of direct and indirect jobs in our sector. In 2020, NAICS code 321 supported 13,734 direct and 36,853 indirect jobs, and NAICS code 322 supported 9,819 direct and 29,981 indirect jobs. While the ERG report does cover some of the economic impacts, it does not fully capture the value of certain sectors. **As the state’s third largest manufacturing sector, we would ask that Ecology conduct a comprehensive leakage analysis, like the one done by Vivid Economics in 2018 for the Oregon Carbon Policy Office, prior to any new policy development or implementation.**²

In its final report to the Legislature, Ecology must provide an accurate and realistic assessment of carbon reduction opportunities for Washington’s forest products sector, including its manufacturers. One of the items that should be included is a comprehensive analysis of potential GHG and jobs leakage for forest products manufacturers in Washington. These two pieces are essential to inform a reasonably achievable allowance reduction schedule for our sector from 2035-2050 that maintains economic competitiveness with facilities outside of Washington State. A schedule that not only supports the state’s GHG reduction goals but also reflects the Legislature’s objective of minimizing the export of

¹ Pan, W. et al. (2020) ‘Carbon leakage in energy/forest sectors and climate policy implications using meta-analysis’, *Forest Policy and Economics*, 115, p. 102161. doi:10.1016/j.forpol.2020.102161.

² https://www.nwpulpandpaper.org/_files/ugd/382624_718723b43ae6401881825e3fea9ee11a.pdf

pollution, jobs, and economic opportunities, supporting sectors that sequester carbon and reducing emissions at the lowest cost to Washington's economy, consumers, and businesses.

Thank you for considering our concerns and the impacts Ecology's report will have on Washington's forest products industry.

Sincerely,

NORTHWEST PULP & PAPER ASSOCIATION
ASSOCIATION OF WESTERN PULP AND PAPER WORKERS UNION
WASHINGTON FOREST PROTECTION ASSOCIATION
WASHINGTON FARM FORESTRY ASSOCIATION
AMERICAN FOREST RESOURCE COUNCIL
WASHINGTON CONTRACT LOGGERS ASSOCIATION

September 3, 2025

Adrian Young
Cap and Invest Industrial Policy Lead
Washington Dept. of Ecology

Re: EITE Allowance Allocation 2035 to 2050

Dear Mr. Young:

I am writing on behalf of Nucor Steel Seattle to offer comments on Ecology's draft recommendations to the legislature for allocation of no cost allowances to Emissions Intensive Trade Exposed Industries ("EITEs") from 2035 through 2050. Nucor owns and operates the only steel mill in Washington state. Our Seattle plant is one of the most energy efficient steel production facilities in the United States. The Seattle plant is an EITE under the Climate Commitment Act, and a Nucor representative serves on the EITE Industries Advisory Group.

In the Climate Commitment Act the legislature established a schedule for allocation of no-cost allowances to EITEs through 2034, and directed Ecology to recommend to the legislature a proposed "schedule of allowances to be provided to facilities owned or operated by each [EITE] from January 1, 2035 through January 1, 2050." The legislature directed Ecology to submit those recommendations by December 1, 2026. RCW 70A.65.110(4)(a).

The EITE Industries Advisory Group has been meeting since May 8, and Ecology has shared six briefing papers with the Group that address topics relevant to allowance allocation strategy. Nucor's comments on those documents, as well as general recommendations for Ecology to consider when developing its report are as follows.

The first thing to note about Ecology's draft recommendations is that they do not yet contain the "schedule of allowances" that the legislature directed Ecology to propose for legislative consideration. Instead, the documents consist mainly of criteria that Ecology proposes to consider in drafting recommendations for 2035-50 EITE allowance allocations. For instance, Document 6, Policy Design Consideration 1 states that Ecology should establish a level playing field for EITEs competing with facilities in jurisdictions without carbon pricing policies, whereas Policy Consideration 4 declares that policies designed to mitigate leakage "must align with the overarching purpose of carbon pricing programs: to reduce emissions in line with emission reduction targets." These are both valid criteria to guide the development of Ecology's recommendations, but Document 6 does not reconcile these potentially conflicting objectives, nor does it provide the proposed schedule that the legislature requested.

During a meeting with the EITE Advisory Group on 8/14/25, Ecology clarified that its intent is not to request broad legislative authority to set post-2034 allowance allocations by rule, but rather to seek legislative direction covering the post-2034 period. In accordance with that

approach, Nucor recommends that Ecology clarify its recommendations to provide the legislature with clear policy proposals, including a schedule of allowances for EITEs.

Ecology's draft documents and other resources shared with the EITE Industries Advisory Group also omit key baseline information that Ecology needs to inform its recommendations, such as facility-specific leakage evaluations for proposed allowance allocation strategies. Avoiding leakage is a policy mandate in the Climate Commitment Act: "The legislature further finds that climate policies must be appropriately designed, in order to avoid leakage that results in net increases in global greenhouse emissions and increased negative impacts to those communities most impacted by environmental harms from climate change." RCW 70A.65.005(6). Nucor Steel Seattle is one of the lowest emitting steel mills in the United States, with an emissions intensity 87% lower than the global average and 67% lower than the U.S. long product average. If decarbonization pathways are designed in a way that makes it infeasible from a technological or financial perspective for Nucor Steel Seattle to operate profitably, there is a potential for higher emission steel products to enter the Washington State market.

Given that leakage avoidance is a key policy mandate, proposed policies should be evaluated on a facility-specific basis to ensure potential leakage effects are understood and mitigated. Nucor and other EITEs are prepared to assist Ecology in evaluating local impacts of potential policies, including changes in the no cost allowance allocation strategy. If this requires more time than is available under the current schedule, Nucor recommends that Ecology consider extending the timeline for submitting its recommendations to December 1, 2026 (the deadline set by the legislature).

Nucor agrees that no-cost allowances should be provided to EITEs from 2035 onwards. This approach has worked so far and will continue to provide EITEs with incentives to decarbonize while maintaining market competitiveness. Allowance allocation strategies must consider several factors for EITEs, including capital planning timelines, and site-specific feasibility of various decarbonization technologies. Ecology has distributed academic analyses by contractors and non-governmental organizations that present broad policy options based on national or world-wide data sets. These studies will not provide an adequate foundation for Ecology to recommend an allowance allocation strategy that will protect Washington state jobs and businesses, while progressing toward achievement of our ambitious climate change mitigation goals. The reality is that Nucor, like various other EITEs, has already invested significantly in technologies and process changes to increase efficiency and reduce emissions. Implementing a cap adjustment factor or benchmarking system, especially one that is unpredictable or reduces allowances at a rate greater than is feasible through implementation of available technology on set capital planning cycles, will significantly increase the risk of leakage for EITEs.

During the 8/14 meeting, the parties discussed the feasibility of decarbonization as a vehicle to reduce the GHG emissions intensity of EITEs. Nucor supports consideration of this opportunity. It is also important to recognize the limiting factor of Washington's power availability on industry decarbonization. The majority of significant decarbonization opportunities for industry revolve around electrification, which is often delayed and sometimes impossible due to grid constraints. For a facility like Nucor Steel, which is already largely electrified, the opportunities

Mr. Adrian Young
September 3, 2025
Page 3

to electrify additional processes (such as the natural gas reheat furnace) must be balanced against the use of that same resource for other decarbonization efforts and/or residential power availability. In addition to limits on power availability, further electrification and other suggested middle-to-long term decarbonization initiatives for the steel sector involve large capital projects which often do not meet industry standards for return on investment. Nucor recommends that Ecology strongly consider policies which increase funding and remove permitting hurdles for clean power infrastructure and industry decarbonization projects.

As discussed above, any cap adjustment factors, benchmarks, or assistance factors should be evaluated on a facility-level prior to submittal to the legislature to ensure that they are protective of industry competitiveness, predictable, and do not pit EITEs against each other to ensure survival. Nucor recommends that a predictable, attainable allowance schedule be proposed, evaluated in collaboration with EITEs, and presented to the legislature. Nucor also supports consideration of several complimentary measures listed in Appendix 1, including expediting electrical grid enhancements for industrial electrification, acceleration of permitting procedures for critical decarbonization projects, increasing funding for Hard-to-Decarbonize Sector Grants Program, and investment in development of a clean hydrogen grid.

Nucor also requests that Ecology provide a draft of its final report to EITE industries and other interested stakeholders with adequate lead time to analyze and comment before it is submitted to the legislature.

Nucor appreciates the efforts Ecology has taken to engage with Washington's EITE industries and welcomes the chance to support Ecology in developing actionable recommendations.

Sincerely,

A handwritten signature in black ink, appearing to read "Tarah Erickson". The signature is fluid and cursive, with the first name "Tarah" being more prominent than the last name "Erickson".

Tarah Erickson
Environmental Manager

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September 3, 2025

Filed via Ecology Website [Public Comment Form](#)

Adrian Young, Cap-and-Invest Industrial Policy Lead
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RE: Cap-and-Invest: Report to Legislature: No-cost allowances for Emission-Intensive Trade-Exposed Industries (EITEs)

Puget Sound Energy (PSE) respectfully submits the following comments in response to the Washington State Department of Ecology's (Ecology) request for feedback for its report to the Legislature (Document 6: Draft Recommendation)¹ on an approach for allocating no-cost allowances from 2035-2050. PSE's comments are from the perspective of a compliance entity serving electric and natural gas utility customers in the state.

By way of background, PSE is Washington State's oldest and largest investor-owned energy utility, serving approximately 1.2 million electric and over 900,000 natural gas customers with safe and reliable energy services. PSE supported the passage of the Climate Commitment Act (CCA or Cap-and-Invest Program) and has dedicated substantial resources and time to implement and comply with the Cap-and-Invest Program. PSE participated in Ecology's EITE Policy Advisory Group process, providing feedback and a utility perspective as Ecology prepares the mandated EITE allocation report to the legislature. PSE appreciates being included in this process, along with the thoughtful manner in which different policy options and impacts were presented and considered. Going forward, PSE encourages thoughtful consideration of these policy options among Ecology and policymakers given the current dynamics of Washington's carbon market with limited liquidity and high allowances costs for compliance entities and their customers.

Legislative Intent:

PSE would like to highlight the legislative intent language embedded in the CCA with respect to allocating no-cost allowances to natural gas utilities and electric utilities in the interest of their customers:

- *The legislature intends by this section to all consumer-owned electric utilities and investor-owned electric utilities subject to the requirements of chapter 19.405 RCW, the Washington clean energy transformation act, to be eligible for allowance allocation as provided in this section **in order to mitigate the cost burden of the program on electricity customers** (emphasis added)².*

- *“Cost burden” means the impact on rates or charges to customers of electric utilities in Washington state for the incremental cost of electricity service to serve load due to the compliance cost for greenhouse gas emissions caused by the program³.*
- ***For the benefit of ratepayers, allowances must be allocated at no cost to covered entities that are natural gas utilities (emphasis added)⁴.***

Given this, policymakers and implementers must thoughtfully balance the legislature’s explicit, and foundational, intent to mitigate costs to utility customers, while also focusing on preventing leakage in the EITE sector – all while considering overall impacts to the market including allowance liquidity and environmental justice impacts. Ultimately, it is important that the EITE sector is not prioritized over entities subject to the Clean Energy Transformation Act (CETA) that are working to mitigate costs to utility customers.

Additionally, any further work related to complementary policies should be thoughtfully considered especially as the CCA is an exceedingly complex policy. This is further exacerbated by the fact that electric utilities like PSE are striving to comply with CETA, CCA, and the emerging and complex dynamics of maturing electricity markets in the West.

Draft Recommendations:

PSE offers the following comments as it relates to selected Ecology draft recommendations from Document 6:

Recommendation 1.1: Maintain Ecology’s authorization to provide no-cost allowances to EITEs from 2035 onwards provided it aligns with program objectives, allowance budgets, and emissions limits.

PSE appreciates inclusion of the language “provided it aligns with program objectives, allowance budgets, and emissions.” This speaks to PSE’s earlier points about the importance of balancing legislative intent and required no-cost allowance allocations to other sectors, i.e. natural gas and electric utilities for the benefit of customers.

Recommendation 1.2: Monitor developments in carbon pricing policies and federal policies including developments in carbon border adjustment mechanisms or alternative policies to address leakage risk.

As part of recommendation 1.2, PSE encourages continued coordination with California and Quebec on EITE policy implementation in order to preserve Washington’s ability to link programs with these jurisdictions. Per statute, Ecology is directed to consider opportunities to implement the program in a manner that allows linking the state’s program with those of other jurisdictions⁵.

Recommendation 2.2: Assess the requirements and impacts of providing no-cost allowances for addressing leakage risk associated with purchased electricity.

PSE again emphasizes that the allocation of EITE no-cost allowances cannot come at the expense of utility customers per CCA legislative intent to mitigate cost burden of the program.

Complementary Policies:

PSE offers the following comments in response to the references made to complementary policies by Ecology in Document 6, Appendix 1:

PSE requests that any pursuit of complementary policies focused on the electric sector be done in careful coordination with electric utilities and the Washington Utilities and Transportation Commission. Electric markets are complex, as is the harmonization of CETA and CCA compliance for electric utilities. Therefore, it is important for electric utilities to be at the table as policymakers consider enabling policies to further industrial decarbonization primarily through the electric sector. This close coordination will help ensure that the design of these policies are effective and enabling with minimal unintended consequences.

Expedite electrical grid enhancements for industrial electrification: Advancing electrical grid reliability, capacity, and affordability improvements outside of adding additional generation capacity can facilitate easier access to the electricity needed for industrial electrification.

Per comments above, this overarching policy goal will require close coordination with Washington's electric utilities who are striving to achieve these advancements given our interest in innovation, as well as regulatory pressures (namely CETA) and rapidly increasing demand. Working closely with electric utilities will help identify specific policies or gaps that could be addressed; or consider increased funding opportunities for electric utilities, including investor-owned utilities, to further reliability and capacity.

Reform industrial electricity tariffs and ratemaking: Utilities accommodating increased electrification-related loads must balance costs to existing ratepayers without jeopardizing progress on clean energy goals. Differentiated large load tariff rates may aid industries to decarbonize while insulating other customers from infrastructure costs.

As it relates to this potential complementary policy, PSE appreciates acknowledgement of our need to balance costs to existing ratepayers without jeopardizing clean energy progress. That being said, investor-owned utilities are regulated by the Washington Utilities and Transportation Commission, and the Commission has existing and adequate authority over these tariff structures.

Accelerate permitting procedures for critical decarbonization projects

PSE encourages continued work to make permitting streamlined and more efficient, especially when paired with meeting the state's clean energy and emissions related goals. While Ecology specifically focuses on industrial decarbonization projects, there continues to be an opportunity

for Washington State to accelerate permitting procedures for the broader clean energy industry in support of state goals. This could include augmenting existing permitting resources, seeking agency efficiencies by limiting regulatory duplication, and ensuring various regulatory agencies are working towards a common goal of enabling clean energy development and decarbonization.

Hydrogen

PSE is supportive of the development of hydrogen as a technology, seeing its value as a potential peaking resource, and applications for gas decarbonization, among other uses for other industries. Relative to the complementary policies in Document 6, PSE and Modern Hydrogen recently announced a strategic partnership to promote the development of distributed methane pyrolysis technology, a groundbreaking solution that removes carbon from natural gas at the point-of-use for commercial and industrial operations in traditionally hard-to-decarbonize sectors. This technology has the potential to help large gas customers accelerate their decarbonization projects and reduce their greenhouse gas emissions in line with Washington State's clean energy goals. Given this potential, there's an opportunity to make changes to the CCA to ensure that these emissions reduction technologies are incentivized under this program and not penalized with compliance obligations. Changes may include definitional updates and modifications to the emissions reporting to enable these technologies.

While PSE understands the focus on green hydrogen given state goals, PSE cautions that green or renewable hydrogen may not reach commercial scale until significant new renewable energy resources (the principal feedstock) are brought online. This will take some time to robustly develop. Additionally, green hydrogen is projected to get more expensive given the shifting federal tax landscape, and the overall cost increases to renewable generation and necessary build-out of the transmission system. Therefore, PSE would suggest that "all-of-the-above" hydrogen generation be encouraged and incentivized through state policy to make incremental progress on state goals while appropriately managing costs to customers and industry. Something to specific to support this approach could include developing appropriate methodologies for evaluating the carbon-intensity of hydrogen through data-based metrics.

PSE is supportive of the proposed complementary policy related to incentivizing hydrogen investments through tax incentives and grants. Because hydrogen is an emerging technology, tax incentives and grants should not be limited to local municipalities and small businesses. Rather, these incentives should be designed to support the broader hydrogen ecosystem to propel development and manage costs.

As it relates to investing in common carrier infrastructure for the transportation of hydrogen, PSE suggests close coordination with natural gas utilities as these entities have existing pipeline infrastructure and rights-of-ways that can be used for these purposes. A hydrogen pipeline delivery system offers numerous benefits to the region, including the ability to store energy, provide resilience benefits, and an existing skilled workforce that is trained in the installation and safe operation of pipelines.



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Thank you for the opportunity to provide comments to inform Ecology's report to the legislature concerning post-2035 allocation of no-cost allowances to the EITE sector and complementary policies. PSE looks forward to further engagement with Ecology and policymakers as this process evolves. Please contact me if you have any additional questions.

Sincerely,

/s/ Kassie Markos

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RMI

RMI was philanthropically funded from September 2024 through June 2025 to perform an analysis of technical decarbonization pathways for Washington's EITE industries, options for determining allocation of no-cost allowances to EITEs, and complementary policies to support the technical decarbonization pathways.

We presented preliminary analysis to the EITE Advisory Groups in November 2024 and May 2025, as well as conducted over two dozen interviews with stakeholders in early 2025. Our final report, entitled "Opportunities for Industrial Modernization in Washington: Technical Pathways, Investments, Policy, and Decarbonizing Options for Emissions-Intensive, Trade-Exposed Industries" is uploaded as a file accompanying this comment as well as available at this url: <https://rmi.org/insight/opportunities-for-industrial-modernization-in-washington/>

Rocky Mountain Institute (RMI) is an independent, nonpartisan nonprofit founded in 1982 that transforms global energy systems through market-driven solutions to secure a prosperous, resilient, clean energy future for all. In collaboration with businesses, policymakers, funders, communities, and other partners, RMI drives investment to scale clean energy solutions, reduce energy waste, and boost access to affordable clean energy in ways that enhance security, strengthen the economy, and improve people's livelihoods. RMI is active in over 60 countries.

Thank you for the opportunity to comment and we welcome questions about our analysis and recommendations.



Opportunities for Industrial Modernization in Washington

Technical Pathways, Investments, Policy,
and Decarbonizing Options for Emissions-
Intensive, Trade-Exposed Industries



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RMI values collaboration and aims to accelerate the energy transition through sharing knowledge and insights. We therefore allow interested parties to reference, share, and cite our work through the Creative Commons CC BY-SA 4.0 license. <https://creativecommons.org/licenses/by-sa/4.0/>.

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About RMI

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Executive Summary

Washington's Cap-and-Invest program is a powerful tool for meeting the state's greenhouse gas (GHG) targets and funding investments that further support its businesses and residents. But how the program considers industrial emissions beyond 2034 will have to be revisited by Washington's legislative and regulatory bodies for it to function efficiently and equitably in the long term.

The Problem Today: The state's carbon targets for 2040 and 2050 are in tension with the current design of the Cap-and-Invest program because industrial allowance allocations in the program will distort the carbon market and thwart the state's legislated carbon targets. Therefore, a range of solutions must be considered to align the carbon targets and the Cap-and-Invest no-cost allowance structure and support the economic viability of industry.

The majority of industrial sector emitters — approximately 40 emissions-intensive, trade-exposed entities (EITEs) — constituted 15% of all allowances issued under the Cap-and-Invest program in 2023.ⁱ Because of their importance to Washington's economy and the relative challenge to achieving near-term decarbonization, the EITEs are given most of the allowances they need for compliance at no cost, an estimated value of at least \$5.4 billion from 2023 to 2034. During the third compliance period (2031–2034), EITEs will receive no-cost allowances from the Washington Department of Ecology (Ecology) equivalent to 94% of a 2015–2019 emissions baseline. Because the Climate Commitment Act does not specify the level of no-cost allowances in subsequent compliance periods (2035–2050), Ecology presumes it is required to allocate no-cost allowances to EITEs at the 94% level through 2050, absent further legislative direction. If no-cost allowances are maintained at the 94% level, by the mid-2040s the amount of no-cost allowances required to be given to EITEs will exceed the number of allowances of Washington's overall emissions cap, a contradiction that threatens the function of the program.

Solutions In the Next Decade: RMI has performed a technical pathways analysis for each of Washington's EITE sectors and found that enough industrial emissions can be reduced by the end of 2034 and by 2050 to justify sectoral benchmarking and new no-cost allowance reduction schedules post-2034. RMI found that existing and near-term technologies could reduce emissions from EITEs 39% by the end of 2034, largely through implementing energy and material efficiency measures and electrifying applications.

Longer-Term Solutions: In the longer term and without anticipating technological breakthroughs, EITEs could implement technology to reduce their emissions 91% by 2050, incorporating additional electrification measures and low-carbon fuels such as green hydrogen, and employing carbon capture and storage (CCS) for the hardest to decarbonize emissions. Based on these pathways, industrial electricity demand would increase by approximately 13,975 gigawatt-hours, reflecting a broad shift toward electrifying process heat where feasible, integrating hydrogen for high-temperature applications, and pairing residual fossil fuel use with point-source CCS to drive deep decarbonization across industry.

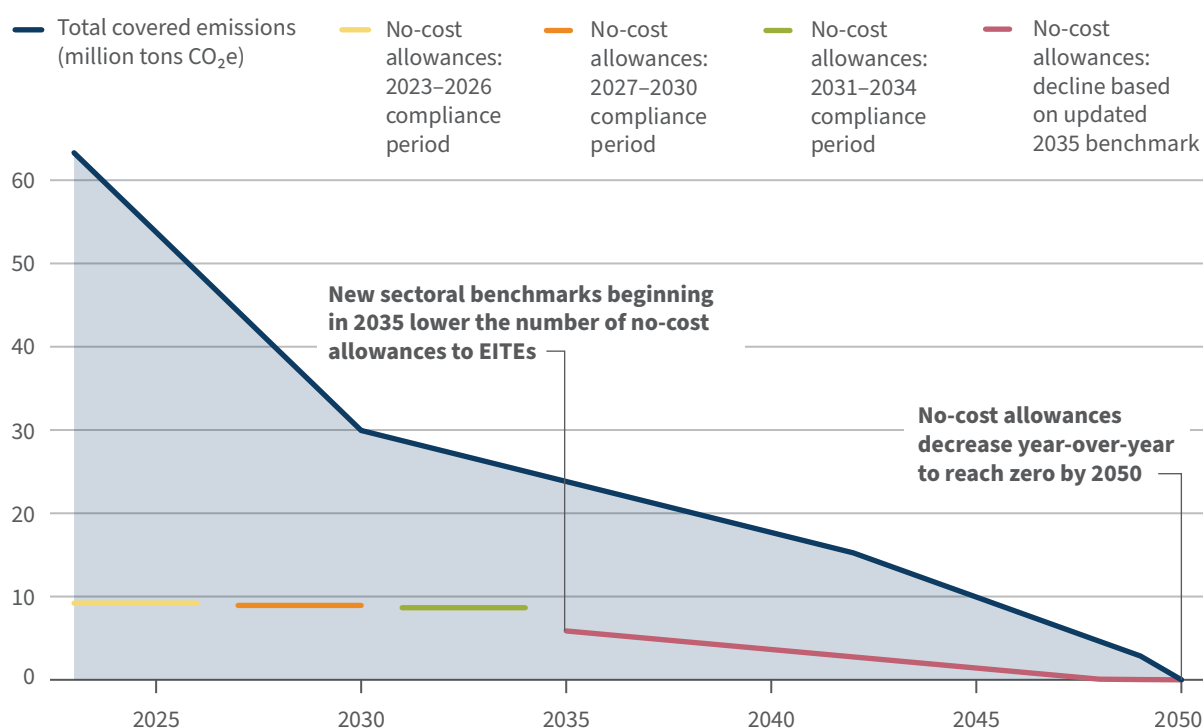
ⁱ Criteria for classification as an EITE entity are outlined in the Revised Code of Washington Chapter 70A.65.110. Broadly, this classification encompasses entities with high energy use and greenhouse gas emissions that also face significant national or global competition for their products.

The Costs: Modeling indicates that the overall cost to implement the 2023 through 2034 portion of the EITE industrial decarbonization pathways, paid for from a variety of sources, equates to \$2.94 billion, far lower than the projected \$5.4 billion value of the no-cost allowances. The cost to implement the full EITE industrial decarbonization pathways, 2023 through 2050, equates to \$17.5 billion. Funding for technical improvements could come from grants, tax credits, low-cost financing, private capital, and the reselling of no-cost allowances.

The Path Forward: We present and explore seven approaches to handle EITE allowances. From this, we recommend that each industrial sector’s respective technical ability to decarbonize over the first three compliance periods (2023 through 2034) be considered for setting sector-specific benchmarks. For example, from each sector-specific benchmark, new no-cost allowance reduction schedules would be applied from 2035 onwards. This recommended action would encourage industrial pollution reductions prior to 2035, ensure EITEs have policy certainty under the Cap-and-Invest program, avoid leakage, and safeguard the value of pollution allowances being put to the highest and best possible use for the people of Washington. The other six options for determining no-cost allowances to EITEs are also evaluated.

Exhibit ES1 Projected annual emissions cap and EITE no-cost allowances with estimated new 2035 sectoral benchmarks

New EITE sectoral 2035 emissions benchmarks, estimated based on emissions reduction potential, would see EITE no-cost allowances adjusted between 2034 and 2035 before declining steadily through 2050.



Note: Total annual Cap-and-Invest program allowance budgets through 2050 based on set total program budget allowance decreases relative to statutory total program baseline values for the 2023-2026 compliance period through 2034. Excludes no-cost allowance allocations to electric and natural gas utilities. Updated 2035 emissions benchmark and 2035-2050 values based on RMI estimates, and exclude aerospace and aluminum.

RMI Graphic. Source: Washington Department of Ecology, Environmental Protection Agency FLIGHT, RMI estimates

To help EITEs decarbonize and ensure the Cap-and-Invest program meets its objectives, we also detail 18 new policy ideas pertaining to Washington’s industrial sector. We categorize these ideas under updating standards and regulations, Cap-and-Invest program evolution and EITE treatment, or state support, and prioritize the policy ideas as essential, recommended, or worth consideration.

New policies, more funding, and updates to the Climate Commitment Act’s treatment of EITEs will likely all be necessary to enable EITEs to smoothly and judiciously implement decarbonization technology over the next decade. Post-2034 policy support and a gradual reduction of no-cost allowances will enable Washington to maintain its economic competitiveness and meet its GHG reduction targets.

Exhibit ES2 New policy opportunities

	 Updating Standards and Regulations	 Cap-and-Invest Program Evolution + EITE Treatment	 State Support
 Essential	Expedite electrical grid enhancements for industrial electrification		
	Accelerate permitting procedures for critical decarbonization projects		
 Recommended	Reform industrial electricity tariffs and ratemaking	Consign EITE no-cost allowances at auction	Set up an industrially focused green bank
	Update existing rules on oil refineries	Require additional criteria to qualify as an EITE	Increase funding for the Hard-to-Decarbonize Sector Grants Program
 Worth Consideration	Introduce a clean heat standard	Allow opt-in EITE entities to receive no-cost allowances	Augment technical assistance planning grants for decarbonization
	Expand methane regulations	Develop additional offset protocols	Strengthen state procurement requirements
			Introduce tax credits for emissions-reducing equipment
			Introduce tax credits for clean manufacturing production
			Invest in common carrier infrastructure for the transportation of green hydrogen
			Incentivize transitions of refineries to other functions

RMI Graphic

Introduction

In 2021, the Washington legislature passed the Climate Commitment Act (CCA), which established a market-based Cap-and-Invest program to reduce carbon pollution and help achieve the GHG limits set in state law: 45% below 1990 levels by 2030, 70% below 1990 levels by 2040, 95% below 1990 levels by 2050.¹ The program began operating on January 1, 2023, with the first emissions allowance auction held on February 28, 2023.² Voters decisively affirmed the Cap-and-Invest program through ballot measure Initiative 2117 in November 2024.³

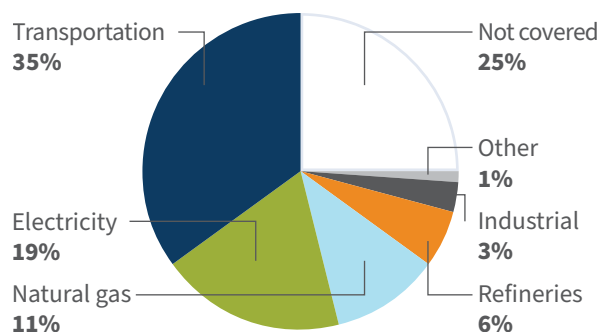
The overall emissions limit, referred to as a “cap,” is divided into allowances, each equivalent to 1 ton (t) of GHG pollution. The allowances are then sold at quarterly auctions held by the Washington Department of Ecology (Ecology).⁴ The emissions cap — and thus the number of allowances auctioned — steadily declines over time in accordance with Washington’s economy-wide GHG targets. Businesses covered by the program must obtain allowances equal to their emissions and submit them to Ecology according to a staggered four-year compliance schedule.⁵ The revenue generated by the program is then invested by the state to further reduce pollution in ways specified by the Washington legislature. The Washington Cap-and-Invest program functions similarly to programs in California, Québec, and for the power sector in Northeastern states.⁶

The Cap-and-Invest program covers approximately 75% of Washington’s statewide GHG emissions.⁹ Covered sources of emissions include gasoline and on-road diesel, electricity consumed in Washington, facilities emitting more than 25,000 t of GHG pollution per year, natural gas distributed to homes and businesses, waste-to-energy (beginning in 2027), railroads (beginning in 2031), and certain landfills (beginning in 2031). Emissions from agriculture, aviation fuels, most marine fuels, biogenic sources, and businesses emitting less than 25,000 t of GHG pollution per year are not covered by Cap-and-Invest.

Washington is currently considering linking its carbon allowance market to that of California and Québec, which originally joined their markets in 2014. The CCA directs Ecology to seek to enter linkage agreements with other jurisdictions. Ecology expects the state’s membership in the California–Québec market to result in stable allowance prices and an increase in overall market activity.⁷ An analysis from Resources for the Future noted likely lower carbon prices for covered Washington entities, higher prices for California, and an overall decrease in carbon emissions across the linked markets.⁸

Exhibit 1

Covered and noncovered emissions under the CCA



RMI Graphic. Source: Washington State Department of Ecology, <https://ecology.wa.gov/ecology/media/BlogMedia/CCA-Covered-Emissions.png>

EITEs are a subset of businesses covered by Cap-and-Invest that receive no-cost allowances to cover nearly all their baseline emissions at least through 2034.¹⁰ EITEs produce a variety of products such as paper, food, beverages, steel, aluminum, glass, cement, building materials, airplanes, semiconductors, fertilizer, and transportation fuels. Although some industrial sources of emissions are not considered EITEs by the program due to low annual emissions or because they do not fall under an applicable North American Industry Classification System (NAICS) code,¹¹ they still experience the price impact of the Cap-and-Invest program through their purchase of electricity and natural gas from electric and natural gas utilities, both of which are covered entities.

The Washington legislature created the EITE designation for several reasons: to acknowledge that certain industries face unique challenges in reducing their GHG emissions in the near term, to dissuade industries from relocating out of state (economic leakage), and to avoid in-state industries being unfairly subjected to a carbon price while out-of-state industries are not (leading to emissions leakage). Because the Washington legislature did not specify the level of no-cost allowances to be given to EITEs post-2034, Ecology has been tasked with preparing a report with recommendations on how EITEs are treated under the program.

RMI investigated Washington's industrial sector and EITE treatment under the Cap-and-Invest program. Our objective was to establish a foundational analysis of decarbonization pathways for Washington's existing and future industry and explore market and policy opportunities to support industrial decarbonization and regional cleantech development. We have:

- Identified technical decarbonization pathways for existing EITE industries and manufacturing in Washington.
- Engaged with stakeholders to understand Washington industries' barriers to decarbonization and preferences for future investments (*see Appendix A, Exhibit A1*).
- Assessed potential changes to the approach for allocating no-cost allowances to EITEs post-2034 to ensure an equitable and orderly drawdown of industrial sector emissions.
- Analyzed the applicability of federal incentives to Washington's industries.
- Produced recommendations for changes in complementary policy and use of Cap-and-Invest revenue to accelerate industrial decarbonization.

The Challenges

EITE allowances

Under the current structure of the Cap-and-Invest program, Ecology is required to freely allocate no-cost allowances to each EITE according to a reduction schedule equivalent to 100% of the EITE's baseline emissions in the first compliance period (2023–2026), 97% of baseline emissions in the second compliance period (2027–2030), and 94% of baseline emissions in the third compliance period (2031–2034). There were approximately 9.2 million allowances (~15% of the overall cap) allocated to EITEs for 2023. Some EITEs use a mass-based baseline, while most use a carbon-intensity baseline; both baseline methods use averages of emissions from years 2015–2019.ⁱⁱ Left undetermined by the CCA are the appropriate levels of no-cost allowances to be allocated to EITEs in compliance periods post-2034. Ecology has interpreted this to mean that allocation levels from the third compliance period (94% of baseline) are the default to continue through 2050 absent legislative and subsequent regulatory action to establish revised allocation levels.¹²

GHG impact of EITE allowances

Because this is a market-based program, the value of future allowances is uncertain, but the allowance price floor and ceiling constrain the range of expected future allowance values. The total value of no-cost allowances to be allocated to EITEs through the first, second, and third compliance periods is estimated to be \$6.7 billion if Washington's carbon market does not link with California and Québec (*see Appendix B, Exhibit B1*). If linkage begins in 2026, the total value of EITE no-cost allowances 2023 through 2034 is estimated to be \$5.4 billion. If prices always stay at price floors between 2026 and 2034, however, that value could be as low as \$4.2 billion, compared to \$12.4 billion if prices in future auctions through 2034 remain at the price ceiling (*see Appendix C, Exhibit C1*).ⁱⁱⁱ

The overall emissions cap declines more steeply than the level of no-cost allowances in the first, second, and third compliance periods, which means no-cost allowances allocated to EITEs will become an increasingly larger proportion of the pre-2035 emissions cap. Specifically, EITE allowances grow from roughly 15% of the overall emissions cap in 2023 to 35% in 2034, equating to approximately \$811 million in value that year, assuming no linkage, or \$545 million assuming linkage.

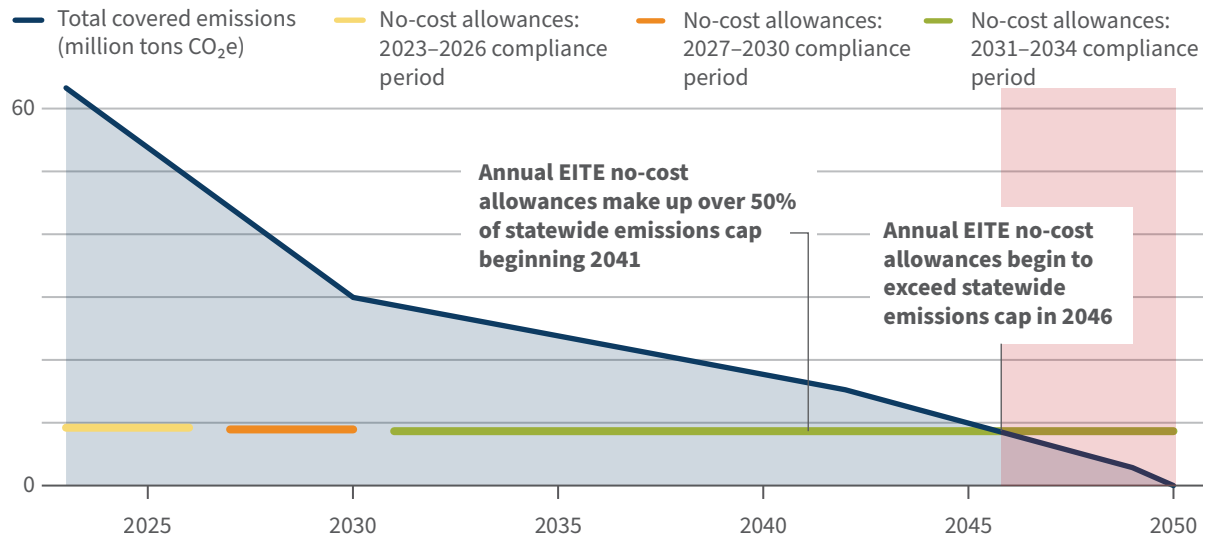
If allocations for no-cost allowances remain unchanged past 2034 and EITE industries continue emitting at a rate equivalent to 94% of their 2024 level of no-cost allowances, then the level of no-cost allowances for EITEs will make up over 50% of the overall state emissions cap (an approximately \$1.3 billion value without linkage, or \$844 million with linkage) by 2041. Furthermore, the level of EITE no-cost allowances would intersect with the economy-wide cap in 2046, causing a failure to meet CCA targets and economic distortions associated with all allowances being initially held by EITEs. This strongly suggests that regardless of emissions reductions in other sectors like transportation, no-cost allocations for EITEs post-2034 will need to be determined through legislation to maintain the viability of the CCA, increase equity among covered entities, and ensure the Cap-and-Invest program fulfills its intended purpose to reduce emissions.

ⁱⁱ Mass-based baseline: Determines allowances based on the facility's average annual emissions over 2015 through 2019. Carbon-intensity baseline: Calculates allowances based on the facility's emissions per unit of production.

ⁱⁱⁱ EITE no-cost allowance value estimates for linkage, price floor, and price ceiling use 2023–2024 historical auction prices and Ecology price estimates for 2025.

Exhibit 2 Projected annual emissions cap and EITE no-cost allowances with no change to EITE no-cost allowances post-2034

If EITE no-cost allowances remain unchanged post-2034 and EITE industries continue emitting at a rate equivalent to 94% of their 2024 level of no-cost allowances, then the level of EITE no-cost allowances would intersect with the economy-wide cap in 2046.



Note: Total annual Cap-and-Invest program allowance budgets through 2050 based on set total program budget allowance decreases relative to statutory total program baseline values for the 2023–2026 compliance period. EITE no-cost allowance figures exclude no-cost allowance allocations to electric and natural gas utilities.

RMI Graphic. Source: Washington Department of Ecology

Economic considerations

The 12-year-long runway (2023–2034) of no-cost allowances to EITEs is intended to prevent leakage and enable deployment of emissions-reducing technology. Meanwhile, many of the remaining emitting sectors (e.g., transportation fuel suppliers, power plants, natural gas utilities) must pay for allowances at auction. Because revenue from the Cap-and-Invest program is a limited and declining resource, the value of allowances allocated to EITEs at no cost is an important factor in making strategic use of state funds to ease decarbonization while growing the state economy.

Auction revenues are held in three primary accounts and four subaccounts, each of which is earmarked for specific project types.¹³ The Climate Commitment Account, in particular, focuses on issues relevant to industrial decarbonization projects, including investing in energy efficiency and deploying carbon dioxide removal (CDR). The CCA requires that a minimum of 35% of auction revenue go toward projects benefiting vulnerable populations within overburdened communities, while 10% of revenues must go toward projects with tribal support.

RMI analysis suggests different industrial facilities can reduce carbon emissions on different timelines, with variance based on the maturation, complexity, and availability of different technological solutions. The rest of this report assesses the viability of technological pathways and time frames for implementation to offer guidance to the State of Washington in determining post-2034 no-cost allowance allocations to EITEs, as well as state actions that could help enable uptake of those decarbonization pathways.

Technical Pathways

Summary

We examined existing technical pathways for reducing GHG emissions across Washington’s EITEs. Our analysis identifies viable decarbonization options without presuming facility shutdowns, focusing instead on technological and operational improvements that can be implemented in the near term (0–4 years), medium term (5–10 years), and long term (10-plus years) with minor variations across sectors. We identify feasible technological pathways for eight key industrial sectors — refineries, pulp and paper, cement, glass production, food processing, chemicals and hydrogen, iron and steel, and electronics — by determining the sequence for introducing specific technological levers.^{iv} Our analysis considers three critical factors: technological readiness level (TRL), marginal cost of abatement (\$/tCO₂e), and relative emissions-reduction potential for each sector. This analysis is based on existing scientific literature and case studies, the US Department of Energy (DOE)’s “The Pathway to: Industrial Decarbonization Commercial Liftoff” (particularly for marginal abatement cost estimates and TRL), as well as RMI’s sector expertise.¹⁴ These technical pathways can also be used to provide a foundation for determining EITE no-cost allowance allocation levels after 2034 and policy opportunities to support industrial decarbonization, as discussed later in this report. *Appendix D* contains more information about the technical pathway methodology.

Below, we introduce common decarbonization levers applicable across the majority of EITE sectors, including energy and material efficiency improvements, electrification of processes, alternative fuels including hydrogen, and carbon capture and storage (CCS) as well as sector-specific technological levers such as incorporating supplementary cementitious materials (SCMs) for cement or biorefinery conversion for refineries.

Exhibit 3 Crosscutting technical interventions for technical decarbonization pathways

IMMEDIATE–4 YEARS		5–10 YEARS		10+ YEARS
Energy efficiency	Electrification	Low-carbon fuels and hydrogen	Carbon capture	
• Near-term solutions not requiring substantial process changes • Includes improvements in system efficiencies, process yield, and recovery of thermal energy; expansion of energy management practices; and increased implementation of smart manufacturing strategies	• Gives an opportunity to leverage decarbonized electricity sources and reduce industrial emissions from on-site fossil fuel combustion • Includes electrification of process heat (e.g., heat pumps) or electrification of hydrogen production for industrial process use	• Decarbonized industrial processes with low-carbon fuels is effective where electrification is challenging due to high temperature needs or chemical processes • Includes use of biogenic fuels (biomass or biogas), waste fuels or tire-derived fuel, and green hydrogen	• Implementing CC(U)S technologies allows industries to capture CO₂ emissions for storage or conversion into valuable products. Critical component for deep decarbonization • Current costs and technical considerations push the technology to the horizon	

RMI Graphic

^{iv} The scope of this technical pathways analysis encompasses the eight sectors identified above, while the aerospace and aluminum sectors fall outside the current assessment parameters due to their reduced emissions significance relative to the 2015–2019 reference period and data constraints that preclude detailed evaluation.

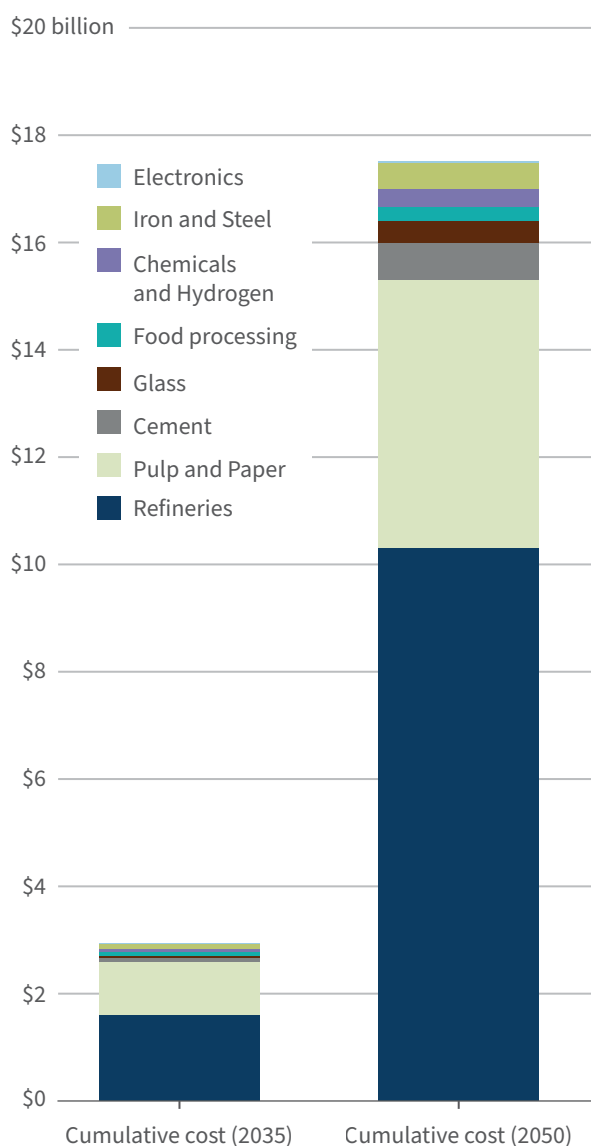
We find that technologies deployable within the next decade could reduce industrial emissions by a cumulative 44.9 million tons (Mt) CO₂e between 2023 and 2034. In aggregate, EITE sectors can reduce emissions by up to 39% by 2035 and by 91% by 2050 compared to 2015–19 baseline levels, with the largest absolute emissions reductions driven by the refineries, pulp and paper, and food processing sectors. *Appendix E, Exhibits E2 through E10* includes additional detailed technical decarbonization pathway figures.

The estimated marginal cost abatement for implementing these technologies ranges from –\$150 to \$500 per ton of CO₂e reduced, leading to cumulative costs of \$2.94 billion by 2035. Although energy and material efficiency measures can be deployed in the short term across all sectors with positive economic returns, certain hard-to-abate sectors like refineries and cement will require more specialized solutions, including hydrogen and carbon capture, utilization, and storage (CCUS) as a final backstop technology. However, current economics and TRLs limit the relevance of these technologies in the long-term implementation horizons. For certain sectors, particularly electronics manufacturing, glass production, and food processing, application of CCUS is not feasible.

Among the evaluated issues for implementation beyond technological challenges and costs is access to stable clean electricity generation, which has also been identified as relevant across all the sectors. Hence, we modeled an incremental annual increase in electricity demand for the eight EITE sectors using an RMI-developed model.^v On average, a relative increase across all sectors by 2030 represents 35% of baseline electricity purchased from the grid in 2018. By 2050 this number increases to 65%, with the highest absolute increase represented by refineries (5,522 gigawatt-hours [GWh]), pulp and paper (3,574 GWh), and food processing (1,704 GWh). More information on both new electricity demand from industrial decarbonization and pathway implementation costs from RMI’s analysis can be found in *Appendix F, Exhibit F1*.

Exhibit 4

Projected total cost of established technical decarbonization pathways from 2023 to 2034 and from 2023 to 2050



RMI Graphic

^v The model assumes full electrification of low-temperature heat processes (< 100°C) and a combination of electrification, green hydrogen, and CCS for high-temperature applications. Annual growth of 2% was assumed for each sector excluding refineries, for which a 2% annual contraction was assumed in the model.

In this regard, sectors that would benefit most from on-site renewable energy systems — due to favorable resource availability, compatible load profiles, or existing infrastructure — include pulp and paper, food processing, electronics, and chemicals and hydrogen. On-site renewables present greater implementation challenges for refineries, glass production, cement, and iron and steel due to their high-temperature process requirements, continuous operation demands, or existing waste-heat recovery systems. Hence, accounting for the specific operational characteristics and energy profiles of each sector helps identify more feasible and applicable decarbonization pathways.

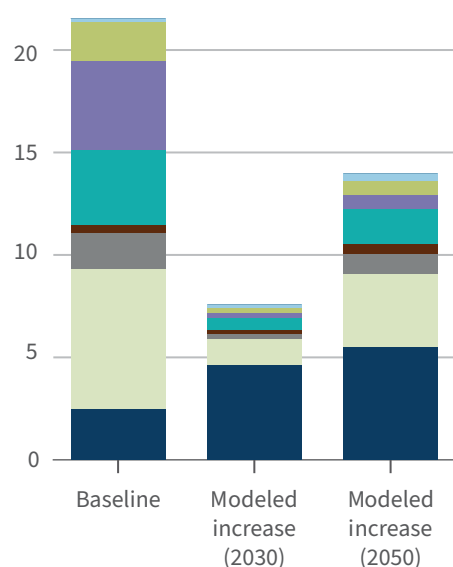
Existing technological pathways allow Washington’s industrial sectors to demonstrate diverse but effective trajectories toward emissions reduction by 2035. Electronics manufacturing is projected to lead in relative terms with a 54% reduction by 2035, followed by glass production and chemicals and hydrogen at 53% and 46%, respectively. Food processing and iron and steel are also set to achieve substantial medium-term progress, with modeled reductions of 40% to 45%. In contrast, refineries show a more gradual pathway, targeting a 36% reduction potential.

In terms of absolute annual emissions savings by 2035, the refinery sector is projected to deliver the largest reduction — over 2.31 MtCO₂e — followed closely by pulp and paper (non-biogenic) with nearly 0.49 MtCO₂e and food processing with 0.3 MtCO₂e. These reductions reflect both the scale of emissions in these sectors and the availability of mature decarbonization technologies.

By 2050, all sectors can achieve deep decarbonization, with targets ranging from 70% to 93%. Realizing these ambitions will require a strategic mix of technology deployment, infrastructure investment, and coordinated policy support. Collectively, these efforts will enable Washington to decarbonize its industrial base while maintaining economic resilience.

Exhibit 5

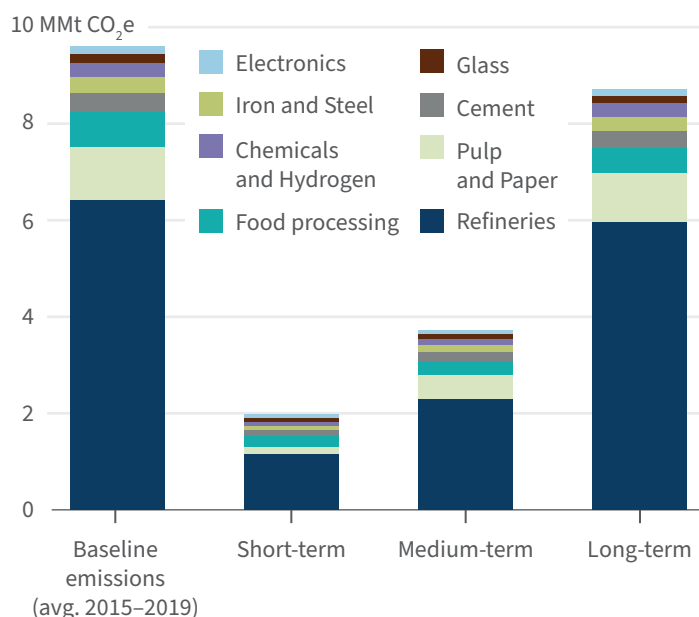
Incremental increase in annual electricity demand (thousand GWh)



RMI Graphic. Source: RMI analysis

Exhibit 6

Emissions-reduction potential by sector by 2050



RMI Graphic. Source: RMI analysis, GHG Reporting Program Publication

Refineries

Washington is home to five major petroleum refineries whose combined operations release roughly 6.4 MtCO₂e each year — about 68% of total EITE emissions. To meet decarbonization goals without presuming facility shutdowns, we recommend sequencing six core strategies over the next decade and beyond.

Near-term opportunities

Refineries should first pursue marginal optimizations and efficiencies that require minimal capital outlay. Switching to lighter, lower-sulfur crudes, coprocessing bio-feedstocks (such as hydroprocessed esters and fatty acids) in existing heaters and boilers, and tightening maintenance and automation protocols can yield substantial emissions savings. Recovering waste heat and upgrading steam traps and insulation will further reduce fuel demand.

Simultaneously, refineries can begin electrifying low- and mid-temperature heating systems. Replacing steam-driven rotating equipment and gas-fired heat applications with electric drives or boilers — where grid capacity allows — can eliminate tens of thousands of tons of CO₂e per facility each year.

Medium-term opportunities

Potential road transport fuel shifts present an opportunity to retire, repurpose, or experimentally electrify heating for most gasoline units and fuel-grade cokers within refineries. These refining units convert lighter and heavier crude fractions, like naphtha and vacuum tower bottoms, respectively, into road transport fuels and will see increasing pressure to adapt as transport demand transitions from primarily gasoline and diesel to electric vehicles. This continues the spirit of using refinery unit modular adjustments to meet evolving societal needs over much of the past century, as seen in changes since 2000 with the gasoline additive methyl tert-butyl ether (MTBE) and corresponding refinery production units.¹⁵ Refineries that shut down these units can redirect higher-sulfur fractions to nonfuel applications like petrochemicals and asphalt inputs, preserving residual value while slashing emissions. Alternatively, replacements of aging heaters and boilers with modern electric or hybrid alternatives will lock in further efficiency gains.

Between years 5 and 10, using hydrogen derived from natural gas through methane pyrolysis, in hydroprocessing units and other remaining high-temperature heat applications can displace conventional fuel use without requiring full grid-scale electrification. Complementing this, deploying advanced membrane and adsorption separations in waste gas recovery units can drive down carbon intensity across the plant.

Long-term opportunities

Direct electrification or green hydrogen produced via electrolysis offers the cleanest heat and feedstock solution for high-intensity units. Finally, capturing CO₂ from fluid catalytic cracking off-gas and converting it to methanol tackles one of the largest point-source emissions streams, paving the way for advanced sustainable aviation fuels and low-emissions chemicals.

Taken together, these six levers from low-cost optimizations to high-value carbon capture can reduce refinery emissions by up to 93% by 2050 compared to the baseline.^{16,vi} Focusing on the near- to medium-term solutions, a reduction of 36% can be achieved by 2035, with a cumulative reduction of 14.27 MtCO₂e and a cumulative cost of \$1.61 billion from 2023 to 2034. Efficiency upgrades start at around –\$100 to \$22/tCO₂e avoided, while electrification, hydrogen, and CCUS options range up to \$130 to \$360/t. Full deployment of these measures is projected to increase statewide annual electricity demand by approximately 4,639.45 GWh by 2030 and 5,522.63 GWh by 2050. Notably, while Washington’s already relatively clean grid makes electrification including electrolysis carbon-beneficial, refinery operators in interviews emphasized the need for clear regulatory signals and grid reliability guarantees to underwrite large-scale electrification investments.

Pulp and Paper

Washington’s 13 kraft and sulfite pulp-and-paper mills constitute the state’s most carbon-intensive manufacturing subsector.^{17,vii} The 16% of the sector’s emissions from non-biogenic sources — originating from natural gas auxiliary boilers, lime-kiln firing near 1,000°C, and bark- or gas-fired power boilers — is covered by the Cap-and-Invest program. The combined annual emissions of pulp and paper nonbiogenic sources total approximately 1.2 MtCO₂e. Because steam generation accounts for more than four-fifths of total energy use, any measure that reduces or electrifies steam demand delivers outsized climate benefit. The remaining 84% of stack emissions are biogenic, released when black liquor and wood waste are combusted, and therefore are not covered within the Cap-and-Invest program.^{viii}

Near-term opportunities

Steam system optimization, leak repair, variable-speed drives, and insulation upgrades together cut fossil and process CO₂ by about 10%–15% at negative to very low marginal cost (from –\$100 up to roughly \$20/t).¹⁸ Capturing waste heat from dryer sections and recovery-boiler flue gas adds a further 10%–20% reduction at approximately \$20–\$40/t.¹⁹ Expanding biomass cofiring in auxiliary boilers provides an additional 15%–30% reduction at around –\$6 to \$16/t, assuming sustainable feedstock supply.^{ix} These interventions are typically executed during planned maintenance and involve modest capital outlays relative to production scale.

Medium-term opportunities

Electrification of low- and medium-pressure steam — via electric package boilers or high-temperature heat pumps — can achieve an incremental 25%–40% reduction at about \$100–\$160/t.²⁰ Partial hydrogen blending (approximately 20% by volume) in lime kilns and auxiliary boilers falls within the same cost envelope, contingent on regional green hydrogen availability.²¹ Sector-wide adoption of these measures is expected to increase annual electricity demand by 3,574 GWh by 2050.

vi We use the average reported by the EITE sector emissions from 2015 to 2019 as our main baseline level of emissions in this analysis. Alternative estimates also use 2022 emissions from the Environmental Protection Agency FLIGHT dataset.

vii Thirteen facilities with over 10,000 t in annual CO₂e emissions and five facilities with over 25,000 t.

viii Biogenic CO₂ emissions are defined as CO₂ emissions related to the natural carbon cycle, as well as those resulting from the combustion, harvest, digestion, fermentation, decomposition, or processing of biologically based materials. Hence, because they are part of the short-term carbon cycle, they are not typically included in decarbonization pathways.

ix Assumes \$0.03/kilowatt-hour for biomass purchased in the United States.

Long-term opportunities

Capturing flue-gas CO₂ from recovery boilers and kilns can eliminate 40%–90% of residual emissions at roughly \$90–\$180/t, with higher costs when transport and storage are included. Electrified rotary lime kilns now progressing through European demonstration programs are expected to become commercially viable over the next decade; when paired with solvent capture, they would remove both combustion and calcination CO₂.

A sequential approach beginning with efficiency measures today, targeted electrification and clean fuels by 2035, and breakthrough kiln electrification, gasification, and carbon capture thereafter can reduce the sector's regulated emissions by more than 93% while preserving the industry's economic importance in Washington. Market analysts expect flat to modest growth (0%–1% per year) in Washington's pulp and paper output through 2035, although there is potential for a higher increase in cardboard and packaging annual demand of 3.95% due to growing e-commerce, increasing population, and expansion of the food and beverage manufacturing sector.²² The suggested technologies are projected to deliver cumulative emission reductions of 16.2 MtCO₂e by 2050 with an associated cost of \$5.01 billion.

Cement

Washington's cement production sector consists of a single facility in Seattle, generating about 0.36 MtCO₂e annually.²³ This represents approximately 3% of the state's total EITE industry emissions. The majority of emissions (about 88%) occur during clinker production, with 53% coming from the chemical calcination process itself and 35% from combustion for thermal energy.²⁴ To achieve state emissions-reduction targets, multiple decarbonization strategies can be implemented sequentially over the coming decades.

Near-term opportunities

Replacing clinker with SCMs like calcined clays, natural pozzolans, fly ash, and slag can significantly reduce process emissions. According to recent life-cycle assessment studies, SCM substitution rates of 20%–50% are technically feasible in the near term, with potential to reduce emissions by 4%–40%, and some pilot projects are aiming for a 70% reduction.²⁵ This approach offers attractive abatement costs (–\$20 to \$25/tCO₂e²⁶), representing potential cost savings while also reducing emissions. The capital investment required is relatively modest compared to other decarbonization options, making this a logical first priority. In addition to being less expensive than portland cement and enhancing durability, SCMs reduce up-front production costs and extend structure life span, thereby lowering overall life-cycle expenses.²⁷

Energy efficiency measures are another short-term option, although they have higher capital expenditures relative to integrating SCMs. Optimal efficiency measures include integrating waste-heat recovery systems, which can cover up to 30% of a plant's power needs, and investing in advanced equipment such as vertical roller mills, multistage preheaters with inline calciners, and high-efficiency coolers that lower kiln thermal energy demand.²⁸

Medium-term opportunities

Medium-term strategies include more complex and capital-intensive technologies such as the introduction of alternative fuels and partial electrification. Switching to low-carbon alternative fuels such as sustainably

sourced biomass, municipal solid waste, or refuse-derived fuel can displace 35%–50% of conventional fossil fuels.²⁹ Fuel switching can result in potential emissions reductions of 40%–50%. Expected abatement costs fall within \$20–\$80/tCO₂e, with capital expenditure needs around \$50–\$100/t for the necessary fuel handling modifications.

Material handling, grinding, and finish-milling processes can be electrified to reduce indirect emissions, which is particularly valuable in Washington given the hydro-dominated electricity grid.^x Facilities can also electrify thermal processes to further reduce combustion emissions, though this remains technically challenging for the main pyroprocessing steps and is therefore recommended as a long-term strategy.

Long-term opportunities

Full-scale CCUS implementation on kiln exhaust streams offers the most significant single reduction opportunity, with potential to abate 50%–90% of remaining emissions. However, existing studies indicate costs of \$150–\$300/tCO₂e, making this technology currently economically noncompetitive unless supported by strong public incentives. Geological storage potential in basalt formations in the Columbia River basin provides a regional advantage for Washington’s cement industry.

Exploring novel production pathways, companies like Sublime, Brimstone, and Fortera are in the early stages of redefining the cement-making process. For instance, research into alternatives like belite-ye’elimite-ferrite (BYF) cements or alkali-activated materials could reduce calcination emissions by 20%–30% compared to portland cement. While technically promising, these options are currently at a very early stage of development, face market acceptance challenges, and would require significant investment in new production infrastructure.

Full electrification can also become a feasible option in the long term with low-cost electricity availability. The electrification of current thermal processes would increase annual electricity consumption at the facility by approximately 930 GWh by 2030 once electrification is implemented, requiring coordination with grid planning authorities.

A systematic implementation of these strategies yields a significant emissions-reduction trajectory, including an approximately 45% emissions reduction between 2023 and 2034 (avoiding about 1.17 MtCO₂e) and up to a 90% emissions reduction by 2050 through comprehensive implementation of all available technologies, including reliance on full-scale CCUS. The relative emissions reduction translates into 5.2 MtCO₂e reduced by 2050 at a total cost of \$0.68 billion.

Regional availability of suitable SCMs is one of the key constraints to these strategies, with fly ash supplies declining due to coal plant retirements. RMI’s research identified calcined clays as a promising alternative that could be sourced within Washington. CO₂ transport infrastructure connecting the sole Seattle facility to geological storage sites would also be necessary to enable CCUS implementation at scale.

x While Washington’s grid is frequently characterized as relatively clean due to hydroelectric capacity, the state faces mounting electricity demand and complex politics around dam operations. A comprehensive strategy for discussing Washington’s grid profile is out of scope of this analysis.

Glass production

Washington's glass industry is represented by two manufacturing plants — one container glass facility and one flat glass facility — that together emit 0.126 MtCO₂e per year, or roughly 1.5% of the state's EITE emissions. A third facility, Ardagh Glass, announced its closure at the end of 2024. An estimated 60%–85% of the sector's total energy demand — and therefore most of its direct CO₂ emissions — comes from the high-temperature melting process.³⁰

Near-term opportunities

Two primary approaches for immediate emissions reductions in glass manufacturing are material efficiency through increased cullet, or recycled glass, usage and targeted energy efficiency upgrades. Cullet melts at lower temperatures than raw materials and avoids process-related CO₂ emissions from limestone decomposition. For every 10% increase in cullet, energy consumption falls by approximately 2.5%–3%, while also cutting particulate, NO_x, and SO_x emissions. This strategy typically yields negative marginal abatement costs, delivering both environmental and economic benefits. Complementing this, energy efficiency measures such as enhanced furnace insulation, low-NO_x burners, and advanced combustion controls can achieve a 10%–15% reduction in emissions. Batch and cullet preheaters, as well as waste-heat recovery systems that repurpose flue gas heat, can boost thermal efficiency by an additional 12%–25%.³¹ Additionally, other waste-heat recovery systems, such as regenerators or recuperative burners, offer further savings of 10%–25% CO₂e by capturing flue gas heat to preheat combustion air or feedstock, with abatement costs ranging from negative to moderate values depending on system design.³²

Medium-term opportunities

Hybrid electric-gas melting systems and oxy-fuel combustion retrofits both offer substantial emissions reductions but require significant capital investments and infrastructure upgrades. Hybrid electric-gas furnaces integrate electric heating elements with traditional combustion, enabling up to 80% of the melting energy to be supplied by renewable electricity. This approach can reduce CO₂ emissions by approximately 60%–64%, depending on the share of renewable energy used and the specific furnace design.³³ For instance, a hybrid furnace operating with 60% electrical heating has achieved a 64% reduction in carbon emissions.³⁴ However, the adoption of hybrid furnaces requires a reliable source of renewable electricity and sufficient local electrical grid capacity. Oxy-fuel combustion retrofits involve replacing air with pure oxygen in the combustion process, eliminating nitrogen from the oxidizer, and significantly reducing the volume of flue gases. This method enhances thermal efficiency and reduces fuel consumption. Oxy-fuel combustion can lead to a 20% reduction in CO₂ emissions compared to conventional air-fuel furnaces.³⁵ However, the implementation of oxy-fuel technology requires significant capital investment and may involve operational adjustments.

Long-term opportunities

Long-term strategies for the glass industry focus on transformative technologies such as fully electric melting furnaces, hydrogen- or biogas-fueled annealing systems, and CCS, each offering significant emissions reductions but accompanied by substantial capital investments and infrastructure requirements, and higher technological risks.

Electric melting furnaces can eliminate 60%–80% of glass manufacturing emissions when powered by low-carbon electricity sources. These advanced systems achieve energy efficiencies of 2.8 gigajoules per ton (0.78 megawatt-hours per ton), representing a 20% improvement over conventional methods. Implementation costs range from \$100 to \$400/tCO₂ abated, with total installed costs around \$300/t of capacity.³⁶ These systems require substantial grid capacity enhancements and reliable renewable electricity access, adding approximately 164 GWh of annual electricity demand by 2030.

Hydrogen or upgraded biogas can replace fossil fuels in forming lehrs and annealing ovens that are challenging to electrify. These alternative fuels can reduce 50%–70% of remaining thermal emissions at abatement costs between \$190 and \$550/tCO₂. However, hydrogen adoption requires infrastructure modifications due to its lower calorific value compared to natural gas, and its combustion produces water vapor that may affect glass quality.

CCUS technologies applied to large oxy-fuel or legacy fossil-fired melters can remove 70%–90% of remaining stack emissions. Abatement costs for industrial CCS range from \$140 to \$290/tCO₂.³⁷

Combined implementation of these technologies could reduce glass sector emissions by 53% by 2035, avoiding roughly 0.64 MtCO₂e between 2023 and 2034, and achieve up to 90% abatement by 2050 with an associated cost of \$0.41 billion.

Food processing

Washington's food sector is largely dominated by potato processing, which consists of eight frozen potato and snack facilities clustered primarily in the Columbia River basin. Food processing facilities cumulatively emit approximately 0.59 MtCO₂e per year, representing roughly 6% of the state's EITE emissions. The potato processing industry transforms raw potatoes into various products including french fries, chips, dehydrated potato products, and potato starch. Approximately 70% of these facilities' total energy demand and the majority of direct CO₂ emissions comes from natural gas boilers that generate steam for blanching, drying, and frying operations. The remaining energy consumption is primarily associated with refrigeration and cold storage electricity use.

Processors emphasize their thin operating margins and continuous-run production schedules, requiring interventions to align with planned annual shutdowns (typically two weeks) or major refits. The demand for frozen potato exports is projected to grow at approximately 2% annually through 2035, underscoring the necessity for scalable, cost-effective decarbonization strategies that maintain the competitiveness of the state's agricultural value chain.

Near-term opportunities

The immediate focus for decarbonization combines energy and material efficiency improvements. Energy efficiency upgrades including condensate recovery, continuous blow-down heat exchangers, boiler-house insulation, and variable-speed drives on pumps and fans can reduce fuel use by 8%–15% at costs ranging from –\$20 to \$10/tCO₂e, with payback periods of one to three years.³⁸ Steam system optimization through automated trap monitoring and low-pressure flash steam reuse, combined with electric resistance heaters for low-temperature wash water, can deliver an additional reduction in emissions. On material efficiency, improved sorting technology and optical grading systems can increase yield by 2%–3%, reducing both

waste and energy requirements per unit of output. Water recirculation systems offer 20%–30% reductions in water consumption while decreasing the energy needed for pumping and heating process water. Refrigeration retrofits — switching from R-404A to ammonia or transcritical CO₂ systems and adding permanent magnet motors — can lower indirect emissions by 10%–15% at costs of \$30–\$80/tCO₂e.³⁹

Medium-term opportunities

As facilities undergo planned retooling, more substantial process changes become viable. Medium-temperature industrial heat pumps (100°C–120°C) can supply blanching water and barrel washers, replacing up to 40% of boiler steam at abatement costs ranging from \$60 to \$120/tCO₂e. Electric boilers designed for peak and shoulder steam loads avoid inefficiencies associated with part-load operations in gas boilers, achieving an additional reduction in fuel emissions at \$70–\$140/tCO₂e. Process intensity redesign measures — including countercurrent blanching, low-moisture infrared drying, and optimized fryer heat-transfer surfaces — can collectively reduce thermal energy demand by 10%–15%. Advanced material efficiency measures become increasingly important during this time frame. Pulse electric field pretreatment for potatoes can reduce cutting losses by 3%–5% and shorten frying times by up to 10%, thereby reducing energy consumption by approximately 5%–8% during frying.⁴⁰ Advanced production planning systems integrating real-time data analytics can optimize batch sizes and reduce transition losses, improving overall resource efficiency by 3%–5%.

Long-term opportunities

Deep decarbonization of potato processing will require fundamental technology shifts. High-temperature heat pumps (up to 190°C), currently in late-stage demonstrations, could displace nearly all remaining medium-pressure steam, reducing thermal CO₂ emissions by 60%–80% at costs of \$120–\$200/tCO₂e.⁴¹ Cofiring on-site green hydrogen or upgraded biogas in directly heated fryers and dryers can address the highest-temperature thermal loads, eliminating an additional 15%–25% of remaining fossil emissions at abatement costs of \$150–\$300/tCO₂e. Full electrification of direct-fired equipment (infrared or radio-frequency dryers, induction fryers) will finalize the decarbonization pathway as capital stock turns over. However, both these technologies are currently expensive, and applications only become feasible for this sector with substantial cost decreases.

Implemented sequentially, the proposed energy and material efficiency and electrification measures could achieve a 40% emissions reduction by 2035, preventing approximately 0.52 MtCO₂e cumulatively from 2023 to 2034, and up to a 70% reduction by 2050 with an associated cost of \$0.26 billion. It would increase annual sectoral electricity consumption by an estimated 1,704 GWh by 2050; however, material efficiency measures could partially offset this rise by reducing overall production energy intensity.

Chemicals and hydrogen

Washington's chemicals and hydrogen sector includes four major facilities: Air Liquide Hydrogen Plant (Anacortes), Emerald Kalama Chemical (Kalama), Solvay Chemicals (Longview), and Matheson (Anacortes). These facilities collectively emitted approximately 0.237 MtCO₂e in 2022. This sector accounts for an estimated 3% of the state's industrial emissions, primarily originating from energy use for purification and separation and direct process emissions from steam methane reforming (SMR) and steam cracking.

Near-term opportunities

The most immediate opportunities for this sector focus on energy efficiency and electrification. Control system upgrades, waste-heat recovery, and process integration improvements can reduce emissions by 10%–20%, with marginal abatement costs as low as –\$50 to \$30/tCO₂e.⁴² Electrification of reactors and process heaters can deliver 20%–35% emissions reductions, though at higher abatement costs of \$40 to \$70/tCO₂e and with two to five years to implement.⁴³

Medium-term opportunities

Deployment of low-carbon inputs, including combinations of green and blue hydrogen, offers additional decarbonization potential. Green hydrogen integrated with CCS in SMR-based plants can reduce emissions by 25%–60%, with marginal abatement costs of \$60–\$150/tCO₂e. All natural gas-fed hydrogen and chemicals assets should source low-leak methane inputs to optimize overall marginal emissions abatement costs. For full asset replacements, electrolytic hydrogen production systems (green hydrogen) should be evaluated as the pathway that offers the most emissions-reduction certainty, especially as costs fall and first projects are de-risked. Of the fossil pathways, autothermal reforming and methane pyrolysis inherently integrate CCS at higher capture rates and lower costs than SMR.⁴⁴ Use of recycled or bio-based feedstocks in such blue hydrogen pathways can also be considered at this stage and may reduce emissions by 18%.

Long-term opportunities

By 2050, a combination of green hydrogen substitution, process electrification, full-scale CCUS deployment, and circular feedstock integration could enable emissions reductions of up to 90%–95% across the sector. Process reconfiguration to accommodate alternative chemistries and heat sources will require reliable, low-carbon electricity, increasing demand for firm power. Full deployment of hydrogen and CCUS is projected to raise electricity demand by 11%–25%, requiring regional coordination with utilities and regulators.

With sequential implementation of efficiency, fuel switching, electrification, and CCUS measures, the sector can reduce emissions by 46% by 2035 and 93% by 2050, for a projected total of \$0.344 billion.

Grid integration and availability of low-cost green electricity will be a key constraint and opportunity in long-term deep decarbonization. As electrification and hydrogen production scale, firm renewable electricity and expanded transmission infrastructure will be essential to avoid shifting emissions upstream. Sequential implementation of the suggested technologies is projected to increase annual electricity demand by 687 GWh by 2050. Sectoral growth — driven by global demand for advanced materials, solvents, and hydrogen — will require a proactive approach to ensure decarbonization does not lag behind output expansion.

Iron and steel

Washington's steel industry consists of a single electric arc furnace (EAF) facility that emits approximately 0.084 MtCO₂e/year, representing roughly 1% of the state's EITE emissions. The facility transforms recycled scrap metal into various steel products including rebar, structural shapes, and merchant bar. Approximately 70% of the facility's total energy demand — and the majority of direct CO₂ emissions — comes from electricity consumption for the EAF operation, while the remaining emissions are associated with natural gas-fired reheating furnaces, carbon electrodes, and other process inputs. As an EAF-based operation, the facility already represents a lower-carbon steelmaking route compared to traditional blast furnace–basic oxygen furnace production.

Near-term opportunities

The immediate focus for decarbonization combines energy and material efficiency improvements. Energy efficiency upgrades including optimized transformer-regulation systems, improved furnace sealing, and variable-speed drives on auxiliary equipment can reduce emissions by 10%–20% at costs ranging from –\$15 to \$30/tCO₂e, with payback periods of one to three years.⁴⁵ Combustion optimization in the reheating furnace through advanced burner technologies and automated control systems, combined with improved insulation and refractory materials, can deliver an additional 5%–10% reduction in natural gas emissions. For material efficiency, enhanced scrap sorting and quality control systems can reduce emissions by 15%–20%, resulting in fewer processing steps and reduced energy consumption per ton of output. Advanced process control systems offer 8%–12% reductions in yield losses while decreasing energy needed for remelting and rework. Oxygen injection and foamy slag practices can improve energy transfer efficiency by 10%–15% at costs of \$20–\$50/tCO₂e.⁴⁶ Implementation of predictive maintenance and real-time energy management systems presents additional opportunities to reduce unplanned downtime and optimize energy consumption across steel production processes.

Medium-term opportunities

Electrification at a steel facility using EAFs is a key decarbonization strategy because EAFs already operate on electricity rather than directly on coal. Additional emissions reductions of 40%–80% can be achieved by replacing residual natural gas burners (used in ladle heating or reheat furnaces) with electric alternatives and by increasing the share of power sourced through renewable power purchase agreements (PPAs). Partial electrification upgrades can be implemented within two to four years, with full transitions taking 6 to 10 years.

Long-term opportunities

Deep decarbonization of EAF steel production will ultimately require additional technology shifts. Hydrogen-based technologies for reheating furnaces could replace natural gas. Together with earlier interventions, these technologies can achieve approximately 90%–95% total emissions reduction by 2050. CCS retrofits targeting process emissions from electrodes and other carbon inputs can address residual emissions, capturing an additional 5%–10% of remaining CO₂. Although CCS is a more natural fit for decarbonizing blast furnace steelmaking, where emissions are high and concentrated, it can also support EAF-based facilities by capturing emissions from auxiliary fossil fuel use. Depending on the setup, CCS can

reduce emissions by 50%–90%, but it currently faces significant financial and technological challenges, particularly around high capital costs and underperformance in capturing the promised volumes of CO₂. Additionally, both hydrogen and CCS solutions will increase clean electricity demand by 11%–25%, requiring reliable, low-carbon power to deliver net climate benefits.⁴⁷ Overall, suggested decarbonization pathways could increase annual electricity demand by 683 GWh by 2050.

The long-term vision for green steel can also include integration into circular economy systems. Closed-loop resource networks integrating slag valorization, waste-heat utilization, and material flows between steel production and complementary industries could reduce primary resource demand by 25%–35%.⁴⁸ Advanced separation technologies for recovering alloying elements from EAF dust can preserve critical materials while reducing waste disposal requirements. Incorporation of alternative iron sources such as direct reduced iron produced with green hydrogen at other locations could further reduce the carbon footprint of the Washington facility by providing lower-carbon metallic inputs for the EAF process.

Implemented sequentially, these energy and material efficiency measures can achieve a 45% emissions reduction by 2035, preventing approximately 1.94 MtCO₂e between 2023 and 2034, and up to a 95% reduction by 2050 at a cumulative cost of \$0.49 billion. Abatement costs range from –\$25/tCO₂e for efficiency projects to approximately \$220–\$500/tCO₂e for hydrogen heating and CCUS retrofits.⁴⁹ Global steel demand is projected to grow at approximately 1.5% annually through 2035, underscoring the need for scalable, cost-effective decarbonization pathways that maintain the competitiveness of Washington’s steel production. Regional coordination will be needed to develop shared infrastructure such as hydrogen production facilities and potential CO₂ transportation networks.

Electronics

Washington’s electronics manufacturing industry consists of two high-volume facilities. These facilities produce semiconductors, printed-circuit substrates, and advanced assemblies, emitting approximately 0.12 MtCO₂e/year, representing roughly 1% of the state’s EITE emissions. Approximately 50% of emissions originate from electricity used for maintaining ultraclean environments and powering process equipment, while the remaining 50% comes from high global warming potential (GWP) perfluorocarbons (PFCs) utilized in etching and chamber-cleaning processes.⁵⁰

Near-term opportunities

Immediate decarbonization efforts should prioritize both PFC emissions reduction and energy efficiency. Installing specialized abatement units on etch and chemical-vapor-deposition tools can achieve 90%–95% PFC capture efficiency. Process optimization to minimize PFC usage without compromising production quality offers additional reductions.

Energy efficiency measures such as intelligent cleanroom management with real-time particle monitoring can optimize air-change rates, reducing unnecessary energy use. Upgrading heating, ventilation, and air-conditioning (HVAC) systems to variable-frequency drives, modernizing facility lighting with LED fixtures, and implementing waste-heat recovery from chillers and vacuum pumps can collectively reduce electricity-related emissions by 10%–15% at costs ranging from \$0 to \$30/tCO₂e with paybacks of one to three years.⁵¹

Medium-term opportunities

Further emissions reductions can be achieved through shifts in process chemistry and electrification strategies. Transitioning to lower-GWP alternatives such as hexafluorobutadiene (C₄F₆) or nitrogen trifluoride (NF₃) plasma can reduce PFC emissions by 20%–30%, while advanced process control systems optimize etching and cleaning cycles.⁵² Electrifying residual gas-fired equipment such as diffusion furnaces and reflow ovens during regular equipment replacement cycles, coupled with renewable PPAs and initial on-site solar installations, could provide additional emissions reductions of 40%–60%. Electrification capital costs are anticipated at around \$100–\$150/kilowatt, with abatement costs approximately \$90–\$150/tCO₂e. Digital twin modeling integrating real-time process data may optimize production efficiency, improving resource use by an additional 5%–8%.

Long-term opportunities

Deep decarbonization requires fundamental technological transformations, including fully PFC-free etching and cleaning processes like atomic-layer etching with inert precursors. Integration of medium-temperature heat pumps delivering 60°C–90°C water loops can replace conventional direct-resistance heating for solvent baths. A comprehensive transition to renewable energy procurement, along with expanded on-site solar-plus-storage systems, would support near-complete electrification.

Implementing carbon removal strategies to offset any residual hard-to-abate emissions further supports long-term carbon neutrality. Together, these long-term technologies can achieve total emissions reductions of approximately 80% by 2050 preventing cumulative emissions of 2.01 MtCO₂e. Introduction of these technologies is expected to increase annual electricity demand by 347 GWh by 2050 at a total cost of \$0.02 billion.

Implemented sequentially, these combined efficiency, electrification, and technological measures can achieve a 40% emissions reduction by 2035, with up to an 80% reduction in CO₂e by 2050.

The industry is projected to grow at approximately 4% annually through 2035, driven by rising demand for edge computing, vehicle electrification, and regional data center expansion.⁵³ As a result, both total energy use and emissions could increase without targeted interventions, underscoring the importance of proactive grid planning. Electrification of thermal processes and growing production throughput will contribute to both higher base and peak load requirements, increasing the urgency for grid modernization and resilient energy infrastructure.

Determining Allocation of No-Cost Allowances to EITEs Post-2034

The legal framework of Washington's Cap-and-Invest program is in the Revised Code of Washington (RCW), Chapter 70A.65 — Climate Commitment Act.⁵⁴ The portion of the CCA pertaining to allocation of allowances to EITEs, RCW 70A.65.110, currently does not specify the appropriate levels of no-cost allowances to be allocated to EITEs in compliance periods post-2034.⁵⁵ Specifying appropriate levels will require legislative action to amend that part of the CCA, and can be informed by the technically feasible decarbonization options available to industries that are identified in the Technical Pathways section of this report. Subsequently, portions of the Washington Administrative Code, Chapter 173-446 WAC — Cap-and-Invest Program, will need to be adapted.⁵⁶ Changes to allocation of no-cost allowances will also have to be aligned with the environmental justice requirements of the Healthy Environment for All (HEAL) Act, and the economic goals of the Building Economic Strength Through Manufacturing Act and Washington Clean Manufacturing Leadership Act to increase manufacturing employment.⁵⁷

For the Cap-and-Invest program to meet its objectives and continue functioning properly through the 2030s and 2040s, it is necessary to determine the levels of no-cost allowances allocated to EITEs post-2034. Failure to do so would eventually result in the number of no-cost allowances required to be allocated to EITEs exceeding the number of allowances available to the entire Cap-and-Invest program. While not exhaustive of all conceivable options, what follows are seven approaches to consider, presented in order of least to most favorable, and the recommended best approach.

Potential approaches

1. No change to law or regulation

The Washington legislature could choose not to change current law regarding EITEs and their allocation of no-cost allowances. This would almost certainly lead to violation of the CCA targets by 2050 if not 2040 due to continued emissions from industry and residual emissions from other sectors. Post-2034, but prior to violation of CCA targets, this also cedes control of the allowance market to EITEs in the late 2030s and 2040s because their no-cost allowances would constitute the majority of the overall allowances.

2. Exempt EITEs from Cap-and-Invest

Changing current law to exempt EITEs from compliance with the Cap-and-Invest program would avoid the issue of no-cost allowance allocations to EITEs ever exceeding the total number of allowances under the cap. However, it would remove the strongest existing incentive for EITEs to decarbonize. Exempting EITEs from compliance would also likely make it impossible for Washington to meet its economy-wide GHG targets due to a preponderance of emissions continuing from industry.

3. Issue more allowances in the 2040s

In the 2040s, Ecology could issue enough additional allowances to EITEs to avoid hitting the overall emissions cap. Issuing more allowances to EITEs sidesteps the issue of market implosion, but it undermines the purpose of the Cap-and-Invest program in helping Washington meet its economy-wide GHG targets. It also cedes effective control of the secondary allowance market to EITEs, forcing other regulated entities to purchase allowances from the EITEs to comply with their obligations.

4. Cease no-cost allowances after 2034

Ceasing no-cost allowances to EITEs after 2034 would mean that EITE firms would have to pay for all their allowances for compliance either at auction or through the secondary market. Although this would generate more revenue for the state through allowance auctions, it also may lead EITE firms to move out of state in the mid-2030s. Ceasing no-cost allowances after 2034 would also likely chill potential investment in decarbonization by EITE firms prior to 2035 due to an expectation of leaving Washington in the mid-2030s.

5. Shift to an economic value basis

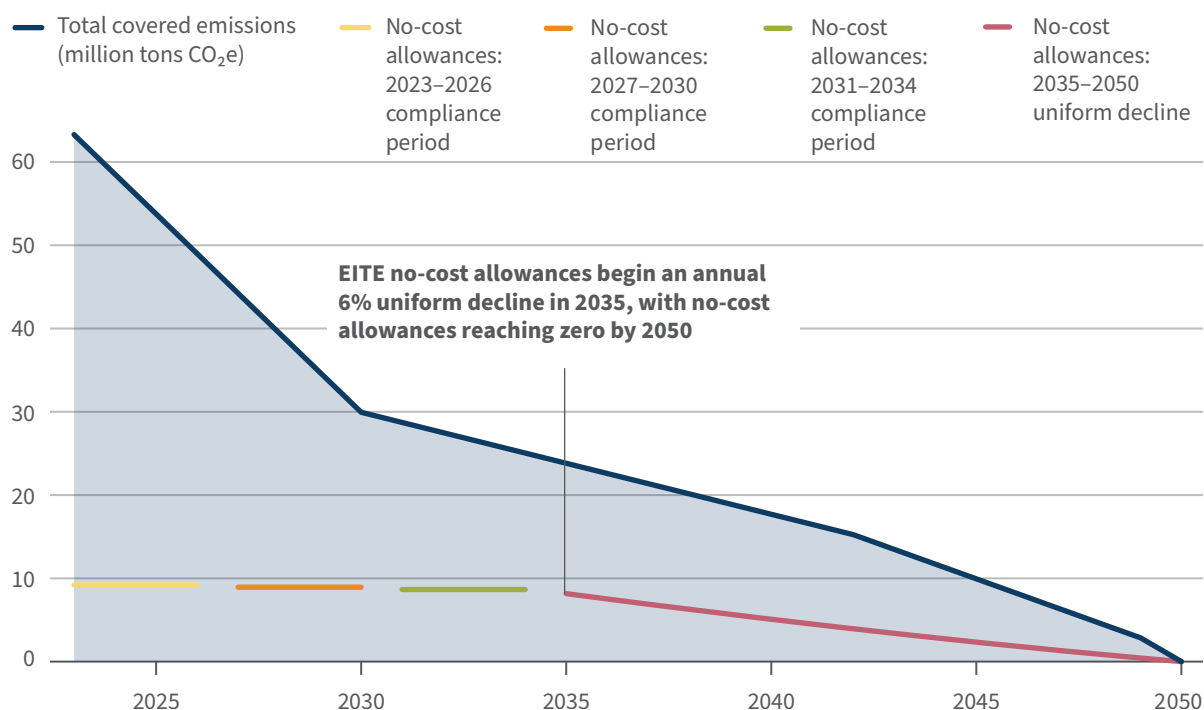
As part of Washington's 2021 State Energy Strategy, the Regional Economic Models Inc. (REMI) economic model was used to estimate the economic impact of Washington's 12 largest industrial sectors.⁵⁸ Although the REMI model's output categories do not map cleanly onto EITE subsector categories, it is similar enough to suggest that current allocations of no-cost allowances by EITE subsector do not have much of a relationship with that subsector's contribution to state gross domestic product (GDP). That is, relatively high emissions from an EITE subsector do not correspond with relatively high contribution to state GDP, and vice versa. More economic analysis would be required to estimate the GDP value of each EITE subsector, and then subsequently develop a tiered approach to allocation and reduction schedules based on economic value.

An economic value basis for allocating no-cost allowances would be a radical departure from the method used in the first, second, and third compliance periods. It would shift which industries most benefit from no-cost allowances and shift the amount of allowances each subsector would have to acquire at auction for compliance; in essence, different industrial winners and losers from the Cap-and-Invest program.

6. Apply a uniform reduction with the cap from 2035 onwards

This option would be similar to a request by Ecology to the legislature in 2021–22, proposed as HB 1682, which did not pass during that legislative session.⁵⁹ The reduction schedule for EITEs as a whole would be updated for years post-2034. In 2035, no-cost allowance allocations to EITEs would be 88% of the EITE's baseline (whether mass-based or carbon intensity-based). For each year 2035 through 2049, EITEs would be awarded no-cost allowances 6% below the percentage of no-cost allowances they were awarded during the preceding year. A visual representation of this scenario without defined multiyear compliance periods is included in Exhibit 7, although multiyear compliance periods would be maintained under this approach. This option would not differentiate between types of EITEs and their ability to decarbonize.

Exhibit 7 Projected annual emissions cap and EITE no-cost allowances with no change to EITE no-cost allowances post-2034



Note: Total annual Cap-and-Invest program allowance budgets through 2034 based on set total program budget allowance decreases relative to statutory total program baseline values for the 2023–2025 compliance period. EITE no-cost allowance figures exclude no-cost allowance allocations to electric and natural gas utilities.
RMI Graphic. Source: Washington Department of Ecology

One way the state could effectuate these declines is through the addition of a cap adjustment factor to the existing formula for the allocation of no-cost allowances. For California’s cap-and-trade program, for example, the regulation behind the program identifies a cap adjustment factor for industrial allowances calculated by a product-based method.⁶⁰ California’s factor decreases each year in proportion to overall annual allowance caps.

7. Set sector-specific benchmarking and reduction schedules

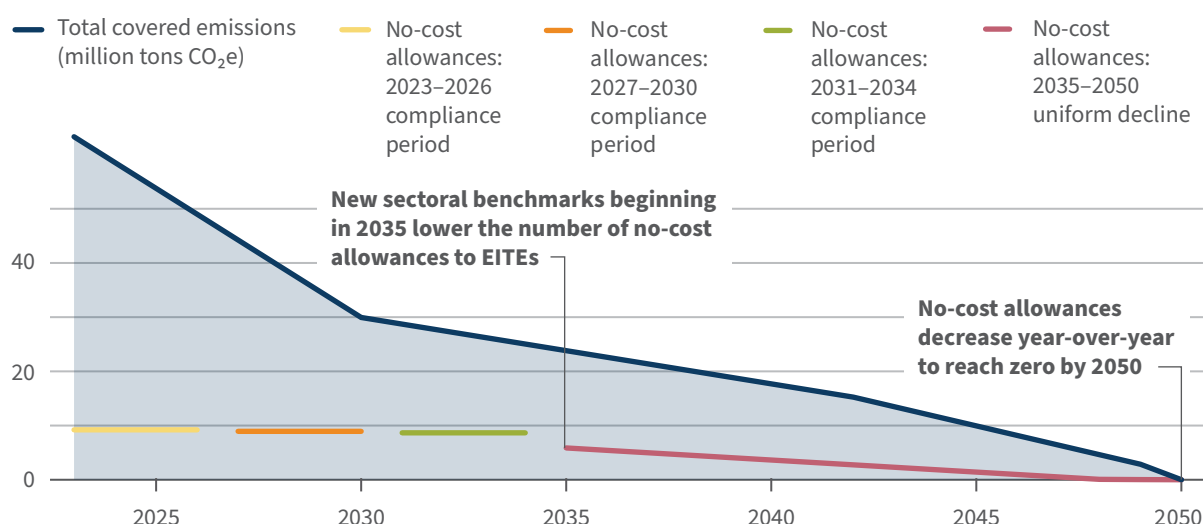
Recognizing variability in EITE’s pre-2035 technical ability to reduce emissions, this option would introduce sector-specific benchmarks that would serve as the starting point for the scheduled reduction of no-cost allowances beginning in 2035. Sector-specific benchmarks are based on the technical pathways detailed in the Technical Pathways section of this report. In each subsequent year, a cap adjustment factor, or new reduction schedule for each sector, would guide the allocation of no-cost allowances. This is necessary to prevent intersection with the overall cap in the late 2040s. Although the allocation of no-cost allowances would decrease each year, multiyear compliance periods would be maintained. Once quantitative analysis of leakage risk has been performed, it would also be appropriate to add an assistance factor to reflect sector-specific emissions leakage risk, similar to the assistance factor present in California’s program.

Exhibit 8 Sector-specific benchmarks and new no-cost allowance reduction schedule

Industrial subsector	Starting emissions levels baseline (tCO ₂ e) 2015–19 average	New 2035 subsector annual benchmark (annual tCO ₂ e)	Emissions-reduction ability by 2035 compared to baseline	Total emissions-reduction ability through 2050 compared to baseline	Annual reduction in no-cost allowances compared to 2035 benchmark	Final year of no-cost allowances
Refineries	6,411,617	4,103,435	36%	93%	7.7%	2047
Pulp and paper – total	6,903,598	3,831,497	44%	93%	N/A	N/A
Pulp and paper – non-biogenic	1,097,726	609,238	44%	93%	7.7%	2047
Cement	392,191	215,705	45%	90%	7.7%	2047
Glass	178,739	84,901	52%	90%	7.7%	2047
Food processing	743,420	446,052	40%	70%	6.7%	2049
Chemicals and hydrogen	292,702	158,791	46%	93%	7.7%	2047
Iron and steel	331,110	182,111	45%	90%	7.7%	2047
Electronics	147,639	68,652	54%	85%	7.1%	2048

Note: Aerospace and aluminum not included. RMI Graphic. Source: EPA FLIGHT data, RMI analysis

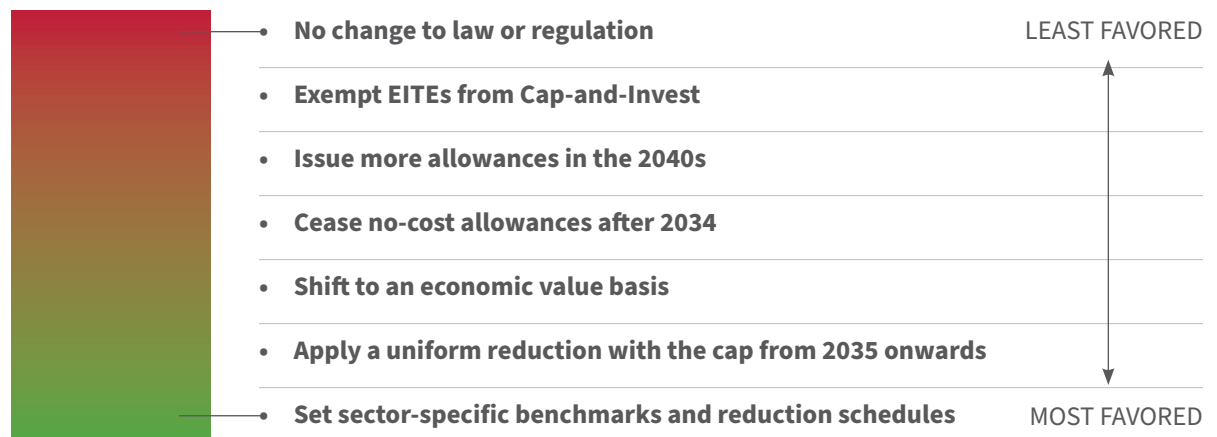
Exhibit 9 EITE no-cost allowances declines under scenario with updated sector-specific benchmarks post-2034



Total annual Cap-and-Invest program allowance budgets through 2050 based on set total program budget allowance decreases relative to statutory total program baseline values for the 2023–2026 compliance period through 2034. Excludes no-cost allowance allocations to electric and natural gas utilities. Updated 2035 emissions benchmark and 2035–2050 values based on RMI estimates and exclude aerospace and aluminum.

RMI Graphic. Source: Washington Department of Ecology, EPA FLIGHT, RMI estimates

Recommended approach for determining allocation of no-cost allowances to EITEs



We do not recommend changing the levels of no-cost allowances in the reduction schedule for the first (2023–2026), second (2027–2030), or third (2031–2034) compliance periods; stability in this key area of Cap-and-Invest policy is very important over the next decade so EITE firms can plan and budget accordingly.

At the beginning of the fourth compliance period (2035), we recommend implementing the **sector-specific benchmarking and reduction** approach. The approach would use sector-specific benchmarks that account for the existing and near-term technical opportunities for decarbonization in each sector available during the first, second, and third compliance periods. This is important for:

- Setting expectations over the next decade for industries to proactively decarbonize while the majority of their compliance needs are being met by no-cost allowances
- Avoiding a windfall of excess value being transferred to EITEs in the late 2030s and 2040s in the form of no-cost allowances that significantly exceed what is needed for an EITE firm’s compliance, as could happen in the uniform reduction with cap approach.

From the sector-specific benchmarks, applying a cap adjustment factor or new sector-specific reduction schedules to the allocation equation will be necessary so that the number of no-cost allowances steadily declines from 2035 through 2050. This would be similar to California’s method for calculating allocation of no-cost allowances to industry. A cap adjustment factor or new sector-specific reduction schedules ensure that no-cost allowances to EITEs do not exceed the total number of allowances under the cap, and also that no-cost allowances from EITEs do not come to dominate the allowance market. Once quantitative analysis of leakage risk has been performed, it would also be appropriate to add an assistance factor to reflect sector-specific emissions leakage risk.

This approach supports EITE industries by continuing a moderate amount of no-cost allowances while also establishing a long-term pathway for EITE industries to take emissions-reducing actions. Alternative approaches — such as complete discontinuation of no-cost allowances post-2034, treating EITE sectors uniformly and without regard to progress that can be made in the first three compliance periods, full continuation of no-cost allowances at the third compliance period levels, or raising the cap levels to create more allowances — are too extreme to support the dual objectives of supporting EITE industries while also reducing statewide GHG emissions.

Opportunities for Near-Term Investments

Resources to implement the technical pathways in each industrial subsector will come from a variety of sources, both new and existing. The largest and likely most crucial source of funding for industrial decarbonization measures will be revenue for EITEs from the reselling of no-cost allowances on the secondary market. As EITEs make their processes more efficient and invest in technologies to reduce emissions, they will need fewer allowances for compliance than they receive at no cost based on their 2015–2019 baseline. These excess allowances can then be sold to other entities on the secondary market and the revenue used to finance additional emissions-reduction equipment. This market-based mechanism is a key feature of cap-and-trade and cap-and-invest programs. When the Washington legislature decided to allocate no-cost allowances to EITEs, it was a decision to give those industries something with market value, not just value as a compliance instrument or permit. Each EITE firm can decide if its no-cost allowances are more valuable to submit for compliance, or for selling and then investing the revenue in emissions reduction.

RMI maintains the Decarbonizing Industry Resource Tool (DIRT) to help project developers, industrial companies, and investors discover the state and federal financial incentives that may be applicable to their heavy industry projects.^{xi} Changes to federal law and policy — such as the Infrastructure Investment and Jobs Act, the CHIPS and Science Act, and the Inflation Reduction Act — were made after passage of Washington’s CCA and have significantly expanded the opportunities for industrial decarbonization. Key tax credits include 45V for clean hydrogen production (up to \$3/kg), 45Q for carbon capture (\$12–\$36/t), 45X for manufacturing clean energy components, and 45Z for clean fuel production (up to \$1.75/gallon). While not directly targeting industrial emissions, clean electricity tax credits (production tax credits [PTCs] and investment tax credits [ITCs]) can support electrification strategies. Federal grants include the 48C Advanced Energy Project Credit and DOE’s Industrial Demonstration Program for hard-to-abate sectors. Loan support is available through DOE’s Title 17 Clean Energy Financing Program and State Energy Financing Institution loans as well as the Energy Infrastructure Reinvestment Program, which supports emissions reductions or repurposing of shuttered energy infrastructure, with loan authority available through September 2026. However, federal tax credits, grants, and loan programs may be subject to rollback under the current administration.

Complementing federal programs, Washington offers its own Hard-to-Decarbonize Sector Grants. Administered by the Washington Department of Commerce, these grants fund projects targeting sectors like iron, steel, aluminum, cement, concrete, glass, pulp and paper, food and beverage, wood and building products, aerospace, electronics, chemicals, and heavy-duty transportation. Grant recipients must demonstrate an ability to achieve significant emissions reductions in Washington by or before 2030. The most recent funding round awarded \$20 million, with additional rounds anticipated.

Existing opportunities, especially given likely upcoming changes to federal policy that remove or diminish incentives, will not be sufficient to ensure effective decarbonization of Washington’s industrial sector. In the next section, we detail options for complementing, augmenting, and/or improving Washington’s Cap-and-Invest program and the state’s broader approach to supporting industrial decarbonization.

^{xi} The DIRT tool can be found at <https://rmi.org/decarbonizing-industry-resource-tool-dirt/>.

New Policy Opportunities

The transition to a low-carbon industrial economy in Washington requires not only technical advancements but also the strategic alignment of policies to catalyze decarbonization efforts, including the technical pathways contained in this report. There are a host of actions Washington can take to support demand-pull, supply-push, and input investments that would enable, encourage, or accelerate local industrial decarbonization by reducing costs, increasing value, or otherwise easing the path toward reduced GHG output. Notably, these actions are in addition to legislating the post-2034 EITE no-cost allocation pathway. Furthermore, while these policy opportunities are not directly centered around carbon leakage risks, policies supporting industrial decarbonization efforts will help limit the risk of industries ceasing business in Washington in favor of operations in states with less stringent emissions rules or carbon markets.

This section identifies three categories of policy opportunities designed to expand the scope and effectiveness of the CCA, including the Cap-and-Invest program:



Updating standards and regulations refers to potential changes to state decision-making processes and rules, standards, or regulations governing issues relevant to industrial decarbonization.



Cap-and-Invest program evolution and EITE treatment refers to actions affecting the future of compliance pathways and allowance allocations for EITE industries.



State support refers to financial mechanisms Washington could leverage to aid industrial decarbonization.

The mix of policy opportunities pursued in concert acknowledges that different kinds and sizes of EITEs need different kinds of support to decarbonize, such as grants, loans, technical assistance (TA), and regulatory reform.

Policies contained within these three categories are further divided into the following categories:



Essential changes are those fundamentally necessary to enable technical decarbonization measures to be implemented.



Recommended changes are those highly likely to enable implementation of the technical measures and realistically achieve emissions-reduction targets.



Changes worth consideration are policy opportunities likely to improve the pace of Washington's industrial decarbonization, but that require additional study to effectively implement in Washington.

Exhibit 10 New policy opportunities

	Updating Standards and Regulations	Cap-and-Invest Program Evolution + EITE Treatment	State Support
 Essential	Expedite electrical grid enhancements for industrial electrification		
	Accelerate permitting procedures for critical decarbonization projects		
 Recommended	Reform industrial electricity tariffs and ratemaking	Consign EITE no-cost allowances at auction	Set up an industrially focused green bank
	Update existing rules on oil refineries	Require additional criteria to qualify as an EITE	Increase funding for the Hard-to-Decarbonize Sector Grants Program
 Worth Consideration	Introduce a clean heat standard	Allow opt-in EITE entities to receive no-cost allowances	Augment technical assistance planning grants for decarbonization
	Expand methane regulations	Develop additional offset protocols	Strengthen state procurement requirements
			Introduce tax credits for emissions-reducing equipment
			Introduce tax credits for clean manufacturing production
			Invest in common carrier infrastructure for the transportation of green hydrogen
			Incentivize transitions of refineries to other functions

RMI Graphic

These policy pathways not only support the uptake of emissions-reducing technologies to maintain and grow the state's heavy industry, they can also aid in efforts to reduce local air pollutants in accordance with state legislation like the HEAL Act.

Essential changes

Expedite electrical grid enhancements for industrial electrification



More clean electricity supply must be built out to support additional loads from industrial decarbonization — estimated at an additional 7,567 GWh annually by 2030 and an additional 13,975 GWh annually by 2050. This is in addition to increased supply needed to meet increasing electricity demand from data centers, transportation electrification, and building electrification. Advancing electrical grid reliability, capacity, and affordability improvements outside of adding additional generation capacity can facilitate easier access to the electricity needed for industrial electrification. It can also potentially reduce financial and logistical barriers to transitions from fossil fuel-based processes to electric alternatives.⁶¹

Recent state legislative efforts attempt to address some of these issues, including a proposal with direct references to reconductoring and one focused on grid transmission needs.⁶²

Financial assistance is another avenue to support grid enhancements. The Washington Department of Commerce announced on April 8, 2025, that it is awarding \$23 million in grants, in part funded through the CCA, to multiple projects advancing grid strength, reliability, and preparedness.⁶³

Accelerate permitting procedures for critical decarbonization projects



Efficient and effective permitting and siting of industrial locations is a crucial element to facilitate the energy transition, and is often cited by developers as one of the greatest barriers to new projects. Washington has taken some crucial steps in the past few years to address these barriers. In November 2022, the Washington State Departments of Ecology and Commerce, in response to a directive by the state legislature, released a comprehensive report with recommendations for improving the siting and permitting processes for industrial clean energy facilities.⁶⁴ This report identified four key issues and issued 73 recommendations across eight strategies to resolve them.

The state legislature subsequently passed HB 1216 in 2023, which aimed to improve the permitting and siting process for large-scale industrial, utility, and energy infrastructure projects. HB 1216 fully addresses 20 recommendations from the report, partially addresses 26 recommendations, and leaves 27 recommendations to future work.⁶⁵ *Appendix G, Exhibit G1* shows each recommendation from the report and where and how it has been addressed by HB 1216 (if it has been addressed).

Among other things, HB 1216 requires Ecology to create a fully coordinated permitting process, which offers project developers a single point of contact and a unified timeline for project permitting. It also requires Ecology to develop a consolidated permit application system and nonproject environmental impact statements for green hydrogen, wind, and solar projects, which will be due by June 30, 2025. Additionally, Washington State University must complete a pumped storage siting study by June 30, 2025. Many of the

impacts of this bill cannot be interpreted yet because the deadlines for action are either still too recent or have not yet passed.

HB 1216 represents a strong first step toward improving the permitting and siting process for clean industrial projects in Washington, addressing many of the most important recommendations from the legislature's 2022 report. However, additional action will be necessary to fully support an industrial green transition at the scale and speed required. After the current reforms are fully implemented and evaluated — particularly following the key deadlines in June 2025 — the legislature should prioritize addressing the remaining recommendations outlined by the Departments of Ecology and Commerce. These unaddressed recommendations, detailed in *Appendix G, Exhibit G1*, represent critical opportunities to further streamline permitting, enhance community engagement, and strengthen environmental protections.

Recommended changes

Reform industrial electricity tariffs and ratemaking



High electricity costs and limited electricity capacity inhibit industrial electrification, a key pillar of economic industrial decarbonization. Developing industrial electricity utility tariff structures to help confront these barriers and facilitate electrification can aid heavy industries in decarbonizing.

While large-load tariffs can vary widely by jurisdiction and have multiple structures, they have grown in popularity as a flexible tool for bringing new load onto the grid quickly without risking ratepayer protections. Furthermore, utilities accommodating increased electrification-related loads must balance costs to existing ratepayers without jeopardizing progress on clean energy goals. Differentiated large-load tariff rates may aid industries to decarbonize while insulating other customers from infrastructure costs. One example of such a structure can be found in Washington's Grant County Public Utility District's "evolving industries" rate class, which covers industries meeting certain criteria rather than identifying specific users.⁶⁶ In Ohio, meanwhile, a proposed tariff structure applies a new tariff to data centers while excluding electrified manufacturing facilities and residential consumers, ensuring that costs incurred from bringing these new loads onto the grid are properly allocated to the large-load customers,⁶⁷ insulating existing customers from large load-related infrastructure improvements.

Other changes related to Washington's broader electricity ratemaking structure may also help with industrial decarbonization.

For example, Washington's existing electricity ratemaking process is governed by the Utilities and Transportation Commission (UTC), which is currently engaged in a five-year review process over how it regulates utilities as part of a 2021 law.⁶⁸

While a traditional cost-of-service ratemaking process, which calculates rates based on actual utility investments, remains a significant component of the regulatory landscape, the UTC will also evaluate performance-based ratemaking (PBR) and provide guidance on its use. PBR differs from traditional cost-of-service structures in that it compensates utilities for their performance rather than for additional electricity sales or infrastructure investments, potentially allowing for the alignment of a utility's profit motives with broader goals like decarbonization or a cleaner grid.⁶⁹

Additionally, incentivizing the purchase of renewable energy certificates (RECs) or facilitating power purchase agreements for industrial customers can promote the use of clean energy. By offering supports like subsidies or tax incentives for these purchases, the state can promote cleaner electricity use by heavy industry. This can be especially true if those supports are structured to encourage industries to align their energy consumption with periods of high renewable energy availability, including via access to wholesale electricity market prices that incentivize low-cost, optimally timed charges and power injections for certain decarbonization technologies like thermal batteries.⁷⁰

Utah's recent legislation SB 0132, which provides a framework for large-scale electrical service requests and exempts them from certain rate regulations, could serve as a legislative example that could be coupled with demand flexibility programs, including those related to heat-as-a-service (a model where customers pay for the heat they use rather than the energy required to generate it).⁷¹ Additionally, programs like Duke Energy's Green Source Advantage can provide large business customers with flexible options to secure renewable energy.⁷²

Update existing rules on oil refineries



As a result of a 2011 court case, *Washington Environmental Council v. Sturdevant*, Washington has an existing regulation to maintain above-average energy efficiency or reduce GHG emissions from oil refineries 10% from 2010 levels by 2025.⁷³ With the target broadly achieved and deadline expiring, Ecology may wish to update the regulation in accordance with the court's decision and the 2030, 2040, and 2050 economy-wide targets. Further, strengthened standards would complement the existing incentives embedded in the Cap-and-Invest program and other new policies described in this report to ensure economy-wide targets are met.

As described in this report and in RMI's *Oil Refinery Emissions Cut Points* report, research suggests that utilizing the reasonably available control technologies would enable greater emissions reductions than current operations.⁷⁴ Analysis indicates that requiring 10% reduction in absolute operational (Scope 1 and 2) GHGs by 2030, 20% reduction by 2035, and 30% reduction by 2040 versus the 2015–19 average baseline is achievable and in alignment with Washington's GHG targets — similar to timelines suggested as feasible by the Oil and Gas Climate Initiative's *Powering Up: Pathways to Decarbonize Refining* report.⁷⁵

Consign EITE no-cost allowances beginning in the third compliance period (2031–34)



Rather than Ecology putting no-cost allowances directly into EITE accounts, it could sell the allowances at auction and give the EITEs the revenue. EITEs would then be free to use the revenue to invest in emissions-reducing equipment or purchase allowances for compliance at auction or the secondary market. Washington already requires some no-cost allowances for electric and natural gas utilities to be consigned for auction.⁷⁶ Consigning no-cost EITE allowances would increase transparency inside EITE firms, aid price discovery, and increase liquidity in the market. Beginning consignment of EITE no-cost allowances in the third compliance period (2031) provides enough lead time for EITEs and Ecology to adapt and plan accordingly. Consigning allowances would not change the percentage levels of no-cost allowances in EITEs' reduction schedule.

Require additional criteria to qualify as an EITE



Recognizing the amount of value in the form of no-cost allowances allocated to EITEs, the current EITE criteria could be strengthened to ensure they are taking measures to reduce emissions, complement other state efforts at decarbonization (e.g., the Clean Energy Transformation Act, Buy Clean and Buy Fair), and effectively prepare for a zero-carbon future.⁷⁷ Additional criteria to maintain EITE qualification could include:

- Sites must submit to Ecology a decarbonization plan by the beginning of the third compliance period (2031) describing measures already taken to reduce emissions and near-, middle-, and long-term measures planned to achieve near-zero emissions by 2050.
- Sites must use 100% of imported power from clean sources via PPAs or RECs matched monthly by 2030. More rigorous recommendations to be implemented by 2034 could include increased temporal and deliverability reporting requirements (hourly matching), use of contracts for power purchasing longer than five years, and using project-based GHG accounting to determine avoided emissions.
- Sites must prove natural gas is purchased with an upstream leak rate less than 0.2% by 2028 through independent certification of suppliers.
- Sites must show that the percent of total energy use from electricity, over a rolling four-year average, is rising every year at least 0.1%.
- Sites must prove that emissions intensity of products on a cradle-to-grave basis are better than the global average over the last four-year average.
- The industry sector must show that the total sales of fossil fuel–based products (primarily combusted in power, transport, or buildings), over a four-year average, is falling every year at least 0.1%, as expressed in million British thermal units. This incentivizes a pathway-agnostic method that could include bio-based products, end-use efficiency, and/or end-use electrification.

Set up an industrially focused green bank



A state-chartered green bank, a form of state energy financing institution focused on industrial decarbonization, could speed up emissions reductions at EITE facilities by providing financial services such as low-interest loans.⁷⁸ A green bank's core goal is to mobilize private capital by sharing risks and enabling projects that would not otherwise move forward, similar to Washington's experience with its revolving loan fund grants within the Clean Energy Fund.⁷⁹ States like California and Minnesota with similarly strong climate pollution targets have public financial institutions — the California Infrastructure and Economic Development Bank and the Minnesota Climate Innovation Finance Authority — that can assist industrial decarbonization projects.^{xii}

Green bank loans are distinct because they fill financing gaps that private markets typically avoid (i.e., they are “additional”). For example, green banks can accept lower returns or take on higher risk (e.g., taking a junior position in the capital stack) to help attract more risk-averse private investors. Green banks can also provide loan guarantees and credit enhancements.

^{xii} For more information on California's public financial institution, see <https://www.ibank.ca.gov/climate-financing/our-products/>. For more information on Minnesota's public financial institution, see <https://mn.gov/commerce/energy/consumer/energy-programs/climate-innovation.jsp>.

A one-time infusion of funds from Cap-and-Invest auction revenue — preliminarily estimated at \$100 million to \$200 million — can serve as startup capital for an industrially focused green bank. Services from an industrial green bank to EITEs would also strengthen the competitiveness of Washington-based industries, help stave off economic leakage, and attract new industries with decarbonization plans, strengthening the state’s position as a hub for clean manufacturing. Green banks can take years to establish and it would be prudent for Washington to initiate and capitalize an industrially focused green bank by the late 2020s while auction proceeds are projected to be relatively high rather than in subsequent decades, when auction revenues will likely be lower.

In addition to new state legislation to charter and capitalize an industrially focused green bank, the bank will need to be structured in a way that clearly shows it will fulfill the public’s interest in reducing pollution to not violate Washington’s “Gift of Public Funds” doctrine.⁸⁰

Increase funding and focus for the Hard-to-Decarbonize Sector Grants Program



The existing Hard-to-Decarbonize Sector Grants Program provided \$20 million in grants in 2024, but the funding levels are too low for major industrial decarbonization projects.⁸¹ Some EITEs, particularly smaller companies, lack the funds to invest in new technologies to reduce emissions. In addition, grants are important for kick-starting and attracting other sources of funding and financing, so increased funding for the grants program would have a multiplicative effect. In addition to increased funding, options to improve the grants program could include limiting grants to EITEs and smaller facilities that otherwise meet the requirements to qualify as an EITE, segmenting grants by industrial subsector to give all kinds of EITEs a chance for funding, funding the highest-impact projects designed to achieve reductions by 2034, or focusing on efficiency and electrification capital expenditures that reduce reliance on fossil fuels.

To improve its existing grant program, Washington can take cues from other states that offer a similar grant program such as:

- **Narrowing the scope of awardees:** Colorado’s Clean Air Program grants are administered by the Colorado Energy Office to encourage facilities to adopt emissions-reducing technologies. The grant program is similar in size to Washington’s, with \$25 million available in funding; however, the program is smaller in scope and the state has focused on awarding funds to its heaviest-emitting facilities. A total of \$5.6 million of the \$7.1 million awarded to date fund projects to decarbonize a facility on the state’s list of 18 priority facilities.⁸² Washington can consider narrowing its scope to EITEs in its Hard-to-Decarbonize Grant Program.
- **Decreasing matching requirements for smaller manufacturers and create applicant “tracks”:** Reducing Industrial Sector Emissions in Pennsylvania (RISE-PA) is a \$400 million grant program funded by the DOE’s Climate Pollution Reduction Grant to encourage industrial decarbonization in Pennsylvania.⁸³ Applicants follow different tracks, applying to small-, medium-, and large-scale program tracks. Washington can consider a similar tracked approach and decrease matching requirements for smaller facilities.
- **Awarding fewer grants with higher dollar amounts:** California’s Industrial Decarbonization and Improvements to Grid Operation program is a competitive grants program with \$46 million in funding for manufacturers and grid operators pursuing emissions reductions.⁸⁴ The minimum award is \$4 million, highlighting that California’s energy office is interested in funding fewer larger projects. Like California, Washington could focus on awarding larger dollar amount grants with higher emissions-reduction potential in EITE facilities.

Changes worth consideration

Introduce a clean heat standard



A clean heat standard (CHS) sets an emissions performance standard for industrial heat sources.⁸⁵ The policy seeks to reduce and regulate emissions from conventional fossil fuels, including natural gas, heating oil, and propane.

A CHS is analogous to renewable portfolio standards or energy efficiency resource standards. It imposes an obligation on market actors that is met by a bottom-up tallying of individual measures.⁸⁶ More specifically, it requires electricity, gas, heating oil, and propane suppliers to increase the uptake of low-emissions heat.

Low-emissions heat can be delivered by a variety of sources, such as renewable electricity, low-carbon hydrogen, and solar thermal. Other measures to achieve the CHS include installing heat pumps and energy-efficient equipment. To date, Massachusetts and Colorado have enacted CHS policies.⁸⁷

In Washington, a CHS can incentivize electrification, energy efficiency, and fuel switching at EITE facilities. It can also encourage a transition among the most polluting industrial activities. For example, a CHS could move refined petroleum and coke production away from cokers and visbreakers, which use high heat, to noncombusted products.

Expand methane and full life-cycle emissions regulations



Methane regulations can mitigate upstream emissions from the electricity sector, the production of chemicals, refined petroleum, and coke, and other manufactured goods relying on natural gas. There is an increasing focus on understanding and regulating emissions associated with upstream and midstream natural gas. Under the EU methane regulations, all imported oil and gas will be required to meet a methane intensity standard by 2030.⁸⁸ And, beginning in 2025, all importers must provide detailed reporting on upstream methane emissions. If Washington wanted to better understand the upstream and midstream emissions associated with the natural gas consumed within the state, it could establish robust, measurement-based reporting requirements covering these emissions. As more information is understood about these emissions, Washington could also choose to impose standards on what natural gas can be consumed within the state.

Other states are beginning to consider how to design upstream reporting requirements. That includes Colorado, with its oil and gas GHG intensity program; California, where the Air Resources Board is working on implementing regulations under California's Climate Disclosure Laws; and New York, where the State Department of Environmental Conservation recently released its proposed Mandatory GHG Reporting Rule.⁸⁹ Meanwhile, industry leaders are working with an array of independent third parties that help them report on their emissions in a verifiable and trustworthy way. Examples include OGMP 2.0, the gas reporting and mitigation program of the UN Environment Programme, and MiQ, a not-for-profit that works with industry to certify methane emissions emitted from upstream and midstream operations⁹⁰. In light of the data that Washington already collects from the natural gas industry, it would be well positioned to implement similar regulations.⁹¹

Similarly, Washington could strengthen its monitoring and control requirements for municipal solid waste landfills to better characterize — and minimize — the fugitive methane emissions associated with

biomethane used within the state. In 2024, Ecology adopted new rules to curb landfill methane pollution, and in 2025, it awarded \$9.6 million to 13 landfills to support compliance.⁹² To build from these efforts and ensure that landfill gas collection and control strategies are working effectively, Washington could expand its methane monitoring efforts, leveraging readily available remote sensing technologies to detect, quantify, and address landfill methane leaks as they arise.⁹³ Direct measurement data could be used to develop a more accurate GHG inventory, guide and assess mitigation efforts, and inform future improvements to landfill methane regulations. Colorado and California are both pursuing remote sensing programs in the waste sector (notifying operators when large plumes are detected and requiring correct action), and New York is considering a direct measurement approach for landfills under its new GHG reporting framework.⁹⁴

Allow facilities emitting less than 25,000 tCO₂e per year that otherwise meet EITE criteria to opt-in to the Cap-and-Invest program and receive no-cost allowances



Industrial facilities in Washington that emit more than 25,000 t of GHG per year are required to comply with the Cap-and-Invest program. Industrial facilities that emit at least 10,000 t of GHGs per year are required to report their emissions to Ecology as part of the state's mandatory GHG reporting program but are not regulated entities under Cap-and-Invest.⁹⁵

Most direct emissions from facilities of this range come from the on-site combustion of methane gas, which are “covered” by the Cap-and-Invest program upstream of the point of combustion through the compliance obligation on natural gas suppliers. Natural gas suppliers pass on the cost of compliance with Cap-and-Invest down to their customers, of which industrial facilities are a subset.

Shifting the compliance burden downstream to opt-in facilities would allow those facilities more flexibility in how they reduce emissions. Compliance shifting to these opt-in facilities would mean they avoid the CCA fees coming from their natural gas suppliers but then would have to manage their own compliance. To ensure the number of no-cost allowances was not increased, and to avoid any double counting, no-cost allowances for opt-in facilities would be subtracted from the amount previously allocated to their natural gas supplier.

Develop additional offset protocols



Offsets are alternative compliance instruments within the Cap-and-Invest program. Emitters are limited in the percentage of offset credits they are allowed to use for compliance, and they must follow a specified protocol to qualify. Washington has four different protocols for offset projects: reforestation, avoided conversion, and improved management on US forest lands; planting trees in urban areas; capturing livestock methane; and destruction of ozone-depleting substances.⁹⁶

Washington could develop one or more additional offset protocols for other types of high-quality CDR that apply to emissions not covered by the Cap-and-Invest program. CDR is defined by the Intergovernmental Panel on Climate Change as “anthropogenic activities removing carbon dioxide from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products.”⁹⁷

Washington already acknowledges the need for “negative emissions” to meet its climate targets, and identifies practices that increase carbon sequestration on natural and working lands, and storage of carbon

in products.⁹⁸ These include practices with existing offset protocols such as afforestation, reforestation, and improved land management. There are dozens of different approaches to removing carbon dioxide from the atmosphere, many of which Washington is poised to deploy in-state.⁹⁹ The State CDR Atlas from RMI highlights the availability of plentiful biomass residue, which can be converted into inert stores of carbon (e.g., through biochar or bio-oil) and stored, as one of several potential pathways.¹⁰⁰ Geochemical approaches to CDR, which use reactive rock to mineralize carbon dioxide out of the atmosphere, are also very promising given Washington's favorable geology, particularly in the eastern part of the state.

Washington's pulp and paper industry may also present an opportunity for CDR deployment, as noted in the study *Toward a Net Zero Future in the Forest Products Industry*.¹⁰¹ Currently, carbon dioxide emissions from biogenic sources are not covered by the Cap-and-Invest program. The vast majority of GHG emissions from the pulp and paper sector are from biogenic sources and so the sector lacks a strong incentive to reduce those emissions. An offset protocol that incentivizes point-source capture of CO₂ from pulp and paper mills for geologic sequestration would economically encourage the installation of CCS technology at pulp and paper and forest products facilities.

This list is not exhaustive, but in 2024, the state legislature commissioned a study of the potential for deploying CDR in the state as a tool for meeting climate targets and for economic development purposes. This study is expected to be released in summer 2025.

Augment technical assistance planning grants for decarbonization



Government-funded technical assistance (TA) can assist EITE facilities in planning for and executing a low-carbon transition. TA involves educating potential adopters on the benefits of complex technology as well as instruction on implementing technologies. It connects academics, consortia, and government experts with industry players. To that end, TA can assist in overcoming financial barriers to completing technical interventions due to their significant costs, and it is most valuable to facilities that are limited in personnel and experience.

Currently, Washington has two avenues for facilities to seek TA. First, the Northwest Onsite Energy Technical Assistance Program, funded by the DOE and headquartered at Washington State University, provides no-cost TA to industrial facilities considering on-site energy projects. This includes TA for battery storage, combined heat and power, industrial heat pumps, and fuel cells, among other projects.¹⁰² Second, Ecology offers free TA to select small and medium-sized manufacturing and industrial plants. A sampling of the consulting team's services includes energy efficiency, lean manufacturing assistance, and solid waste reduction.¹⁰³

The existing scope of current TA offerings leaves a gap in baseline knowledge needed for long-term transition planning. Decarbonization is a broad and daunting challenge for private sector actors.¹⁰⁴ Current offerings in Washington could be augmented, or new ones could be introduced, to provide more holistic support for EITE facilities that extend beyond energy efficiency. TA planning grants could be expanded for development of facility-level climate and resilience plans.

As an example, the National Renewable Energy Lab, in partnership with DOE, is executing the Advanced Energy and Manufacturing and Recycling Grants Program, which supports small and mid-sized manufacturers. The grant program awards can be used for feasibility analyses and planning, regulatory support, stakeholder identification and engagement, and other activities.¹⁰⁵

Leverage state procurement to encourage low-carbon manufacturing



Robust “Buy Clean” procurement requirements that set clear standards for the carbon intensity of products can help leverage the purchasing power of the government to create a consistent market for clean, locally produced products.¹⁰⁶

Washington signed its existing Buy Clean and Buy Fair act into law in 2024. The law requires state agencies and higher education institutions to report on the environmental impacts of select concrete, wood, and steel materials used in the construction or renovation of large state-owned buildings, but does not require covered materials purchased by state institutions to meet minimum environmental thresholds.¹⁰⁷ In 2022, the state government spent approximately \$2.2 billion in capital outlay on construction, according to US Census Bureau data.¹⁰⁸

Establishing a comprehensive clean material procurement requirement could aid in decarbonizing Washington’s heavy industries, including some EITs. California, for example, has a Buy Clean California Act requiring state agencies to publish the maximum acceptable GWP limit for four eligible construction materials and mandating that those materials used in public works projects not exceed established GWP limits.¹⁰⁹ A similar bill was introduced in Washington’s 2022 session.¹¹⁰ Other states, like Oregon and Colorado, have laws that include language more specifically targeting procurement by select agencies like transportation departments.¹¹¹

Furthermore, by establishing and extending a clean procurement requirement to additional construction materials like asphalt, Washington could incentivize additional sectors to innovate and invest in cleaner production technologies, thereby reducing overall emissions associated with construction materials.

Introduce state-level tax credits for emissions-reducing equipment.



State-level tax credits for industrial decarbonization can ease the cost differential between legacy fossil equipment and lower-carbon-intensity and electrified equipment. Cost is the major determinant of whether a facility adopts new technologies, and currently electrified process heating sources for manufacturing make financial sense in only a handful of applications, typically in lower-temperature processes with lower heat duties.

A state industrial decarbonization credit can help cover that difference and make the financial case for a wider range of applications.

The federal version of this tax credit, 48C, was heavily oversubscribed, with applications in the first round totaling \$42 billion worth of projects — over 10 times the available funding.¹¹² This highlights that many firms are ambitious enough to adopt new, clean technologies if there is an additional incentive to do so. Two Washington-based firms succeeded in obtaining 48C funding.¹¹³

Colorado is an example of a state that has adopted its own version of 48C, called the Colorado Industrial Tax Credit Offering (CITCO).

CITCO is a competitively awarded, refundable tax credit with \$168 million of funding through 2032. CITCO is offered to all manufacturers including Greenhouse Gas Emissions and Energy Management for Manufacturing (GEMM) 1 and 2 rule regulated facilities, a program that mandates emissions reductions for

high-emitting facilities in Colorado's industrial sector specifically.¹¹⁴ Colorado therefore offers both a carrot and a stick for industrial decarbonization, by first mandating emissions reductions, and then rewarding first movers by subsidizing their associated compliance costs. CITCO covers a whole host of decarbonization projects, from purchasing electric equipment like heat pumps, to conducting industrial studies, to adding economizers and waste-heat recovery mechanisms to existing machinery.

In Washington's case, the state can pursue either a discretionary or a statutory tax credit for industrial decarbonization projects.

Both 48C and CITCO are discretionary, refundable tax credits and involve administrative capacity to review and approve industrial decarbonization projects. By going this route, Washington can ensure it is awarding projects that align with predetermined state criteria, but would need to dedicate staff time to the administration of credits and review periods.

Alternatively, Washington could offer a statutory, capped tax credit to be credited against the business and occupation tax. This statutory tax credit would require a more limited and clearly defined scope of projects. For example, the state could offer credit for manufacturers of a certain size, and only for adoption of certain technologies like heat pumps, e-boilers, and clean-fuel-compatible equipment. This would ease the application process for both manufacturers and state personnel but would require the legislature and the state revenue department to promulgate clear regulations to prevent the offering being co-opted for applications that do not meet emissions-reduction goals.

Introduce state-level tax credits for clean manufacturing production



A clean manufacturing production tax credit is a fiscal incentive that can help producers of high-emitting products switch to cleaner modes of production. Unlike an investment tax credit for emissions-reducing equipment, a clean manufacturing production tax credit would be claimed by a business year after year and help cover higher operating costs associated with less-carbon-intense production methods. Washington can encourage high-emitting industries like steel and cement to decarbonize by providing a production tax credit for every ton of green steel or green cement that is produced in the state.

A policy like this does not exist at the federal or state level in the United States and would require further research on the in-state per ton cost differential between green and conventional material production methods. It would also require an assessment of green steel and cement demand from the state's Buy Clean and Buy Fair program, and evaluate corporate willingness to pay for a green product to meet Scope 3 emissions targets. A production tax credit would take those factors into account — the cost differential between conventional and green production, public demand for green products, and corporate willingness to pay — to determine a fair price per ton of green product to offer to steel and cement manufacturers. For industries already considering making the switch to green production, a clean manufacturing production tax credit could make the difference, especially for plants that are at the end of equipment life cycles and can switch to cleaner production methods without stranded assets.

Alternatively, the state could expand its existing solar manufacturing tax credit to cover more cleantech manufacturing industries that would enable decarbonization in the industrial sector.¹¹⁵ As Washington pushes manufacturers toward cleaner production methods, the state could consider where this enabling equipment is manufactured and whether it could be manufactured in-state. If facilities need to switch

to industrial heat pumps or hydrogen fuels, for example, the state could focus on expanding its solar component tax credit to include industrial heat pumps, electrolyzers, and other technologies that will enable industrial decarbonization at scale.

Invest in common carrier infrastructure, such as pipelines, for the transport of green hydrogen



Transitioning to green hydrogen as a fuel source requires the availability of robust and resilient quality infrastructure.¹¹⁶ The infrastructure includes the pipelines, liquification plants, storage facilities, and other equipment involved in the storage and delivery of green hydrogen to an industrial facility. As of 2024, Washington has three miles of intrastate hydrogen pipelines and no interstate hydrogen pipelines.¹¹⁷

Building a hydrogen delivery network, including assessing compatibility of existing pipelines with hydrogen, optimizing design, and demonstrating efficient delivery, will take between 5 and 12 years. To that end, Washington would benefit from consulting with its industrial facilities and establishing a plan to invest in and build the required common carrier infrastructure and establish the appropriate regulatory authorities.

Incentivize safe, sensible, and proactive full transitions of refineries to other functions



While our core suggestions seek to retool existing refineries to keep fossil-based transport fuels as their primary products for most sites, current market trends may drive site closures, such as those recently announced in California (Wilmington, Benicia¹¹⁸) and Texas (Houston¹¹⁹). Economic implications of shutdowns were recently studied by the Washington Department of Commerce against a set of other most common historical refinery adaptation pathways.¹²⁰ If future shutdowns occur, policies can support more novel methods to minimize economic disruptions while maintaining emissions reductions such as:

- Accelerating new low-carbon housing builds at former refinery sites. This can be either directly (e.g., Victoria by the Bay, California¹²¹) or indirectly by siting new commercial and light industrial facilities so existing older buildings can be converted (e.g., Philadelphia, Pennsylvania¹²²).
- Developing new carbon-free energy hubs. This could be more structured industry–academia–government collaborations (e.g., Yamaguchi, Japan¹²³) or more open-ended financial backing of bids for preapproved redevelopment pathways (e.g., Grangemouth, Scotland¹²⁴).

Because of the relative size of Washington’s refineries compared to other sources of industrial GHG pollution, the impact of a refinery shutdown on overall industrial emissions and the allowance market would be significant.

Conclusion

Washington's Cap-and-Invest program is a popular and powerful tool for reducing climate pollution, but faces challenges in how the industrial sector participates in decarbonization. Our report has detailed the technical pathways that would significantly decrease industrial pollution by the mid-2030s and lead to deep decarbonization by 2050. Implementing those pathways in a fair and cost-effective manner while meeting CCA targets will require new legislation, dedicated funding for industry, and changes to regulations to reduce industrial allowances over time and enable deployment of upgraded and new technologies.

The overall CCA targets are achievable if they are treated as shared goals and shared burdens between industry, government, and the public. With smart policy to support implementation of the technical pathways, not only can industrial economic and emissions leakage be avoided, but new clean industries can also be attracted to Washington, thereby supporting the twin goals of economic vitality and reduced pollution. Washington really can be a world leader in the clean industrial economy. As noted on the Choose Washington website, "If it's difficult we do it immediately. If it looks impossible, it may take a bit longer."¹²⁵

Endnotes

1. Chapter 70A.65 Revised Code of Washington, Greenhouse Gas Emissions — Cap and Invest Program, State of Washington, July 25, 2021, <https://app.leg.wa.gov/RCW/default.aspx?cite=70A.65>.
2. “Cap-and-Invest Auctions & Market,” Washington State Department of Ecology, accessed May 13, 2025, <https://ecology.wa.gov/Air-Climate/Climate-Commitment-Act/Cap-and-Invest/Auctions-and-market>.
3. “Washington Initiative 2117, Prohibit Carbon Tax Credit Trading and Repeal Carbon Cap-and-Invest Program Measure (2024),” Ballotpedia, accessed May 13, 2025, [https://ballotpedia.org/Washington_Initiative_2117,_Prohibit_Carbon_Tax_Credit_Trading_and_Repeal_Carbon_Cap-and-Invest_Program_Measure_\(2024\)](https://ballotpedia.org/Washington_Initiative_2117,_Prohibit_Carbon_Tax_Credit_Trading_and_Repeal_Carbon_Cap-and-Invest_Program_Measure_(2024)).
4. “Cap-and-Invest Auctions & Market,” accessed May 13, 2025.
5. “Cap-and-Invest Auctions & Market,” accessed May 13, 2025.
6. “Cap-and-Trade Program,” California Air Resources Board, accessed May 13, 2025, <https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program>; “The Carbon Market, a Green Economy Growth Tool!,” Government of Québec, accessed May 13, 2025, https://www.environnement.gouv.qc.ca/changementsclimatiques/marche-carbone_en.asp; “The Regional Greenhouse Gas Initiative,” Regional Greenhouse Gas Initiative, accessed May 13, 2025, <https://www.rggi.org/>.
7. *Cap-and-Invest Linkage Criteria: Preliminary Analysis Report*, Washington State Department of Ecology, October 2023, <https://apps.ecology.wa.gov/publications/documents/2314005.pdf>.
8. Nicholas Roy, Suzanne Russo, and Dallas Burtraw, *Considerations for Washington’s Linkage Negotiations with California and Québec*, March 17, 2025, <https://www.rff.org/publications/reports/considerations-for-washingtons-linkage-negotiations-with-california-and-quebec/>.
9. “Cap-and-Invest Program Covered Emissions,” Washington State Department of Ecology, accessed June 5, 2025, <https://ecology.wa.gov/ecology/media/BlogMedia/CCA-Covered-Emissions.png>.
10. “Emission-Intensive, Trade-Exposed Industries (EITEs),” Washington State Department of Ecology, accessed May 13, 2025, <https://ecology.wa.gov/air-climate/climate-commitment-act/Cap-and-Invest/emissions-intensive-trade-exposed-industries>.
11. Section 70A.65.110 Revised Code of Washington, Allocation of Allowances to Emissions-Intensive, Trade-Exposed Industries, State of Washington, December 12, 2024, <https://app.leg.wa.gov/RCW/default.aspx?cite=70A.65&full=true#70A.65.110>.
12. “EITE Industries Advisory Group Meeting 1: August 22, 2024,” Washington State Department of Ecology, August 22, 2024, https://www.ezview.wa.gov/Portals/_1962/Documents/EITE-Industries/Meeting%201%20Presentation%20-%20Industries%20Advisory%20Group.pdf.

13. “Cap-and-Invest Auction Revenue,” Washington State Department of Ecology, accessed May 13, 2025, <https://ecology.wa.gov/air-climate/climate-commitment-act/auction-revenue>.
14. *Pathways to Commercial Liftoff: Industrial Decarbonization*, US Department of Energy, September 2023, https://climateprogramportal.org/wp-content/uploads/2025/02/LIFTOFF_DOE_Industrial-Decarbonization_v8.pdf.
15. “The United States Continues to Export MTBE, Mainly to Mexico, Chile, and Venezuela,” US Energy Information Administration, last modified July 13, 2018, <https://www.eia.gov/todayinenergy/detail.php?id=36614>.
16. “GHG Reporting Program Pie by Sector.” Washington State Government, accessed May 2025, <https://data.wa.gov/Natural-Resources-Environment/GHG-Reporting-Program-Pie-by-Sector/9zjz-tfi5>.
17. “Pulp and Paper,” Clean Energy Transition Institute, accessed May 2025, <https://www.cleanenergytransition.org/cmm/pulp-and-paper>.
18. Dylan D. Furszyfer Del Rio et al, “Decarbonizing the Pulp and Paper Industry: A Critical and Systematic Review of Sociotechnical Developments and Policy Options,” *Renewable and Sustainable Energy Reviews* 167 (October 2022), <https://www.sciencedirect.com/science/article/pii/S1364032122005950>.
19. “Waste Heat Recovery from Paper Drying,” Industrial Efficiency Technology Database, accessed May 13, 2025, <https://www.iipinetwork.org/wp-content/letd/content/waste-heat-recovery-paper-drying.html>.
20. “Opt for Electric Medium Temperature Heating Systems,” TheClimateDrive, accessed May 13, 2025, <https://www.theclimatedrive.org/es/action-library/opt-for-electric-medium-temperature-heating-systems>; and “Adopt Heat Recovery Technologies in the Pulp Mill,” TheClimateDrive, accessed May 13, 2025, <https://www.theclimatedrive.org/action-library/adopt-heat-recovery-technologies-in-the-pulp-mill>.
21. Alessandro Mati, Andrea Ademollo, and Carlo Carcasci, “Assessment of Paper Industry Decarbonization Potential via Hydrogen in a Multi-Energy System Scenario: A Case Study,” *Smart Energy* 11 (August 2023), <https://www.sciencedirect.com/science/article/pii/S2666955223000217>.
22. *Paper Packaging Material Market Trend, Share, Growth, Size and Forecast 2030*, Zion Market Research, November 2023, <https://www.zionmarketresearch.com/report/paper-packaging-material-market>.
23. “Ash Grove Cement Company-Seattle, Total Facility Emissions in metric tons CO₂ equivalent (mt CO₂e)” US Environmental Protection Agency, accessed May 2025, <https://ghgdata.epa.gov/ghgp/service/facilityDetail/2023?id=1002537&ds=E&et=&popup=true>.
24. Salim Barbhuiya, Bibhuti Bhusan Das, and Dibyendu Adak, “Roadmap to a Net-Zero Carbon Cement Sector: Strategies, Innovations and Policy Imperatives,” *Journal of Environmental Management* 359 (May 2024), <https://www.sciencedirect.com/science/article/pii/S0301479724010387>.

25. Mónica Antunes et al, “Alternative Clinker Technologies for Reducing Carbon Emissions in Cement Industry: A Critical Review,” *materials* 15, no. 1 (2022), <https://www.mdpi.com/1996-1944/15/1/209>; and Willy Carlsen, Ankita Gangotra, and Kevin Kennedy, “Cutting-Edge Projects Aim to Decarbonize US Cement Emissions,” World Resources Institute, July 17, 2024, <https://www.wri.org/insights/low-carbon-cement-technology>.
26. Sam Goldman et al., *Pathways to Commercial Liftoff: Low-Carbon Cement*, US Department of Energy, September 2023, <https://liftoff.energy.gov/wp-content/uploads/2023/09/20230918-Pathways-to-Commercial-Liftoff-Cement.pdf>.
27. *Use of Supplementary Cementitious Materials (SCMs) in Concrete Mixtures*, US Department of Transportation Federal Highway Administration, accessed May 2025, <https://www.fhwa.dot.gov/pavement/concrete/trailer/resources/hif19054.pdf>.
28. *Strengthening Sustainability in the cement industry*, International Finance Corporation, 2025, <https://www.ifc.org/content/dam/ifc/doc/2025/2025-strengthening-sustainability-in-the-cement-industry.pdf>.
29. Charles Cannon, Valentina Guido, and Lachlan Wright, *Concrete Solutions Guide: Use Green Heat (Decarbonize Kiln Technology)*, RMI, July 2021, <https://rmi.org/wp-content/uploads/2021/08/ConcreteGuide6.pdf>.
30. Michael Zier et al., “A Review of Decarbonization Options for the Glass Industry,” *Energy Conservation and Management: X* 10 (June 2021), <https://www.sciencedirect.com/science/article/pii/S2590174521000088>.
31. Ioannis Dolianitis et al., “Waste Heat Recovery at the Glass Industry with the Intervention of Batch and Cullet Preheating,” *Thermal Science* 20, no. 4 (2016), <https://thermalscience.vinca.rs/pdfs/papers-2016/TSCI151127079D.pdf>.
32. Zier, “A Review of Decarbonization Options for the Glass Industry,” 2021.
33. “Hybrid Furnaces: Revolutionizing Glass Melting with 80% Renewable Energy,” Glass Manufacturing Industry Council, last modified April 7, 2025, <https://gmic.org/hybrid-furnaces-revolutionizing-glass-melting-with-80-renewable-energy/>.
34. “Switch to Hybrid-Electric Furnace Design in Glass Production,” TheClimateDrive, accessed May 2025, <https://www.theclimatedrive.org/action-library/switch-to-hybrid-electric-furnace-design-in-glass-production>.
35. “Oxy-Fuel Combustion: Proven Performance,” Fives Group, accessed May 2025, <https://www.fivesgroup.com/fr/glass/glass-melting/oxy-fuel-furnaces>.
36. “The Efficient Future for the Glass Industry Is ‘All-Electric,’” Watlow, accessed May 2025, <https://www.eurotherm.com/us/glass-manufacture/the-efficient-future-for-the-glass-industry-is-all-electric/>.
37. *Pathways to Commercial Liftoff*, 2023.

38. K. J. West, J. J. de Jonge, and M. van Hout, *Decarbonisation Options for the Dutch Potato Processing Industry*, Manufacturing Industry Decarbonisation Data Exchange Network, June 15, 2021, https://www.pbl.nl/sites/default/files/downloads/pbl-2021-decarbonisation-options-for-the-dutch-potato-products-industry_3658.pdf.
39. Benjamin K. Sovacool et al., “Decarbonizing the Food and Beverages Industry: A Critical and Systematic Review of Developments, Sociotechnical Systems and Policy Options,” *Renewable and Sustainable Energy Reviews* 143, no. 110856 (June 2021), <https://www.sciencedirect.com/science/article/pii/S1364032121001507>.
40. *Potato Processing International* 32, no. 6 (2024), <https://potatobusiness.com/magazines/2024-6-jksdhf63/pdf/volume-32-6.pdf>.
41. West, *Decarbonisation Options for the Dutch Potato Processing Industry*, 2021; and Iwona Cameron, Alfredo Lopez, and Aaron Yule, *Decarbonisation Road Map for the European Food and Drink Manufacturing Sector*, Ricardo Energy & Environment, July 7, 2021, https://www.fooddrinkeurope.eu/wp-content/uploads/2021/09/Decarbonising-the-European-food-and-drink-manufacturing-sector_v2.pdf.
42. *Pathways to Commercial Liftoff: Industrial Decarbonization*, 2023.
43. *Pathways to Commercial Liftoff: Industrial Decarbonization*, 2023.
44. *Path to Hydrogen Competitiveness: A Cost Perspective*, Hydrogen Council, January 20, 2020, https://hydrogencouncil.com/wp-content/uploads/2020/01/Path-to-Hydrogen-Competitiveness_Full-Study-1.pdf; and *CCUS-Enabled Hydrogen Production Report*, Hydrogen UK, September 2023, <https://hydrogen-uk.org/wp-content/uploads/2023/09/HUK-CCUS-Enabled-Hydrogen-Production.pdf>.
45. Zhiyuan Fan and Julio Friedmann, “Low-Carbon Production of Iron and Steel: Technology Options, Economic Assessment, and Policy,” *Joule* 5, no. 4 (April 21, 2021), <https://www.sciencedirect.com/science/article/pii/S2542435121000957>.
46. Jeremy Jones, Paykan Safe, and Brian Wiggins, “Optimization of EAF Operations Through Offgas System Analysis,” *Gas Cleaning & Energy Solutions*, 2012, https://gcteng.com/wp-content/uploads/2022/07/1999_Optimizatio_of_EAF_Operation_Through_OffGas_System_Analysis.pdf.
47. Hannah Ritchie, “How Much Electricity Would We Need for Green Steel? Some Numbers from Chris Goodall’s new book,” *Sustainability by numbers*, March 28, 2024, <https://www.sustainabilitybynumbers.com/p/green-steel-goodall>.
48. Ana T. Lima et al., “Mapping Circular Economy Practices for Steel, Cement, Glass, Brick, Insulation, and Wood — A Review for Climate Mitigation Modeling,” *Renewable and Sustainable Energy Reviews* 202, no. 114697 (September 2024), <https://www.sciencedirect.com/science/article/pii/S1364032124004234>.
49. *Pathways to Commercial Liftoff: Industrial Decarbonization*, 2023.

50. Peter Rumsey, Lee Eng Lock, and Chris Lotspeich, “Ten Tips for Cleanroom Energy Efficiency,” *Semiconductor Digest*, accessed May 2025, <https://sst.semiconductor-digest.com/2004/03/ten-tips-for-cleanroom-energy-efficiency/>.
51. Sebastian Göke et al., “Keeping the Semiconductor Industry on the Path to Net Zero,” McKinsey & Company, last modified November 4, 2022, <https://www.mckinsey.com/industries/semiconductors/our-insights/keeping-the-semiconductor-industry-on-the-path-to-net-zero>.
52. Mohsen Manesh and Brian Kendrick, “The Need for PFC Abatement in Semiconductor Manufacturing,” *Inquiry: The University of Arkansas Undergraduate Research Journal* 3, no. 1 (2002), <https://scholarworks.uark.edu/inquiry/vol3/iss1/17/>.
53. Garvit Vyas, *Global Electronic Components Market Research Report*, Market Research Future, June 2025, <https://www.marketresearchfuture.com/reports/electronic-components-market-42345>.
54. Chapter 70A.65 Revised Code of Washington, Greenhouse Gas Emissions — Cap and Invest Program, State of Washington, July 25, 2021, <https://app.leg.wa.gov/rcw/default.aspx?cite=70A.65>.
55. Section 70A.65.110 Revised Code of Washington, Allocation of Allowances to Emissions-Intensive, Trade-Exposed Industries, State of Washington, December 12, 2024, <https://app.leg.wa.gov/rcw/default.aspx?cite=70A.65.110>.
56. Chapter 173-446 Washington Administrative Code, Climate Commitment Act Program Rule, State of Washington, December 2024, <https://app.leg.wa.gov/wac/default.aspx?cite=173-446>.
57. Chapter 70A.02 Revised Code of Washington, Environmental Justice, State of Washington, <https://app.leg.wa.gov/rcw/default.aspx?cite=70A.02>; Washington Building Economic Strength Through Manufacturing Act, House Bill 1170, Washington State Legislature, 2021, <https://app.leg.wa.gov/billsummary?BillNumber=1170&Year=2021>; and Washington Clean Manufacturing Leadership Act, Second Substitute Senate Bill 5269, Washington State Legislature, 2023, <https://app.leg.wa.gov/billsummary?BillNumber=5269&Year=2023>.
58. *Washington 2021 State Energy Strategy: Transitioning to an Equitable Clean Energy Future*, Table 3, Washington State Department of Commerce, December 2020, <https://deptofcommerce.app.box.com/s/t4qd4zhohb5kmp0rz5yb4c5h248e67e>.
59. House Bill 1682, Washington State Legislature, 2022, <https://lawfilesext.leg.wa.gov/biennium/2021-22/Pdf/Bills/House%20Bills/1682.pdf?q=20211222080132>.
60. Article 5. California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms, California Code of Regulations, State of California, [https://govt.westlaw.com/calregs/Browse/Home/California/CaliforniaCodeofRegulations?guid=I113417D05A2111EC8227000D3A7C4BC3&originationContext=documenttoc&transitionType=Default&contextData=\(sc.Default\)](https://govt.westlaw.com/calregs/Browse/Home/California/CaliforniaCodeofRegulations?guid=I113417D05A2111EC8227000D3A7C4BC3&originationContext=documenttoc&transitionType=Default&contextData=(sc.Default)); and “Allowance Allocation to Industrial Facilities,” California Air Resources Board, accessed May 2025, <https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program/allowance-allocation/allowance-allocation-industrial>.

61. *Utility Engagement Playbook for Industrial Customers: Addressing Power Sector Barriers to Electrification*, Renewable Thermal Collaborative, December 11, 2024, <https://www.renewablethermal.org/wp-content/uploads/2018/06/Utility-Engagement-Playbook-for-Industrial-Customers.pdf>.
62. House Bill 1819, Washington State Legislature, 2025, <https://app.leg.wa.gov/billsummary/?BillNumber=1819&Year=2025&Initiative=false>; and Senate Bill 5466, Washington State Legislature, 2025, <https://app.leg.wa.gov/billsummary?BillNumber=5466&Year=2025>.
63. “Commerce Invests Over \$23 Million to Improve Grid Infrastructure, Increasing Grid Reliability for 18 Communities,” Washington State Department of Commerce, last modified April 8, 2025, <https://www.commerce.wa.gov/commerce-invests-over-23-million-to-improve-grid-infrastructure-increasing-grid-reliability-for-18-communities/>.
64. *Siting Improvement Report (Report and Recommendations for Improving Siting and Permitting of Industrial Clean Energy Facilities)*, Washington State Department of Ecology and Washington State Department of Commerce, November 2022, <https://apps.ecology.wa.gov/publications/documents/2206013.pdf>.
65. House Bill 1216, Washington State Legislature, 2023, <https://app.leg.wa.gov/billsummary?Year=2023&BillNumber=1216>.
66. Stacy Sherwood, *Review of Large Load Tariffs to Identify Safeguards and Protections for Existing Ratepayers*, Energy Futures Group, January 28, 2025, <https://energyfuturesgroup.com/wp-content/uploads/2025/01/Review-of-Large-Load-Tariffs-to-Identify-Safeguards-and-Protections-for-Existing-Ratepayers-Report-Final.pdf>.
67. “AEP Ohio, PUCO Staff, Ohio Consumers’ Counsel, Ohio Energy Group and Others Agree on How to Address Growing Data Center Power Needs,” American Electric Power, last modified October 23, 2024, <https://www.aep.com/news/stories/view/9829/AEP-Ohio-PUCO-Staff-Ohio-Consumers-Counsel-Ohio-Energy-Group-and-Others-Agree-on-How-to-Address-Growing-Data-Center-Power-Needs/>.
68. “Performance-Based Regulation (PBR),” Washington Utilities and Transportation Commission, accessed May 2025, <https://www.utc.wa.gov/performancebased>.
69. Gennelle Wilson, Rachel Gold, and Cory Felder, “States Move Swiftly on Performance-Based Regulation to Achieve Policy Priorities,” RMI, March 31, 2022, <https://rmi.org/states-move-swiftly-on-performance-based-regulation-to-achieve-policy-priorities/>.
70. Kathleen Spees, J. Michael Hagerty, and Jadon Grov, *Thermal Batteries: Opportunities to Accelerate Decarbonization of Industrial Heat*, The Brattle Group, October 2023, <https://www.renewablethermal.org/wp-content/uploads/2018/06/2023-10-04-RTC-Thermal-Battery-Report-Final-.pdf>.
71. Senate Bill 132 Electric Utility Amendments, Utah State Legislature, 2025, <https://le.utah.gov/~2025/bills/static/SB0132.html>.

72. Sherwood, *Review of Large Load Tariffs to Identify Safeguards and Protections for Existing Ratepayers*, 2025.
73. Case No. C11-417 MJP, *Washington Environmental Council v. Sturdevant*, United States District Court, W.D. Washington at Seattle, December 1, 2011, <https://www.leagle.com/decision/infdco20120705c79>; and “Oil Refinery Greenhouse Gas Standards,” Washington State Department of Ecology, accessed May 2025, <https://ecology.wa.gov/Air-Climate/Air-quality/Business-industry-requirements/Oil-refinery-requirements>.
74. TJ Conway, Joseph Fallurin, and Thomas Kirk, *Oil Refining Emissions Cut Points*, RMI, 2022, <https://rmi.org/insight/oil-refining-emissions-cut-points/>.
75. *Powering Up: Pathways to Decarbonize Refining, Oil and Gas Climate Initiative and Wood*, October 2023, <https://www.ogci.com/wp-content/uploads/2023/10/Pathways-to-Decarbonize-Refining-Report.pdf>.
76. *Allowance Consignment Guidance: Washington Cap-and-Invest*, Washington State Department of Ecology, June 2023, <https://apps.ecology.wa.gov/publications/SummaryPages/2302056.html>.
77. “Clean Energy Transformation Act (CETA),” Washington State Department of Commerce, last modified April 8, 2025, <https://www.commerce.wa.gov/energy-policy/electricity-policy/ceta/>; and “Buy Clean and Buy Fair (BCBF),” Washington State Department of Commerce, last modified January 21, 2025, <https://www.commerce.wa.gov/seep/bcbf/>.
78. Molly Freed and Wendy Jaglom-Kurtz, *The State Energy Financing Institution (SEFI) Program Playbook for States: How States Can Use SEFI to Boost Clean Energy Investment*, RMI, August 2024, https://rmi.org/wp-content/uploads/dlm_uploads/2024/08/state_energy_financing_institution_playbook.pdf.
79. “Clean Energy Fund (CEF),” Washington State Department of Commerce, accessed May 2025, <https://www.commerce.wa.gov/epic/legacy-programs/cef/>.
80. “Gift of Public Funds,” Municipal Research and Services Center of Washington, accessed May 2025, <https://mrsc.org/explore-topics/officials/ethics/gift-of-public-funds>.
81. Engrossed Substitute Senate Bill 5200, Washington State Legislature, 2023, <https://lawfilesex.leg.wa.gov/biennium/2023-24/Pdf/Bills/Senate%20Passed%20Legislature/5200-S.PL.pdf?q=20230516094055,55-56>.
82. *Clean Air Program Report*, Colorado Energy Office, November 2024, https://docs.google.com/document/d/1mt3GzzBCbeVDQDmpP_STpu6IOEDcLb7BYuQEKrwgWnA/edit?tab=t.0#heading=h.grub4aacdl46.
83. “Reducing Industrial Sector Emissions in Pennsylvania (RISE-PA),” Pennsylvania Department of Environmental Protection, 2024, [https://greenport.pa.gov/elibrary/GetDocument?docId=8698326&DocName=REDUCING%20INDUSTRIAL%20SECTOR%20EMISSIONS%20IN%20PENNSYLVANIA%20\(RISE%20PA\)%20APPLICANT%20PROGRAM%20SHEET%202024.PDF%20%20%3Cspan%20style%3D%22color%3Agreen%3B%22%3E%3C%2Fspan%3E%20%3Cspan%20style%3D%22color%3Ablue%3B%22%3E\(NEW\)%3C%2Fspan%3E%209%2F4%2F2026](https://greenport.pa.gov/elibrary/GetDocument?docId=8698326&DocName=REDUCING%20INDUSTRIAL%20SECTOR%20EMISSIONS%20IN%20PENNSYLVANIA%20(RISE%20PA)%20APPLICANT%20PROGRAM%20SHEET%202024.PDF%20%20%3Cspan%20style%3D%22color%3Agreen%3B%22%3E%3C%2Fspan%3E%20%3Cspan%20style%3D%22color%3Ablue%3B%22%3E(NEW)%3C%2Fspan%3E%209%2F4%2F2026).

84. “Industrial Decarbonization and Improvements to Grid Operations (INDIGO),” California Climate Investments, accessed May 2025, <https://www.caclimateinvestments.ca.gov/industrial-decarbonization>.
85. *Enabling Industrial Decarbonization: A Policy Guidebook for U.S. States*, United States Climate Alliance, December 2022, https://usclimatealliance.org/wp-content/uploads/2022/12/USClimateAlliance_Guide_IndustrialDecarbonizationStatePolicyGuidebook_2022_EditedAug2023.pdf.
86. Gabrielle Stebbins and Chris Neme, *A Comparison of Clean Heat Standards: Current Progress and Key Elements*, Energy Futures Group, February 2024, https://www.edf.org/sites/default/files/2024-03/Clean%20Heat%20Standards%20Report_FINAL%2002-2024.pdf.
87. “How States Are Tackling Clean Heat and What It Means for Utilities,” UtilityDive, March 25, 2024, <https://www.utilitydive.com/spons/how-states-are-tackling-clean-heat-and-what-it-means-for-utilities/711096/>.
88. The Reduction of Methane Emissions in the Energy Sector and Amending Regulation (EU) 2019/942, Regulation (EU) 2024/1787 of the European Parliament and European Council of 13 June 2024, 2024, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:L_202401787.
89. “Oil and Gas Greenhouse Gas Intensity Program,” Colorado Department of Public Health and Environment, accessed May 2025, <https://cdphe.colorado.gov/oil-and-gas-greenhouse-gas-intensity-program>; “Information Solicitation to Inform Implementation of California Climate-Disclosure Legislation: Senate Bills 253 and 261, as amended by SB 219,” California Air Resources Board, December 16, 2024, https://ww2.arb.ca.gov/sites/default/files/2024-12/ClimateDisclosureQs_Dec2024.pdf; and “Mandatory Greenhouse Gas Reporting,” New York State Department of Environmental Conservation, last modified April 30, 2025, <https://dec.ny.gov/environmental-protection/air-quality/mandatory-greenhouse-gas-reporting>.
90. “The Oil & Gas Methane Partnership 2.0,” United Nations Environment Programme, accessed May 2025, <https://www.ogmpartnership.org/>; and “MiQ,” MiQ, accessed May 2025, <https://miq.org/>.
91. Chapter 173-441 Washington Administrative Code, Reporting of Emissions of Greenhouse Gases, Washington State Legislature, December 2024, <https://app.leg.wa.gov/wac/default.aspx?cite=173-441>.
92. Chapter 70A.540 Revised Code of Washington, Landfills — Methane Emissions, Washington State Legislature, 2024, <https://app.leg.wa.gov/RCW/default.aspx?cite=70A.540>; and “Ecology Awards \$9.6 Million for Landfill Methane Reduction,” Washington State Department of Ecology, last modified May 6, 2025, <https://ecology.wa.gov/about-us/who-we-are/news/2025/may-6-landfill-methane-emissions-reduction-grants>.
93. Ebun Ayandele, Tom Frankiewicz, and Ellie Garland, *Deploying Advanced Monitoring Technologies at US Landfills*, RMI, March 2024, https://rmi.org/wp-content/uploads/dlm_uploads/2024/03/wasteMAP_united_states_playbook.pdf.

94. “Landfill Methane Reductions in Colorado,” Colorado Department of Public Health & Environment, accessed May 2025, <https://cdphe.colorado.gov/landfill-methane-reductions-in-colorado>; “Landfill Methane Regulation,” California Air Resources Board, accessed May 2025, <https://ww2.arb.ca.gov/our-work/programs/landfill-methane-regulation>; and “Mandatory Greenhouse Gas Reporting,” 2025.
95. “Mandatory Greenhouse Gas Reports,” Washington State Department of Ecology, accessed May 2025, <https://ecology.wa.gov/air-climate/reducing-greenhouse-gas-emissions/tracking-greenhouse-gases/mandatory-greenhouse-gas-reports>.
96. “Cap-and-Invest Offsets,” Washington State Department of Ecology, accessed May 2025, <https://ecology.wa.gov/Air-Climate/Climate-Commitment-Act/Cap-and-invest/Offsets>.
97. “Glossary,” In *Global Warming of 1.5°C. An IPCC Special Report on the Impacts of Global Warming of 1.5°C Above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways* (Annex I, Glossary), Intergovernmental Panel on Climate Change (IPCC), 2018, <https://www.ipcc.ch/sr15/chapter/glossary/>.
98. Section 70A.45.020 Revised Code of Washington, Greenhouse Gas Emissions Reductions — Reporting Requirements, Washington State Legislature, <https://app.leg.wa.gov/rcw/default.aspx?cite=70A.45.020>.
99. Rudy Kahsar et al., “From Trees to Tech and Beyond: Carbon Dioxide Removal (CDR) in All Its Variations,” RMI, November 27, 2023, <https://rmi.org/from-trees-to-tech-and-beyond-carbon-dioxide-removal-cdr-in-all-its-variations/>.
100. “State CDR Atlas,” RMI, accessed May 2025, <https://rmi.org/state-cdr-atlas/>.
101. Barry Malmberg, *Toward a Net Zero Future in the Forest Products Industry*, National Council for Air and Stream Improvement, Inc., November 2023, https://www.ncasi.org/wp-content/uploads/2023/11/WP-23-04_Toward_Net_Zero_Future_Nov2023.pdf.
102. “Onsite Energy Technical Assistance Partnerships,” Washington State University Energy Program, accessed May 2025, <https://www.energy.wsu.edu/IndustrialEfficiency/OnsiteEnergyTechnicalAssistancePartnership.aspx>.
103. “Efficiency Services for Manufacturing and Industrial Facilities,” Washington State Department of Ecology, accessed May 2025, <https://ecology.wa.gov/regulations-permits/guidance-technical-assistance/pollution-prevention-services/toxics-reduction-assistance/efficiency-services-for-manufacturing-industries>.
104. *Enabling Industrial Decarbonization*, 2022.
105. “Technical Assistance Available for Small- and Medium-Sized Manufacturers,” National Renewable Energy Laboratory, last modified May 1, 2023, <https://www.nrel.gov/news/detail/program/2023/technical-assistance-available-for-small-and-medium-sized-manufacturers>.

106. *State Best Practices Guide for Decarbonizing the Industrial Sector*, Industrial Innovation Initiative, December 2022, <https://industrialinnovation.org/wp-content/uploads/2024/01/i3-State-Best-Practices-Procurement.pdf>.
107. “Buy Clean and Buy Fair (BCBF),” 2025.
108. “2022 State & Local Government Finance Historical Datasets and Tables,” United States Census Bureau, October 2022, <https://www.census.gov/data/datasets/2022/econ/local/public-use-datasets.html>.
109. “Buy Clean California Act,” California Department of General Services, accessed May 2025, <https://www.dgs.ca.gov/PD/Resources/Page-Content/Procurement-Division-Resources-List-Folder/Buy-Clean-California-Act>.
110. Senate Bill 5659, Washington State Legislature, 2022, <https://app.leg.wa.gov/billsummary?billnumber=5659&year=2021>.
111. Relating to Reductions of Greenhouse Gas Emissions in the State’s Transportation System; and Prescribing an Effective Date, House Bill 4139, Oregon Legislative Assembly, 2022, <https://track.govhawk.com/public/bills/1574028>; and Global Warming Potential For Public Project Materials, House Bill 21-1303, Colorado General Assembly, 2021, <https://leg.colorado.gov/bills/hb21-1303>.
112. “48C Application Round 1 Best Practices,” US Department of Energy, accessed May 2025, https://www.energy.gov/sites/default/files/2024-06/48C_Round_1_Application_Best_Practices.pdf.
113. “Applicant Self-Disclosed 48C Projects,” US Department of Energy, last modified January 17, 2025, <https://www.energy.gov/mesc/applicant-self-disclosed-48c-projects>.
114. “Colorado Industrial Tax Credit Offering,” Colorado Energy Office, accessed May 2025, <https://energyoffice.colorado.gov/citco>.
115. “Tax Incentive Programs,” Washington State Department of Revenue, accessed May 2025, <https://dor.wa.gov/taxes-rates/tax-incentives/tax-incentive-programs>.
116. *A Quality Infrastructure Roadmap for Green Hydrogen*, International Renewable Energy Agency, November 2024, <https://www.irena.org/Publications/2024/Nov/A-Quality-Infrastructure-Roadmap-for-green-hydrogen>.
117. “PHMSA Portal Access Page,” Pipeline and Hazardous Materials Safety Administration, accessed May 2025, https://portal.phmsa.dot.gov/analytics/saw.dll?Portalpages&PortalPath=%2Fshared%2FPDM%20Public%20Website%2F_portal%2FPublic%20Reports&Page=Infrastructure.
118. “Phillips 66 Provides Notice of Its Plan to Cease Operations at Los Angeles-Area Refinery,” Phillips 66, last modified October 16, 2024, <https://investor.phillips66.com/financial-information/news-releases/news-release-details/2024/Phillips-66-provides-notice-of-its-plan-to-cease-operations-at-Los-Angeles-area-refinery/default.aspx>; and “Valero Announces Notice to the California Energy Commission Regarding its Benicia, California, Refinery,” Valero, last modified April 16, 2025, <https://investorvalero.com/news/news-details/2025/Valero-Announces-Notice-to-the-California-Energy-Commission-Regarding-its-Benicia-California-Refinery/default.aspx>.

119. “LyondellBasell Announces Delay in Refining Business Exit,” LyondellBasell, last modified May 31, 2023, <https://www.lyondellbasell.com/en/news-events/corporate--financial-news/lyondellbasell-announces-delay-in-refining-business-exit/>.
120. “New Legislative Report and Webinar Recording – Washington State Refinery Economic Impact Study,” Washington State Department of Commerce, last modified April 14, 2025, <https://www.commerce.wa.gov/new-legislative-report-and-webinar-recording-washington-state-refinery-economic-impact-study/>.
121. Katie Lauer, “Is This East Bay Refinery-Turned-Housing-Development a Model for Reclaiming Contaminated Sites?,” *East Bay Times*, May 3, 2024, <https://www.eastbaytimes.com/2024/05/02/is-this-east-bay-refinery-turned-housing-development-a-model-for-reclaiming-contaminated-sites/>.
122. *The Potential Economic Impact of the Redevelopment of the PES Refinery*, Econsult Solutions, Inc., January 1, 2022, <https://econsultsolutions.com/redevelopment-pes-refinery-hilco/>.
123. Robert Brelsford, “Soon-To-Be-Shuttered Japanese Refining Complex to Become Carbon-Free Energy Hub,” *Oil & Gas Journal*, January 23, 2024, <https://www.ogj.com/energy-transition/article/14303990/soon-to-be-shuttered-japanese-refining-complex-to-become-carbon-free-energy-hub>.
124. Robert Brelsford, “Scottish, UK Governments Release Plan for Post-Refining Grangemouth Site,” *Oil & Gas Journal*, March 21, 2025, <https://www.ogj.com/home/article/55276596/scottish-uk-governments-release-plan-for-post-refining-grangemouth-site>.
125. “Our Key Sectors,” Washington State Department of Commerce Choose Washington, accessed May 2025, <https://choosewashingtonstate.com/why-washington/our-key-sectors/>.

Drew Veysey, Valeriya Azarova, Camellia Moors, and Hannah Thonet, *Opportunities for Industrial Modernization in Washington: Technical Pathways, Investments, Policy, and Decarbonizing Options for Emissions-Intensive, Trade-Exposed Industries*, RMI, 2025, <https://rmi.org/insight/opportunities-for-industrial-modernization-in-washington>.

RMI values collaboration and aims to accelerate the energy transition through sharing knowledge and insights. We therefore allow interested parties to reference, share, and cite our work through the Creative Commons CC BY-SA 4.0 license. <https://creativecommons.org/licenses/by-sa/4.0/>.



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Technical Appendices

Opportunities for Industrial Modernization in Washington: Technical Pathways, Investments, Policy, and Decarbonizing Options for Emission-Intensive, Trade-Exposed Industries

June 2025

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Appendix A: Stakeholder interviews

RMI spoke with stakeholders across more than two dozen different entities while developing this report. Through interviews, we spoke with a majority of the members of the Washington Department of Ecology Cap-and-Invest EITE Industries Advisory Group and the Cap-and-Invest EITE Policy Advisory Group, although some stakeholders we spoke to were not included in either of these groups. Organizational members of each group are listed in Exhibit A1.

Exhibit A1

Organizational Members of the EITE Industries Advisory Group	Organizational Members of the EITE Policy Advisory Group
Nutrien	Climate Solutions
Alliance of Western Energy Consumers	Washington Public Ports Association
Kaiser Aluminum	United Steelworkers Union - Local 338
Nippon Dynawave Packaging	The Nature Conservancy
Glass Packaging Institute	IAM 751
HF Sinclair	Clean and Prosperous
Collins Aerospace	Puget Sound Energy
Par Pacific and U.S. Oil and Refining	Washington Conservation Action
Cardinal FG Company	SEI Fuel Services (7-Eleven)
Northwest Pulp & Paper Association	Cowlitz Public Utility District No. 1
Lamb Weston	
Western States Petroleum Association	
bP America	
Association of Western Pulp and Paper Workers	
CRH Americas Materials/Ash Grove Cement	
Boeing	
Food Northwest	
Nucor Steel Seattle	
Packaging Corporation of America	
J.R Simplot Company	
TSMC Washington	
Phillips 66 Company	
Matheson Tri Gas	

Interviews — conducted between November 2024 and April 2025 — were oriented around topics including:

- Feedback on RMI’s proposed decarbonization pathways, including technology feasibility, costs, and implementation timelines
- Washington facilities’ priorities for industrial decarbonization
- Perspectives on the structure of the Cap-and-Invest program, uses of the revenue generated through the program, and the future of no-cost allowance allocations
- The largest barriers to and opportunities for industrial decarbonization, including issues like clean electricity availability and state permitting procedures.

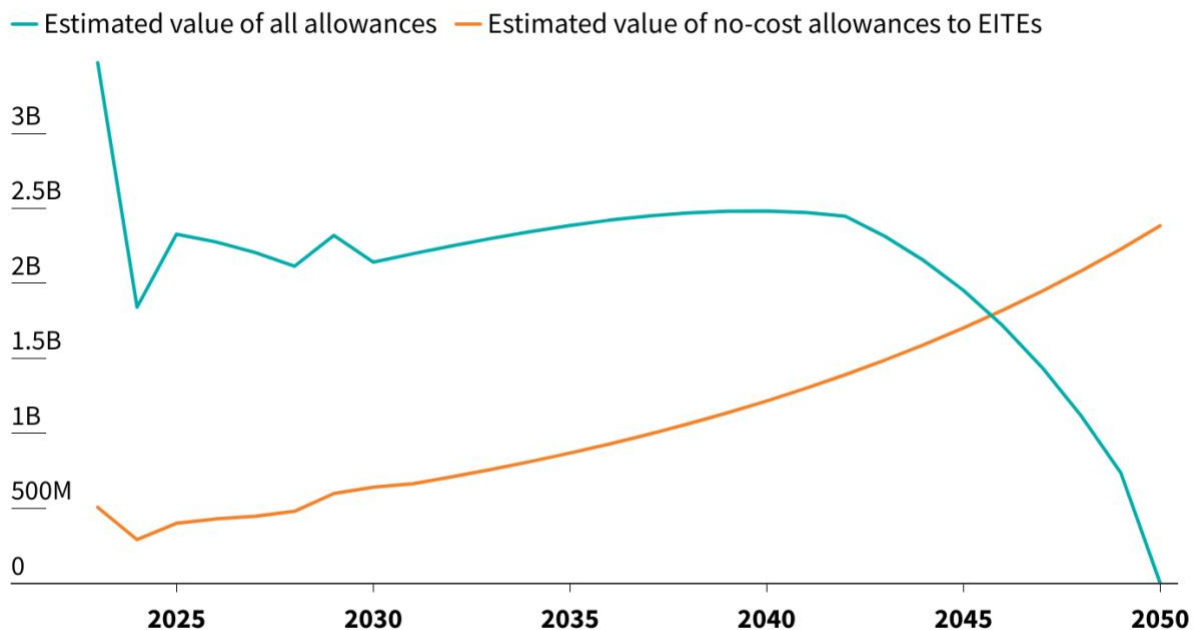
Where relevant, RMI has attempted to take interviewee feedback into account throughout the report.

Appendix B: Value of EITE no-cost allowances, no linkage scenario

Exhibit B1

Estimated value of Cap-and-Invest program allowances (\$)

The estimated value of no-cost allowances to EITEs without linkage begins to exceed the estimated value of all allowances beginning in 2046.



Allowance prices based on historical sale prices for 2023–24. Price estimates for 2025–29 based on average of Washington Department of Ecology baseline auction price forecasts (excluding APCR, ECR, & ceiling prices) for auctions held in a calendar year. Prices for 2030–50 based on historical and baseline price forecast average annual percent change. Overall level of allowances and allowances to EITEs based on RMI estimates from statutory annual cap levels and reductions relative to existing baseline, and excludes no-cost allowances to electric and natural gas utilities.

Chart: RMI • **Source:** Washington Department of Ecology.

To estimate the 2023-2025 values of EITE no-cost allowances, Exhibit 2 relies on an average of annual no-cost allowance allocations to EITEs as published by the Washington Department of Ecology to determine the volume of no-cost allowances allocated to EITEs over that period. Volumes of EITE no-cost allowance allocations between 2026 and 2050, assuming no linkage and with no change to no-cost allowances post-2034, were determined using the reduction schedule as outlined in the Washington Administrative Code.

To determine the volume of all allowances, which was then used to estimate the value of all allowances between 2023 and 2025, this analysis used total Cap-and-Invest program baseline and total Cap-and-Invest program information as published in Washington's Administrative Code.

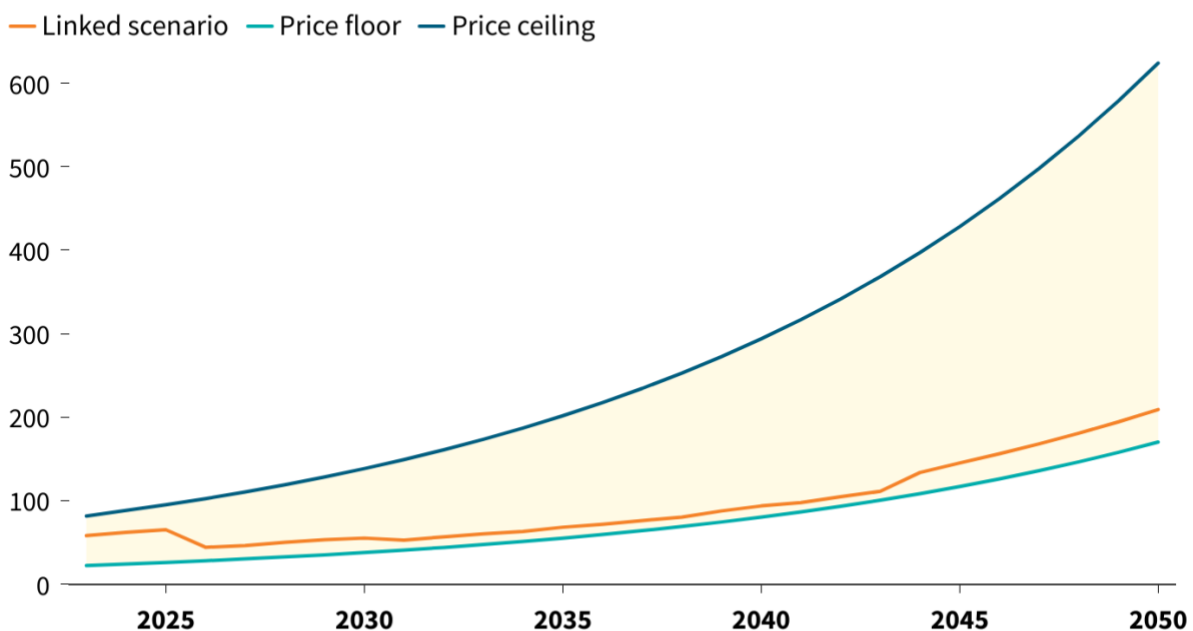
Average annual vintage auction prices as published by the Washington Department of Ecology were used for 2023 and 2024 prices and were multiplied by the volumes as determined above to derive allowance values for those years. Estimates derived from the Washington Department of Ecology's price forecasts were used to estimate annual prices between 2025 and -2029, and average rates of change were used to estimate prices thereafter, through 2050.

Appendix C: Modeled allowance prices under linkage scenario

Exhibit C1

Modeled Cap-and-Invest program allowance prices under linkage scenario beginning 2026 (\$)

If Washington links its Cap-and-Invest program to the California and Québec carbon markets ("linked scenario") beginning in 2026, forecast linked prices are between forecast price ceiling and price floor amounts through 2050.



Linked scenario values use modeled frontloaded allowance prices for 2023–25 and estimated modeled linked prices for 2026–30 from Vivid Economics. Estimated modeled linked prices for 2031–45 from Resources for the Future (RFF). Estimated modeled linked prices for 2046–50 calculated by RMI from RFF estimated changes. 2023–25 price floor and ceiling values from historical auction prices published by Washington Department of Ecology. Price ceiling and floor values for 2026–50 calculated by RMI from estimated adjustment factor based on state statute.

Chart: RMI • **Source:** Vivid Economics, Resources for the Future, Washington State Department of Ecology, and RMI.

The inputs used to produce the 2023-2045 “linked scenario” values in Exhibit C1 are derived from a study Vivid Economics conducted for the Washington Department of Ecology in 2022 and from a study Resources for the Future (RFF) published in 2025. Linked scenario values for 2045-2050 were estimated based on the average annual rate of change from RFF’s estimates.

The price floor and ceiling values for 2023-2025 were derived from historical auction prices published by the Washington Department of Ecology. For price ceiling and floor values between 2026 and 2050, RMI estimated those values based on the Washington Administrative Code’s language that ceiling and floor prices are the ceiling or floor price for the prior calendar year, increased annually by 5% plus the rate of inflation based on the most recently available 12 months

of the consumer price index for all urban consumers (CPI-U). RMI then determined the 10-year average annual CPI-U rate of change and applied it, in conjunction with the specified 5% annual increase, to the most recent historical price floor and ceiling values through 2050.

Appendix D: Technical pathways methodology

To estimate the decarbonization potential of Washington's EITE sectors, the analysis integrates facility-level emissions data with sector-wide applicable relative emissions reductions for each of the selected technologies modeling. The goal is to quantify realistic, cost-effective emissions reduction opportunities through 2050, using consistent baseline assumptions and technology performance parameters.

The evaluation draws on published academic literature, industry case studies, conducted interviews, and modeling reports to assess a range of decarbonization technologies. Each option was characterized by its expected relative GHG emissions savings per site, capital expenditure and marginal abatement cost, and estimated implementation timeframe. Relative reduction values were primarily sourced from peer-reviewed studies such as those from the Journal of Cleaner Production, as well as US DOE and EU industrial transition reports and RMI research and modeling. These percentages were applied to each facility's baseline emissions (average for 2015–2019 reported emissions) to estimate total achievable reductions in a comparable and consistent manner by 2035 and 2050 respectively.

Marginal abatement costs and gross Capex estimates were obtained from real-world project documentation, industry databases, and synthesis studies on industrial decarbonization economics including DOE reports. Sources included documented pilot projects (e.g., electrified boilers, CCUS retrofits) and aggregated reviews of capital and operating expenditures across industrial decarbonization pathways. Where ranges were given, midpoints or conservative values were used to derive cost-efficiency ratios (\$/ton CO₂e reduced annually). Additionally, following our stakeholder interviews, we adjusted both capital expenditure and marginal abatement cost estimates to reflect real-world constraints. For example, several food-sector operators confirmed that while full electrification remains a technically feasible long-term pathway, the steep up-front investment and integration challenges with existing steam systems made it impractical within our 2050 cost-optimization framework. Consequently, full-scale electrification was excluded from the final emissions reduction portfolio for this sector (while remaining possible given technological breakthroughs and significant cost reductions), and its potential was instead captured implicitly through partial electrification measures with lower capital expenditure and more favorable marginal costs.

Estimated implementation timelines were drawn from project development cycles observed in commercial deployments and construction benchmarks cited in existing literature and case studies. Technologies were grouped into near-term, medium-term and long-term categories based on technical readiness level, infrastructure requirements, permitting complexity, costs, and emission reductions potential. For example, measures like fugitive methane control and rate adjustments have shorter lead times, while large retrofits like green hydrogen integration and FCC gas carbon capture require multi-year planning and investment.

To translate facility-level decarbonization pathways into a sector-wide emissions reduction potential and to derive the sector's total abatement cost we follow a structured, transparent, and replicable procedure:

1. Compile baseline emissions by sector
 - Gather reported 2015–2019 CO₂e for each of the facilities reporting GHG emissions and calculate average emissions (E_i)
2. Select and characterize decarbonization technologies
 - For each facility, identify feasible options (e.g., electrification of boilers, FCC CCU, biorefinery retrofit, hydrogen fuel switching).
 - For each technology j at facility i , collect:
 - Relative reduction factor (r_{ij} , % of E_i)
 - Marginal abatement cost (MAC_{ij} , \$/tCO₂e) from case-study data and peer-reviewed literature and DOE reports
3. Compute technology-level absolute reductions

For each facility-technology pair:

$$\Delta E_{ij} = r_{ij} \times E_i$$

Example: A 20% reduction at a 1.0 MtCO₂e facility yields 0.2 MtCO₂e/y abatement.
4. Calculate total abatement cost per technology
 - Use literature and case study MAC values rather than deriving from capital costs due to limited data availability.
 - Compute $cost_{ij} = MAC_{ij} \times \Delta E_{ij}$
(e.g., \$50/t × 0.2 Mt = \$10 M).
5. Sequence and adjust for overlap
 - Order technologies in operational sequence (e.g., efficiency → electrification → CCU).
6. Aggregate to facility and sector totals
 - Sum absolute abatements at each facility: $\Delta E_{i,total} = \sum_j \Delta E_{ij}$
 - Sum costs across all technologies and all facilities: $Cost_sector = \sum_{ij} cost_{ij}$
 - Sum total abatement: $\Delta E_sector = \sum_i \Delta E_{i,total}$
7. Calculate emissions reduction potential for 2035 and 2050
 - Projected business-as-usual emissions: Estimate total sector emissions for target years 2035 (E_{2035}) and 2050 (E_{2050}) using industry growth forecasts, policy scenarios, and assumed technology adoption rates.
 - Absolute Reduction Potential: Calculate the difference between the baseline sector emissions ($E_{baseline}$) and projected emissions:
 - $\Delta E_{2035} = E_{baseline} - E_{2035}$
 - $\Delta E_{2050} = E_{baseline} - E_{2050}$
 - Relative Reduction Potential: Express ΔE_{2035} and ΔE_{2050} as a percentage of the baseline emissions to facilitate cross-sector comparisons.

Appendix E: Additional technical decarbonization pathway information

Exhibit E1

WA State EITE 2022 emissions

■ Building Products, Electronics and Aerospace Manufacturing ■ Food Processing and Manufacturing ■ Petroleum Refining and Chemical Manufacturing ■ Pulp, Paper, and Cement Manufacturing ■ Steel, Aluminum, and Glass Manufacturing

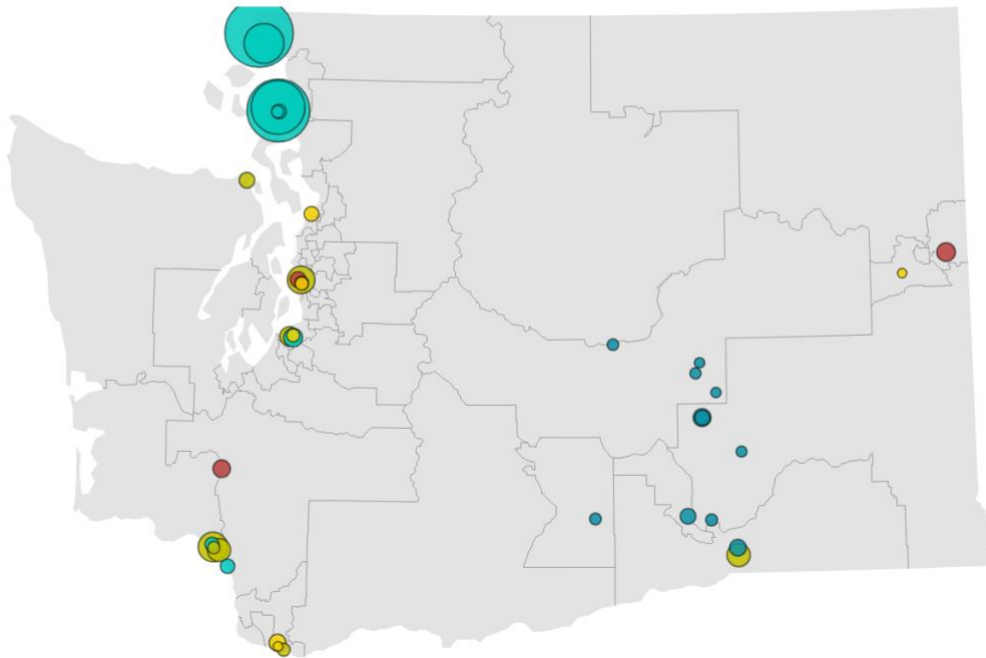
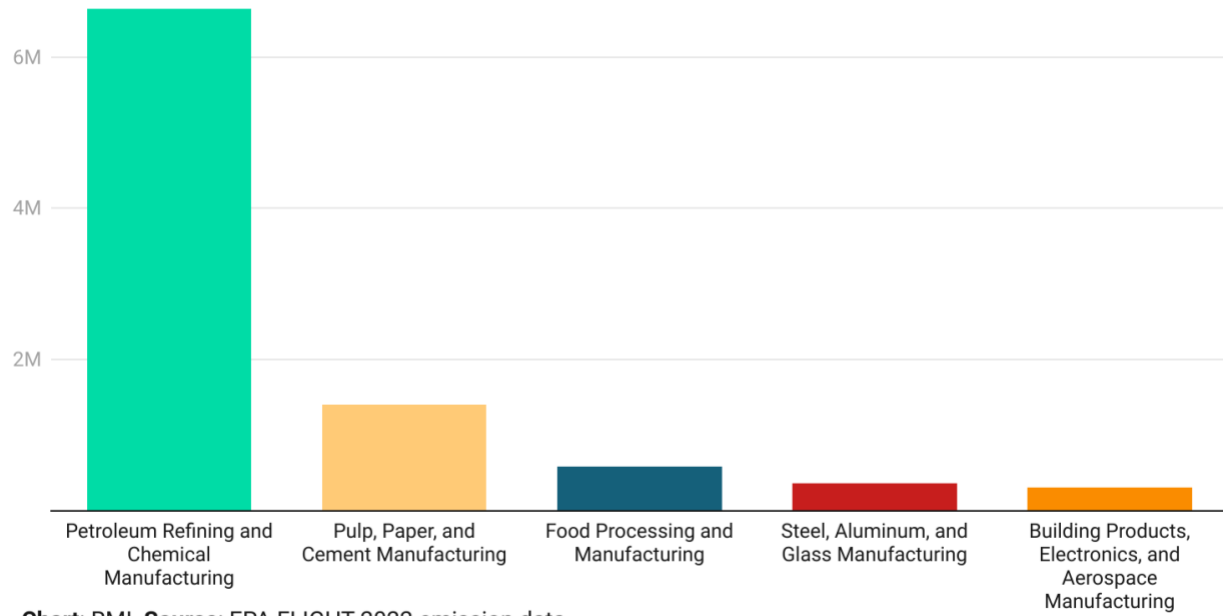


Exhibit E2

Annual emissions by EITE sector (tons CO₂e)



Created with Datawrapper

Exhibit E3

Refineries

Sector snapshot



Pulp and paper

Sector snapshot



Cement

Sector snapshot



Glass production

Sector snapshot



Food processing

Sector snapshot



Chemicals and hydrogen

Sector snapshot



Iron and steel

Sector snapshot



Electronics

Sector snapshot



Appendix F: New electricity demand and pathway implementation costs from analysis

Exhibit F1

	Annual additional electricity demand in 2030 (GWh)	Annual additional electricity demand in 2050 (GWh)	2035 Cost \$M	2050 Cost \$M
Refineries	4639.5	5522.6	\$1,61	\$10,284
Pulp and paper	1242.4	3574.1	\$978	\$5,010
Cement *	278.1	931.0	\$70	\$681
Glass *	163.9	526.2	\$51	\$414
Food processing	625.5	1704.4	\$58	\$260
Chemicals and hydrogen	232.1	686.8	\$69	\$344
Iron & steel	224.7	683.1	\$99	\$487
Electronics	161.6	347.0	\$4	\$20
Total additional electricity demand in 2030	7567.8			
Total additional electricity demand in 2050			13975.2	
Total cost by 2035			\$2.94B	
Total cost by 2050				\$17.5B

*Baseline loads for glass and cement sectors were estimated, while all other sectors are based on actual data.

Appendix G: Permitting and siting

The Washington State Departments of Ecology and Commerce produced the *Low-Carbon Energy Project Siting Improvement Report* which made 73 recommendations related to permitting and siting. Subsequently, the Washington legislature passed H.B. 1216 relating to permitting and siting. RMI evaluated H.B. 1216 against the recommendations from Ecology and Commerce. When evaluating H.B. 1216 against the recommendations in *Low-Carbon Energy Project Siting Improvement Report*, we found the following goals were fully addressed: EJ-4, EJ-6, Tribal-1, Tribal-2, Tribal-3, Tribal-4, Tribal 5, Tribal-10, Tribal-13, Tribal-17, Local-3, Local-7, Local-8, EE-1, EE-2, EE-7, Plan-2, Assist-10, Coord-2, State-1. Exhibit 15 below includes the recommendations we consider to be partially addressed or unaddressed by H.B. 1216.

Exhibit G1

Goal ID	Recommendation	How it is addressed
EJ-1	Develop detailed guidelines for agencies and local governments to engage overburdened communities as part of planning processes in equitable and accessible ways	Partially addressed — engagement encouraged, but detailed guidelines not mandated.
EJ-2	Consider how local government could coordinate with communities to develop guidelines on how best to engage with representative organizations.	Unaddressed — no requirement for local governments to develop engagement guidelines with communities.
EJ-3	Coordinate with communities on options to provide longer timelines for review and comment on permits.	Partially addressed in Section 303(2) — some flexibility implied, but extensions not mandated.
EJ-5	Consider providing funding for local governments, Tribes, and communities to provide information and training directly to developers on meaningful engagement.	Unaddressed — no funding provisions created.
EJ-7	Require environmental justice impact analysis be conducted as part of a state environmental review process or other related review process.	Partially addressed — nonproject reviews require EJ consideration, but no universal project-level EJ analysis.
EJ-8	Consider developing guidance and best practices for conducting impact analysis for overburdened communities.	Partially addressed — analysis in nonproject reviews, but no general guidance issued.
EJ-9	Incorporate equity consideration in requests for proposals for consumer-owned utility projects, similar to Washington Utilities and Transportation Commission requirements.	Unaddressed — utility RFP requirements not updated.
EJ-10	Agencies not covered by the HEAL Act should review the benefits of opting in.	Unaddressed — no directives to opt into HEAL Act participation.
EJ-11	Opt-in agencies with a nexus to clean energy siting or permitting should consider participating in the HEAL Interagency Work Group.	Unaddressed — no references to expanding HEAL Interagency Work Group participation.

TRIBAL-6	When assessing Tribal lands and interests that may be directly, indirectly, or cumulatively affected by a project, the evaluation should include Tribal treaty reserved rights, Tribal reservations, off-reservation rights, Trust lands, other Tribal-owned land and other areas of significance to Tribes.	Addressed in Sections 209(1) and 302(3)(a) — impacts considered, but cumulative effects not fully addressed and trust lands and other areas of significance not mentioned.
TRIBAL-7	Fund and request individual Tribes to self-identify their areas of interest.	Unaddressed — no funding mechanism provided.
TRIBAL-8	Develop map layers for routes of migratory species, vessel traffic routes or other information of interest to Tribes.	Partially addressed in Section 302(6) — Mapping mentioned, but as a final nonproject environmental review document, not a comprehensive mapping project, and species/vessel layers not explicitly required.
TRIBAL-9	Consider creating high-level map layers where a Tribe could self-identify areas of interest and provide contact information for early communication regarding potential projects.	Partially addressed — Mapping tools are required for projects but no self-identified tribal interest layer is mandated.
TRIBAL-11	Require ongoing monitoring of facilities for impacts to treaty resources.	Unaddressed — Monitoring encouraged but not required.
TRIBAL-12	Consider options to provide state funding for Tribal staff for clean energy planning and project reviews.	Unaddressed — No funding mechanism created.
TRIBAL-14	Support sufficient federal funding for Tribal staff to meet federal requirements for project reviews.	Unaddressed — Federal coordination not addressed in the law.
TRIBAL-15	Consider how the state could assist Tribes to develop clean energy projects.	Unaddressed — Focus is on project permitting, not Tribal project development.
TRIBAL-16	Consider how to provide additional funding and staffing to state agencies and Tribal Historic Preservation Officers to support Tribal consultation and engagement work related to clean energy projects.	Partially addressed — Coordination supported but no funding mechanism included.
LOCAL-1	Consider how to assist counties and cities in updating local codes for emerging clean energy technology by providing template language that could be modified locally.	Partially addressed — Coordinated permitting helps, but no code templates or planning guidance are provided.
LOCAL-2	Expand training opportunities for local governments on clean energy processes and regulations, emerging technologies and on Tribal affairs and relations.	Partially addressed in Section 102(1)(g) — Developer training is included, but local governments may not be included in developer trainings.
LOCAL-4	Consider how to assist local government in accessing federal funding for clean energy.	Unaddressed — The law does not direct technical or grant support for federal funding applications.
LOCAL-5	Consider developing GMA guidance on land conversion for clean energy projects, including for rural and resource lands.	Partially addressed in Section 307 — Commerce's rural clean energy report may inform this, but guidance is not required.
LOCAL-6	Update the Rural Element Guidebook.	Unaddressed — No mention of or requirement to revise the Rural Element Guidebook.
EE-3	Consider options for workforce development opportunities, including understanding workforce availability and opportunities for training, apprenticeships and high-quality jobs.	Partially addressed — The bill supports good jobs in intent, but does not fund or require workforce programs.

EE-4	Consider how to include labor standards, workforce agreements and local hiring provisions for clean energy projects.	Unaddressed — Labor agreements or standards are not required or incentivized.
EE-5	State agencies develop rural clean energy economy roadmaps in collaboration with local governments.	Partially addressed in Section 307 — Commerce must consult rural stakeholders and publish a rural energy report, but not a roadmap per se.
EE-6	Consider incentives to develop projects at sites identified through least-conflict studies or through planned actions or programmatic EISs to avoid or minimize impacts.	Partially addressed in Section 302(7) — Preferred zones may be designated in the future, but incentives are not included.
EE-8	Consider statutory change to strengthen requirements that communities receive benefits when new energy resources are developed.	Unaddressed — CBAs are voluntary; there's no statutory obligation to provide community benefits.
EE-9	Consider how to incentivize use of already developed industrial areas, infrastructure and brownfields, including opportunities to overcome financing barriers.	Unaddressed — No incentives or redevelopment tools for brownfield reuse are provided.
EE-10	Provide assistance to local governments related to documentation required for utilizing brownfield or Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) sites for clean energy projects.	Unaddressed — Technical assistance for brownfield reuse is not included.
EE-11	Provide funding and technical assistance for cleanup activities and reuse planning for siting on contaminated brownfields.	Unaddressed — No funds or grants are created for this purpose.
EE-12	Consider modifications or revisions to tax language to address different or concurrent uses of land, such as when land could be used for agricultural purposes and also for clean energy purposes.	Unaddressed — No tax provisions are updated or created.
EE-13	Consider developing guidelines for county assessors about how the income capitalization approach could be used to value clean energy facilities to avoid shifting tax burden due to depreciating assets.	Unaddressed — Tax assessment or valuation reform is not addressed.
EE-14	Develop information on tax incentive options for local government, developers and Tribes.	Unaddressed — No central incentive resource is created or mandated.
EE-15	Consider and explore financial tools for mitigating impacts of clean energy facilities.	Partially addressed — Section 206(8) allows mitigation through CBAs, but broader financial tools (e.g., impact fees) are not created.
PLAN-1	Conduct additional least-conflict mapping for specific geographic areas or energy types.	Partially addressed in Section 302 — Applies to solar only (WSU study); no requirement for other sectors or geographies.
PLAN-3	Provide funding for local governments, Tribes, agencies and communities for early planning.	Partially addressed — Tribes and stakeholders are consulted (302, 102), but no dedicated planning funds are provided.
PLAN-4	Develop guidance on how local governments can utilize least-conflict processes and upfront planning to provide information and reduce timelines for review and permitting of projects.	Unaddressed — No guidance or planning support tools provided to local governments.
ASSIST-1	State agencies should consider developing publicly accessible roadmaps for specific types of energy projects.	Unaddressed — No roadmaps or project-specific permitting timelines are developed.

ASSIST-2	Develop pre-application guidance for developers to consider when designing and siting clean energy projects.	Partially addressed in Sections 204–206 — Ecology’s initial assessment informs applicants, but no standard guidance is issued.
ASSIST-3	Provide greater clarity about state agency, local government, and Tribal government roles and responsibilities, and processes for making siting, review and permitting decisions.	Partially addressed — Roles are described in permitting sections (204–209), but no formal role summary or handbook exists.
ASSIST-4	Conduct internal process improvement analysis for state agency permitting processes.	Unaddressed — No agency evaluations or Lean/efficiency reviews are required.
ASSIST-5	Agencies should consider developing lessons learned for the public about the review and permitting processes for projects.	Unaddressed — No post-project analysis or reporting is mandated.
ASSIST-6	Develop guidance on the type of information needed for environmental reviews and permitting.	Partially addressed — Section 302 defines what nonproject reviews must include, but project-level requirements are not clarified.
ASSIST-7	Build state-level expertise on clean energy facilities and impacts to provide technical assistance for reviews and permitting.	Partially addressed in Sections 102 & 204 — Interagency council provides limited coordination, but technical expert roles not established.
ASSIST-8	Conduct studies and develop guidance to provide updated data and information for use by state agencies, local governments, Tribes and developers in environmental assessments.	Partially addressed in Section 302(3) — Requires impact and mitigation analysis, but no new studies are directly funded.
ASSIST-9	Develop tools to support consistent policies, standards and guidance on mitigation of impacts.	Partially addressed in Section 302(3)(b) — Mitigation must be identified in nonproject EISs, but no tools or frameworks are developed.
COORD-1	Develop landscape-level plan for federal lands that includes impact analysis and mitigation with state and federal agencies to be used for permitting of projects.	Unaddressed — No coordination or planning effort for federal lands is required in the bill.
COORD-3	Consider the development of standard MOUs or cooperative agreements to establish consistent federal and state coordination for environmental reviews.	Partially addressed in Section 206(3)(b)(i) — Ecology is tasked with inviting federal participation, but no template or MOU structure is mandated.
STATE-2	Develop a dashboard to provide one stop for information on proposed clean energy projects.	Unaddressed — No dashboard, tracking system, or project database is mentioned in the law.
STATE-3	Establish “clean energy navigators” at a state agency to provide guidance and expertise on state agency processes.	Partially addressed in Sections 204–206 — Ecology serves as lead coordinator, but no dedicated navigator role is created.
STATE-4	State agencies should assess current project-level interagency coordination for potential improvements to siting, environmental review and permitting roles and actions.	Unaddressed — No mandate for reviewing or reforming current coordination systems.
STATE-5	State agencies assess needs for staff dedicated to working on clean energy projects, planning and providing technical assistance.	Partially addressed in Section 102(3) — The council may recommend resource needs, but no formal capacity assessments required of agencies.



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Swinomish Indian Tribal Community

A Federally Recognized Indian Tribe Organized Pursuant to 25 U.S.C. § 476

* 11404 Moorage Way * La Conner, Washington 98257 *

December 18, 2024

Shannon Pressler
WA Department of Commerce
1011 Plum Street SE
P.O. Box 42525
Olympia, WA 98504-2525

Re: Refinery Impacts to Swinomish Indian Tribal Community

Dear Ms. Pressler:

The Swinomish Indian Tribal Community ("Swinomish" or "the Tribe") appreciates the opportunity to provide input for the Washington Refinery Study conducted by the Department of Commerce and Western Washington University. Swinomish is heavily impacted by the existence and operation of multiple refineries on lands surrounding the Salish Sea and we believe this study is an excellent opportunity to take a hard look at the complex and nuanced impacts, both beneficial and detrimental, direct and indirect, of the refineries on Swinomish.

Historical Context

The Swinomish Tribe is a present day successor in interest to the tribes and bands that signed the 1855 Treaty of Point Elliott ("Treaty") with the United States, which established the Swinomish Reservation. Approximately one hundred years later, two refineries were constructed on March Point, within Swinomish's Treaty-reserved homeland. The refineries, which have subsequently had a number of owners and operators, are now owned and operated by Marathon Petroleum Corporation and by HF Sinclair Corporation.

These refineries were built in an era and world that is vastly different from today. The Federal government's policy at the time was to terminate the existence of Federally-recognized Tribes and to dismantle their sovereignty, self-governance, community, culture and land base. Federal environmental protection at the time was limited, predating the Clean Water Act and other bedrock environmental statutes.

On the state level, the State of Washington persisted in refusing to recognize that Federal treaties with Indian Tribes were and remained the supreme law of the land. It was not until decades after the refineries were built that Judge Boldt reaffirmed the continuing vitality of the treaties, including the Treaty of Point Elliott. *United States v. Washington*, 459 F. Supp. 1020, 1049 (1975). It was then more than a decade after that when the State formally acknowledged its government-to-government relationship with Washington Tribes in the Centennial Accord.

In this context of formal Federal and State policies explicitly hostile to Washington Tribes, it is no surprise that the refineries on the Salish Sea were not the product of consultation, let alone collaboration, with the affected tribes by their Federal trustee, State and local governments, or the businesses that conceived of and built the refineries. As a result, despite the explicit recognition of the Swinomish Reservation in the 1855 Treaty, despite the proximity of the refineries to the Swinomish Village and to traditional Swinomish fishing grounds, and despite the scale and foreseeable impacts of the refineries and of accompanying industrial activities, the refineries were not the product of consultation or Tribal consent.

Nonetheless, in subsequent years Swinomish has adapted as much as possible to the presence of the refineries and their accompanying industrial infrastructure. Swinomish also recognizes that there are, as discussed below, benefits brought by the refineries, their employees and contractors. However, the benefits do not alter the fact that Swinomish did not have a role in determining whether these large-scale industrial facilities would be located in its homeland and adjacent to its waters. In this, the ongoing presence of the industrial facilities stands as a stark reminder of the lack of respect and concern for Tribal homelands, Treaty resources and Tribal sovereignty and self-determination at the time of the refineries' construction.

However, past wrongs need not be perpetuated. The March Point refineries have new operators, and this presents an opportunity to demonstrate respect for the Tribe's sovereignty, self-determination, homeland and Treaty rights and resources. Indeed, the operators of the March Point refineries initiated outreach to Swinomish when they recently acquired their facilities, and have continued active communications with Swinomish in the years since. From these beginnings there is an opportunity for increasing respect and trust, as well as cooperation to increase the beneficial impacts of the refineries, reduce their detrimental impacts, and address concerns, challenges and opportunities shared by Swinomish and the neighboring refineries.

Beneficial Refinery Impacts

Swinomish operates a number of economic enterprises in the vicinity of the two March Point refineries operated by Marathon and HF Sinclair. The refineries have direct and indirect positive economic impacts for Swinomish. At the highest and broadest level, the refineries generate income streams that are disbursed throughout the local and regional economy, providing

financial resources that may then find their way, directly or indirectly, to support Swinomish businesses.

Refinery employees and contractors, their families, and friends are important customers and guests at three Swinomish markets and gas stations, as well as the Swinomish Casino & Lodge, Swinomish Golf Links, and Swinomish retail tobacco and coffee shops. Swinomish Shellfish Company oysters are sold at Swinomish markets and at a pop-up bar adjacent to the Swinomish market closest to the refineries. Refinery employees, contractors and families also are among potential customers at seasonal fireworks retailers operated by individual Swinomish Tribal members and their families on Tribal land not far from the refineries, further diversifying the Swinomish economy.

The refineries' economic impacts at Swinomish increase seasonally in a predictable and financially important cycle. During "turnaround" work on a refinery, contractors and their employees live and work in the local area for an extended period of time, and Swinomish businesses observe increased customers and a positive financial impact while the turnaround contractors and employees are present. Year round, business visitors to the refineries and their local contractors also may stay overnight at the Swinomish Lodge.

The refineries themselves generate business, directly and indirectly, for the Swinomish Casino and Golf Links. Direct economic impacts arise from refinery banquets at the Swinomish Lodge and refinery use of Swinomish catering services. Indirect economic impacts generated by refinery employees or business visitors include enjoying lunch at the Casino, playing golf after work, in a league or by hosting outings at Swinomish Golf Links.

Over the decades, the refineries and their contractors have provided employment opportunities to Swinomish Tribal members. Some of this work is year-round, and some is seasonal employment for turnaround contractors. Such locally-available employment paying competitive wages brings important financial resources to Swinomish families and helps to further diversify the Swinomish economy.

The proximity of a local refinery supplier to the Swinomish fuel markets can reduce greenhouse gas and other emissions from transporting refined product to the markets for retail sale to customers, and may as well reduce financial costs incurred in transporting fuel for sale.

The resulting financial benefits from these relationships to Swinomish economic enterprises are particularly important because the enterprises' financial return to the Tribe helps support essential Swinomish governmental services to the Reservation, such as law enforcement, environmental protection and land management. The enterprises also support important Swinomish governmental programs that have been developed to help address disparities in areas

such as health and education that disproportionately affect Swinomish and other indigenous communities. Given limitations on tribal tax jurisdiction, the role played by Swinomish enterprises in supporting Swinomish self-government is critical.

In addition to these business relationships, refinery sponsorship of the Swinomish Boys & Girls Club's annual golf tournaments helps support services to youth in the Swinomish Village. In the absence of the March Point refineries, Swinomish enterprises and the governmental services and programs they support would not enjoy their current level of operations.

Detrimental Refinery Impacts

There are inevitably costs and risks that accompany the benefits and successes that are supported by the local refineries. Like the benefits outlined above, the costs and risks are complex and nuanced, direct and indirect, obvious and subtle. These detrimental impacts are not abstract but intensely local – refineries are located within the Swinomish Treaty Reservation and homeland. The impacts are and will be enduring – Swinomish members have lived in this area since time immemorial and expect to continue to do so for many, many generations into the future.

One of the core rights recognized and guaranteed by the Treaty is the Tribe's right to fish in the Tribe's adjudicated Usual and Accustomed fishing areas in and around the Salish Sea. *United States v. Washington*, 459 F. Supp. 1020, 1049 (1975). Those Usual and Accustomed fishing areas are not only adjacent to the March Point refineries but encompass four of the five refineries in the state. Any oil spill or other incident at or adjacent to any one of those facilities, or during the conveyance of crude oil or refined product to or from any of those facilities, could have potentially devastating impacts on the ability of members of the Swinomish community to exercise the Tribe's Treaty reserved right to fish.

Additionally, the two refineries located on March Point pose ongoing risks to the Reservation and the Swinomish community. Those risks are very real, with spills from train derailment (BNSF derailment occurring on an easement across the Swinomish Reservation) and pipelines (Olympic Pipeline Gasoline Spill) happening within the last two years and an unplanned flare from one refinery in 2015 resulting in more than 500 reports of injuries to those on and near the Swinomish Reservation.

In order to guard against those risks, Swinomish expends substantial financial and staff resources. Several Swinomish employees are tasked specifically with emergency management and response as their full-time jobs while biologists, health workers, construction experts, lawyers and other specialists are tasked with attending to a wide range of impacts from the refineries. There are few activities of the Swinomish Indian Tribal Community that are not touched in some way by the reality of the nearby refineries.

Swinomish is impacted, directly and indirectly, by the refineries in at least the following ways:

Vessels:

- Vessel Traffic - More than 27% of Tribal Usual and Accustomed areas for fishing are occupied by shipping lanes and anchorages. Vessels from refineries on the Salish Sea account for a significant portion of that traffic and the majority of vessels at anchor. Anchorages occur almost exclusively within productive crab habitat, preventing those areas from being utilized by Tribal members exercising Treaty fishing rights.
- Vessel Destruction of Fishing Gear - For years Swinomish Tribal members exercising their Treaty-reserved fishing rights have experienced persistent loss or destruction of their valuable fishing gear by vessels operating in the Tribe's Usual and Accustomed fishing areas. Such gear loss impacts Tribal fishers and their families directly when new replacement gear must be purchased, and indirectly when catch is foregone because gear has been lost. Tribal staff and leadership are continuing their years-long efforts to address gear loss.
- Vessel Spill Risk - Shipping Crude Oil and Refined product by vessel accounts for a major risk to the Salish Sea. An allision or collision resulting in an oil spill has the potential to devastate the Salish Sea, decimate populations of fish, crab and other shellfish, and marine mammals, and severely impact Swinomish lands. James Stronach & Aurelien Hospital, *The Implementation of Molecular Diffusion to Simulate the Fate and Behavior Modeling of a Diluted Bitumen Oil Spill and Its Application to Stochastic Modelling*, Conference Paper, (June 2014) <https://www.researchgate.net/publication/274083520>; Julann A Spromberg, Sarah E. Allan & Nathaniel L. Scholz, *Potential Population-level impacts of future oil spills on Pacific Herring Stocks in Puget Sound*, Human and Ecological Risk Assessment Vol. 30 Nos. 1-2 (February 19, 2024) <https://doi.org/10.1080/10807039.2023.2301529>. [Impacts on marine Treaty resources in turn impact Swinomish community members and their families, as well as the economic, cultural and social life of the community as a whole.](#)
- Bunkering risks - The most common fuel and oil spills occur during bunkering. While vessels are being fueled, it is not uncommon for small amounts of fuel and oil to spill into the water. These minor spills impact local habitat and species and their impacts can be cumulative over time, depending on the types of product involved. National Research Council, *Oil in the Sea III: Inputs, Fates, and Effects*, 134 (2003) <http://nap.edu/catalog/10388.html>. [Again, such cumulative harm to marine Treaty resources in turn impacts Swinomish community members, their families and the broader Swinomish community.](#)
- Vessel Noise - Noise from vessels transporting crude oil or refined products disturbs the local ecosystem and impacts several endangered species including Southern Resident Killer Whales. Simone Cominelli et. al., *Noise Exposure from Commercial Shipping for the Southern Resident Killer Whale Population*, Marine Pollution Bulletin 136 (2018) 177-

200 <https://doi.org/10.1016/j.marpolbul.2018.08.050>. Swinomish Tribal members diving to exercise Treaty fishing rights have first-hand experience with the noise generated by vessel traffic.

- Vessel Emissions - While underway, at a berth, or at anchor, vessels rely entirely on fossil fuels for their power. They do not connect to local electricity at any point. This continual burning of fossil fuels is a major contributor to the release of greenhouse gasses, associated impacts, and to the degradation of local air quality. Naya Olmer et. al., *Greenhouse Gas Emissions from Global Shipping, 2013-2015*, The International Council of Clean Transportation (October 2017) <https://theicct.org/publication/greenhouse-gas-emissions-from-global-shipping-2013-2015/>; Cesar Ducruet et. al., *Ports and their Influence on Local Air Pollution and Public Health: A Global Analysis*, Science of the Total Environment Volume 915 (March 2024) <https://doi.org/10.1016/j.scitotenv.2024.170099>

Rail:

- More than a century ago, a rail line was constructed across the Swinomish Reservation and utilized for about one hundred years without the consent of the Tribe or the United States. As a result, the Tribe and U.S. were required to pursue litigation in Federal Court to vindicate the Tribe's ownership of the burdened land and to obtain compensation for use of the land for the rail line.
- Derailment Risk - Derailment of a train poses serious risk to the Swinomish Tribe as the railway used to transport crude oil and other chemicals to the March Point refineries passes through the Swinomish Reservation and very closely to Swinomish's economic development area including its Casino & Lodge, RV park, and retail stores. Derailment is an ongoing concern to Casino & Lodge management. Guests at the Swinomish Casino & Lodge occasionally comment on the derailment risk, and guests at the RV park stay immediately adjacent to the tracks and are impacted by the noise of moving trains. The local railway also crosses the Swinomish Channel and over a portion of Padilla Bay. Derailments can be *relatively* minor, as was the case when a train derailed on the Swinomish Reservation in March of 2023 and released around 2,100 gallons of diesel fuel, or they can be catastrophic as has been the case multiple times in Washington State, the United States and Canada. A catastrophic derailment on the Swinomish Reservation could result in injury or worse for guests and staff at the Swinomish RV park immediately adjacent to the rail line or at the nearby Swinomish Casino & Lodge, as well as damage to and closure of these and other Swinomish commercial ventures in the area for weeks, months or longer. Such business interruption has the potential to significantly damage the Swinomish economy, and therefore the Swinomish governmental services and programs the Tribe's commercial ventures support, and the community members and Reservation residents who benefit from those programs and services. A catastrophic derailment into the Swinomish Channel or Skagit River could inundate not only the Channel, River and adjacent shorelines with oil, but also more distant areas impacted by spilled fluids swiftly transported by the strong tidal currents in the area, including the Swinomish Reservation's shorelines, the Swinomish Village, the Swinomish Casino & Lodge, the Swinomish Clam

Garden, and important cultural areas such as Lone Tree Point and Kukutali Preserve. On a broader scale, railways for refineries on the Puget Sound are regularly located along and crossing waterways and on the shores of the Salish Sea. Derailments and spills into those waters with their strong and fast tidal currents would also dramatically impact and alter where Swinomish members could fish.

- Bay Access and Land Use Optimization - The presence of the railway impedes direct terrestrial access to Padilla Bay from the adjacent lands of the Swinomish Reservation, and prevents the Tribe's optimal utilization of those lands as part of its economic enterprises.
- Swinomish Channel - In order for the railway to reach the March Point Refineries, it must cross the Swinomish Channel. To do so, the railroad constructed a swing bridge, now many decades old. This bridge severely limits Swinomish fishing and Fisheries Enforcement vessels traveling through the Swinomish Channel when it is "closed" and only allows free access when it is opened. This bridge is a major impediment to Swinomish fishers, particularly with the very short windows for fishing that are common for Swinomish fisheries. Delays in accessing waters north of the Swinomish Channel reduce the time that fishers can actually engage in Treaty fishing. For instance, if fishing for shrimp is opened for four hours north of the Channel but fishers are delayed for an hour by the closure of the swing bridge, the time available for fishing is reduced by 25%. Such travel delays and reduced fishing opportunity have a direct and significant impact on Treaty fishing income to the fishers and their families. Similarly, the swing bridge is a major potential point of failure both from a mechanical standpoint and from a human error standpoint. Any failure of the swing bridge has the potential to cause a catastrophic derailment into the Swinomish Channel.
- Train Emissions - Trains burn fossil fuels and contribute to the increase in greenhouse gases and climate change from which the Swinomish Tribe is experiencing significant impacts. Train emissions also degrade the local air quality resulting in health impacts to community members. *Technology Assessment: Freight Locomotives*, California EPA, Air Resources Board (November 2016) https://www.arb.ca.gov/msprog/tech/techreport/final_rail_tech_assessment_11282016.pdf
- Viewshed – As noted above, the railway was installed in the late 1800s, over the objections of the Swinomish Tribe and the United States, along the shores of Padilla and Fidalgo Bays. Both of those bays have significant cultural importance to the Swinomish people and commercial importance as they provide the main view for the Swinomish Lodge and nearby RV park. While some guests may enjoy watching trains, the regular presence of trains traveling to and from the refineries impedes and impairs the viewshed of those two bays significantly.

Pipeline:

- Decades ago, pipelines for petroleum product transport were constructed across the Swinomish Reservation without the consent of the Tribe or the United States. As a result, the Tribe and U.S. were required to pursue litigation in Federal Court to vindicate the Tribe's ownership of the burdened land and to obtain compensation for use of the land for the pipelines.
- Pipeline Spill Risk- When pipelines spill it is more difficult to both detect and stop those spills than other methods of transporting oil. Mutiu Adesina Adegboye, Wai-Keung Fung & Aditya Karnik, *Recent Advances in Pipeline Monitoring and Oil Leakage Detection Technologies: Principles and Approaches*, Sensors 2019 (June 4, 2019) <https://doi.org/10.3390/s19112548>. Remediation of underground pipeline spills requires far more effort and land disturbance than spills to the surface. Most recently, the Olympic pipeline spilled near the Swinomish Reservation in December of 2023. The Swinomish Tribe exerted months of effort as part of the remediation and restoration team, a process that continues even today. Three separate pipelines cross the Swinomish Reservation and Swinomish Channel, carrying refined product from the refineries. A spill from any of those pipelines would impact the Reservation and could result in the disruption or closure of the nearby Swinomish Casino & Lodge, the RV park, and several Swinomish owned retail stores. A pipeline spill into the Channel would result in the impacts described in connection with a derailment of rail cars and spill into the Channel.
- Pipeline Presence – Just like the rail line, the continuing presence of three pipelines built across the Swinomish Reservation without the Tribe's consent precludes the Swinomish Tribe from utilizing its land above and adjacent to those pipelines and effectively reduces Swinomish's total usable land. In this, the continuing presence of the pipelines diminishes the land base reserved by the Tribe for its own use in the Treaty of Point Elliott.

Refineries:

- Refinery Operations - Refineries are inherently dangerous and large industrial plants. The location of two refineries on March Point poses a significant threat to the Swinomish Tribal members, to the Reservation, and to guests and staff of Swinomish economic enterprises. Industrial accidents can and do occur which result in impacts to neighboring communities. For instance, the 2010 explosion and fire at the Tesoro Anacortes Refinery killed 7 workers at the refinery and released chemicals into the air which sickened those nearby, including Tribal members. In 2015, an unexpected flare sickened more than 500 on and near the Swinomish Reservation, including Tribal members. Additionally, populations living within 10 miles of refineries experience increased risk of multiple types of cancer – and the entirety of the Swinomish Reservation is within 10 miles of both the March Point refineries. Stephen B. Williams, et. al., *Proximity to Oil Refineries and Risk of Cancer: A population Based Analysis*, JNCI Cancer Spectrum, Volume 4 Issue 6 (October 7, 2020) <https://doi.org/10.1093/jncics/pkaa088>
- Refinery Emissions and products - Refinery operations and the use of refinery products release greenhouse gases contributing to climate change and degrading local air quality. Refinery emissions pose potential health risks to the Reservation population, Swinomish

business guests and employees, and the Swinomish Shellfish Company aquaculture operation in Similk Bay, located directly south of the refineries. Indeed, odors from the refinery can be detected at times by Shellfish Company staff. Some guests at the Casino & Lodge do not like the proximity of the refineries, concerned that they are polluting.

- Viewshed - The March Point refineries are located on the shores of Padilla and Fidalgo bays, and their infrastructure physically dominates the area. The refineries are visible from the Swinomish Links Golf course, and from some locations at the Swinomish Casino & Lodge. Like the rail line, the presence of extremely large industrial plants on these waters severely degrades the viewshed of the area.
- Refinery Presence Precludes Land Use - The March Point refineries are located on lands that are part of the Swinomish Treaty Reservation that were illegally occupied by non-tribal settlers and then purportedly severed from the Reservation by an Executive Order. Those lands were important areas for traditional food production, including camas propagation and harvesting, and for cultural practices. The presence of the refineries precludes access to and use of the land for those purposes and has potentially permanently eliminated those lands for food production purposes.

Future Refinery Impacts

The March Point refineries could provide opportunities for a greater sharing of their benefits with the Swinomish Tribe and its members, and for reducing their risks and detrimental impacts on the Tribe, its members, resources and Reservation. In addition, as the larger economy transitions to address global warming, there may be opportunities for achieving some degree of historical justice as refineries transition, downsize or close. The lands that now support the refineries will remain should operations cease. It could bring Swinomish a measure of historical justice and an opportunity to create its own, alternative future, to have those lands returned to Tribal ownership as the Treaty provided in 1855.

Thank you again for this opportunity to participate in evaluating the future of refineries in Washington. We look forward to further discussions on the impacts to the Swinomish Indian Tribal Community from Oil Refineries and their operations and the myriad options for the future. If you have any questions about these comments or would like to discuss them, please do not hesitate to contact me.

Sincerely,



Steve Edwards, Chairman

September 3rd, 2025

Submitted Electronically

Adrian Young

Washington Department of Ecology

Re: Document 6: Draft Recommendations for EITE Allowance Allocation 2035-2050

Dear Adrian Young,

Thank you for the opportunity to comment on the Draft Recommendations to the legislature on EITE Allowance Allocation. The Nature Conservancy (TNC) has engaged on and supported the Climate Commitment Act since before its passage and is committed to ensuring the effective implementation of the law. TNC recognizes that it is critical to both decarbonize emissions intensive, trade-exposed industries (EITEs) and mitigate leakage risk. To that end, we make the following recommendations:

Clearly communicate that EITE no-cost allowances are under the cap, and EITEs must reduce emissions to maintain the integrity of the CCA cap

The key principle that Ecology should maintain in these recommendations and communicate to the legislature is the importance of the CCA's greenhouse gas emissions cap and the role EITEs must play to reduce emissions in-line with the cap. Ecology should emphasize the clarity of the law on this point. EITEs are covered entities under the CCA (RCW 70A.65.110), which by definition in law means that the cap applies to them (RCW 70A.65.010). Washington has rightfully recognized that EITEs compete with producers outside of Washington State, and that decarbonizing will require significant capital investments. To accommodate that, the legislature gave EITEs 12 years of no-cost allowances with an estimated value of at least \$5.4 billion, a public investment that other emitters do not receive.¹ Ecology should make clear in this report that as covered entities EITEs are required to reduce emissions and not entitled to break the cap with free pollution into perpetuity. The purpose of this public subsidy of industrial pollution is to assist EITEs in making the necessary investments to decarbonize while maintaining competitiveness. We recommend Ecology visually demonstrate how the EITEs' requests to remain at 94% of

¹ Drew Veysey, Valeriya Azarova, Camellia Moors, and Hannah Thonet, Opportunities for Industrial Modernization in Washington: Technical Pathways, Investments, Policy, and Decarbonizing Options for Emissions-Intensive, Trade-Exposed Industries, RMI, 2025, <https://rmi.org/insight/opportunities-for-industrial-modernization-in-washington>.

baseline no-cost allowances from 2035-2050 will break the cap, and how EITE no-cost allowances when combined with utility no-cost allowances will break the cap even earlier.

Recommend that the legislature take action to communicate industry is required to reduce emissions

Ecology should recommend that the legislature take decisive action on EITEs that requires them to reduce emissions in-line with the cap. Industry representatives repeated throughout the workgroup process that they need clear signals that they will be required to reduce emissions before making the necessary capital expenditures. Given Ecology's responsibility for implementing the cap and this request for certainty from industry, it is Ecology's responsibility to recommend reductions in no-cost allowances that brings industrial polluters the clarity they need to invest in decarbonization.

One way for the legislature to communicate this intent is requiring consignment of no-cost allowances and directing EITEs to spend the value of those allowances on decarbonization. We urge Ecology to recommend consignment of allowances beginning in the second compliance period. Please see more detailed recommendations on consignment below in response to Draft Recommendation 3.2.

Provide Examples of a Range of Suites of Specific Policy Options

TNC is concerned that Ecology's report continues to be too high-level to prepare legislators not already deep in the weeds on EITEs to make decisions about the future of EITE treatment in the CCA. TNC recommends that Ecology put forward a few examples of suites of policies that would achieve the goals of reducing emissions and mitigating leakage. That would provide the legislature with the framework they need to understand the scope of decisions available to them that will meet the needs of the cap and EITEs. For example, one scenario could include a) a step down of no cost allowances in 2035 to align with cap, b) a cap adjustment factor, and c) consignment of some no-cost allowances before 2035 and all no-cost allowance after 2035 with a requirement that the value of consigned allowances be spent on decarbonization. A second scenario could take a sector-by-sector approach to emissions reductions as described in the RMI report. By providing example scenarios without being prescriptive Ecology can help the legislature understand the realm of feasible policies to consider that would address both decarbonization and leakage risk. Knowing that the realm of recommendations requires decarbonization will also help provide EITEs the certainty they need to invest in electrification.

Consider Impacts of Linkage

Ecology has made clear that Washington intends to link with California. A linked market is likely to result in lower allowance costs. It also will bring California based competitors into the same market conditions as Washington EITEs, reducing the need for EITE protection for those facilities. Given these considerations, an EITE policy in a linked market should become more stringent to drive decarbonization, maximize investments in Washington, and support market function while still minimizing leakage. TNC recommends that Ecology consider linkage scenarios in its assessment of policy options.

Show detailed analysis

TNC encourages Ecology to include more detailed analysis in the report to the legislature for those who want to get deeper in the weeds. Ecology could do this by adding an additional section that provides the background information for each topic area and better explains the depth, reasoning, conclusions, and outstanding questions of Ecology's analysis. This is particularly important for the complex policy ideas addressed in the recommendations that legislators may not already be familiar with. An example of additional information needed is around the scoring matrix from Document 5. In multiple instances a proposed policy/strategy was not seen as viable due to a low or negative score on "Minimizes administrative / implementation costs and technical requirements." Insufficient information was provided on what perceived complexities or costs were considered in determining that score. Additional information is absolutely necessary for legislators to make their own determination on the value of a given proposal to achieve a needed end with its relative cost or administrative complexity.

Draft Recommendation 1.2

TNC appreciates the recommendation for monitoring developments in a carbon border adjustment mechanism, which would help prevent leakage for some EITEs and compliment a no-cost allowance policy that aligns with the cap.

Draft Recommendation 2.1 & 2.2

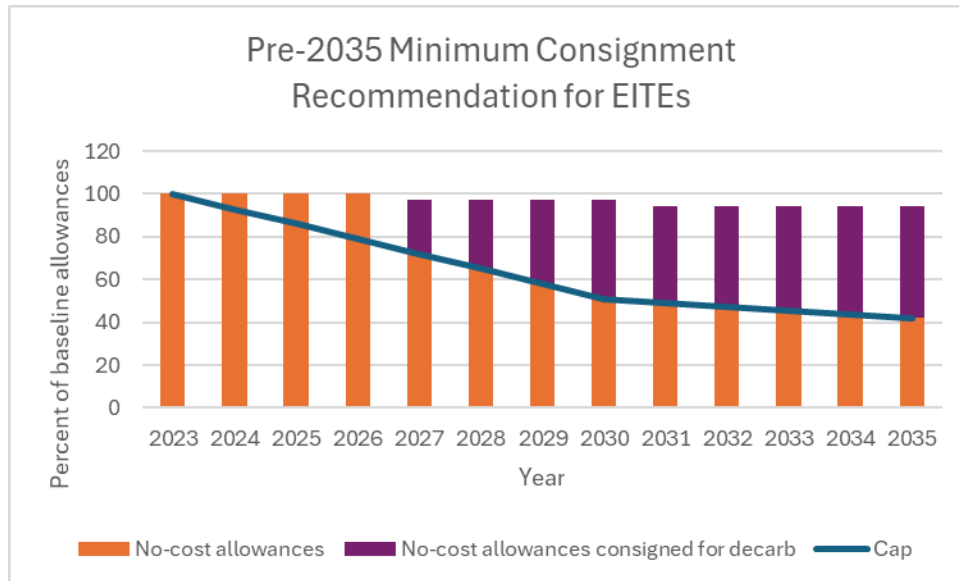
TNC appreciates that Ecology plans to assess leakage risk and tailor assistance based on that risk, since the purpose of no-cost allowances is to prevent leakage *while industrial emitters decarbonize*. If their leakage risk is low or emitters are not decarbonizing, they should not be getting fewer no-cost allowances.

Draft Recommendation 3.1: Clarify how product-based benchmarks or alternative methods for establishing allocation baselines will align with cap

While TNC is open to the idea of re-baselining, it is important that any re-baseline lead to emissions reductions and alignment with the cap. TNC recommends a step down in no-cost allowances in 2035 to align with the cap and sector specific decarbonization pathways. EITEs have been given high levels of no-cost allowances through 2034 in order to minimize leakage while they decarbonize. A step down in no-cost allowances in 2035 to align with the cap will provide EITEs with the certainty that they have requested in order to invest in decarbonization. It is also necessary to meet Washington's GHG emissions targets. Any re-baselining recommendation should align with such a step-down.

Draft Recommendation 3.2: Recommend consignment of no-cost allowances beginning in the second compliance period

We urge Ecology to change Draft Recommendation 3.2 to recommend that Ecology implement consignment beginning in the second compliance period and that EITEs must invest the value of consigned allowances in decarbonization. This should apply regardless of the recommendations Ecology makes in this report for allowances from 2035 to 2050. At a minimum Ecology should recommend that the legislature require consignment for allowances above the level that EITEs would receive if their no-cost allowances reduced directly proportional with reductions in the cap until 2035, and then consignment of all allowances after 2035. Ecology should also consider requiring full consignment of allowances beginning in the 2nd compliance period. This would provide EITEs more certainty as well as a direct financial incentive to invest in decarbonization. It would also strengthen market function by increasing the availability of allowances at auction.



Thank you for your consideration of these comments and dedication to effective implementation of the CCA. Please contact David Mendoza with questions at david.mendoza@TNC.org.

Sincerely,

David Mendoza
Director of Policy and Government Relations
The Nature Conservancy

Joshua Rubenstein
Climate Policy Associate
The Nature Conservancy

September 3, 2025

Adrian Young
Cap-and-Invest Program Industrial Policy Lead
Department of Ecology
State of Washington
P.O. Box 47600
Olympia, WA 98504-7600

Re: Comments on Report to Legislature on No-cost Allowances for Emission-Intensive Trade-Exposed Industries (EITEs)

Dear Adrian Young:

Washington Conservation Action appreciates the opportunity to provide comments on Ecology's draft recommendations for no-cost allowance allocation for emissions-intensive trade-exposed industries (EITEs) under the Cap-and-Invest Program. Washington Conservation Action, formerly known as Washington Environmental Council, has been a leading state policy voice for the environment for nearly 60 years. We develop, advocate, and defend policies that advance environmental progress and justice. We supported the passage of the Climate Commitment Act in 2021, have participated in multiple phases of rulemaking and implementation over the past four years, and worked to protect the law from repeal in 2024. We remain committed to its equitable implementation as we strive to meet Washington's climate goals.

We appreciate the invitation to serve on the EITE Policy Advisory Group, Ecology's efforts to convene industry and policy stakeholders, and the agency's ongoing work on this complicated and important program. We submit these comments for your consideration.

Upholding Structure and Effective Functioning of the Climate Commitment Act

Ecology's report to the legislature should include clear sideboards that reflect the intent of the Climate Commitment Act (CCA) and promote its effectiveness in achieving our state climate goals. The report should not promote any policy options that would compromise the structure or effective functioning of the CCA, such as maintaining or increasing levels of no-cost allowances to EITE facilities, as some covered entities have proposed during joint advisory meetings. The intent of the CCA is clear that emissions from covered entities should decline over time and aggregate emissions from sectors covered under the program should remain under the cap. Throughout the report,

Ecology should make clear that since EITE facilities are covered entities under the CCA, their emissions are included “under the cap.”

The most important measure for successful treatment of EITE facilities under the CCA will be proportionate emission reductions throughout the sector in line with Washington’s 2030, 2040, and 2050 emission limits. If the current trajectory continues, no-cost allowances allocated to EITE facilities will at some point exceed the total allowances released by Ecology each year, compromising the effectiveness of the program. We urge Ecology to clarify that the current no-cost allowance trajectory for EITE facilities is not a viable policy option, as it clearly undermines the intent of the CCA. We agree with representatives of the industry advisory group that predictability is necessary for the success of any policy options for reducing no-cost allowances.

Draft Recommendation 1.2

We support Ecology’s recommendation to continue monitoring developments in other national and international carbon pricing policies, including carbon border adjustment mechanisms and other policies that could address leakage risk. As industrial decarbonization policy is dynamic and changing, it is important for Ecology to regularly assess the success of Washington’s decarbonization policies and stay up to date on successful policies nationally and in other jurisdictions.

Draft Recommendations 2.1 and 2.2

We support Ecology’s recommendation for further research on leakage risk. While there is general agreement in the desire to prevent leakage, there is a need for more research on the risk of leakage for specific sectors.

As Ecology’s report is intended to help the legislature prevent emissions leakage and economic harm, it is important to remember that no policy recommendations are fail-proof. Preventing leakage is extremely important. However, more research needs to be conducted on the likelihood of leakage occurring as a consequence of potential CCA allowance allocation pathways. We hope that Ecology will incorporate the findings of future studies in their report or as an addendum whenever new information becomes available.

Draft Recommendation 3.1

We support the adoption of product-based benchmarks for establishing allocation baselines. Of the options presented by Ecology, product-based benchmarks will bring Washington into alignment with the best practices already in place in California and Quebec. Product-based benchmarks prevent unintentional favoring of some facilities over others within the same sector. Other means of developing baselines are either too ambiguous or fail to appropriately compare facilities to each other, such as facility-specific baselines currently used in the program.

We recommend that Ecology consider an allowance formula similar to that used in California that factors in product-based benchmarks, facility output, leakage risk, and a cap adjustment factor.¹ Factoring in product-specific emissions reduction potentials, as recommended in RMI's study "Opportunities for Industrial Modernization in Washington,"² is another option that should be explored.

Draft Recommendation 3.2

We agree with Ecology's recommendation to conduct further research on the efficacy and feasibility of requiring EITEs to consign no-cost allowances to auction and spend revenues on emission reduction projects. Ecology should explore consignment as a potential policy option as well as specific means of ensuring that the funds from consignment would go toward desirable decarbonization efforts.

Draft Recommendations 4.1 & 4.2

We strongly support implementing a cap adjustment factor that ensures EITE allowance allocation aligns with the overall program allowance budgets and net-zero emissions limits. As stated above, reducing no-cost allowances allocation in alignment with the cap is imperative for the success of the CCA.

Draft Recommendation 5.1

We appreciate Ecology's recommendation to assess the environmental justice impacts

¹ <https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program/allowance-allocation/allowance-allocation-industrial>

² "Opportunities for Industrial Modernization in Washington: Technical Pathways, Investments, Policy, and Decarbonizing Options for Emissions-Intensive, Trade-Exposed Industries," RMI (2025).



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ACTION**

Protecting People & Nature as One

of all proposed policy options. It is important for environmental justice to be at the front of mind in both Ecology's and the legislature's development process for EITE policy. We strongly urge Ecology to strengthen the language of this recommendation beyond assessment, to include factoring environmental justice implications into the decision-making process.

Thank you for the consideration of these comments. We look forward to continuing the conversation as work continues to equitably implement the CCA and achieve our state's climate goals.

Sincerely,

Keith Curl-Dove
Climate and Communities Manager
keith@waconservationaction.org



Jessica Spiegel

Vice President, Northwest Region

September 3, 2025

Sent via email to: CCAEITEIndustries@ecy.wa.gov

Adrian Young
Cap-and-Invest Industrial Policy Lead
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Re: Comments on Policy Design Considerations for EITEs under the Climate Commitment Act

Dear Adrian,

On behalf of the Western States Petroleum Association (WSPA), thank you for the opportunity to comment on the Department of Ecology's (Ecology) draft legislative report on methods for allowance allocation for emissions-intensive, trade-exposed (EITE) industries beginning in 2035 under the Climate Commitment Act (CCA). WSPA represents refineries and other covered fuel suppliers that are central to Washington's economy, energy security, and workforce; and which are directly impacted by the allowance allocation framework under development.

WSPA's recommends a framework that is durable, predictable, and helps prevent leakage by continuing an EITE compliance curve and no-cost allocations beyond 2034. WSPA also recommends that any framework offered by Ecology should avoid major declines in allowance distributions that would be antithetical to future growth and investment; should prioritize competitiveness and leakage prevention; and should ensure any modifications are grounded in realistic assessments of technical feasibility, economic impacts, and statutory obligations.

WSPA and our members have participated actively in the EITE advisory group process, including the Industries Advisory Group (IAG) and – when allowed – policy discussions via the Policy Advisory Group. We appreciate Ecology's effort to gather perspectives from stakeholders. However, we do have concern that the process did not initially focus on providing Ecology staff the interaction with industrial stakeholders needed to provide the depth of knowledge needed to assess the impacts some recommendations have on each sector. As a result, WSPA remains concerned that several of the draft recommendations and supporting analyses would not help prevent emissions leakage and economic harm, and therefore many not align with legislative intent in RCW 70A.65.110, which directs Ecology to evaluate allocation approaches by December 1, 2026 that "*prevent emissions leakage and economic harm to trade-exposed businesses*".

WSPA believes this possible gap between the recommendations by Ecology and the legislative goals of the report may be remedied by further dialogue and additional stakeholder meetings with each industry sector, to allow Ecology staff a better understanding of the implications of recommendations on each sector. WSPA and our members welcome the opportunity to work with Ecology staff in developing deeper industry knowledge to better inform these work products as well as work products Ecology will need to prepare in the future.

This letter builds on our previous written comments submitted in April, June, and July 2025, which are incorporated here in full. We expand on those points with additional observations about

program design, compliance flexibility, environmental justice mapping, and leakage prevention. Finally, we provide narrow but important responses to the ERG and RMI consultant reports, highlighting technical flaws identified by our subject matter experts and independent reviewers.

Continued Provision of No-Cost Allowances Beyond 2034

WSPA strongly supports the continuation of no-cost allowance allocations to all existing and future EITE facilities in Washington beyond 2034. The Legislature was explicit in RCW 70A.65.110 when it directed Ecology to design an allocation framework that prevents leakage and protects the competitiveness of trade-exposed industries.

The dominant factors that compelled legislative direction in 2021 remain unchanged. Washington refineries remain among the most trade-exposed industries in the state. If Washington facilities are forced to absorb costs that competitors elsewhere do not bear, the result will likely be reduced production in the state of Washington, with supply made up through production from jurisdictions with weaker environmental standards. This dynamic—leakage—increases global emissions and undermines the state’s climate objectives. California’s recent experience provides a cautionary example: insufficient recognition of leakage risk has driven market volatility, discouraged investment, and left state regulators struggling to reconcile program costs with economic competitiveness.

Some stakeholders have suggested alternatives such as a carbon border adjustment mechanism (CBAM). While these approaches may appear attractive in theory, they are largely untested at a subnational level. WSPA does not oppose monitoring international developments in CBAM policy, but any suggestion that such mechanisms could substitute for robust no-cost allocations in Washington should be rejected.

For these reasons, we urge Ecology to clearly state in its report to the Legislature that the provision of allowances to protect EITEs should continue beyond 2034. This clarity is essential for long-term investment certainty.

Adjustment Factors and the Need to Avoid “Cliffs”

Any adjustments to EITE allocations beginning in 2035 must be undertaken with care to ensure that the legislative intent to protect trade-exposed industries is not compromised. WSPA has consistently cautioned against the use of a “cap adjustment factor” or other blunt instruments that would impose sudden reductions in allocations. Such approaches create “cliffs”—sharp declines in allowance distribution over an abbreviated period—that destabilize operations and investment planning for facilities with long capital cycles.

By 2035, Washington’s cap will already have declined significantly relative to 2023 levels, meaning EITE facilities will be operating in an increasingly constrained environment if any new adjustment factors are applied. Introducing a cliff-like reduction in free allocations at that point would be destabilizing, and inconsistent with the Legislature’s stated objective of preventing leakage. Instead, WSPA recommends that allowance allocations for EITEs remain on a smooth trajectory that avoids sudden discontinuities.

One option mentioned in draft materials—an annual allocation cap—may warrant further exploration, as it could provide flexibility to ensure adequate allowances for highly trade-exposed industries in cases where less competitive facilities exit the market. This approach could leverage use of allowances that become available to ensure that facilities which remain can stay

competitive in the global marketplace.

We also note with concern the concept of “net-zero industry prioritization” embedded in some discussions. This approach is inconsistent with the legislative intent of EITE allocation. It would pick winners and losers among facilities based not on trade exposure but on an arbitrary categorization. Such an approach should be rejected.

Finally, we urge Ecology to reject calls to adopt RMI’s sector-specific benchmarking claims (such as its Exhibit 8 assumptions about refineries’ ability to achieve deep emissions reductions by 2035). These assumptions are grossly overstated and technically infeasible, as explained further in our response to the RMI report later in this letter. They should not be used as justification for reducing allocations to EITEs.

Maintain Current Facility Baseline Allocation

Stability is essential for ensuring that Washington’s Cap-and-Invest program achieves its objectives without creating unnecessary risk for EITE facilities and the state’s economy. EITE industries make capital investments on long timelines and require predictability in order to plan effectively.

One of the most important elements of program stability is the treatment of baseline years. WSPA strongly recommends that Ecology retain the existing 2015–2019 facility baseline period for post-2034 allocation¹. This period reflects representative operational levels for covered entities and provides a solid, known foundation for planning. Changing the baseline years at this stage would create perverse incentives: it could encourage facilities to delay or hold back emission reduction efforts in order to secure more favorable baselines, and it would penalize companies that have already invested in efficiency improvements or emissions reductions.

Consistency in baseline selection also promotes fairness. All covered entities have made business decisions with the current baseline years in mind. Altering those years midstream would unfairly disadvantage companies that acted early to reduce emissions or adjust operations. It would also create confusion in comparing Washington’s program with linked or comparable programs in other jurisdictions.

Product Based Benchmark

Ecology has suggested sector-specific or product-based benchmarking as a method of allocating allowances. While this may appear aligned with some other jurisdictions practices, it could be especially problematic for Washington’s EITE industries, and for refineries.

As an example, under federal antitrust law, the prior “safety zone” guidance regarding information exchanges (which allowed thresholds such as at least five participants and no single participant over 25% of market share) was rescinded by the FTC and DOJ in February 2023. It is our understanding that this change occurred due to concerns over maintaining competitiveness within the broader market. The advent of artificial intelligence models raised concerns that any data gathered could be disaggregated and un-anonymized, meaning that companies’ competitively sensitive data could be made public. This concern would also be relevant for data collected by the State.

¹ WSPA does remain interested in Ecology considering an adjustment for the overall program baseline due to the differences of included products, but not at a facility level for allocations.

In addition, switching to this benchmark would force a baseline transition, which would add additional unnecessary complexity, expense, and time.

For these reasons, WSPA recommends that Ecology rejects product-based benchmarking as a default allocation method.

Best Available Technology (BAT) Benchmark

BAT is a term that identifies technologies that may reduce emissions in a greater quantity than some other similar technology, generally for a specific application within a production process. The designation of BAT is not intended as a framework for determining allowance distribution.

Requiring BAT as a condition for receiving allowances conflates two distinct policy objectives and undermines the predictability that EITE facilities need for long-term planning. While WSPA does not oppose making a BAT pathway available on a voluntary basis for facilities that wish to pursue it, any compulsory BAT allocation mechanism could be unworkable.

WSPA recommends that Ecology reserve BAT only as an optional pathway for interested facilities. The most effective approach remains the continuation of the current framework, which balances competitiveness with emissions accountability.

Leakage Risk Assessments

Ecology's draft report contemplates the use of leakage risk assessments as part of the framework for post-2034 allocation. WSPA strongly cautions against this approach. These assessments, while framed as technical exercises, are in practice highly subjective, resource-intensive, and prone to politicization. They introduce new layers of uncertainty without adding meaningful insight into the actual risk faced by EITE facilities in Washington.

The legislative intent in SB 5126 and RCW 70A.65.110 was clear: EITE facilities are recognized as highly vulnerable to leakage. That recognition drove the Legislature's directive to provide robust no-cost allowances. Attempting to "re-prove" leakage risk through new academic studies disregards that legislative determination and risks undermining the very protections the law was designed to secure.

Moreover, leakage risk assessments invite regulatory drift by shifting the burden onto industry to continually justify its vulnerability. This would create instability in allowance allocation and could discourage long-term investments in emissions reduction projects. Companies cannot responsibly commit capital if the level of allocation support is subject to recurring re-evaluation based on evolving academic methodologies.

Ecology's draft report also references the possibility of an "assistance factor." If this concept is pursued, WSPA recommends that it be set at least 1.0 (in consideration of the California methodology) or the highest leakage factor, to acknowledge the risk to EITE's. Any value lower than 1.0 would arbitrarily reduce the protection provided to trade-exposed industries and would directly contradict the policy rationale embedded in SB 5126. We note that AB 398 (2017) in California codified the assistance factor to 1.0. This change was in response to the California Air Resources Board adoption of a Cap-and-Trade regulation that included a lowered assistance factor. This affirms California's approach that the leakage risk for EITE remains high.

Finally, leakage cannot be reliably predicted or publicly signaled by the very companies at risk.

Under federal securities laws, publicly traded entities cannot disclose or forecast material adverse developments such as facility closures, reductions in output, or loss of competitiveness before such events are finalized and disclosed in accordance with SEC requirements. Asking facilities to anticipate or quantify leakage in advance would place them in direct conflict with securities law. And it is equally problematic for the state to attempt such forecasting itself — in essence speculating which plant might close first. Beyond the legal conflicts, this raises ethical concerns: government should not be in the position of predicting or effectively signaling the demise of specific employers, facilities, or local economies. Together, these issues underscore why leakage risk assessments are both impractical and inappropriate as a policy tool.

To reiterate, WSPA strongly cautions against this approach. These assessments, while framed as technical exercises, are in practice highly subjective, resource-intensive, and prone to politicization. They can introduce new layers of uncertainty without adding meaningful insight into the actual risk faced by EITE facilities in Washington.

Decarbonization Pathways and the Limits of Electrification

A recurring theme in stakeholder discussions has been the potential for deep decarbonization of industrial facilities through electrification. While WSPA supports efforts to pursue technically feasible emissions reductions, we caution against overreliance on electrification as a pathway for Washington's EITE industries. At present, commercially and technically feasible options to electrify refining and other high-temperature processes, at scale, do not exist. The infrastructure, permitting, and cost barriers remain significant, and until these are removed the commercial viability of any existing or new technology will remain challenging.

Real-world case studies confirm these challenges: even relatively low-temperature, seemingly straightforward equipment retrofits have proven technically complex and prohibitively costly.

An illustrative example is provided in Appendix A.

Electricity Allocations and Consignment

Some stakeholders have raised the issue of providing no-cost allowances for purchased electricity used by EITE facilities. The need for this protection will diminish over time as Washington's grid becomes increasingly decarbonized under the Clean Energy Transformation Act (CETA). We encourage Ecology to weigh the potential benefits of electricity allocations against the administrative effort required to implement them, recognizing that the balance of costs and benefits may shift as grid emissions decline.

Ecology has also raised the possibility of requiring a portion of EITE allocations to be consigned to auction, with the proceeds reserved for projects intended to reduce emissions. WSPA does not oppose consignment in principle but emphasizes that flexibility and safeguards are essential to make this tool workable. At a minimum, these should include:

- Expedited permitting for funded projects, so that proceeds can be deployed in a timely manner.
- Flexibility to redirect proceeds if intended projects cannot be implemented.
- Protections for facilities that cannot reasonably access or deploy consignment proceeds.

Without these guardrails in place, any use of consignment would risk creating additional

compliance costs without achieving meaningful emissions reductions.

Response to ERG and RMI Supporting Reports

Several of Ecology's draft recommendations rely on consultant reports prepared by Eastern Research Group (ERG) and Rocky Mountain Institute (RMI). While these reports provide perspective, they contain significant methodological flaws that make them an unsound basis for long-term policy decisions.

ERG Report

Overburdened Community

Given the technical nature of the ERG analysis, WSPA hired Trinity Consultants to provide a third-party review of the Air Quality/Overburdened Community portion of the ERG analysis which is provided as Appendix B to this comment letter. As WSPA noted during the advisory committee meetings, the ERG materials are missing calculations and data that did impact the ability to complete a full review. However, Trinity's review of the ERG analysis used in Ecology's draft report found the following technical and methodological flaws. These errors consistently overstated both the environmental and economic benefits of reducing EITE allocations. The following highlights the most significant issues that call into question the validity of ERG's conclusions:

- **No Basis for CAP Reductions** – ERG assumed a one-to-one relationship between GHG allowance reductions and criteria air pollutant (CAP) reductions despite no technical or operational linkage. CAPs are already controlled by existing permit limits and NAAQS compliance, and EITEs contribute less than one percent of statewide CAPs in most categories.
- **Model Issues with use of EPA's COBRA Tool** – ERG used the COBRA screening model incorrectly, producing misleading health benefit estimates. For example, Trinity notes that

"the 2023 baseline emissions inventory in the COBRA model used to assess health impacts is fundamentally different than the 2023 Ecology baseline emissions inventory used by ERG to compute the assumed reductions in EITE CAP emissions ... [the result of this for refining] of the ERG report's methodological error led it to model a 21 to 47% increase in refinery CAP emissions instead of 6%."

As another example, some of the modeled reductions were treated as increases, inflating the projected benefits from negligible changes.²

- **Inflated Social Cost of Carbon (SCC) Value** – ERG appears (the calculation method is obscure) to have significantly overstated climate benefits relative to the EPA social cost of carbon value, valuing reductions at \$2.6 billion. To replicate the calculation, using EPA's SCC, the Trinity assumed a 6% reduction in 2034 and calculated a value closer to \$213 million (in 2034).
- **Mapping Without Analysis** – ERG's maps of EITEs relative to overburdened communities and Tribal lands applied inconsistent radii (3 miles vs. 10 miles) with no justification, implying nearly half the state is impacted. These visuals are misleading and

² WSPA encourages Ecology staff to also confirm that the models are using a correct inventory database in the COBRA model that aligns with the current EITE facilities.

unsupported by emissions data. For the majority of the overburdened community areas, many point sources are just not a measurable source for criteria pollutants.

Economics

Separately WSPA hired Turner Mason to provide a third party review of the RMI report. Given that more in depth analysis, WSPA hired an affiliated consultant, DSC, to perform a quick third-party review of the economic section of the ERG analysis. ERG's draft report appears to mischaracterize Washington's refining industry and its ability to absorb or adapt to carbon costs. These errors consistently understate risks and overstate transition potential. The following highlights the most significant issues that lead to the understatement of risks:

Findings

- **Volatility Understated** ERG's analysis makes the refining business look more stable than it actually is. In reality, refining is highly cyclical — profits swing up and down much more sharply than ERG reported, closely tied to oil prices. When measured this way, volatility is over 60% higher than ERG showed. This means Washington refineries already operate on a financial rollercoaster, with very limited ability to absorb new costs.
- **Employment Undercounted** – ERG's “~2,000 workers” only focuses on direct employment³. Various studies show more indirect wages, contract wages, and that refinery roles are up to 60% higher than county averages, magnifying the economic and community importance of these jobs. These impacts are typically evaluated when assessing economic impacts to a regional area, especially more rural areas like Whatcom and Skagit Counties.
- **Transition Pathways Overstated** – ERG's suggestion that Washington refineries could shift rapidly to renewable diesel or SAF ignores market realities. Renewable diesel margins are compressed due to overcapacity, and SAF remains hampered by the lack of a coherent U.S. policy framework and thin state-level incentives. These constraints severely limit near-term viability.

RMI Report

As noted above, WSPA also contracted with Turner Mason & Company to conduct an independent technical review of the RMI pathways analysis included in Ecology's draft materials. This review is provided to Ecology in Appendix C. Their findings show that RMI's assumptions are unrealistic, economically damaging, and in some cases counterproductive from a climate perspective. The following highlights the most significant flaws:

- **Global Emissions May Increase** – RMI failed to account for the global emissions impact of continuing to need products, such as gasoline, if the local refineries are no longer producing those products and they need to be brought in from other jurisdictions.
- **Severe Margin Losses** – Turner Mason assessed the financial impact of closing or converting major refinery units, which they analyzed would reduce margins by \$0.7 to \$1.2 billion annually per facility, threatening the long-term viability of Washington refineries.

³ Both the ERG and RMI reports consistently cite only ~2,000 direct refinery jobs, overlooking the additional ~2,000 contractors as well as broader indirect and induced employment. The repetition of this narrow figure across multiple analyses raises concerns about the separation and independence of these inputs. In economic analyses of this nature, indirect employment effects are typically included, and their exclusion significantly understates the workforce and community impacts of policy decisions affecting Washington's refining sector and the economies of the surrounding counties.

- **Workforce Impacts Understated** – RMI counted only direct unit operators, overlooking contractors and broader economic effects. In reality, closures would displace thousands of workers, with many facing wage losses of 40–50%.
- **Capital Projects Not Competitive** – Options such as FCC carbon capture, renewable diesel conversions, or low-carbon hydrogen require billions in capital and only break even at carbon prices between \$100 and \$600/ton, even after federal IRA incentives. These projects would not be prioritized in corporate portfolios under current market and policy conditions.
- **Timing Constraints Ignored** – Large-scale projects can only be scheduled during refinery turnaround cycles, typically every five years. With permitting and construction timelines added, most major decarbonization projects could not be realistically completed before the late 2030s or 2040s.

WSPA appreciates that Ecology took steps to clarify the relationship with the RMI submissions and recommends that it be clear that RMI's submissions represent external advocacy, not contracted technical analysis. Treating them otherwise risks embedding aspirational positions in place of sound policy grounded in feasibility, statutory intent, and data.

Conclusion

WSPA supports the objective of decarbonizing the industrial sector while maintaining economic competitiveness and legal defensibility. However, the draft recommendations in their current form do not necessarily reduce the likelihood of emissions leakage and economic harm. We urge Ecology to revisit its assumptions, take more time to get to know our industry and sector, and incorporate stakeholder feedback into a revised report that recognizes the real-world constraints and risks facing EITE facilities.

We welcome further dialogue and look forward to continued engagement on this important issue.

Sincerely,



Jessica Spiegel
Vice President, Northwest Region



CC: Joel Creswell, Department of Ecology
CC Tamara Jones, Department of Ecology
CC Andy Hayes, Department of Ecology
Attachments:

- Appendix A: Refinery Electrification Example
- Appendix B: Trinity Review of WA ERG Report
- Appendix C: Turner Mason Memo EITE Decarbonization Pathways for Washington Refineries

Standalone Memo Refinery Electrification

Subject: Technical and Cost Barriers to Electrification – Illustrative Case Study

Overview

This memorandum provides an illustrative example of the complexity and cost associated with attempting to electrify even relatively low-temperature refinery equipment. The purpose is to demonstrate why electrification, while often discussed as a decarbonization pathway, presents significant technical and economic barriers that cannot be overlooked when evaluating policy options for emissions-intensive, trade-exposed industries (EITEs).

Case Study Example

Within the last few years, one facility conducted a screening exercise to identify potential “low-hanging fruit” opportunities to replace steam-based heating with electric heating. A heat exchanger was identified as a potential candidate for a straightforward conversion.

- The exchanger was a modest unit (~9 MMBtu/hr duty) with a relatively low steam requirement.
- Because it operated at lower temperatures and only performed sensible heat duty (no vaporization), it appeared to be a good test case for electrification.
- The initial concept was to remove the existing tube bundle and replace it with an approximately 2.7 MW electric heating element while retaining the existing shell, with the expectation that this would keep costs down.

In practice, the retrofit proved infeasible. The number and size of the required electric rods made the bundle unable to fit within the existing shell due to required rod spacing to address electrical impedance concerns. This requirement dictated an increase in the shell to effectively double its original size and weight then creating both structural concerns and significant piping rework to proceed.

The redesign dramatically increased the overall cost of conversion — more than 300 percent above the original estimate. This outcome occurred despite the fact that this was considered one of the “simpler” and lower-temperature electrification opportunities available. This project is estimated to deliver a value in the range of \$400–\$600 per metric ton of CO₂ reduced. However, it should be noted that the realized value depends on where within the steam system boiler network the project is implemented. In some cases, the benefits may be offset by how decarbonization and offsets are measured under the CCA framework, and at certain points in the system network no directly measurable reductions would occur for the refinery.

Implications

This example highlights the real-world engineering and cost challenges of electrification:

- Even relatively small, low-temperature units pose significant feasibility hurdles.
- Conversions often require major redesigns of equipment rather than simple component swaps.
- The associated costs can increase severalfold beyond initial estimates, undermining economic viability.
- Scaling such approaches to larger, higher-temperature refinery equipment would be even more complex and costly.

Conclusion

While electrification is frequently raised in policy discussions as a potential decarbonization strategy, this example demonstrates the need for caution. Technical feasibility and cost barriers remain substantial even for modest applications, and policymakers should avoid assuming rapid or low-cost electrification pathways in Washington's EITE sectors.

**Technical Review of
Eastern Research Group's (ERG) Report
"Environmental Justice and Economic/Market
Information on Emissions-Intensive, Trade-Exposed
(EITEs) Facilities in Washington"**

Prepared for Western States Petroleum Association

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September 2, 2025



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1. EXECUTIVE SUMMARY

The Washington Climate Commitment Act (CCA), enacted in 2021, established the Cap-and-Invest program to reduce greenhouse gas (GHG) emissions from large industrial facilities in the state, referred to as “covered facilities.” To prevent GHG emissions leakage from Emissions-Intensive, Trade-Exposed (EITE) facilities, the CCA currently provides “no-cost” GHG allowances, covering 100% of reported facility emissions. These no-cost allocations are scheduled to decline to 97% from 2027 through 2030 and then to 94% from 2031 to at least 2034.

It has not yet been established if there will be changes in the manner in which no-cost allowances are allocated to EITE facilities during the period from 2035 to 2050. As a result, the Washington Department of Ecology (Ecology) has been directed to prepare a report for the Washington Legislature that assesses the issue and provides recommendations on the most appropriate approach to allocating no-cost allowances to EITE facilities beginning in 2035.

As part of this process, Ecology contracted Eastern Research Group (ERG) to assess the potential environmental and economic impacts of different no-cost allowance allocation approaches by analyzing the expected impacts of the 6% reduction scheduled for 2034 (from 100% to 94% no-cost allocation). The ERG report, *“Environmental Justice and Economic/Market Information on Emissions-Intensive, Trade-Exposed (EITEs) Facilities in Washington,”* was published on June 30, 2025, and is publicly available on the Washington State Department of Ecology’s website¹. The report focuses on the following environmental issues:

- ▶ The estimated contribution of EITEs to total emissions of criteria air pollutants (CAPs), hazardous air pollutants (HAPs), and GHGs
- ▶ The projected health benefits from reductions in EITE-related CAP emissions resulting from the 2034 reduction in no-cost allowance allocations to EITE facilities
- ▶ The estimated monetary value of GHG emission benefits resulting from the 2034 reduction in no-cost allowance allocations to EITE facilities

In addition, the ERG report presents three case studies intended to address air quality issues in select counties with higher numbers of EITE facilities.

At the request of the Western States Petroleum Association (WSPA), Trinity Consultants, Inc. (Trinity) has conducted a technical review of the ERG report’s methodologies, assumptions, and findings related to the environmental issues listed above. In summary, Trinity identified the following major flaws and shortcomings and has determined that in addition to providing poorly documented analyses the ERG report:

- ▶ Improperly assumed that reductions in no-cost GHG allowance allocations to EITE facilities would lead to directly proportionate reductions in CAP emissions.
- ▶ Did not identify any meaningful air quality issues associated with CAP and HAP emissions from EITEs, or discuss any substantial air quality benefits that would be expected from the 6% reduction in no-cost

¹ Eastern Research Group. 2025, June 30. Environmental Justice and Economic/Market Information on Emissions-Intensive, Trade-Exposed (EITEs) Facilities in Washington (Publication No. 25-14-057). Washington State Department of Ecology. <https://apps.ecology.wa.gov/publications/documents/2514057.pdf>

GHG allowances to EITE facilities, whether considered statewide, in overburdened communities, or in counties with higher numbers of EITE facilities.

- ▶ Failed to properly conduct the analysis of potential health benefits from assumed CAP reductions resulting from the 6% reduction in no-cost GHG allowances to EITE facilities, rendering the results of that analysis meaningless.
- ▶ Failed to accurately compute the monetary value of GHG reductions expected to result from the 6% reduction in no-cost GHG allowances to EITE facilities, reducing the health benefits from the stated \$2.6 billion to the Trinity-calculated \$213 million.

2. INTRODUCTION

One element of the Washington Cap-and-Invest program, established under the Climate Commitment Act (CCA) in 2021 and implemented in 2023, is intended to reduce greenhouse gas (GHG) emissions from large industrial facilities in the state. The law sets a declining cap on emissions and requires major emitters to obtain tradable allowances, with targets of reducing GHG emissions to 45% below 1990 levels by 2030, 70% below 1990 levels by 2040, and 95% below 1990 levels by 2050, at which point “net-zero” carbon emissions are to be achieved. One concern addressed during the development of the Cap-and-Invest program² was to ensure that leakage of GHG emissions from Emissions-Intensive, Trade-Exposed (EITE) facilities did not occur and that the facilities were not adversely impacted by the CCA. Under the CCA, EITEs are facilities that are energy intensive and have significant exposure to trade and are defined as facilities in the following sectors, including but not limited to those specifically listed:

- ▶ Building Product, Electronics, and Aerospace Manufacturing
- ▶ Food Processing and Manufacturing
- ▶ Petroleum Refining and Chemical Manufacturing
- ▶ Primary Metals and Glass Manufacturing
- ▶ Pulp, Paper, and Cement Manufacturing

The issue of concern with EITEs is that CCA requirements mandating GHG emission reductions would economically disadvantage in-state facilities, likely leading to a decline in in-state manufacturing, which would be offset by increased production and emissions at out-of-state facilities to meet existing product demand, a dynamic commonly referred to as “leakage.”

To address the risk of leakage, the Washington CCA’s Cap-and-Invest program provides “no-cost” GHG allowances to EITE facilities, allowing them to comply with program requirements without experiencing significant adverse economic effects. Under the current requirements, no-cost allowances are allocated to EITEs based on a baseline for facility emissions established using actual emissions from 2015 to 2019, as follows:

- ▶ 100% no-cost allowances from 2023 through 2026
- ▶ 97% no-cost allowances from 2027 through 2030
- ▶ 94% no-cost allowances from 2031 through 2034

The legislation and current WAC rules do not specify the manner in which no-cost allowances will be allocated to EITE facilities during the period from 2035 to 2050. As a result, the Washington Department of Ecology (Ecology) has been directed to prepare a report for the Washington Legislature, providing an assessment of the issue and recommendations on how best to proceed with no-cost allowance allocation to EITEs beginning in 2035.

As part of its process to develop this report for the Legislature, Ecology contracted Eastern Research Group (ERG) to assess the potential environmental and economic impacts of no-cost allowance allocation choices by analyzing the expected impacts of the 6% reduction scheduled for 2034 (from 100% to 94% no-cost allocation). The ERG report documenting this work, titled “*Environmental Justice and Economic/Market Information on Emissions-Intensive, Trade-Exposed (EITEs) Facilities*,” presents the following findings:

² RCW 70A.65.005(6) states: “The legislature intends to create climate policy that recognizes the special nature of emissions-intensive, trade-exposed industries by minimizing leakage and increased life-cycle emissions associated with product imports.”

- ▶ The estimated contribution of EITEs to total statewide emissions of criteria air pollutants (CAPs), hazardous air pollutants (HAPs), and GHGs is less than 1% for most CAPs, 9% for NO_x, and 21% for SO₂, less than 0.4% for HAPs, and 13.3% for GHGs.
- ▶ The projected health benefits from reductions in EITE-related CAP emissions as a result of the 2034 reduction in no-cost allowance allocations to EITE facilities are \$30.4 to \$50.2 million.
- ▶ The estimated monetary value of GHG emission benefits expected from the 2034 reduction in no-cost allowance allocations to EITE facilities is \$2.6 billion.

In addition, the ERG report also addresses the locations of EITE facilities relative to overburdened communities and presents three case studies focused on air emissions issues in select counties with larger numbers of EITE facilities.

At the request of the Western States Petroleum Association (WSPA), Trinity Consultants, Inc. (Trinity) conducted a technical review of the ERG report's methodologies, assumptions, and findings related to the environmental issues listed above. The results of Trinity's review are presented in this report.

3. CRITERIA AIR POLLUTANT (CAP) EMISSIONS

The ERG report assumes that the 6% reduction in GHG emission allowances will directly result in proportional reductions of criteria air pollutants (CAPs). This assumption is flawed for multiple reasons as described in Section 4 of this report. CAPs are compounds for which health-protective National Ambient Air Quality Standards (NAAQS) have been established or are precursors to pollutants for which NAAQS exist.

The CAPs addressed in the ERG report that have established NAAQS are:

- ▶ Carbon monoxide (CO)
- ▶ Sulfur dioxide (SO₂)
- ▶ Particulate matter with diameters of 10 micrometers or less (PM₁₀)
- ▶ Particulate matter with diameters of 2.5 micrometers or less (PM_{2.5})
- ▶ Nitrogen dioxide (NO₂)

The CAPs addressed in the ERG report that are precursors to compounds with established NAAQS are:

- ▶ Volatile organic compounds (VOC) – precursors to ozone formation
- ▶ Oxides of nitrogen (NO_x – including NO₂) – precursors to both ozone formation and PM_{2.5}
- ▶ SO₂ and Ammonia (NH₃) – precursors to PM_{2.5} formation

The NAAQS for ozone were established because ozone is an oxidant and the primary compound associated with smog. As noted, VOC and NO_x emissions are precursors to the formation of ozone in the atmosphere, which results from photochemical reactions. Similarly, substantial portions of PM_{2.5}, and to a lesser degree PM₁₀, can be formed as a result of various atmospheric processes involving NO_x, SO₂, and NH₃. Importantly, according to Ecology's attainment status data³, and with the recent redesignation of Whatcom County to attainment for SO₂⁴, all areas of Washington currently comply with all NAAQS.

CAP Selection

The ERG report focuses its environmental analysis on certain CAPs but provides no explanation as to why these CAPs were selected. The selection of CO is particularly surprising, as the last Washington area out of compliance with the CO NAAQS came into attainment in the early 2000s, and all subsequent monitoring across the state has shown levels well below the standard. Similarly, the selection of SO₂ does not appear justified, given that only one area near the aluminum smelter in Whatcom County was in non-attainment with the SO₂ NAAQS, but that area was redesignated as attainment in January 2025. Statewide monitoring data show that SO₂ concentrations are now consistently far below the NAAQS. Inclusion of NO_x is more reasonable, given the need to maintain compliance with the ozone and PM_{2.5} NAAQS, which is generally a regional issue. However, NO₂ emissions are also well below NAAQS, as discussed in the next section.

³ Washington State Department of Ecology. 2025. Areas Meeting and Not Meeting Air Standards. <https://ecology.wa.gov/regulations-permits/plans-policies/areas-meeting-and-not-meeting-air-standards>

⁴ EPA. 2024. Designation of Areas for Air Quality Planning Purposes; Redesignation Request and Associated Maintenance Plan for Whatcom County, WA 2010 SO₂ Nonattainment Area. Federal Register, 89 (FR 101896), pp. 101896–101901. Environmental Protection Agency. <https://www.federalregister.gov/d/2024-29575>

CAPs and Air Quality

The ERG report presents ambient air quality data for the years 2020 through 2023 for NO₂, CO, SO₂, and ozone in Table 6 of their report, while providing minimal context. The reader is required to find “Comparison Values” (each pollutant’s NAAQS) and compare those with “Design Values” (monitored concentrations in the form of each pollutant’s respective NAAQS), some of which are presented in different units (e.g., CO values are presented in both ppm and ppb).

To assist in putting air quality data into perspective, Trinity prepared Figure 1 and Figure 2, which show that NO₂ and CO concentrations are far below the respective NAAQS values. Ozone concentrations are shown in Figure 3, and while they appear closer to NAAQS levels, it is important to note that the data used in the ERG report are not corrected for exceptional events (wildfire days). For ozone, Table 6 of the ERG report is also missing data for several sites that were reported by Ecology Network Plan; these missing 2023 design values are included in Figure 3 below based on Ecology’s 2024 publication.⁵ According to the Puget Sound Clean Air Agency⁶, the 2023 ozone design value for the Enumclaw site, when wildfire smoke-impacted days are excluded, is 0.067 ppm, rather than the 73 ppb (0.073 ppm) reported by ERG. Since the current ozone NAAQS is 0.070 ppm (70 ppb), the difference between these values is critical for determining attainment status⁷. In addition, the Figure 3 chart appears to indicate there may be an increasing trend in ozone at the Enumclaw site; however, the 3-year design values are highest in 2022 and 2023 because they are most influenced by the wildfire years in 2021 and 2022 (2022 and 2023 are the two years that included both 2021 and 2022 in the 3-year average). The 4th highest 8-hour concentrations in 2023 and 2024 were lower than those measured in previous years at the site.⁸

Table 6 in the ERG report includes SO₂ design values for year 2020 and only from the Ferndale monitors, which were impacted by the now-closed aluminum smelter (which was not an EITE facility). The design value for those sites is now 3 ppb in contrast to the 68 and 89 ppb reported by ERG for the two Ferndale monitors. In addition, ERG did not report SO₂ data from ambient air quality monitoring conducted at three other Ecology monitoring sites (Anacortes, Cheeka Peak, and Seattle-Beacon Hill in Skagit, Clallam, and King counties, respectively) during all four years. The SO₂ design values ranged from only 1 to 3 ppb in 2023 compared to the NAAQS of 75 ppb, which is why Trinity did not prepare a figure presenting those data (i.e., the measured values are so far below the NAAQS that the bars would be indistinguishable from zero).

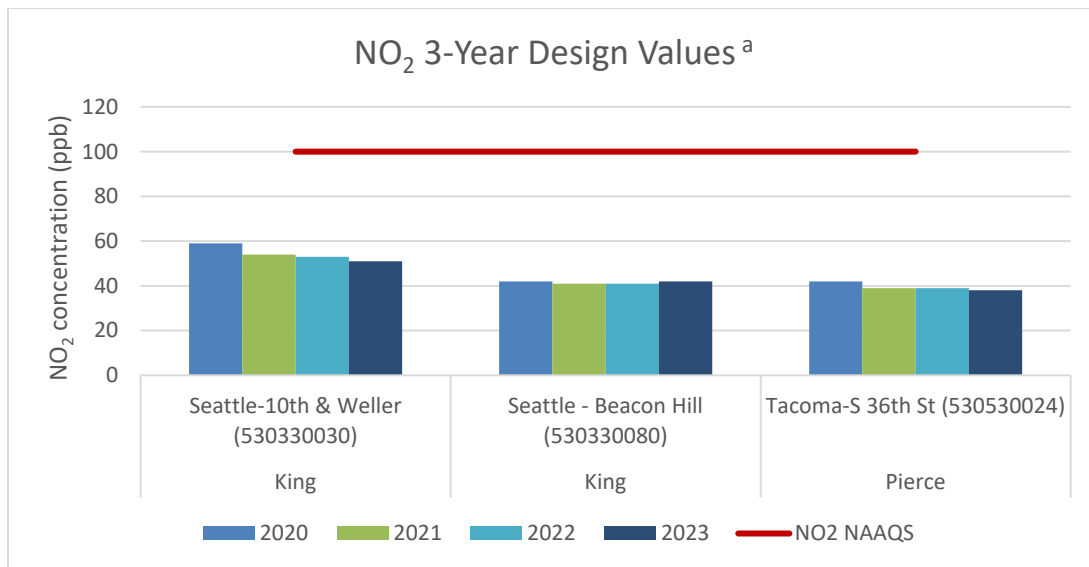
⁵ Washington State Department of Ecology. 2024. Ambient Air Monitoring Network Plan 2024 (Publication No. 24-02-017). Washington State Department of Ecology. <https://apps.ecology.wa.gov/publications/documents/2402017.pdf>

⁶ Puget Sound Clean Air Agency. 2024. 2023 Air Quality Data Summary (Air Quality Report). <https://www.pscleanair.gov/DocumentCenter/View/5649/Air-Quality-Data-Summary-2023?bidId=>

⁷ U.S. Environmental Protection Agency. 2024. NAAQS table (Criteria Air Pollutants). <https://www.epa.gov/criteria-air-pollutants/naaqs-table>

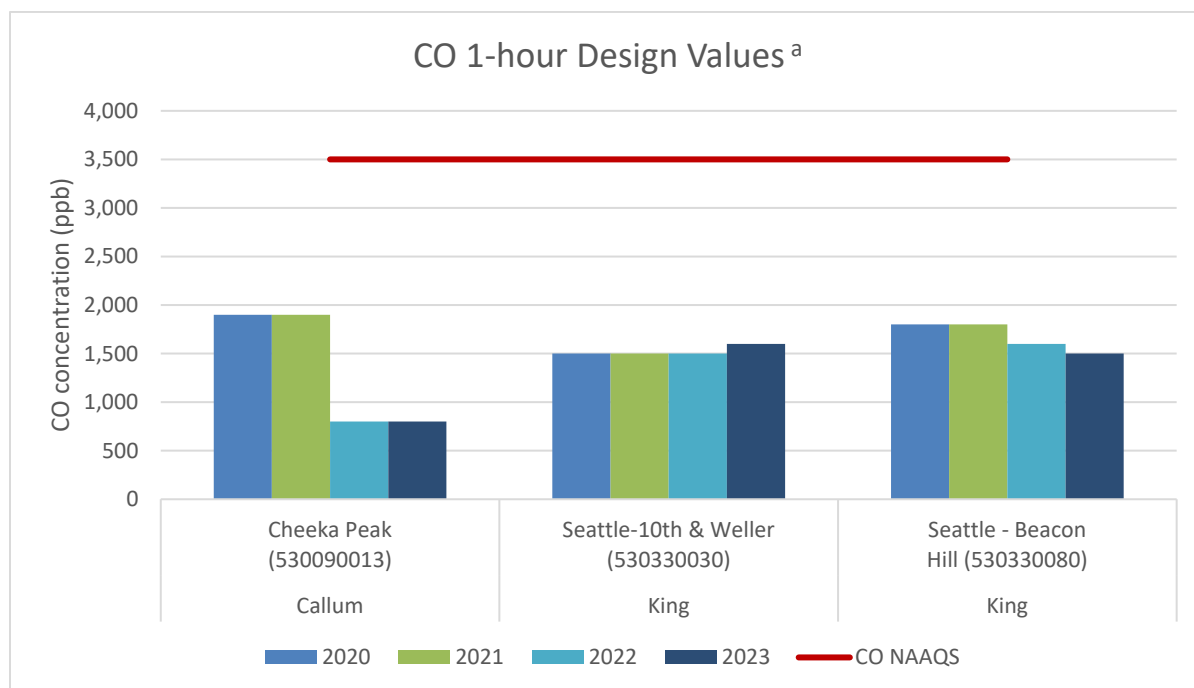
⁸ Puget Sound Clean Air Agency. 2025. 2024 Air Quality Data Summary (Air Quality Report). <https://pscleanair.gov/DocumentCenter/View/6035/2024-Data-Summary?bidId=>

Figure 1. Comparison of NO₂ Design Value^a Data Presented by ERG to the NAAQS Level.



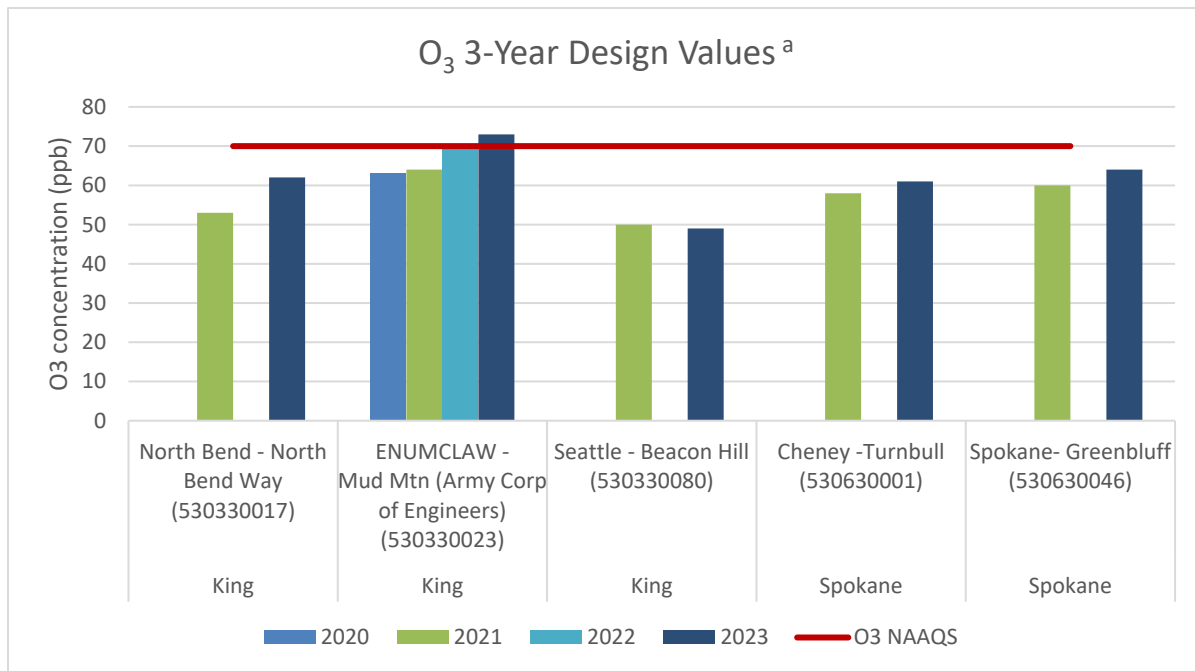
- a. The NO₂ 1-hour NAAQS design value is the 3-year average of 98th percentile of the yearly distribution of 1-hour daily maximum concentrations.

Figure 2. Comparison of CO Design Value^a Data Presented by ERG to the NAAQS Level.



- a. The CO 1-hour NAAQS design value is the 2nd highest 1-hour average value in each year (not averaged over 3 years).

Figure 3. Comparison of Ozone (O₃) Design Value ^a Data Presented by ERG to the NAAQS Level.



- a. The ozone 8-hour NAAQS design value is the 3-year average of annual 4th highest daily maximum 8-hour concentrations.

EITEs and Statewide Inventory

The ERG report's assessment of CAPs relies on 2022 emissions inventory data in Table 2 (page 6 of the ERG report), which shows the total contribution of CAP emissions from EITEs to total statewide CAP emissions. According to the ERG report, EITEs contribute less than 1% of total statewide emissions of each CAP, with the exception of NO_x and SO₂. For NO_x, total EITE emissions are about 9% of total statewide emissions, and for SO₂, EITE emissions represent about 21% of total statewide emissions. Recall that the Design Values for SO₂ are orders of magnitude below the NAAQS, indicating minimal benefit of any subsequent reductions. Overall, the fact that air quality in the state of Washington complies with all federal NAAQS, and that EITEs contribute little to total statewide CAP emissions, except for SO₂, which is now significantly below NAAQS, suggests that there is not a pressing need for emissions reductions from EITEs beyond those already required under federal, state, and local regulations.

The ERG CAP assessment continues with reporting of total emissions inventory data for CO, NO_x, and SO₂ for 15 of Washington's 39 counties with EITEs in 2022, along with the percentage of county-level totals emitted by EITEs. As shown in Table 3 of the ERG report, in 9 of these 15 counties, EITE emissions accounted for 5% or less of total county-level emissions of each pollutant. The maximum contributions of EITEs to total emissions of CO, NO_x, and SO₂ were about 11%, 47%, and 96.4%, respectively.

Unfortunately, the ERG report does little to put these results into proper context, given that regardless of the contribution of EITEs to total emissions, pollutant concentrations do not violate the federal NAAQS.

In summary, nothing presented in the sections of the ERG report discussed above suggests that reductions in EITE emissions, resulting from reductions in no-cost GHG allowance allocations, would improve air quality in Washington.

4. HEALTH RISK ASSESSMENT

The ERG report does attempt to link reductions in CAP emissions from EITEs to health benefits. The report's analysis involves the use of U.S. EPA's CO-Benefits Risk Assessment Health Impacts Screening and Mapping Tool (COBRA)⁹. The ERG report notes on page 22 that COBRA:

"...can be utilized to better understand how changes in air pollution from clean energy and fuel programs can impact human health."

According to the ERG report, COBRA results indicated that a 6% reduction in CAP emissions from EITEs in 2034 would correspond to a total monetary health benefit of \$5.5 to \$8.5 million per year in the counties where EITE facilities are located, and a statewide benefit of \$34 to \$50 million. The ERG report also notes that about 95% of these monetary benefits are due to a reduction in mortality of 0.3 to 0.4 people in EITE counties and 1.6 to 2.4 people statewide. To put these mortality rates into perspective, the state of Washington reported¹⁰ 66,062 deaths statewide in 2023, which means even the upper bound mortality reduction of 2.4 reported by the ERG report translates to an overall reduction of 0.004% in statewide deaths.

Additionally, Trinity's review shows that there are a number of flaws in the way the ERG report applied the COBRA model, and that these flaws caused the ERG report to overstate the health benefits associated with the assumed reduction in CAP emissions.

COBRA Model Use

The ERG report failed to appropriately characterize the COBRA model, which could lead the reader to inappropriately rely on the information presented as authoritative rather than recognize its modeling results as a preliminary screening, especially since dollar values are presented for the estimated health benefits.

The ERG report does not include or even mentions U.S. EPA's disclaimers,¹¹ which state:

"COBRA does not replace regulatory quality analyses. COBRA serves as a preliminary screening tool to identify those scenarios that might benefit from further evaluation with the more sophisticated air quality modeling approaches that are currently available."

⁹ U.S. Environmental Protection Agency. 2024. CO-Benefits Risk Assessment (COBRA) Health Impacts Screening and Mapping Tool. <https://www.epa.gov/cobra>

¹⁰ Washington State Department of Health. (n.d.). All Deaths – County and State Dashboards [Data dashboard]. Washington State Department of Health. <https://doh.wa.gov/data-and-statistical-reports/washington-tracking-network-wtn/death/county-all-deaths-dashboard>

¹¹ U.S. Environmental Protection Agency. 2025. Why Use COBRA? <https://www.epa.gov/cobra/why-use-cobra-0>

CAP and GHG Correlation

Further, the ERG analysis inappropriately correlates the reduction in CAPs with GHG emission reductions. On page 2, the ERG report notes that COBRA was used to:

“...estimate the potential health benefits associated with EITE emission reductions in Washington. The analysis outlines the potential health benefits associated with a six percent reduction in criteria air pollutants (CAPs) from the 2023 baseline by 2034. This assumes the reduction in CAPs aligns with the GHG emission reductions.”

The ERG report assumes that the 6% reductions in EITE emissions of the CAPs VOC, NO_x, PM_{2.5} and SO₂ would result from a 6% reduction in no-cost GHG allowance allocations – presumably because the report assumes EITE activity would decrease by 6%. There is clearly no technical basis for this assumption, given that GHG reductions needed for compliance with the CCA could be achieved by EITEs through specific GHG control strategies such as carbon capture and sequestration (CCS) or the use of renewable fuels for process energy, which may or may not result in proportional reductions in CAPs.

Interestingly, even the ERG report acknowledges that its assumption is invalid, as stated in footnote 17 (bottom of page 21 of the ERG report):

“The correlations between EITE facility GHG emissions and CAP emissions between 2012 and 2023 are 0.698 for SO₂, 0.868 for NO_x and 0.588 for CO. However, for the purpose of this analysis, we assume a 1 to 1 relationship between reductions in GHG emissions and reductions in CAP emissions.”

This acknowledgement, which makes sense given the regulatory requirements and emissions control systems already in place to reduce CAP emissions, means that the ERG report overstated the reduction in CAPs, given that the 6% reduction applies specifically to GHG emissions. This also means that the health benefits are also overstated. Further, the relatively poor correlation values between CAPs and GHGs reported by ERG demonstrate that any meaningful effort to estimate CAP reductions from EITE facilities due to reductions in no-cost allowances should be performed on a facility specific basis using detailed information about how facility operations would be changed.

Modeling Methodology

In addition to the above, there are other serious flaws with ERG report's overall modeling methodology to assess health benefits associated with presumed reductions in CAPs. Although ERG states (pages 21 to 26 of the report) that its results represent the benefits that would result from the assumed reductions in CAP emissions from EITEs, the description provided in Appendix A for Table A.12 states:

“Table A. 12 outlines each EITE's county, sector, and changes in emissions that ERG input into COBRA. In COBRA, the selected county and sector dictate the emissions baseline. Given that some baseline emissions were less than the reduction amount, ERG input the change in emissions as an increase and then used the absolute value of the results. When emissions were not provided by Ecology, “N/A” is presented.”

In other words, the ERG report treated the health impacts of increased CAP emissions as equal in magnitude to the health benefits of decreased CAP emissions. This approach assumes a strictly linear relationship between emission changes and health outcomes in the COBRA model. The ERG report did not provide support for this assumption, even though it is well known that many atmospheric processes modeled by COBRA are non-linear — for example, the effects of changes in VOC and NO_x emissions on ozone levels.

As stated in the ERG report, the reason why the health impacts of assumed reductions in EITE CAP emissions were modeled as increases instead of reductions is that total EITE emissions (in tons per year) in that sector and for a given county were smaller than the assumed ton-per-year reductions in CAP emissions. As a result, applying those assumed reductions in EITE CAP emissions would have eliminated all EITE CAP emissions in that sector for that county from the COBRA modeling. However, the ERG report's choice to model emission reductions as emissions increases is, quite simply, incorrect.

The root of the problem is that the 2023 baseline emissions inventory in the COBRA model used to assess health impacts is fundamentally different than the 2023 Ecology baseline emissions inventory used by ERG to compute the assumed reductions in EITE CAP emissions. This mismatch creates a complete inconsistency between the 2023 baseline inventory and the modeled EITE CAP emissions reductions.

This issue can be easily illustrated through examination of the 2023 baseline emissions inventory for the Petroleum and Related Industries sector, which is split into three subsectors in the COBRA model: Asphalt Manufacturing, Oil and Gas Production, and Petroleum Refineries and Related Industries. COBRA contains emissions only for the Petroleum Refineries and Related Industries subsector, which is essentially the five petroleum refineries located in Washington¹² and all of which are EITEs. The ERG report also provides total 2023 CAP baseline emission estimates for all five of these petroleum refineries, as well as the assumed 2034 CAP reductions due to the 6% reduction in no-cost GHG allowance allocations to the refinery facilities. The baseline 2023 COBRA and ERG report inventory values are presented in Table 1.

As shown, the ERG report's baseline inventory ton-per-year values are about 3.5 to 8 times higher than the COBRA baseline inventory ton-per-year values, depending on the pollutant. As a result, when the ERG report assumed in its baseline inventory that a 6% reduction in no-cost GHG allowances would result in a 6% reduction in CAP emissions, the outcome was a much larger percentage of the COBRA baseline inventory. This is also shown in Table 1, where the results of the ERG report's methodological error led it to model a 21 to 47% increase in refinery CAP emissions instead of 6%. Clearly, this error dramatically inflated the magnitude of the apparent changes in EITE emissions and also resulted in a dramatic overstatement of the magnitude of the health impacts.

¹² BP Cherry Point Refinery, HF Sinclair Puget Sound Refinery, Marathon Anacortes Refinery, Phillips 66 Ferndale Refinery and U.S. Oil and Refining Co.

Table 1. COBRA and ERG 2023 Washington Petroleum Sector Emissions (tons per year)

	VOC	NO _x	PM _{2.5}	SO ₂
COBRA Baseline	618	707	141	286
ERG Baseline	2485	5491	483	998
ERG 6% Reduction	149	329	29	60
Ratio ERG Baseline to COBRA Baseline	4.0	7.8	3.4	3.5
Ratio ERG 6% Reduction to COBRA Baseline	0.24	0.47	0.21	0.21
Effective Change in Sector Emissions Used by ERG in COBRA Modeling	+24%	+47%	+21%	+21%

While Trinity has not investigated every sector in the ERG report's assessment, it is highly likely that similar problems with inventory discrepancies exist in those sectors as well. This is evidenced by the ERG report's own statement that emission increases had to be used instead of decreases because the magnitude of the 6% reductions calculated in the ERG report was greater than the COBRA baseline emissions. It should also be noted that, as indicated in the COBRA user's manual, the ERG report could have input a custom emissions inventory baseline, just as it did for the human population estimates by county.

In summary, notwithstanding its modeling limitations, the ERG report had two options to properly exercise the COBRA model. The first was to use the COBRA baseline inventory and implement appropriate assumptions for emission reductions in each sector on a percentage basis rather than the ton-per-year basis. The second was to input the ERG baseline inventory as a custom emissions inventory. The ERG report did neither. Instead, it computed emission changes in tons per year using its own baseline and then applied those to the COBRA tons per year baseline, thereby inflating the actual magnitude of the emissions change.

The fact that CAP emission reductions were modeled as increases, coupled with the failure to recognize the fundamental inconsistencies between the COBRA baseline inventory and the ERG report baseline inventory, renders the ERG report's health impact assessment and associated cost benefit results meaningless. Again, it should be stressed that proper analysis will likely result in dramatically lower health impact values, even when using the COBRA model.

5. GHG EMISSIONS AND SOCIAL COST OF CARBON

The ERG report presents very little information related to overall GHG emissions in Washington or those specifically associated with EITEs. In the Executive Summary and the GHG Emissions section of the report (pages 4 and 5), ERG states that in 2023, based on data collected by Ecology, there was a total of 90.8 million metric tons of CO₂-equivalent emissions reported under Washington's GHG Reporting Program. It also states that, in 2023, the 39 identified EITEs accounted for 13.3% of the total reported emissions. Table A1 in Appendix A of the report presents annual GHG emissions in terms of CO₂ equivalents for each of the 39 EITEs over the period from 2012 through 2023.

The ERG report then discusses the benefits of GHG reductions that would result from the 6% reduction in no-cost allowance allocation to EITEs in 2034, expressed in terms of the social cost of carbon (pages 26 and 27). The extremely brief description of the methodology mentions that a social cost of carbon value for 2034 was interpolated from data presented in U.S. EPA's 2023 Report on the *Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances*.¹³ However, the actual value used for the social cost of carbon is not provided by ERG.

Next, the ERG report indicates that it determined the GHG reductions as follows:

"Using the 2023 covered emissions as a baseline, we assumed a six percent reduction in covered greenhouse gas emissions by 2034, in line with the no-cost allocation for EITEs in 2034."

While not specifically discussed, it appears that ERG then multiplied the social cost of carbon in 2034 by 6% and, after accounting for inflation, arrived at an estimate of \$2.6 billion as the total benefit of the GHG emission reductions resulting from the 6% decrease in no-cost allowance allocation to EITEs. Results for specific EITE sectors are presented in Table 13 of the ERG report. It is important to note that the report contains no details of how this value was calculated, as it does not provide the value of the 2034 social cost of carbon used, the 2034 GHG emission reductions assumed to result from EITEs, or the value of the adjustment to convert from 2020 dollars to 2024 dollars.

Given the lack of detail provided in the ERG report regarding its social cost of carbon calculation, Trinity attempted to replicate it. Trinity first estimated the GHG emission contribution of EITEs in the state of Washington by multiplying the total 2023 covered emissions of 90.8 million metric tons of CO₂-equivalent emissions by 13.3% as follows:

Total GHG emissions from EITEs = 0.133 x 90,800,000 metric tons of CO₂-equivalent emissions

The result is 12.1 million metric tons of CO₂-equivalent emissions. Next, the emission reductions from the 6% reduction in no-cost allowance allocations in 2034 are estimated as follows:

2034 GHG reductions from EITEs = 0.06 x 12,100,000 metric tons of CO₂-equivalent emissions

¹³ U.S. Environmental Protection Agency. 2023. EPA Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances (Supplementary Material for Regulatory Impact Analysis). https://www.epa.gov/system/files/documents/2023-12/epa_scghg_2023_report_final.pdf

The result is 0.73 million metric tons of CO₂-equivalent emissions. It should be noted that this reduction represents less than 1% of the assumed 90.8 million metric tons of covered GHG emissions.

Next, Trinity obtained the 2034 social cost of carbon value of \$245 per metric ton of CO₂ emissions¹⁴ from Table A.5.1 of the 2023 EPA report referenced above, using the 2% discount rate in line with the ERG report. Trinity then adjusted the cost from 2020 dollars for inflation, applying a CPI index of 1.19, and arrived at \$292 per metric ton of CO₂ emissions in 2024 dollars. Finally, Trinity calculated the value of the 2034 GHG reductions from EITEs as follows:

Value of 2034 GHG reductions from EITEs = \$292 per metric ton x 730,000 metric tons

The result was \$213,160,000 or about 8% of the \$2.6 billion value from the ERG report. To put this in perspective, the social cost of carbon used in the ERG report would have to be about \$3,600 per metric ton of CO₂, which is completely inconsistent with the values presented in the EPA report. Unfortunately, given the lack of information provided in the ERG report, the source of the discrepancy between the ERG report's calculations and Trinity's calculations cannot be identified.

It is also important to note that the estimated monetary value of GHG reductions obtained using the social cost of carbon values from the referenced U.S. EPA report represents global impacts, not impacts in the geographic region where the GHG reductions occur. This means that only a very small fraction of the \$213 million in benefits would actually be realized in the state of Washington, in contrast to the full economic impacts, which would directly affect the state.

¹⁴ The EPA report presents social cost values for methane and nitrous oxide. However, because the ERG report expresses GHG emissions in CO₂ equivalents, the differing global warming potentials of these gases have already been accounted for, and the use of the social cost of CO₂ is appropriate.

6. HAZARDOUS AIR POLLUTANT (HAP) EMISSIONS ASSESSMENT

The ERG report also presents an assessment of hazardous air pollutant (HAP) emissions from EITEs relative to HAP emissions from other sources. As noted by ERG in Table 1 (page 4), HAPs are: “*pollutants that are known or suspected to cause cancer or other serious health effects.*” and that “*Washington state regulates over 430 toxic air pollutants from industrial and commercial sources.*” The ERG report also notes on page 15 that there are 188 HAPs and indicates in Table A.9 that emission inventory values contained in the report were developed by U.S. EPA as part of the National Emissions Inventory.¹⁵

HAPs and Air Quality

The ERG report presents an analysis of total HAP concentration data based on ambient air quality monitoring. These results, which do not differentiate between HAPs emitted by EITE facilities and all other sources of HAPs, are presented in terms of monitor locations where the cancer risk posed by all HAPs exceeds 1 in a million (see Table 7 of the ERG report). In addition, specific compounds are identified where monitoring data shows a Noncancer Hazard Quotient equal to or greater than 1 (Table 8), or where monitored concentrations exceed Acceptable Source Impact Level (Table 9). However, no differentiation is made between emissions of HAPs from EITEs and emissions from other sources, so reported data reflect contributions from all HAP sources and do not represent potential impacts from EITEs.

In contrast, a technically sound assessment of potential HAP impacts from EITEs would need to apportion the sources of HAPs observed at each monitor and determine the fraction of the measured concentration attributable to EITE facilities in the area. Similarly, to assess the impacts of a reduction in EITE HAP emissions resulting from reductions in no-cost GHG allocations, one would need to evaluate whether any reductions in HAPs would occur, model those reductions on a facility-specific basis, and then apply pollutant-specific toxicity data to assess health benefits.

HAPs and Statewide Inventory

In addition to the above, the large number of HAPs (and TAPs) regulated by the state of Washington have a wide range of potential health effects and potencies. However, in the ERG report, HAPs are summed together and reported in terms of their total mass. Tables 4 and 5 (pages 7 and 8 of the ERG report) indicate that total HAP emissions from all EITEs represented only 0.4% of the total statewide HAP inventory in 2022. Total HAP emissions in the 15 counties where EITEs are located accounted for as little as 0.005% and up to 8.3% of total HAP emissions, depending on the region analyzed. Although the ERG report performs no analysis of the impact of reductions in no-cost GHG emission allowances on EITE HAP emissions, if the same (unsupported) correlation approach is applied to HAP emissions as the ERG report implemented during the CAP-based health benefits assessment, the reductions would amount to only a 0.024% reduction in total statewide HAP emissions and about a 0.5% reduction in HAP emissions in those counties where EITEs make the greatest contributions.

In summary, given the lack of a technically sound analysis, the ERG report does not provide meaningful insight into HAP or TAP impacts from EITE facilities or from possible reductions in emissions of those compounds. Based on the information presented, the ERG report should have concluded that the HAP

¹⁵ U.S. Environmental Protection Agency. 2025. 2022v1 Emissions Modeling Platform. <https://www.epa.gov/air-emissions-modeling/2022v1-emissions-modeling-platform>

emissions from EITEs are too small to warrant a detailed analysis, or that HAP concentrations are already below levels of concern.

7. REVIEW OF ERG'S CASE STUDIES

The ERG report also presents what are described as “Case Studies” of Cowlitz, King, and Skagit counties (see pages 57-89), which were selected because “...*they host a large number of EITEs and have high levels of GHG emissions from EITEs.*” The report indicates that the number of EITE facilities is seven in Cowlitz county, four in King county, and four in Skagit county. No explanation is provided for how these case studies are relevant to the report’s findings.

In each case study, the amount of GHG emissions from EITEs is presented along with comparisons to total county GHG emissions from all facilities covered by the CCA. The report then notes that EITEs account for a substantial portion of each county’s covered GHG emissions. However, there is no discussion on what conclusions, if any, should be drawn from these findings. Their inclusion may imply that reductions in GHG emissions from EITE facilities would produce some sort of localized air quality benefits. If so, it should be noted that there is no technical basis for this conclusion, since GHG emissions are global in scale and do not provide localized benefits in and of themselves except through unproportional “co-benefits” such as potential reductions in CAPs and HAPs.

Similar discussions are presented for EITE contributions to CAP and HAP emissions in each county, using data generally already included in the broader CAP and HAP sections of the ERG report. Again, the ERG report is silent on how these county-level results are relevant to the report’s overall conclusions.

Nothing in the ERG report’s case studies suggests that, even in counties with higher numbers of EITE facilities, EITE emissions contribute substantially to an identified air quality issue, or that potential reductions in EITE emissions resulting from reduced no-cost GHG allowance allocations would provide a meaningful air quality benefit.

8. OVERBURDENED COMMUNITIES

The ERG report also discusses EITEs in relation to their proximity to Overburdened Communities (OBCs) and OBCs “Highly Impacted by Air Pollution.” In its Executive Summary, the ERG report states:

“Twenty EITEs are located within overburdened communities in Washington State and 10 EITEs are located within overburdened communities highly impacted by air pollution, as defined by the Department of Ecology. Seven EITEs are located in or near Tribal Lands.”

However, the ERG report does not provide any assessment of the actual impacts of EITEs on OBCs, nor does it evaluate the impacts that reductions in GHGs, CAPs, or HAPs from decreased no-cost allocations of GHG allowances to EITE facilities would have on these communities. Instead, the report only notes the geographic proximity of some EITEs to OBCs.

Presumably, the ERG report’s consideration of OBCs is related to the Revised Code of Washington (RCW) Section 70A.65.020, which requires that the CCA achieve reductions in criteria pollutants as well as greenhouse gas emissions in overburdened communities highly impacted by air pollution. A map showing the location of OBCs with the highest cumulative air pollution levels, developed by Ecology,¹⁶ is presented in Figure 4 below, along with Figure 5, which shows the locations of EITEs in relation to OBCs highly impacted by air pollution and is from the ERG report (reference Figure 33). As shown, the communities shown in Figure 4 developed by Ecology generally align with the OBCs highly impacted by air pollution identified in the ERG report in Figure 5, and it does appear, based on Figure 5, that ten EITEs are located in OBCs highly impacted by air pollution. This means that the other twenty-nine of the total of 39 EITEs (or roughly 75%) in Washington are located outside of OBCs that are highly impacted by air pollution. Figure 5 also shows that OBCs highly impacted by air pollution cover only a relatively limited portion of the state.

¹⁶ Washington State Department of Ecology. (n.d.). Improving Air Quality in Overburdened Communities. <https://ecology.wa.gov/air-climate/climate-commitment-act/overburdened-communities>

Figure 4. Washington communities with the highest cumulative air pollution levels.



Figure 5 (ERG Figure 33). Map of EITEs and OBCs highly impacted by air pollution.

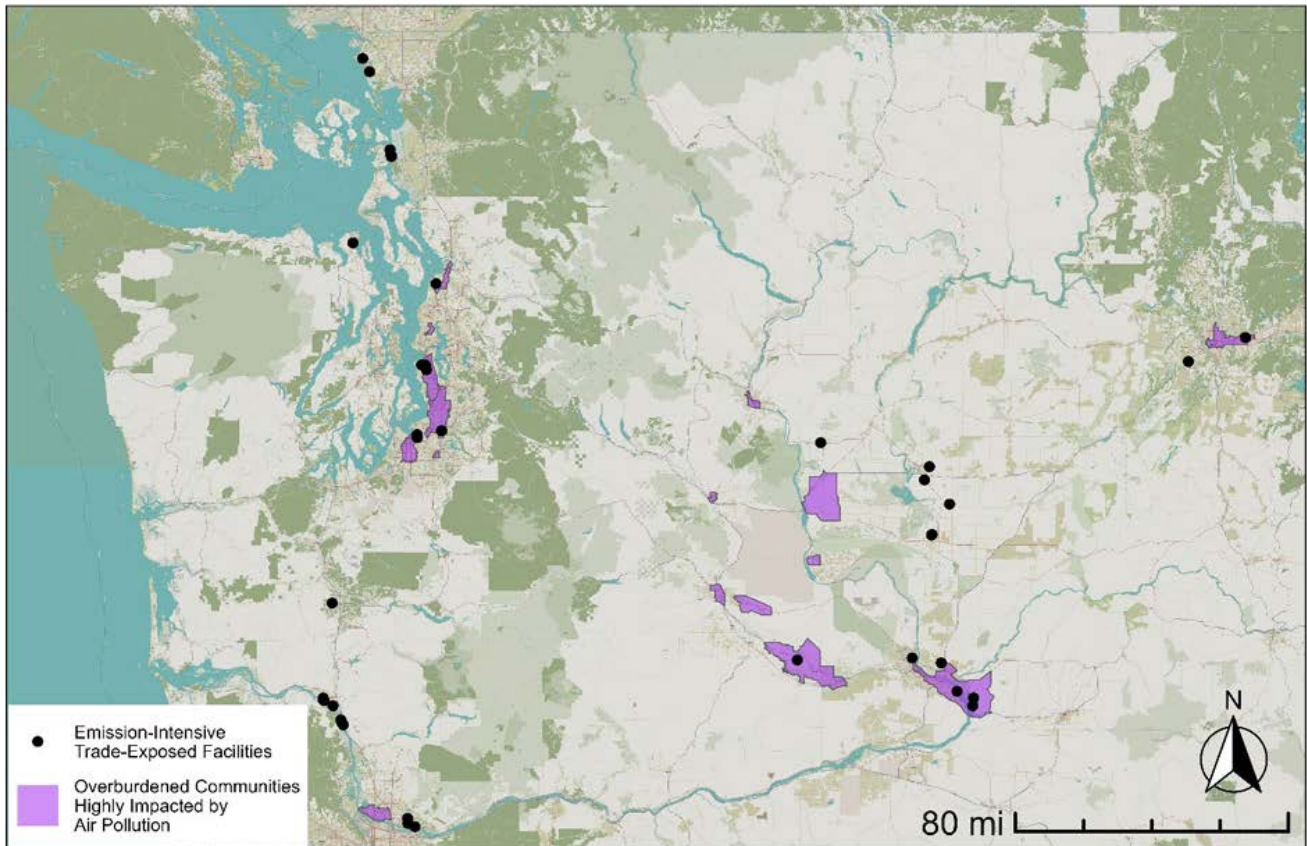


Figure 33. Map of EITEs and OBCs highly impacted by air pollution.

A similar map is presented in Figure 6 (Figure 34 of the ERG report), showing the location of EITEs relative to Tribal Reservations. This figure again is consistent with the ERG finding that seven EITEs are located on or near tribal lands. However, ERG fails to make it clear which EITEs are both located in OBCs highly impacted by air pollution and also located on or near tribal lands. Again, the ERG report provides no analysis or data on the impact of total EITE emissions, or reductions in EITE emissions, on Tribal Reservations due to reductions in no-cost GHG allowances to EITE facilities.

Figure 6 (ERG Figure 34). Map of EITE locations and Tribal Reservations.

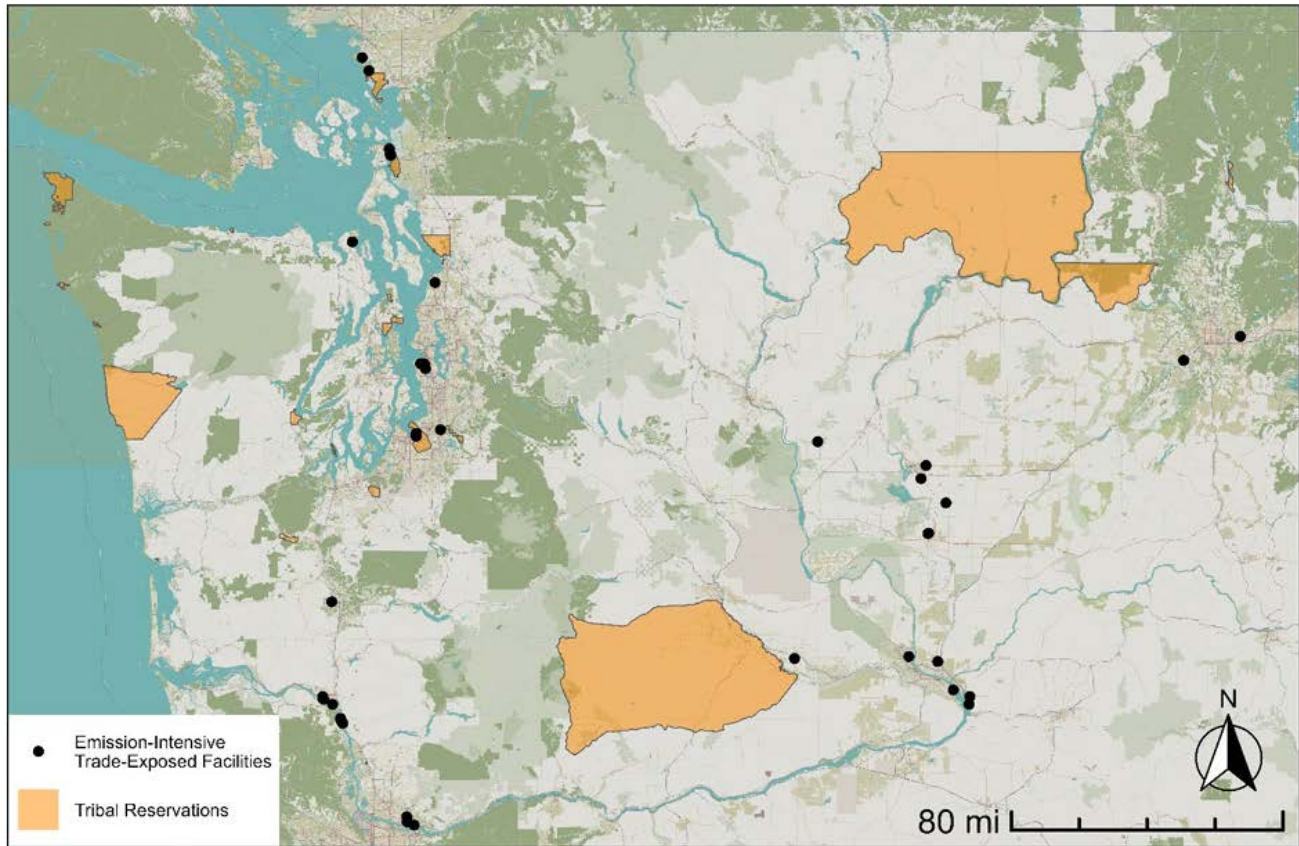


Figure 34. Map of EITE locations and Tribal Reservations

Interestingly, the ERG report also includes another map in Figure 32 (referenced as **Figure 7** in this report), which shows EITE locations and apparently the locations of all overburdened communities in Washington, from which ERG reaches the conclusion listed below:

“There are 20 EITEs located within overburdened communities in Washington State, and an additional 15 EITE facilities located nearby (within three miles) of overburdened communities (see Figure 32).”

There are a number of issues raised by ERG's Figure 32. First, ERG provides no explanation of why the location of EITEs in or near OBCs that ***are not*** highly impacted by air pollution is relevant. Second, ERG again provides no analysis or data that addresses either the direct impact of EITEs on these OBCs or how a reduction in the no-cost allocation of GHG allowances would affect any of these communities. Finally, although unstated by ERG, the point of Figure 32 seems to be to show that 35 of 39 EITEs in Washington are in or near OBCs (which are shown to cover roughly half of Washington's geographic area) and to imply a linkage between EITEs and OBCs, even if the OBCs are not highly impacted by air pollution.

Figure 7 (ERG Figure 32). Map of overburdened communities and EITE facilities.

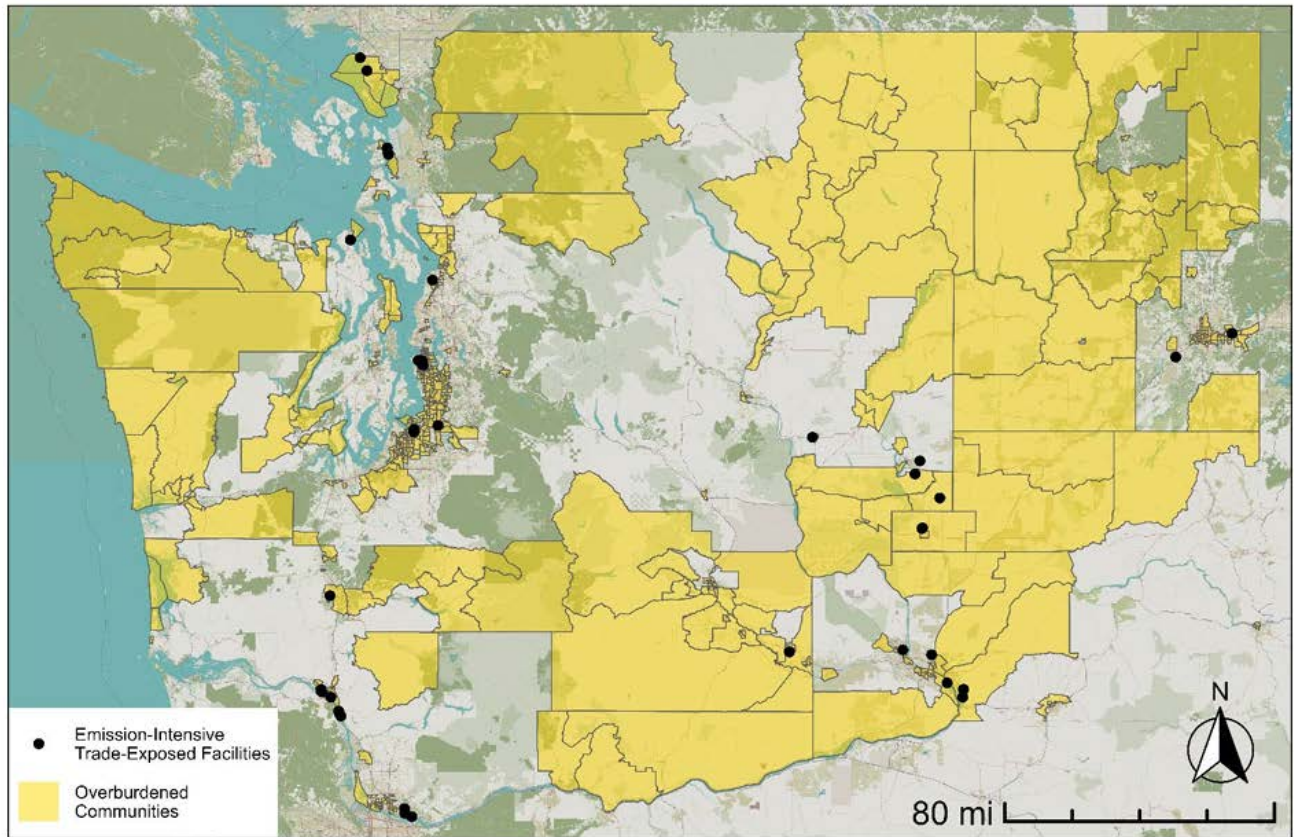


Figure 32. Map of overburdened communities and EITE facilities.

Memorandum

To: Western States Petroleum Association
From: Turner, Mason & Company
Date: August 28, 2025
Subject: Analysis of Decarbonization Pathways for Washington Refineries

Executive Summary

Implementing the decarbonization pathways analyzed in this memo have the potential to reduce CO₂e emissions ~5 MMTPA (Million Tons per Annum), a 78% reduction from current levels. Fully implementing these projects across all Washington refineries could take until the mid-2040s, with total required investment ranging from \$12 to \$22 billion (in \$2025).

We note the following significant findings:

- 1) Reduction in CO₂e emissions in Washington would be offset by higher emissions elsewhere in the world as products needed to balance the market in Washington would be refined and imported. Net emissions could be higher depending on the trade-off of reduced emissions from shutting down a processing unit in Washington and increased emissions from importing finished products to and exporting unfinished products from the Washington market.
- 2) Shutting down units, such as a naphtha reformer or delayed coker would have material negative commercial implications, with annual margin losses in the range of \$0.7 to \$1.2 billion depending on the unit closed. Shutting down these units could require major changes in operations and logistics, which could increase operational risks and threaten the economic viability of the refinery.
- 3) While workforce reductions appear somewhat small (25 to 45 FTE or “full-time equivalent” workers for each unit closed), displaced operators could face 40 – 50% reductions in compensation relative to comparable jobs in Washington.
- 4) Most capital projects to reduce CO₂e emissions have negative economic value and are unlikely to be competitive for capital in a refining company’s capital budget.
- 5) Planning for maintenance turnarounds before 2030 are underway already. Unless turnarounds in the next five years already includes a decarbonization capital project, such CO₂e reductions could not be implemented until well into the latter

half of the 2030s. Quite likely only one such project could be implemented per turnaround given their complexity and other required work.

Background

Turner, Mason & Company (TM&C)¹ was commissioned by WSPA (Western States Petroleum Association) to evaluate decarbonization pathways for Washington refineries as presented by RMI (Rocky Mountain Institute) at the EITE (Emissions Intensive Trade Exposed) Industries Advisory Group meeting on November 14, 2024. This memo summarizes the project scope, economic implications, timelines, and key findings related to CO₂e emissions reductions, with a focus on operational changes and major capital investments.

The primary differences between the analysis by RMI and TM&C are twofold. First, RMI does a top-down analysis based on theoretical estimates using information gathered from the U.S. Department of Energy, as well as a variety of other public sources. By contrast, TM&C analysis is a bottom-up analysis using operating parameters and capital cost estimates from a number of actual projects we have worked on with clients or vetted for potential financial investors. We apply these real project examples to a typical petroleum fuels refinery in the Pacific Northwest to consider potential changes in refinery configurations, operations, and capital costs. The second difference is we consider changes in global greenhouse gas emissions net of material movements required to keep the refineries and broader Pacific Northwest petroleum fuels markets in balance.

A key assumption in this analysis is that petroleum fuel demand is independent of any change of configuration or operations of a refinery. Thus any reduction in petroleum fuels production in Washington refineries would need to be imported to meet local demand.

Shutting down key processing units, such as a naphtha reformer and/or a delayed coker would increase vessel traffic to handle exports of intermediates to keep the refineries balanced and imports of finished products to keep local petroleum product markets balanced.² We assume there is sufficient dock and harbor capacity to handle this increase

¹ Turner, Mason & Company (TM&C) provides research and consulting services utilizing reasonable care and employing methodologies consistent with industry practice and applicable professional standards. Our assessments are based on our experience in the petroleum, renewable and biofuels markets and are consistent with practices commonly used in these sectors but ultimately represent our professional judgements and, in some cases, opinions. Unless explicitly stated, forward looking data and other information herein, do not include, nor should they be construed as including advice, guidance, or recommendations from TM&C to take, or not to take, any actions or decisions in relation to any matter, including without limitation, relating to investments, or the purchase or sale of any securities, shares or other assets of any kind. Should you take any such action, or decision based on information contained herein, you do so entirely at your own risk. TM&C does not guarantee the accuracy or completeness of the data or our assessments and shall have no liability whatsoever for any loss, damage, costs, or expenses incurred or suffered by you as a result of your reliance on them.

² Unlike the US Gulf Coast, refineries in the Pacific Northwest are not surrounded by petrochemical plants that have the potential to absorb intermediate products as feedstocks. California refineries also tend (cont'd on page 3)

in vessel traffic. Any capital investments required for additional logistics capacity or debottlenecking are not included in our estimates. We also have not factored in any potential operational risks from these material changes in logistics and supply chains.

We calculate CO₂e emissions related to the imports of refined products to meet local demand, as well as the export of unfinished or intermediate products that could no longer be processed to meet local Pacific Northwest product specifications.

Decarbonization from Changing Operations

Shutting Down a Naphtha Reformer

A naphtha reformer converts low-octane straight-run naphtha from the CDU (crude distillation unit) into high-octane reformate, which is a key component of gasoline. The primary purpose of the reformer is to improve the octane rating of gasoline and to produce hydrogen, as a byproduct, which is used in other refinery processes, such as hydrotreating (reducing sulfur in a product) and hydrocracking (a process designed to crack heavier molecules into distillates).

Shutting down a naphtha reformer actually has the potential to **increase** global CO₂e emissions. Shutting down a naphtha reformer would reduce unit-specific CO₂e emissions 6%. However, in our representative refinery, a SMR (steam methane reformer), which is used to make hydrogen, must be run at a higher utilization to make up for the loss of hydrogen supply when the naphtha reformer is closed. In our representative refinery, CO₂e emissions increase ~10% because of greater natural gas usage in the SMR.

The straight-run naphtha from the CDU (that no longer goes to the naphtha reformer) would not meet gasoline blending specifications (especially octane). We assume those naphtha volumes are exported to Asia.³ Shipping to the U.S. Gulf Coast requires the use of scarce and expensive Jones Act tankers in addition to the logistical complexity of transiting the Panama Canal. Shipping to Europe is generally more expensive than Asia because in addition to the Panama Canal fees there are longer voyage distances and EU carbon pricing fees for marine transport.

By losing the naphtha reforming, gasoline production decreases ~20% and we assume that volume needs to be replaced by imports from Asia to keep the Pacific Northwest gasoline market balanced. This assumption is consistent with the latest forecast from the Washington Transportation Economic and Revenue Forecast Council that projects gasoline sales in the state to be essentially flat for the next 10 years⁴.

to be internally balanced so Washington refineries would need to export intermediate materials that could no longer be processed in a now closed processing unit.

³ The US Gulf Coast or Europe could be alternative markets for sources of gasoline imports or destinations for naphtha exports. We exclude them from this analysis because each market likely has structurally higher transportation costs than sailing to/from Asia.

⁴ See slide 12 (on page 16 of pdf) at: https://erfc.wa.gov/sites/default/files/2025-06/trans20250625_0.pdf

The higher utilization of the SMR to make up the hydrogen lost when the reformer is closed, as well as the CO₂e emissions associated with importing gasoline and exporting naphtha, would result in a net increase in CO₂e emissions of ~45% (+0.5 MMTPA).

The loss in gasoline production also compresses refinery margins about 80%, which for our representative model would be a loss of almost \$700 MM per year, based on 2024 prices. Given that carbon emissions increase while the refinery loses money, calculating an implied cost of carbon is not meaningful.

Shutting Down a Coker

A coker is an oil refinery unit that processes very heavy residues from the CDU and VDU (vacuum distillation unit) and cracks them into lighter gas oils, which can be fed to conversions units, *e.g.*, such as the FCC (Fluid Catalytic Cracker) or hydrocracker to make higher value products, such as gasoline and diesel. One of the by-products from the coking process is solid petroleum coke, which can be used as a fuel, anode material for aluminum smelting, or other industrial applications.

A coker is valuable to a refinery because it can increase liquid yield from heavy crude residues, which supports processing of heavier, cheaper crude slates. The coker also helps to reduce low-value residual fuel oil production, whose use is often limited by environmental regulations.

Shutting down a coker reduces CO₂e emissions but has significant economic and operational drawbacks. In our representative refinery, shutting down the coker reduces the feed to the FCC, which reduces the production of gasoline (-15%) and jet fuel or diesel (-35%). Jet/diesel production has a larger volume loss because low-value marine (bunker) fuel oil production increases tenfold. Meeting marine fuel specifications requires blending volumes of distillates (*e.g.*, jet, diesel) with the atmospheric and vacuum residue that would no longer be used as feedstock to the coker. We assume the marine fuel oil is exported to Asia because it is the most liquid market for fuel oil bunker sales.

CO₂e emissions from coker operations would decrease by 0.2 MMTPA, or 15%, due to reduced natural gas consumption. Similar to shutting down a naphtha reformer, the loss in finished product volumes compresses refinery margins. For our representative refinery this loss would be over \$1.2 billion per year, assuming the refinery does not change its operations, such as its crude slate.⁵ Looking at just the reduced margin associated with reducing CO₂e emissions from the coker implies a carbon cost of over \$7,200 per ton of CO₂e reduced.

The refinery could lighten its crude slate by running less heavy crude oil, such as Western Canadian Select (diluted bitumen) and more North American light-sweet crude oils, such as those streams found in the Bakken of North Dakota. Lightening the crude slate would reduce the amount of marine fuel oil, which tends to sell at a discount to crude oil. The

⁵ Losses could be potentially higher if the coker produces anode-grade coke, which is used for steel/aluminum manufacturing. Anode coke can sell for sizable premiums to typical petroleum cokes, which tend to be used as substitutes for coal. There are several cokers in Washington with the potential to make anode coke.

lighter crude slate would be more expensive but reduces the need to export large volumes of marine fuel (that sell at a discount to crude oil). This reduces the margin loss from shutting down the coker and the implicit carbon cost to about \$4,200 per ton of CO₂e.

However, when looking at the change in total carbon emissions including those associated with importing and exporting product volumes to keep the Washington petroleum market in balance, shutting down the coker results in a net increase in CO₂e emissions. Thus, on a total carbon emissions basis the implied cost of carbon is not meaningful because the refinery loses money, but total CO₂e emissions increase.

Logistical Challenges

Shutting down processing units within an integrated refinery design could require major changes in operations and logistics, such as, increased vessel traffic to handle imports. We assume sufficient dock and harbor capacity exist so no material infrastructure investments are required to close either type of unit.⁶ Such changes could increase risks around the operations of the refinery and required supply chains. These risks have the potential to threaten the economic viability of the refinery and have not been incorporated in this analysis.

Workforce Implications

According to a study by Western Washington University, Washington's refineries employ approximately 2,200 permanent employees and an additional 2,000 contract workers.⁷ The number of employees necessary to operate each individual process unit depends on the unit's size, technology level of automation, and site practices. Staffing levels are usually measured in FTEs (full-time equivalent) required for each shift, combining field and process control roles for continuous operation (typically several crews rotating shifts). In addition, there are additional FTEs to support equipment reliability, maintenance, and process operations. These support FTEs can be embedded on-site or on-call depending on the plant's size and automation level.

For a typical naphtha reformer FTE staffing levels are in the range of 2 – 4 FTEs per shift (across 5 rotating shifts) for a total of 10 – 20 personnel to support operations on a 24/7

However, the import of gasoline, jet, and diesel to keep Washington petroleum product market demand satisfied, combined with the export of marine fuel oil to Asia results in a net *increase* in CO₂e emissions for the Washington refining system of 0.5 MMTPA.

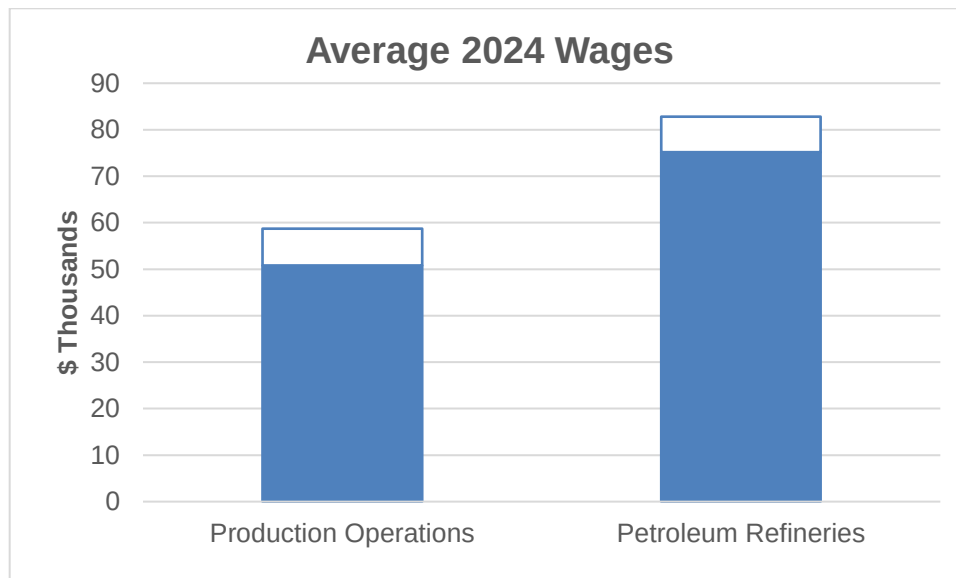
basis. For a delayed coker operational FTEs can range 15 – 25 for the unit. Additional FTEs for technical support and maintenance can double the FTEs for each unit.

⁶ If marine logistics investments were required, there is no guarantee such projects could be permitted. Examples of denied vessel traffic permits in Washington include the Gateway Pacific Terminal (2016) and Millennium Bulk Terminals (2017) coal export terminals. These permits were denied over environmental and vessel traffic concerns.

⁷ *Washington State Refinery Economic Impact Study*, Center for Business and Economic Research, Western Washington University, February 2025.

These refineries are not only significant local employers, but also provide high wages relative to other industries in the communities where they are located. Based on State of Washington data for 2024, refinery plant workers earn wages that are 40-50% higher than comparable process operation jobs (see Figure 1).

Figure 1: Comparing Refining Wages to Other Industries



Source: TM&C analysis; *Occupational employment and wage statistics*, State of Washington, Employment Security Department, 2024

Thus, while workforce reductions appear somewhat small (25 to 45 FTE for each closed unit), displaced operators could face 40 – 50% reductions in compensation relative to comparable jobs in Washington. Many of these workers could face the dilemma of accepting a job less than half of what they currently earn (assuming they can find a job) or be compelled to leave their current location (or the state) in search of opportunities elsewhere.

Decarbonization from Capital Projects

Competing against other projects for limited capital

Many capital projects for decarbonization, such as RD (renewable diesel) or SAF (Sustainable Aviation Fuel) conversion, FCC carbon capture, and green hydrogen production have negative economic value. Even if projects could have positive value, they may not be competitive with other projects in the company's project portfolio. Therefore, without significant incentives, low-carbon projects tend to not be competitive for capital in refining companies' budgets.

Timelines are another reason low-carbon projects can be unattractive to investors. Regulatory compliance and permitting can heavily impact project timing. For example, typical permitting timing can range between 6 to 72 months depending on the jurisdiction.⁸ For this analysis we assume three years and a construction window of two years (with a range of 18 to 48 months). Longer permit processes tend to erode the economics of a project for two reasons: (1) project costs tend to rise over time and typically escalate faster than the assumed price path of revenue streams in petroleum markets and (2) project NPV (Net Present Value) tends to consider a project begins with the first activity specific to the project (e.g., permit applications, ordering long-lead items) rather than when construction begins. The longer the permit process, the farther in the future is the beginning of receiving benefits from the project. The benefits are discounted at a corporate hurdle rate that usually is greater than the company's cost of capital. The more distant the benefits are and/or the higher the discount rate, the less valuable those future benefits are, relative to the costs, when discounted back to the beginning of the project (e.g., permit applications).

Another key aspect to the start-up timing of a new project is minimizing how much its commissioning impacts other refinery operations. Planning for a start-up window (and backtracking to when construction commences) is a function of other operations, maintenance, and turnaround activities. A delay in permitting can materially disrupt when the project can be commissioned and, by extension, when construction should begin. In the worst case, a project can be delayed by an entire turnaround cycle which could be as much as 5 years in duration.

Converting units to renewable diesel or Sustainable Aviation Fuel

Converting existing petroleum refining units to renewable diesel production is a strategic pathway for energy companies seeking to reduce carbon intensity while leveraging existing infrastructure. Refiners can retrofit hydrotreaters or hydrocrackers to process renewable feedstocks, such as used cooking oil, animal fats, and vegetable oils, into renewable diesel, a drop-in fuel chemically similar to conventional diesel but with significantly lower lifecycle greenhouse gas emissions. This approach not only extends the value of existing assets but also minimizes capital expenditures, shortens project timelines, and enables refiners to respond quickly to growing policy incentives and market demand for low-carbon fuels. Renewable diesel can be converted into SAF with additional processing steps to meet jet fuel specifications for viscosity, freezing point, and flash point.

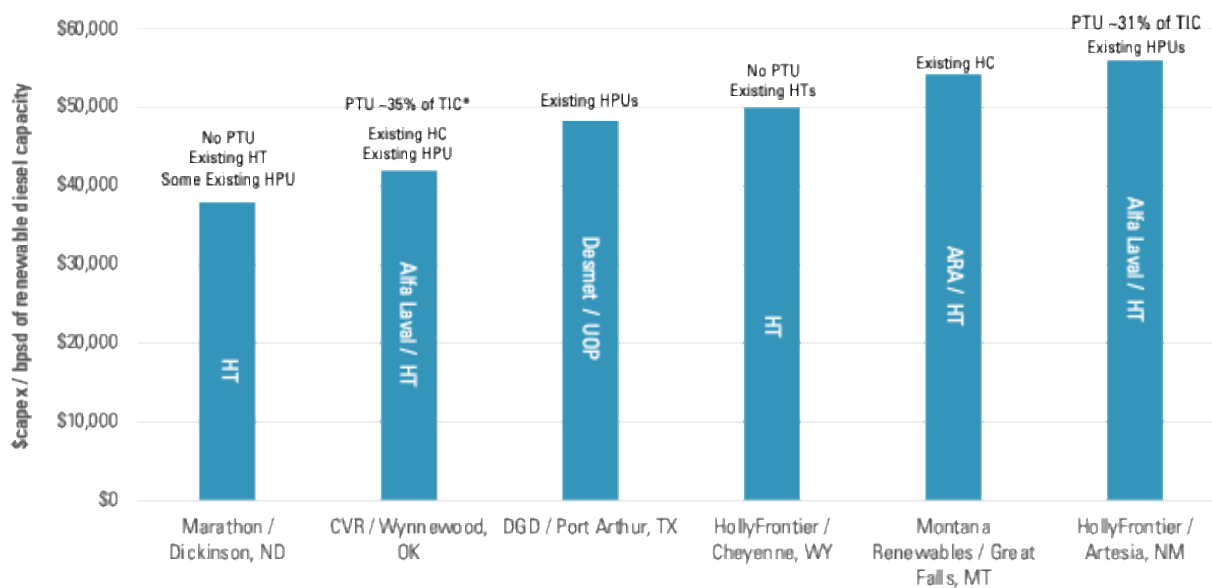
Conversion to RD/SAF production could have positive value under certain conditions, particularly with incentives like the 45Z Clean Fuel Production tax credit. The original IRA (Inflation Reduction Act) limited the credit to clean transportation fuels produced and sold between January 1, 2025 and December 31, 2027. The OBBBA (One Big Beautiful Bill

⁸ Chevron's refinery in Richmond, California had a modernization project in which some of the permits took over nine years to approve. The initial permit applications were submitted to the City of Richmond during 2006, with final approval received in April 2015.

Act) extends the claim period by two years, now allowing credits for fuel produced and sold through the end of 2029. However, the OBBBA imposes new constraints on renewable fuels projects, such as feedstock origin, so combined with the difficulty to commission a major project before 2030 likely reduces the value of extending the credit period.

The following chart provides estimated capital investment for RD conversions based on our analysis of actual renewable diesel projects. Brownfield capital costs depend on what units are available for re-purposing.

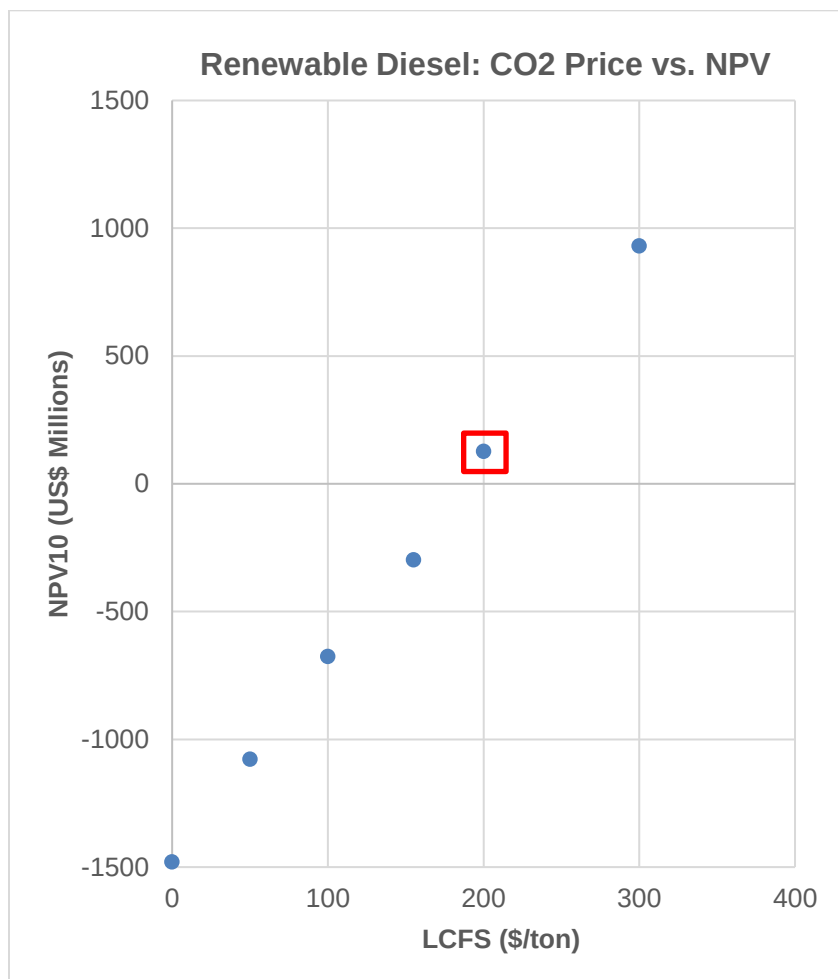
Figure 2: Renewable Diesel Capital Costs



Source: TM&C Regulatory & Renewable Fuels Outlook.

A hydrocracker is ideal, but there is only one in Washington at BP-Cherry Point. We focus on revamps of distillate or naphtha hydrotreaters. Naphtha hydrotreaters have an average capacity of 22 TBD (thousand barrels per day), while diesel hydrotreaters tend to be larger, with average capacity of 40 TBD. To help minimize capital costs, we model a hydrotreater with a capacity of 25 TBD. We assume a conversion cost of ~\$46,000/bpd, which is 30% higher than a similar project in the U.S. Gulf Coast to account for less fabrication economies of scale and availability of skilled labor in the Pacific Northwest.

Figure 3: Renewable Diesel/SAF Project Economics



Source: TM&C analysis

The reduction in CO₂e is about 0.2 MMTPA, which is 16% of the refinery's CO₂e emission profile. The implied carbon cost that makes the project break-even on an NPV basis is just under \$200/ton (net of tax credits).

FCC carbon capture

The FCC is a key processing unit designed to convert heavy fractions, such as gas oil into a blendstock for gasoline, a more valuable product. It achieves this through a process called catalytic cracking, where a catalyst and heat are used to break down longer hydrocarbon molecule chains into smaller ones.

This unit is a candidate for CCS (Carbon Capture and Storage) primarily because it is one of the largest single-point sources of CO₂e in a petroleum oil refinery; about 25–35% of total refinery CO₂e emissions, mainly from the regenerator during coke combustion.

The regenerator process in FCC units, which combusts coke at high temperatures, naturally concentrates emissions and makes the logistics of carbon capture more straightforward. The flue gas stream from FCC regenerators is continuous and accessible, which makes it viable for post-combustion capture technologies or alternative capture approaches.

We considered three technologies to test the potential project economics of effective carbon capture from FCC operations:

- 1) **Post-Combustion** - CO₂ is captured from the flue gas after combustion. The most common approach uses amine-based solvents to absorb and strip CO₂, which can capture 85 - 90% of CO₂ emissions. It has advantages of minimizing required unit modifications and is widely proven in power and industrial sectors. Its challenges include high energy consumption and relatively high operating costs.
- 2) **Oxyfuel (Oxy-Firing) Combustion** - uses pure oxygen mixed with recycled CO₂ instead of air. This leads to a flue gas with a much higher CO₂ concentration, simplifying downstream capture, which can lead to 90 – 100% capture efficiency and flue gas with 93 – 95% CO₂ concentration. This can result in lower operating costs than post-combustion, but higher capital costs due to required air separation units and modifications to the FCC regenerator. Thermal management and potential corrosion also must be addressed.
- 3) **Chemical Looping Combustion (CLC)** - uses oxygen carriers (typically transition metals) to combust coke in the regenerator. Its main advantages include lower energy intensity and a high purity CO₂ stream (90 – 96% capture). Key challenges include significant catalyst redesign, integration of air reactor, and the technology is still largely at laboratory/pilot scale.

Table 1: Comparing Carbon Capture Technologies for FCC Emissions

Technology	Capture Rate	Capex (\$/TBD)	Key Modifications	Status
Post-Combustion	85 – 95%	\$3,200	Minimal	Commercial/pilot
Oxyfuel	90 – 100%	\$4,700	Air separation, regenerator	Pilot/commercial
CLC	90 – 96%	\$4,900	Catalyst, air reactor	Lab/pilot

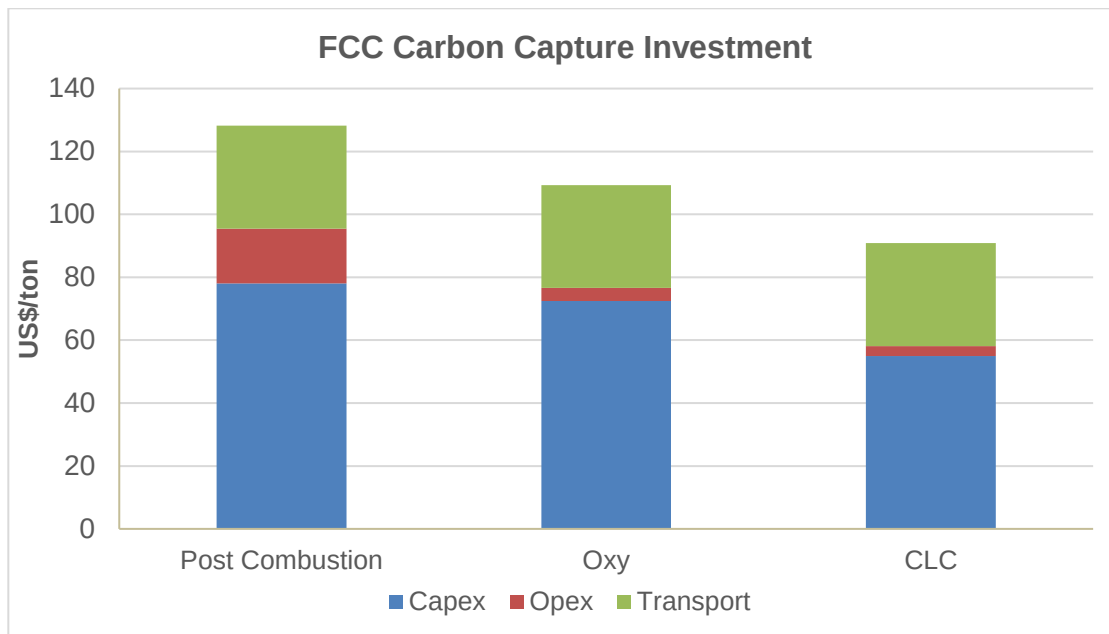
Source: TM&C analysis, industry research, “Progress in the CO₂ Capture Technologies for Fluid Catalytic Cracking (FCC) Units—A Review”, *Frontier Energy Research*, vol 8, 2020;

Our modeled FCC has a capacity of 60 TBD, with CO₂e emissions of about 400 ktpa (thousand tons per annum) and an assumed capture rate of 90%.⁹ The capital cost runs from \$350MM to \$530MM depending on which technology is chosen. Operating costs

⁹ It is important to distinguish between design capacity and actual operational rates. In real-world practice, actual rates may be somewhat lower due to factors such as maintenance, equipment downtime, variable loads, and off-design performance. A typical capture rate over a three-year period tends to be around 75%, but improving with experience and scale.

include transportation to the nearest proposed sequestration facility (*i.e.*, Big Sky Carbon Sequestration Project) and range \$93/ton to \$140/ton. We assume each project qualifies for 45Q tax credit (\$85/ton) and will begin construction before the tax credit is scheduled to sunset on January 1, 2033.

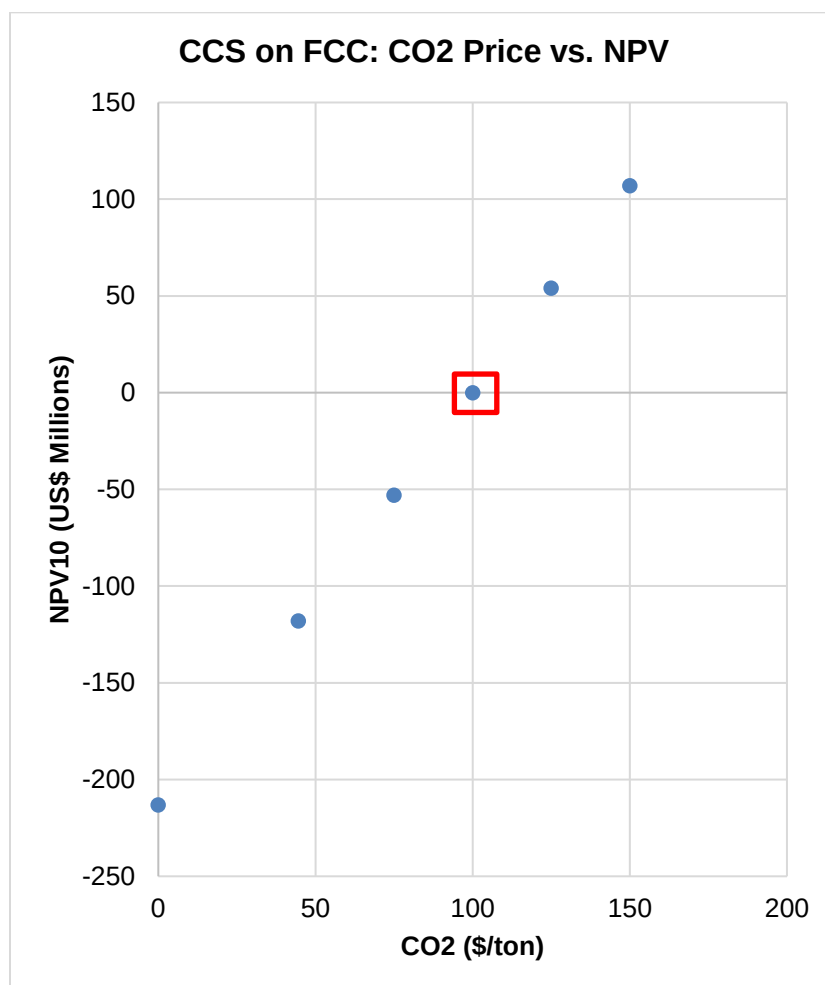
Figure 4: Comparing Technology Capital Cost for FCC Carbon Capture



Source: TM&C analysis, , industry research

The implied carbon cost that makes the project break-even on an NPV basis is about \$100/ton (net of the 45Q tax credit). The CO₂e reduction is 0.36 MMTPA (about 32% of the refinery's CO₂e emissions).

Figure 5: CO2 Price Drives FCC Carbon Capture Project Economics



Source: TM&C analysis

Across all cases, the 45Q tax credit has a project value of about US\$180 million.

Low-carbon hydrogen

Hydrogen is essential to multiple refinery processes to upgrade heavier, higher-sulfur crude fractions into lighter, cleaner transportation fuels. The major uses are: hydrotreating (removing sulfur, nitrogen, metals, and olefins/aromatics saturation to meet fuel specifications and protect downstream catalysts), hydrocracking (converting heavy gas oils to lighter, high-value products, e.g., jet, diesel, naphtha, while simultaneously removing sulfur and nitrogen), isomerization (rearranging the molecular structure of light hydrocarbons to improve the octane number of gasoline components), and lubricants (improving the quality of lubricants, waxes, and other specialty products by removing impurities and saturating aromatic compounds).

The economic feasibility of a low-carbon hydrogen depends on very high carbon prices because it is typically more expensive to produce than conventional hydrogen from unmitigated steam methane reforming using natural gas (*i.e.*, “grey hydrogen”). A sufficiently high and predictable carbon price helps close that cost gap and creates bankable offtake. This is a key enabler for projects to secure financing and reach FID (Final Investment Decision).

Green hydrogen through electrolysis has a number of project challenges, such as capital cost of electrolyzers, low thermal efficiency of the process chain, difficulty to scale the project, and the uncertain availability of green electricity (unless building that generation and transmission is included in the project).

The 45V tax credit under the IRA is intended as a mechanism to address some of these challenges. To receive the full 45V tax credit of \$3/kg a green hydrogen project must meet specific conditions related to lifecycle greenhouse gas emissions, production methods, and other requirements.¹⁰ For example, under U.S. Treasury’s final rules (released December 2024), electricity used for hydrogen production must meet three pillars to ensure low-carbon intensity:

- **Additionality** - generation must be new (constructed within 36 months before the hydrogen facility is placed in service) or from a source with increased capacity to ensure it contributes to grid decarbonization;
- **Temporal Matching** - electricity must be generated at the same time as hydrogen production (annual matching is allowed until 2028 when hourly matching is required);
- **Geographic Matching** - electricity must come from the same grid region as the hydrogen production facility to ensure it reflects local grid emissions characteristics.

These additional requirements can increase significantly the cost of a low-carbon hydrogen project as the table below shows:

Table 2: Capital Costs of Low-Carbon Hydrogen Plant (US\$MM)

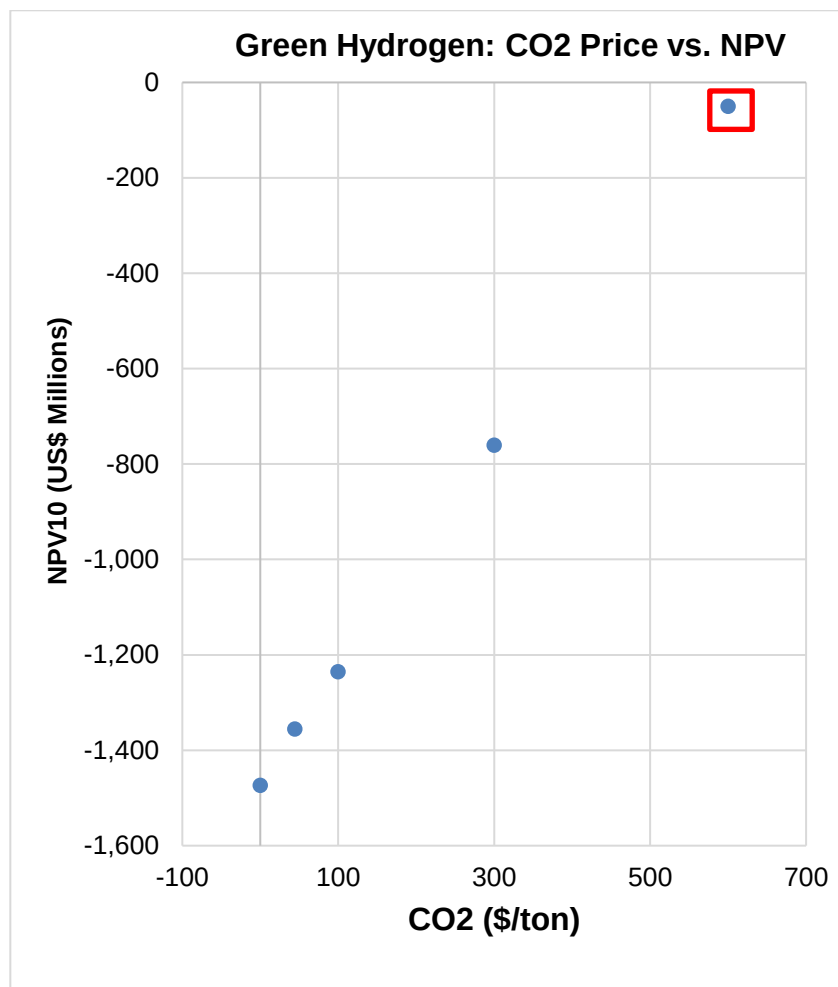
	Low	High
H2 Plant	635	1,325
Green Electricity	660	1,580
Transmission	270	750
Total	1,565	3,655

Source: TM&C analysis

¹⁰ The OBBBA accelerates the phase-out of the 45V credit for facilities starting construction after December 31, 2027.

We model a low-carbon hydrogen project that produces enough volume to support the 25 TBD renewable diesel project described above, which is about 70 MMCFD (million cubic feet per day) or about quadruple the hydrogen required to desulfurize a similar volume of petroleum diesel.

Figure 6: Low-carbon Hydrogen Project Economics



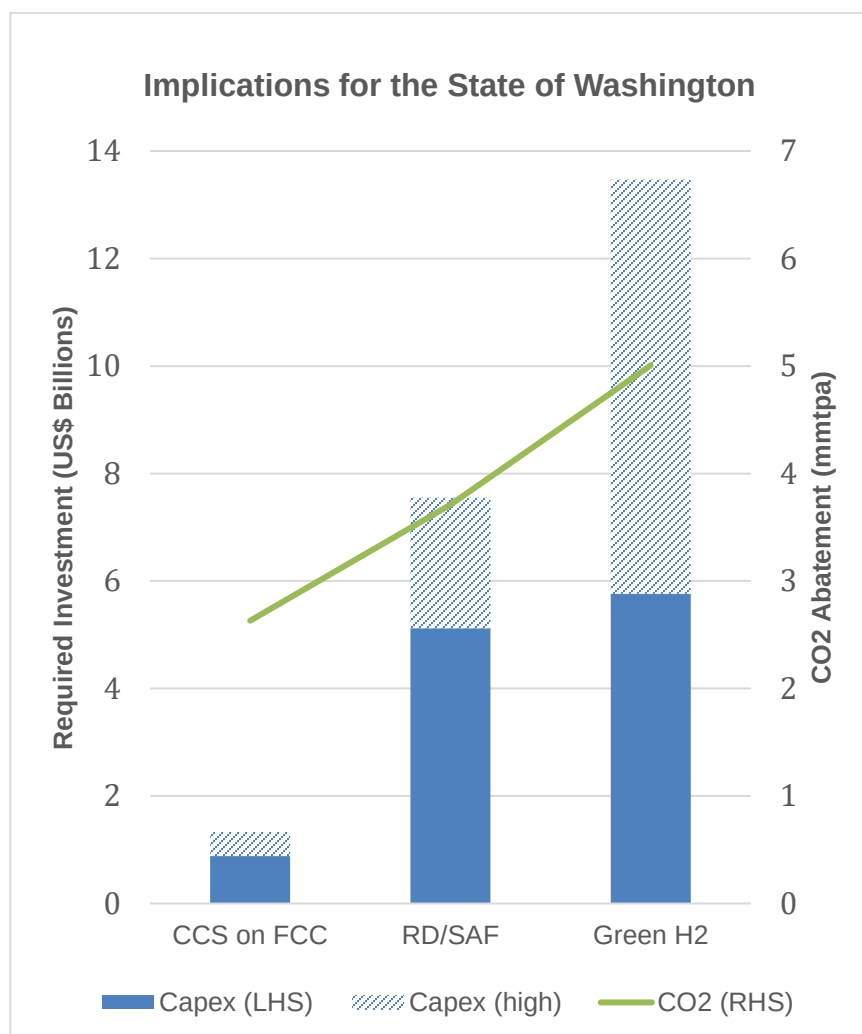
Source: TM&C analysis

The implied carbon cost that makes the project break-even on an NPV basis is about \$600/ton (net of the 45V tax credit). The CO₂e reduction is 0.36 MMTPA (about 32% of the refinery's CO₂e emissions). Configurations becomes more attractive as qualification for tax credit incentives improve.

Global CO₂e Emissions Implications

Fully implementing these projects across all Washington refineries could take until the mid-2040s. We assume each refinery would be able to implement no more than one capital project per turnaround cycle given their complexity and other work required around integrating the project with the rest of the refinery. Total required investment could range \$12 to \$22 billion (in \$2025) based on economics of actual projects TM&C has examined across the U.S. If all suggested pathways were implemented, CO₂e emissions could be reduced ~5 MMTPA, a 78% reduction from current levels.

Figure 7: Summary of Project Costs and Impact



Source: TM&C analysis

Reducing emissions in Washington by shutting down units like cokers or naphtha reformers does not yield a net reduction in global CO₂e emissions. The shortfall in local

production would require importing refined products from Asia or the Middle East, which increases global emissions due to shipping and potentially less efficient foreign refineries. When processing units in Washington are shut, exporting unfinished intermediates from Washington to other regions could further increase net emissions. It is ironic that shutting down a naphtha reformer or coker could result in intermediate products being exported to a foreign refinery, processed into finished products, and then imported back to meet local Washington demand. The CO₂e emissions savings from shutting the unit would be swamped by the increase in emissions from shipping unfinished volumes to a foreign refinery and then returning finished product to Washington.

Recommendations

- **Re-evaluate Operational Changes** - shutting down cokers or naphtha reformers is not a cost-effective decarbonization strategy due to high margin losses (\$0.8–\$1.4 billion annually) and workforce impacts;
- **Prioritize Incentives** - projects, such as FCC carbon capture and RD/SAF conversion, may become economically viable with enhanced incentives. Policymakers could consider continuing, restoring, or expanding these incentives to improve project economics;
- **Global Perspective** - address the lack of net global CO₂e reductions by exploring local renewable fuel production or carbon capture technologies that minimize reliance on imported products;
- **Further Analysis** - conduct detailed studies on RD/SAF conversion costs and green hydrogen economics to better assess their feasibility with current incentives.

Conclusions

Decarbonizing Washington refineries presents significant economic and operational challenges. While operational changes, such as shutting down a coker might reduce local CO₂e emissions, they incur substantial margin losses and potentially increase global emissions due to the need to increase product imports to keep the Pacific Northwest market in balance.

Capital projects, such as converting to RD/SAF or FCC carbon capture achieve greater reductions than shutting down the units studied, but require significant investment and incentives to be viable.

TM&C recommends a balanced approach that leverages incentives and prioritizes projects with the greatest **net** CO₂e reduction potential and economic feasibility.

Methodology

Our analysis focuses on refinery CO₂e emissions, plant economics, and the timing of decarbonization pathways. Pathways are divided into operational changes (e.g., shutting down units such as naphtha reformers or delayed cokers) and capital-intensive projects

(e.g., RD/SAF conversion, green hydrogen production, and carbon emissions capture on units, such as the FCC).

We used TM&C's proprietary refinery modeling system to create a complex refinery representative of a typical Washington refinery. To design the configuration of the refinery, we used EIA (Energy Information Agency of the U.S. Department of Energy) unit capacity data of the five petroleum fuel refineries in Washington. Capacities of key processing units include:

- Crude Distillation Unit: 150 TBD
- Naphtha Reformer: 25 TBD
- Naphtha Hydrotreater: 22 TBD
- Distillate Hydrotreater: 40 TBD
- Fluid Catalytic Cracker: 60 TBD
- Coker: 30 TBD
- Other units sized as needed to balance the refinery

We modeled a simplified refinery crude slate based on EIA foreign imports, inter-PADD transfers, and State of Washington data.

We use 2024 average prices in our analysis. Results are based on our knowledge of industry practices and assumptions based on our collective years of experiences. We also compare our results to a representative USGC Coking Refinery.