

EITE Rulemaking Background Memo 2

Approaches from Other Jurisdictions to Emissions-Intensive, Trade-Exposed Industries

Overview

Many countries and states have developed greenhouse gas emissions reduction programs that use a multi-sector emissions limit, often called cap-and-reduce or cap-and-invest programs.¹ Like DEQ's Climate Protection Program, many of these programs include policies and program elements designed to maintain the competitiveness of emissions-intensive, trade-exposed (EITE) industries, and to keep production local. As DEQ works on developing greenhouse gas emissions intensity targets for industrial sources regulated by the Climate Protection Program, DEQ is reviewing other programs' key design elements and lessons learned.

EITEs generally have high energy requirements and greenhouse gas emissions. Some face more technical and cost challenges to decarbonizing emission-intensive operations, having emissions related to industry-specific manufacturing processes, with fewer options for lowering emissions.

Jurisdictions have unique features of their economies and may have different complementary programs to incentivize greenhouse gas emissions in the industrial sector.² Oregon hired Vivid Economics to study this issue before adopting its Climate Protection Program.³ Each jurisdiction also has unique elements of its greenhouse gas emission reductions program. Not all these policies will be reviewed in depth. This document focuses on program elements most relevant to developing greenhouse gas emissions intensity benchmarks and reduction schedules in the EITE rulemaking.⁴

Oregon's approach with the Climate Protection Program

When developing the Climate Protection Program, DEQ considered several approaches for incentivizing emission reductions in the industrial sector. One approach was identifying best available emission reductions opportunities at emissions-intensive industrial facilities. Another was regulating all emissions from natural gas supplied by a natural gas utility, at the utility instead of at industrial facilities.

DEQ developed our current approach of directly regulating emissions at EITE and DNG sources, which provides sources with more options to reduce emissions. As these are larger companies, this approach allows them to leverage their resources strategically and take comprehensive approaches

¹ The European Union, Québec, New Zealand, and California have longstanding greenhouse gas emission reduction programs with mandatory emissions limits. Other jurisdictions with more recent programs include Washington, Brazil, Mexico, China, and South Korea. Some jurisdictions, such as Colorado, combine market-based program elements with direct greenhouse gas emissions controls.

² International Climate Action Partnership 2025, [Emissions Trading Worldwide: Status Report 2025](#).

³ Vivid Economics 2018, [Oregon Sectoral Competitiveness under Carbon Pricing](#).

⁴ To efficiently use state resources, this document borrows from recent work by the Washington Department of Ecology staff, including verbatim sections of text. DEQ is grateful for their work, used here by permission.

to managing their production and facilities. This approach also allows DEQ to consider various reduction timelines for these facilities, while maintaining the overall program’s emission reductions. EITE and DNG emissions are included in the program’s overall declining cap on total emissions, though they are currently scheduled to have a slower reduction schedule than natural gas or liquid fuel providers.

The Climate Protection Program’s [list of emissions-intensive trade-exposed industrial sectors](#) (below) closely mirrors those sectors identified in programs across the globe. For example, California, the European Union, Québec, and New Zealand all identify pulp and paper, chemicals, cement, aluminum, and steel sectors as EITE sectors.

EITE source classifications	
NAICS Code	Sector Definition
3364	Aerospace Product and Parts Manufacturing
3251	Basic Chemical Manufacturing
3273	Cement and Concrete Product Manufacturing
3315	Foundries
3114	Fruit and Vegetable Preserving and Specialty Food Manufacturing
3272	Glass and Glass Product Manufacturing
3311	Iron and Steel Mills and Ferroalloy Manufacturing
3274	Lime and Gypsum Product Manufacturing
3314	Nonferrous Metal (except Aluminum) Production and Processing
2123	Nonmetallic Mineral Mining and Quarrying
3329	Other Fabricated Metal Product Manufacturing
3279	Other Nonmetallic Mineral Product Manufacturing
3253	Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing
3261	Plastics Product Manufacturing
3221	Pulp, Paper, and Paperboard Mills
3211	Sawmills and Wood Preservation
3344	Semiconductor and Other Electronic Component Manufacturing
3212	Veneer, Plywood, and Engineered Wood Product Manufacturing

Each year DEQ distributes compliance instruments to entities regulated by the program. The number of compliance instruments distributed by DEQ is equal to that year’s emissions cap. A compliance instrument allows a regulated entity to emit one ton of greenhouse gas emissions. As the cap declines, DEQ distributes fewer compliance instruments.

Regulated entities can trade unused compliance instruments or bank them for future use. Regulated entities can also choose to earn community climate investment credits. A community climate investment credit allows a regulated entity to emit one ton of greenhouse gas emissions, subject to limitations. For every ton of greenhouse gas emissions, a regulated entity must have an equal number of compliance instruments or credits to meet program requirements.

As it does for other types of regulated entities, DEQ would distribute free compliance instruments to EITE and DNG sources. Currently, DEQ is scheduled to distribute compliance instruments to EITE and DNG sources based on their historic emissions for the program’s second compliance period.

However, through this EITE rulemaking, DEQ aims to develop emission intensity benchmarks – starting values of emissions per unit of output or process – to accommodate changes in production levels and growth.

DEQ would use these intensity benchmarks along with a schedule of emissions reductions to calculate how many compliance instruments to distribute to each EITE or DNG source.

An example of this would be:

benchmark (emissions/unit output) multiplied by reduction schedule multiplied by annual output equals the number of compliance instruments

DEQ would distribute compliance instruments to EITE and DNG sources first. Natural gas utilities receive a fixed percentage of the remaining compliance instruments (per OAR 340-273-9000(4)), and then DEQ distributes the balance to liquid fuels and propane supplies using a [specific distribution methodology](#).

Approaches for allocating compliance instruments/allowances

Greenhouse gas emissions reduction programs that allocate compliance instruments, or allowances, to meet compliance requirements, usually employ one of three approaches for industrial facilities:

- a) Grandparenting, whereby allowances are allocated based upon historic emissions from a facility in a specified timeframe. This is the approach for allocating compliance instruments to EITEs beginning in 2028 that is currently in the program rules.
- b) Fixed-sector benchmarking, whereby allowances are allocated based on a fixed efficiency benchmark across an industry sector. Benchmarks are set using historic production levels rather than historic emissions. These benchmarks usually do not vary based on climate, material quality, plant age or size, or technology used. This is a hybrid approach between grandparenting and output-based allocation. If production benchmarks are frequently updated, as they are in most systems, this approaches an output-based allocation approach.⁵
- c) Output-based allocation, whereby allowances are allocated using output and an efficiency benchmark. Those benchmarks can be sectoral or facility specific. Allowances are based on current output, not historic production levels.

The International Climate Action Partnership (ICAP) assessed these three approaches in 2020.⁶ Vivid Economics reviewed various approaches for Oregon in 2018 and reached similar conclusions.⁷ Both found grandparenting is the easiest to implement because it only requires data on historical emissions. However, grandparenting has limitations, most notably the risk of overcompensating EITEs during periods of lower production or penalizing manufacturers that expand their production. When developing the Climate Protection Program, DEQ and interested parties noted the advantages of a simplified distribution approach using historic emissions but also noted these limitations.

The two other approaches require detailed production and historical emissions data at the industry or facility level to develop benchmarks. Benchmarking involves determining allocation with reference to product, facility, or sector-level benchmarks rather than solely historical emissions at a facility. Benchmarking offers the advantage of removing the link between an individual firm's historical emissions and the allowances or compliance instruments they receive, providing clearer incentives for emissions reductions that don't come from reducing output, but efficiency improvements.

⁵ Fixed-sector benchmarking is used in the European Union phases 3 and 4 and the Korean ETS. In Phase 3, allocation was based on product-based benchmarks and mean value of annual output, unless production dropped 50% or more. In Phase 4, allocations change if production increases or decreases more than 15% based on the average of the previous two years.

⁶ ICAP 2020, [Carbon Leakage and Deep Decarbonization: Future-Proofing Carbon Leakage Protection](#).

⁷ Vivid Economics 2018, [Oregon Sectoral Competitiveness under Carbon Pricing](#).

ICAP found output-based allocation approaches are best practice because they target leakage more robustly through adjustment of allowances based on production levels. This means when a facility produces an extra unit of output it receives additional allowances, in contrast to grandfathering or fixed-sector benchmarking approaches. ICAP found the approach most effective when paired with fixed-sector benchmarking, thereby rewarding the most efficient facilities in a sector.⁸

Output-based allocation approaches are the most common across other jurisdictions' programs. The most common output-based allocation method relies on an emissions intensity benchmark, based on volume of emissions per unit of output. Other approaches calculate benchmarks based on emissions per unit of revenue, value-added, or profit. While calculating allowances based on the benchmarks is a starting point, overall allowances/output are generally reduced over time in an effort to reduce emissions.

Output-based allocation policies reward companies that maintain or increase their production within the jurisdiction while also encouraging them to reduce the carbon intensity of their production processes.

Distribution methods

Currently, most jurisdictions allocate allowances to EITEs for free, though other regulated entities may be required to obtain allowances through auctions or are required to consign some allowances they receive from the jurisdiction to auction. All compliance instruments in the Climate Protection Program are distributed for free. Free allocation of allowances can lower costs but diminish incentives to reduce emissions. Some incentives remain, as companies can sell excess instruments to other regulated parties. Additionally, most programs reduce free EITE allowance allocation over time as part of their emission reductions schedule.⁹ The European Union, California, Québec and New Zealand progressively reduce the number of free allowances over time.

Program stability has value. As ICAP notes, "As the sale of free allowances is necessary to cover [the costs of investing in emissions reduction], firms must trust that they will continue to receive free allowances long after the investment has been made (and emissions reduced)... the credibility of such an approach therefore relies on the stability of regulatory arrangements around the provisions of free allocation as well as technology developments and the demand for allowances from other sectors."¹⁰

Jurisdictions may make other adjustments that affect the allocation of allowances to EITEs. Jurisdictions may adjust allowances based on carbon leakage risk (assistance factors), and declining emission caps (cap adjustment factors, which reduce the level of free allocation). Some jurisdictions adjust for anticipated efficiency improvements and technological improvements over time. Washington allows facilities to ask for increased allowances if they can demonstrate additional reductions in carbon intensity or mass emissions are not technically or economically feasible. See Tables 1 and 2 near the end of this document.

In jurisdictions that distribute allowances via auctions, some are using consignment. Eligible entities are allocated free allowances, but a portion of the allowances are consigned and sold at auction by

⁸ Allocating just based on a facility's own output and intensity can be called facility-level benchmarking, whereas basing benchmarks on a sector and adjusting allowances based on output may be considered output-based allocation with sectoral benchmarks.

⁹ The European Union will be phasing out free allowances altogether from 2026-2034 and replacing it with the carbon border adjustment mechanism.

¹⁰ International Climate Action Partnership, [Carbon Leakage and Deep Decarbonization: Future-proofing Carbon Leakage Protection](#), 2020.

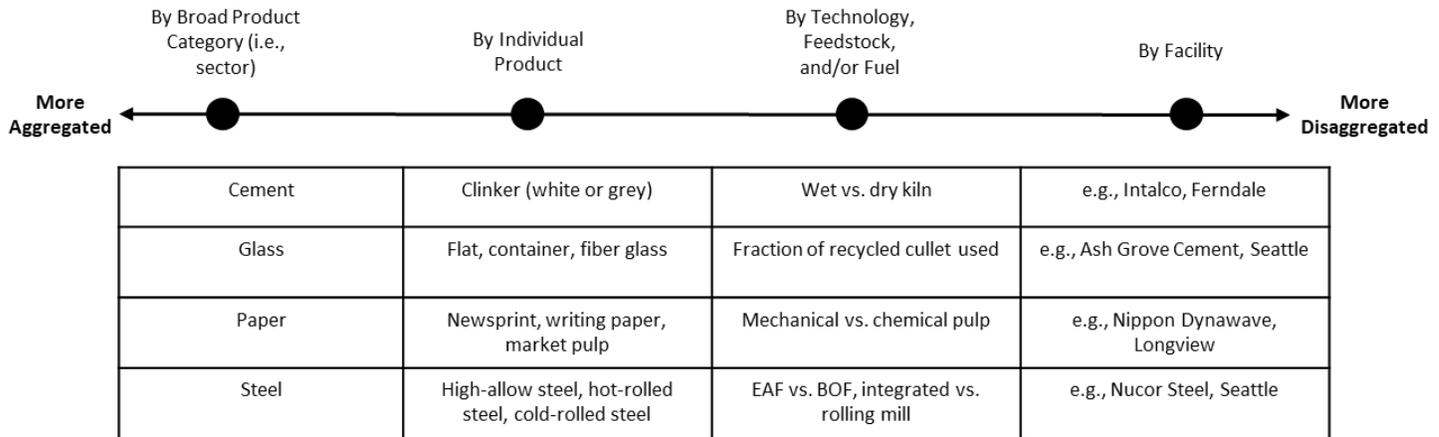
the jurisdiction. The entities then receive the revenue from the sale of the consigned allowances, often with conditions specifying how revenue can be used.¹¹

This approach has been mostly used for utilities, as in Washington and California, however, Québec recently introduced consignment as part of an update to its EITE allocation policy. Now 1.7% of total EITE allocation is consigned to auction and revenues must be used for specified emission reduction projects.¹²

Output-based allocation questions

One of the questions about output-based allocation is the level of product at which the carbon intensity is defined. Some options follow.

Product definition based on levels of aggregation for benchmarking for selected industrial sectors¹³

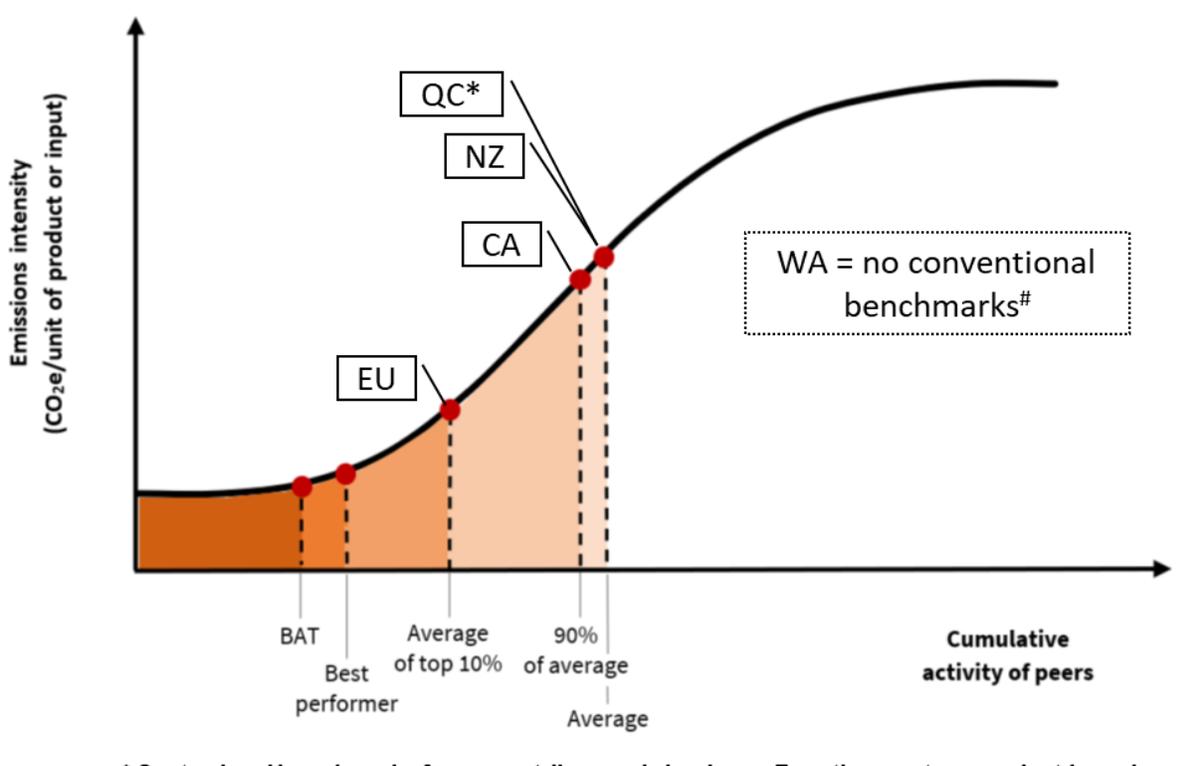


¹¹ World Bank/International Climate Action Partnership, [Emissions Trading in Practice: A Handbook on Design and Implementation](#), 2021.

¹² Ministère de l'Environnement (Québec), [Projects Eligible for Payment from Consigned Funds](#).

¹³ From Washington Department of Ecology, adapted from Stockholm Environment Institute, [Issues and Options for Benchmarking Industrial GHG Emissions](#), 2010.

Jurisdictions also have used different approaches in choosing a starting benchmark. In the chart below, BAT means using best available technology – which would result in the lowest possible emissions. The European Union set its benchmarks using the average emissions of the top 10% most efficient producers in the sector. California calculated the average emissions per product and set benchmark emissions 10% below that, or, if no facility was at that level, best-in-class, to ensure at least one facility is already operating at the benchmark value. New Zealand generally used average emissions at New Zealand facilities. Québec set both facility-specific and sector-wide benchmarks, and Washington set theirs based on Washington facility-specific emissions from 2015-2019. Some jurisdictions later updated their benchmarks to reflect actual carbon intensity of production and account for efficiency improvements.



* Sector-level benchmarks for cement, lime and aluminum. For other sectors product-based benchmarks are based on facility-level averages and not specified in regulation.
 # Carbon-intensity baselines are based on facility-specific averages using composite production metrics that do not differentiate between different products.

Leakage in the industrial sector

As previously discussed, jurisdictions have long been concerned about the possibility of emissions and production leakage. Economists generally assess the possibility of leakage from EITEs by reviewing the level of impact emission reduction costs have on a facility and the ability of a facility or sector to adjust to compliance costs without significant loss of market share. The European Union Emissions Trading System also looks at market characteristics, profitability, and emissions reduction opportunities, such as the extent of adoption of best available technologies.

Outside of their emissions reduction programs, jurisdictions often use complementary tools to retain local production. Examples include targeted investments in clean technologies, consumption charges on the use of emissions-intensive goods, subsidies or rebates linked to in-state production and number of high-quality jobs, or encouraging lower emissions products through marketing, labeling, or preferential state purchasing rules.

ICAP reviewed the available literature in 2020 and found limited evidence of companies relocating due to greenhouse gas regulations as of that date.¹⁴ That finding may be because allowance prices have been low, program design elements such as free allocation and exemptions, high expense and long timeline of industry relocation, and the broader business and trade environment such as tax rates, labor availability, and infrastructure has a greater impact on large-scale competitiveness.¹⁵

The California Air Resources Board commissioned multiple studies to assess risk for EITEs and found some industrial activities would face higher relocation risk than others.¹⁶

In Oregon, Vivid Economics wrote a report, which found in part:

*“Purchasing emission permits or paying a carbon tax is only one part of the cost function [for EITEs] and other factors such as resource prices or labor costs are often more significant. . . . factors such as access to a qualified labor force, stable institutions, and innovation and technological development are often more important than mere cost competition, and are crucial to Oregon’s state competitiveness. These findings are in line with a longstanding and large body of research. . . .”*¹⁷

A report on manufacturing competitiveness in Washington published by the Association of Washington Business also focused on wider competitiveness factors, including taxes and fiscal policy (e.g. overall tax obligations), labor and innovation (e.g. talent availability and investment in research and development), energy and land costs, infrastructure, and regulatory costs and certainty.¹⁸

Evaluations of the economic impacts of greenhouse gas emission reduction programs would also need to consider the growth and benefits of clean energy jobs. Investments in emissions reduction technology can result in significant numbers of new jobs required to manufacture, install, and maintain that technology.¹⁹

¹⁴ International Climate Action Partnership, [Carbon Leakage and Deep Decarbonization](#), 2020.

¹⁵ The best available public dataset, the US Census Bureau’s Commodity Flow Survey, is only published every five years and does not disaggregate beyond the NAICS 3-digit level in the current published version (2017).

¹⁶ Hamilton et al. 2016, Gray et al. 2016, Fowlie et al 2016.

¹⁷ Vivid Economics 2018, [Oregon Sectoral Competitiveness under Carbon Pricing](#).

¹⁸ Association of Washington Business 2021, [Manufacturing Competitiveness Study](#).

¹⁹ Political Economy Research Institute 2022, [Job Creation Estimates Through Proposed Inflation Reduction Act](#), projected nearly 120,000 jobs to be created through industrial transformation at energy-intensive manufacturing facilities.

Carbon border adjustment mechanisms

While most systems have used free allocation of emission allowances to protect emission intensive industries exposed to trade, another approach used by nations is a carbon border adjustment mechanism (CBAM). This imposes a price adjustment on imports of energy or emissions-intensive products from countries with less stringent climate policies. The European Union established a CBAM in 2023. Reporting obligations started that year, and the CBAM went into effect January 1, 2026, for imports of six industrial products: aluminum, cement, electricity, fertilizers, hydrogen, and iron and steel. By 2030 all sectors covered by the European Union Emissions Trading System will be covered. The United Kingdom is scheduled to introduce a CBAM in 2027.²⁰

²⁰ Read more on the current state of carbon border adjustment mechanisms at the [Center for Climate and Energy Solutions](#).

Table 1. Key Design Aspects of EITE Allowance Allocation Policies

Source: Washington Department of Ecology; used with permission.

Jurisdiction	Approach for identifying industrial sectors exposed to leakage risk	Policies used to address leakage risk	Discount factors applied
Washington	Sectors identified in statute based on NAICS codes. Sectors not identified in statute can petition Ecology to be classified as EITE based on criteria whereby 'emissions intensive' = annual emissions >25,000 MT and 'trade exposed' = TE of >15%.	Output-based allocation (with facility-specific baselines).	'Reduction schedule' fixed at 100% for 2023-2026, 97% for 2027-2030, and 94% for 2031-34 (equivalent to an ~0.47% year on year reduction from 2023-2034). Defaults to 94% from 2035-2050 unless changed by Legislature before December 2027. No cap adjustment factor or other discount factors applied.
California	Two methods used to determine leakage risk classification for industrial sectors: emissions intensity (EI) and trade exposure (TE). Sectors classified as high, med or low leakage risk.	Output-based allocation (with sector-level product-based benchmarks). + Electricity credits (output-based) for purchased electricity (currently limited to EITEs served by IOUs).	Assistance factor: fixed at 100% through to 2030 (was initially meant to be differentiated based on high/med/low leakage risk). Cap adjustment factor declines approx. 4% annually in proportion to the overall cap through to 2031. Certain EITEs (with high process emissions) subject to more moderate cap adjustment factor.
Québec	Two methods used to determine leakage risk classification for industrial sectors: emissions intensity (EI) and trade exposure (TE). Sectors classified as high, med or low leakage risk.	Output-based allocation (with product-based benchmarks: both sector-level and facility-specific). From 2024, 1.7% of total allocation consigned to auction and revenues must be used for emission reduction projects by EITEs.	<u>For total allocation (including consigned allowances):</u> Assistance factor specified between 90%-100% based on leakage risk during 2023-2030, plus a 1% annual reduction applied as 'minimal expected effort'. <u>For direct allocation (excluding consigned allowances):</u> Assistance factor (90-100%) and cap decline factor (2.34% annually), plus other discount factors specific to each facility (average annual reduction for all discount factors combined is 2.7% annually).
New Zealand	Two methods: emissions intensity (EI) and trade exposure (qualitative - based on trans-oceanic trade of products). Sectors classified as highly or moderately exposed to leakage risk.	Output-based allocation (with sector-level product-based benchmarks).	Assistance factor: 90% for highly emissions intensive industrial activities and 60% for moderately emissions intensive activities. Cap adjustment factor ('phase-out rate'): 1% annual reduction for 2021-2030 2% annual reduction for 2031-2040 3% annual reduction for 2041-2050
EU (Phase 4 – 2021-30)	Two methods: emissions intensity (incl. indirect electricity emissions) and trade exposure (TE). Binary approach for classifying sectors as exposed to leakage risk.	Fixed sector benchmark (with sector-level product-based benchmarks). Compensation provided to EITEs by some EU members states for purchased electricity ('indirect cost compensation') From 2026-2034 industrial allocation will be phased out as the Carbon Border Adjustment Mechanism is phased in.	Assistance factor of 100% for all industrial activities above the threshold of leakage risk (regardless of their degree of emissions intensity and trade exposure). Cap adjustment factor ('cross-sectoral correction factor'): 2.2% reduction annually in Phase 4.

Table 2. Allowance Allocation and Benchmarking Across Jurisdictions

Note: the table below is a summary for discussion purposes. Many of the programs have additional nuances.

	Allocation method	Fallback	Benchmarking method	Updating/adjusting benchmarks
Oregon	To be determined	Grandparenting “...average covered emissions for 2022 through 2023 multiplied by the emission reduction target in OAR 340-273-9000 Table 8...”	To be determined	To be determined
Washington	Output-based (facility-specific)	Mass-based (based on average emissions 2015-2019; used for a few facilities)	Facility-specific benchmarks. Each facility is assigned a specific allocation baseline, with a single production metric (i.e. without product differentiation). <u>Allocation baselines</u> = avg. emissions/avg. production at each facility during 2015-2019 (intensity-based) or avg. emissions at each facility during 2015-2019 (mass-based).	Facility-level allocation baselines do not routinely change once they are set. The reduction schedule reduces total allocation by 0% during 2023-2026, 3% from baseline during 2027-2030, and 6% from baseline during 2031-2034 (approx. 0.47% year on year reduction across the 12 years).
California	Output-based (sector-specific)	Energy-based (When product-based metrics can't create effective incentives, uses allowances based on the energy input.)	Product-based benchmarks. Sector-level equal to 90% of average or “best in class” facilities in CA based on 2008-2010 data. ~90 product-based benchmarks specified in regulation.	Benchmarks do not routinely change once they are set. No other adjustments to explicitly account for efficiency improvements and new technologies (but other discount factors are applied).
Québec	Output-based (facility- or sector-specific)	Energy-based	Product-based benchmarks. Sector-level benchmarks specified in regulation for cement, lime and aluminum sectors. Average emissions intensity based on 2007-2010 data. For all other sectors each facility has an individual target intensity based on its average emission intensity 2007-2010.	During 2024-2030 the target intensity (benchmark) for each facility will be progressively updated based upon actual emissions intensity during 2017-2019. A 1% annual reduction is applied as minimal expected effort to improve efficiency, along with other discount factors and consignment.

Allocation method	Fallback	Benchmarking method	Updating/adjusting benchmarks
European Union	Product-based (fixed-sector benchmarking with updating)	Energy-based	<p>Benchmarks were updated between 2021 and 2025 to account for technological progress.</p> <p>No other adjustments to explicitly account for efficiency improvements and new technologies, but other discount factors are applied. From 2026-2034 industrial allocation will be phased out as the carbon border adjustment mechanism is phased in.</p>
New Zealand	Output-based (product-based)	No fallback	<p>Product-based benchmarks. Allocative baselines = average emissions intensity per unit of production based on 2006- 2009 data from all relevant facilities (in some cases only one facility). NZ has about 44 product-based benchmarks specified in regulation.</p> <p>Benchmarks are being updated using emission intensity data from 2016-2021.</p> <p>No other adjustments to explicitly account for efficiency improvements and new technologies</p>
Colorado	Mass-based		<u>Requires</u> 20% reduction from 2015 levels by 2030.

Benchmarks example

An [illustrative example of benchmarks](#) comes from California and the European Union. California has had product-based benchmarks since 2010. The European Union has had its carbon trading system since 2005, and has significantly strengthened it three times:

CALIFORNIA AIR RESOURCES BOARD

<u>Sector</u>	<u>NAICS code</u>	<u>Activity</u>	<u>CA Benchmark (Imperial Units)</u>	<u>CA Benchmark Units (SI Units)</u>	<u>EU ETS Benchmark (SI Units)</u>		
Paper (except Newsprint) Mills	322121	Through-Air-Dried (TAD) Tissue Manufacturing	1.30	Allowances / Air-Dried Short Ton of TAD tissue	1.43	Allowances / Air-Dried Metric Ton of TAD tissue	N/A N/A
		Recycled Boxboard Manufacturing	0.499	Allowances / Air-Dried Short Ton of Recycled Boxboard	0.550	Allowances / Air-Dried Metric Ton of Recycled Boxboard	0.273 Allowances / Air-Dried Metric Ton of Coated Carton Board
Paperboard Mills	322130	Recycled Linerboard (Testliner) Manufacturing	0.468	Allowances / Air-Dried Short Ton of Recycled Linerboard	0.516	Allowances / Air-Dried Metric Ton of Recycled Linerboard	0.248 Allowances / Air-Dried Metric Ton of Testliner and Fluting
		Recycled Medium (Fluting) Manufacturing	0.394	Allowances / Air-Dried Short Ton of Recycled Medium	0.434	Allowances / Air-Dried Metric Ton of Recycled Medium	0.248 Allowances / Air-Dried Metric Ton of Testliner and Fluting

Additional information

For updates on the EITE rulemaking, please [subscribe for email updates](#) and visit the [EITE rulemaking web page](#).

Please visit the [program web page](#) for more information on the Climate Protection Program.

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