

MAKING POLLUTERS ACCOUNTABLE: INDUSTRIAL EMISSION PERFORMANCE STANDARDS

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1.0 Introduction

This proposal seeks feedback on Ontario's proposed Emissions Performance Standard (EPS) approach for the industrial sector.

The federal government intends to regulate greenhouse gas emissions through a federal backstop, the *Greenhouse Gas Pollution Pricing Act* (GGPPA) enacted in 2018. The Act is comprised of two parts; Part 1 applies a charge to fuels used by households and businesses and Part 2 applies an Output-Based Pricing System (OBPS) (industrial charge) to electricity and industrial sectors. The backstop applies to any province or territory that does not have a carbon pricing system that meets the federal benchmark. On October 19, 2018, Ontario was added to Part 2 of Schedule I for the OBPS under the GGPPA. Part 1 will result in higher costs to households and businesses for heating their homes and businesses and driving their cars or moving their products to market.

Ontario has developed this regulatory proposal as an alternative to the federal OBPS set out in Part 2 of the Act. Ontario is best suited to develop a made-in Ontario approach that will reduce greenhouse gas emissions from industry while addressing the unique circumstances of Ontario's industrial sectors. Ontario will continue to refine this proposal through consultation with stakeholders and will work with the federal government to remove Ontario from Part 2 of Schedule I while Ontario's constitutional reference regarding the GGPPA is pending, so Ontario can address industrial emissions under its program.

A key step in this direction was taken on November 29, 2018, when Ontario released a made-in-Ontario Environment Plan to help protect our air, land and water, address litter and reduce waste, support Ontarians to continue to do their share to reduce greenhouse gas emissions, and help communities and families prepare for climate change. The plan, that was the subject of consultation, reflects the government's continued commitment to addressing Ontario's environmental challenges, including climate change, in a way that considers our province's specific priorities, region-based challenges and opportunities, and respect for our hardworking taxpayers.

The climate change plan that is part of Ontario's Environment Plan includes a proposal for an Emissions Performance Standard (EPS) approach for the industrial sector. At 30% of the total provincial GHG emissions in 2016, industry remains a significant source of provincial GHG emissions and hence will need to contribute towards the province's proposed GHG reduction target of 30% below 2005 emissions by 2030.

The EPS is one potential approach to achieve cost effective reductions for large emitters. Industry GHG emissions are comprised of some large manufacturing sectors such as iron and steel, petroleum refineries, cement, lime and chemicals. These industries have the technical expertise and the ability to identify and implement cost effective GHG emissions reduction projects.

The EPS is a regulatory approach that would establish greenhouse gas emissions performance standards that facilities would be required to meet. The objective of these standards would be to drive GHG emission reductions from large emitters while maintaining competitiveness of

Ontario businesses and minimizing carbon leakage¹. Any industries that do not meet the standard will have to pay. This proposal sets out an approach that is tough but fair, cost-effective and flexible to the needs and circumstances of our province. Several Canadian jurisdictions have put in place or are working towards performance standards for their large industrial emitters with compliance mechanisms (e.g., Saskatchewan, Alberta).

At the same time, we intend to support industry and the business climate by removing existing policy or regulatory barriers that hinder their ability to reduce their emissions with new technologies or processes. As part of this effort, we will use payments for compliance units from industries that do not meet the standards to contribute to an emissions reduction fund that industry can access to invest in new reduction technologies and to drive compliance with the standards.

The Ontario government is also actively challenging the federal government's "backstop" as an unconstitutional disguised tax in two reference proceedings. On November 30, 2018, Ontario filed its factum with the Ontario Court of Appeal questioning the constitutionality of the federal GGPPA. On January 25, 2019, Ontario filed a similar factum with the Saskatchewan Court of Appeal in the parallel legal proceeding occurring there.

¹ Carbon leakage occurs when production moves from a jurisdiction with stringent climate policies to a jurisdiction with no or lower cost climate policies. In this situation, the economy of the jurisdiction with stringent climate policies could suffer while overall emissions either stay the same or increase.

2.0 Program Scope

2.1 Regulated Sectors

At a minimum, Ontario proposes to regulate the same sectors to be covered by the federal OBPS in order to facilitate reporting and compliance and to provide clarity for Ontario businesses while Ontario's constitutional reference regarding the GGPPA is pending. The federal government OBPS currently covers the following sectors in Ontario:

- cement;
- chemical sectors (specifically ammonia, hydrogen, nylon, carbon black, citric acid; MPMD, petrochemical, vaccines);
- electricity generation;
- food sectors (specifically sugar, corn milling);
- industrial, food and fuel ethanol;
- metal tubes and steel (from scrap or ores);
- lime;
- metal from mining or milling of ore;
- mineral products (brick, gypsum, mineral wool, glass);
- natural gas liquids;
- natural gas transmissions pipelines;
- non-ferrous metal smelting, refining (e.g., nickel, copper);
- petroleum refineries;
- oilseeds processing;
- pulp and paper;
- upstream oil extract and upgrading;
- vehicle manufacturing

Ontario is also considering including additional sectors in Ontario's program that are not covered by Part 2 of the federal GGPPA but would incur fuel charges under Part 1 of the federal legislation while Ontario's constitutional reference regarding the GGPPA is pending. These include:

- Institutions
 - Institutions would incur costs under the federal fuel carbon charge (Part 1) and are proposed to be compensated by the federal government through the return of some proceeds.²
- Greenhouse operators:
 - Fuel used by greenhouses will be subject to 20% of the federal carbon fuel charge.
- Thermal Energy Supply
 - Providers of steam and other thermal energy to industry and commercial/institutional users would incur costs under the fuel charge (Part 1) of the federal backstop.

² See https://www.fin.gc.ca/n18/data/18-097_4-eng.asp for more details

2.2 Type of Emissions

There are different types of greenhouse gas emissions that can occur from industrial processes. These include fixed process emissions and non-fixed process emissions. Fixed process emissions are generally the result of chemical or physical reactions (that are not related to combustion). Non-fixed process emissions include combustion, fugitive and on-site mobile sources. Combustion emissions include greenhouse gases from the burning of fuel. Fugitive emissions result from equipment leaks and unintentional losses. Ontario is proposing to cover both fixed process and non-fixed process emissions of facilities in the program.

2.3 Emissions Threshold

Threshold refers to the smallest size of in-scope facilities covered by the program, usually based on the amount of annual emissions in tonnes of CO₂e per year and sometimes on a production or capacity threshold such as megawatt hour of electricity produced.

For the start of the program, Ontario is considering whether to either establish a mandatory emissions threshold at 25,000 or at 50,000 tonnes/year and allowing smaller facilities with emissions between 10,000 tonnes per year and the mandatory threshold to voluntarily participate (opt-in) to the program beginning in 2019. A lower threshold on a megawatt hour basis is also being considered for the electricity sector. Complementary amendments would be made to the Greenhouse Gas Emissions: Quantification, Reporting and Verification regulation (O. Reg. 390/18) to align the verification threshold with the mandatory threshold for the EPS program.

3.0 Emission Performance Standards

An EPS establishes a limit (e.g., annual emission limit) on the amount of emissions that can be released from a source of pollution (on a facility, process or equipment basis) over a period of time. This limit can be applied in different ways using different methods - it can be a reduction requirement from a historical average of emissions (i.e., 95% of average emissions from 2015 to 2017 by 2022) or from an average of emissions intensity (i.e. 95% of average emissions per tonne of cement over 2014 to 2016 by 2022). The standard can also be established on a facility basis or on a sector average basis if there are multiple facilities making the same product.

3.1 Performance Standard Methods

Most commonly, a performance standard for greenhouse gases ties emissions to the level of output or production from a regulated facility. The emissions standard can be derived from emissions on a per facility basis or on a sector average basis if there are multiple regulated facilities making similar products. Performance standards can also be applied to utilities generating electricity, heat or steam.

Performance standards may also include the application of a stringency factor to incent industry to be energy efficient by encouraging emission reductions. The stringency factor generally considers competitiveness impacts for industry in order to minimize carbon leakage. Separate stringency factors can be applied to non fixed process emissions and fixed process emissions in recognition that fixed process emissions are harder to reduce. See Section 6 for further information on considerations for setting the stringency factor and approaches to assessing competitiveness impacts (leakage risk).

Table 1: Proposed Stringency Factors

EITE Level	Emission Type	2019 SF	2020 SF	2021 SF	2022 SF
High	Fixed Process	100%	100%	100%	100%
High	Non-Fixed Process	98%	96%	94%	92%
Medium/Low	Fixed Process	100%	100%	100%	100%
Medium/Low	Non-fixed Process	95%	90%	85%	80%

3.1.1 Sector-Based Performance Standard

Sector based performance standards are average greenhouse gas emissions standards based on weighted average emission intensity for historical years (e.g., 2015 to 2017). It includes direct emissions (non-fixed and fixed process) related to the industrial operations and potentially attributed (indirect) emissions (e.g., imported steam). See detailed equation in Appendix C.

A sector average performance standard typically has two components: a stringency factor (SF) and a sector average emission intensity.

$$PS = EI \times SF$$

Where,

PS = Performance Standard for Sector

EI = Average Emission Intensity of the Sector in tonnes of CO₂e per unit of production

SF = Stringency Factor expressed as a fraction, e.g. 0.95.

Production units may be final manufactured goods, intermediate products/material for use in other parts of the regulated facility, material input, energy input or energy outputs.

Establishing an emissions intensity for a sector requires detailed annual emissions and production data. MECP is proposing to establish performance standards on a sector basis where there are multiple facilities making similar products and where there is sufficiently detailed emissions and production data. This applies to the grey cement, refining and steel sectors.

Additionally, MECP is proposing to establish separate standards for fixed process and non-fixed process emissions to allow for the application of different stringency factors. Fixed process emissions are generally the result of chemical or physical reaction (that are not related to combustion). Non-fixed process emissions include combustion, fugitive and mobile sources. See Table 1 in Appendix A for the proposed approaches to sector average intensity calculations.

3.1.2 Performance Standards for Fossil Based Electricity, Thermal Energy Supply and Cogeneration

For utilities such as electricity generation, cogeneration and thermal energy supply, the ministry is proposing the following approaches to setting the performance standards:

1. Electricity generation:

Ontario has phased out coal and in 2017, approximately 96% of the electricity generated in Ontario was emissions-free. The combination of nuclear, hydro, other renewables and efficient natural gas has given Ontario one of the cleanest energy grids in North America. . The emissions from electricity generation are predominantly from natural gas-fired generators. The performance standard for this sector would be based on what is achievable by natural gas fired electricity generators. In recognition of the significant reductions made in the electricity sector, a stringency factor may not be applied.

2. Thermal energy supply:

Under this category, the generation of thermal energy (e.g., steam) takes place outside of a regulated facility and the thermal energy is supplied to industrial or residential customers. The performance standard for thermal energy supply would take into consideration what is achievable with a natural gas-fired boiler operating at a high level of efficiency (e.g., 90%).

3. Cogeneration:

A facility with cogeneration generates both electricity and heat for use in mostly industrial processes. The performance standard for cogeneration would take into consideration the performance of an efficient natural gas-fired cogeneration system (e.g., 90% overall efficiency).

See Table 2 in Appendix A for proposed standards for electricity generation, thermal energy supply and cogeneration.

3.1.3 Alternatives to Sector Based Performance Standards

Other approaches to performance standards are necessary in instances where there is only one regulated facility or where it is difficult to establish a product-based performance standard (e.g., it is difficult to determine the applicable production metric for a sector based performance standard), MECP is proposing the following alternative approaches to incenting greenhouse gas reductions for these situations. See Table 1 in Appendix B for a list of sectors for which MECP is considering using alternative standards.

1. Facility specific emission intensity

Facility specific emission intensity is based on recent historical emissions and production information, if readily available, for the facility (e.g., 2015-2017). It will be the preferred approach where feasible, especially when a sector contains two or less facilities.

A facility-specific emission intensity is based on the emissions intensity of a single facility rather than the average emissions intensity of multiple facilities. A stringency factor will be applied to the facility average to determine the annual emissions limit.

2. Energy Use intensity

Energy use intensity is an alternative approach to product output standards, and is based on the amount of fuel (e.g., natural gas, fuel oils) used at the facility. An energy use intensity method may apply to facilities if product based approaches are not feasible (e.g., it is difficult to determine the applicable production metric for a sector based performance standard), the facility is anticipating changes in operations, or to supplement other methods. The energy-use intensity method is flexible and can accommodate a larger number of potential facilities; however it does not recognize onsite emission reductions.

MECP is proposing to establish a process where a regulated facility may apply to switch from an energy-use intensity method to a facility-specific emissions intensity method that adjusts the limit based on a comparison of the current emissions intensity to the historical emissions intensity. A regulated facility would need to apply to the Ministry in the year before the compliance deadline and would need to identify a suitable product(s) for the emissions intensity. Similar to the sector-average performance standards, a stringency factor would also be applied to facilities regulated under this method. See detailed equation in Appendix C.

3. Historical Facility Average Emission Limits

Unlike performance standards discussed above, emission limits based on a facility's historical emissions are not tied to facility production changes or energy use.

The limits will be based on recent average historical emissions for the regulated facility (e.g., 2015-2017), and will be used only in situations where it is difficult to determine the applicable production metric or facilities have process emissions making the energy use intensity method unsuitable. A stringency factor would also be applied to facilities regulated under this method. Since a facility's emissions limits is not tied to production changes or energy use, if compliance units are provided for overachieving the annual emission limit, it is proposed that a limit be imposed on the number of these units that a regulated facility under this method is able to obtain. (e.g., maximum of 5% of the facility's verified emissions for the compliance year).

4.0 Compliance Flexibility

Compliance flexibility is an important feature of the EPS design, as it reduces overall costs of compliance for facilities covered by the EPS. It can also broaden the GHG emissions reduction incentive across the economy and support investment in GHG emissions reduction solutions.

The EPS could be met by a regulated facility either by reducing their GHG emission intensity or by using compliance units for voluntary reductions made by others, overachieving the standard, or payments made for excess emissions.

The possible compliance flexibility mechanisms commonly used with emission performance standard approaches for greenhouse gases include:

1. **Compliance units – payment:**

With this option, facilities covered by the EPS receive compliance units by making payments for any emissions in excess of the performance standard. Payments collected by the program could go into a fund that would support greenhouse gas emissions reductions in industry. The price for these compliance units will start at \$20 per tonne in 2019 and increase \$10 per year to a maximum of \$50 per tonne in 2022.

2. **Compliance units for Emissions Below a Facility's AEL:**

Facilities with emissions below the facility's AEL can receive compliance units for the portion of their emissions that are below the standard. A regulated facility may be able to bank these compliance units to use in meeting future compliance obligations or, alternatively, trade them to other regulated facilities in the program, creating an incentive for facilities to reduce emissions below their limit when it is cost effective to do so. As noted above, there may be a limit on the number of these compliance units that could be obtained under some methods (e.g., for historical average emission limits).

3. **Compliance units for voluntary carbon emission reductions or removals:**

A compliance unit that recognizes voluntary emission reductions or removals undertaken for greenhouse gas emissions not regulated by the EPS will be subject to a number of rules set out in protocols designed to ensure the legitimacy of the offset credit.

5.0 Compliance Obligation

To avoid the implementation of the federal OBPS while Ontario's constitutional reference regarding the GGPPA is pending, the government is aiming to have the program in place by Summer 2019 and to have it apply to emissions as of January 1, 2019. Facilities regulated under the Ontario EPS would be required to submit an annual compliance report in June, in respect of the GHG emissions for the previous year (emissions from Jan 1 to Dec 31). The report will include the GHG emissions, production data, annual emission limits (AEL), and compliance obligations for the facility for the previous year. Verification will also be required for the compliance report, potentially by September 1 in the initial year to allow time for facilities to implement the new requirements.

A regulated facility will have a compliance obligation due in December 2020 if the facility's total verified emissions exceed the AEL for the facility. In this case, the compliance obligation will be the difference between the regulated facility's total verified emissions and its AEL. If the total verified emissions is less than the AEL, compliance units could be provided for the amount of the difference.

Under the EPS, the AEL will be determined for each regulated facility. AEL is the tonnes of CO₂e a regulated facility can emit and still be in compliance and would be calculated based on one or more of the following methods discussed earlier in Section 3.1 along with the applicable stringency factor:

1. Sector average performance standard:

The AEL under this method would be the sum of all the applicable performance standard(s) times the applicable production unit(s) and the stringency factor.

2. Fossil fuel based electricity generation, thermal energy (e.g., steam) supply and cogeneration performance standard:

The AEL under these methods would be the performance standard of the energy output times the amount of energy output in the year and the stringency factor, if applicable.

3. Facility specific emission intensity:

The AEL under this method would be the facility specific emission intensity times the applicable production value and the stringency factor.

4. Energy use intensity (with optional adjustments for emissions intensities):

The AEL under this method would be the annual energy use (expressed in gigajoules) times the emission factor for natural gas and the stringency factor.

5. Historical absolute facility average emissions:

The AEL under this method is the facility specific average historical emissions times the stringency factor.

6.0 Competitiveness and Carbon Leakage Assessment

The stringency of the standards generally considers their effect on business competitiveness, with the goal of minimizing the risk of carbon leakage. The competitiveness of a sector can be defined as its ability to maintain profits and market share. Competitiveness pressures can arise if regulated entities in a jurisdiction face compliance with a stringent climate change policy that increases their production costs.

Carbon leakage occurs when production moves from a jurisdiction with stringent climate policies to a jurisdiction with no or lower cost climate policies. In this situation, the economy of the jurisdiction with stringent climate policies could suffer while overall emissions either stay the same or increase.

Conditions that lead to competitiveness pressures and carbon leakage include:

- Sector is emissions intensive and faces high compliance costs due to absence of low cost abatement opportunities, including low carbon fuels
- Inability or constrained ability to pass on the compliance costs (carbon cost) due to high trade exposure
- Competitors in other jurisdictions do not face the same level of climate change policy costs
 - Inconsistency between the stringency of policies can have both economic and environmental implications as companies compete across jurisdictions in national and international markets.

6.1 Assessment Metrics

Competitiveness and carbon leakage risk assessments usually require an understanding of exposure to carbon cost increases and the ability of entities in a sector to pass-through increased costs to customers.

Jurisdictions generally use two indicators of carbon leakage risk: emissions intensity and trade exposure (EITE). Sectors most vulnerable to competitiveness concerns and carbon leakage are both emissions-intensive and trade-exposed (EITE). The more emissions intensive a sector is, the greater compliance cost it would face. The greater a sector’s trade exposure, the lower is its ability to pass on costs.

Emissions Intensity:

Emissions intensity is the level of GHG emissions per unit of economic activity. Emission intensity can be calculated as the amount of GHG emissions (tonnes of CO₂e) produced per unit of gross value added or gross domestic product. This approach is used by Quebec and California.

Emissions intensity can also be calculated as the proportion of carbon cost (without any assistance or free allocations to sectors) relative to gross value added. Alberta, the Government of Canada and the European Union have adopted this approach.

Trade Exposure:

Trade exposure can be expressed as the sum of a sector’s imports and exports divided by the sum of its domestic production and imports. This measures how vulnerable a sector is to regional or international competition. If a sector produces goods for a highly exposed competitive market, it would not be able to pass on compliance costs to consumers without losing market share. These sectors are either exporters or importers competing with producers in jurisdictions with less stringent climate change policies.

6.2 Ontario’s Proposed Competitiveness and Carbon Leakage Assessment Methodology

The risk of carbon leakage can be determined based on the results of the emissions intensity (EI) and trade exposure (TE) assessments. The tables below provide proposed formulas and thresholds for emissions intensity and trade exposure. These would form the basis of a method to rank Ontario sectors according to risk of competitiveness and carbon leakage impacts.

EITE Indicators:

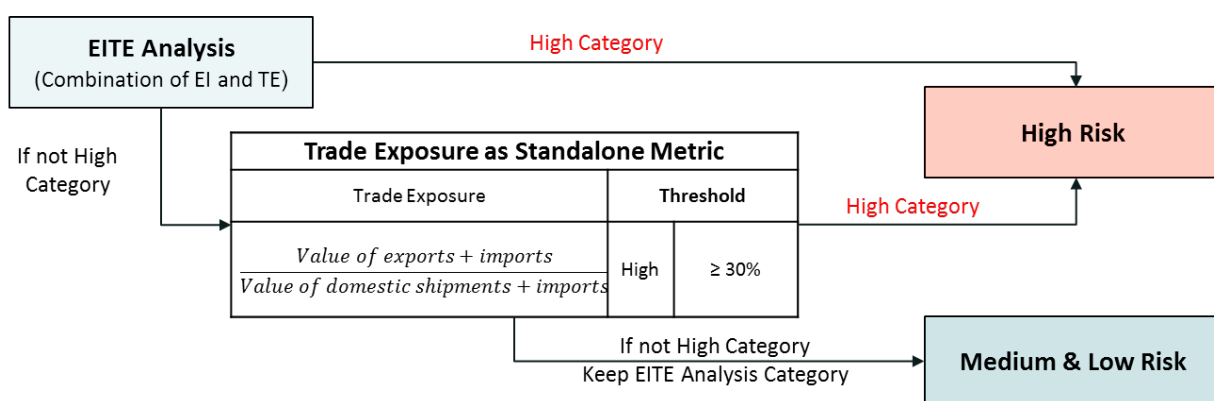
Emissions Intensity	Trade Exposure
$\frac{\textit{Emissions}}{\textit{Value added}}$	$\frac{\textit{Value of exports + imports}}{\textit{Value of domestic shipments + imports}}$

Thresholds:

Carbon Leakage Risk Category	Step 1 Emissions Intensity and Trade Exposure Combination		Step 2 Trade Exposure metric
	High	≥ 1000	≥ 10%
Medium	< 1000	≥ 10%	< 30%
Low	< 1000	<10%	<30%

The proposed approach uses a two-step process to determine if a sector is at risk of carbon leakage and to classify the risk as high, medium or low.

Ontario’s proposed approach is explained in the schema below:



Step 1 of the process uses a combination of emissions intensity and trade exposure (see thresholds in the table above) to determine the carbon leakage risk category. Step 2 of the process recognizes that for industry in Ontario, trade exposure is higher, broader and of greater importance. Step 2 employs trade exposure as a standalone metric (see thresholds in the table above) to determine carbon leakage risk for sectors that do not fall into the high category in step 1. The European Union also uses trade exposure as a standalone metric for determining carbon leakage risk attributable to its emissions trading system.

7.0 Next Steps

Ontario will continue to refine this proposal through consultation with stakeholders and will work with the federal government to accept our made-in-Ontario program while Ontario’s constitutional reference regarding the GGPPA is pending.

The government is intending to have the program in place by Summer 2019 to provide industry with regulatory certainty on their compliance obligations, well in advance of the requirement to submit compliance units or pay the fuel charge under the federal GGPPA in December 2020 while Ontario’s constitutional reference regarding the GGPPA is pending.

8.0 Questions for Discussion

- Q1.** How can the EPS be designed to optimize GHG emission reductions while minimizing carbon leakage?
- Q2.** What compliance options should industrial facilities have under the program (e.g. use of compliance units for payments for excess emissions that go into a fund that could be used to support greenhouse gas emissions projects in industry, voluntary emission reductions or removals or overachieving the EPS, other)?
- Q3.** If facilities receive compliance units for GHG emission reductions beyond the standard for the facility, should they be eligible to trade or bank them indefinitely?
- Q4.** Which industrial facilities should be covered by the program (e.g. industrial facilities with GHG emissions greater than 10,000 or 25,000 or 50,000 tonnes CO₂e per year)?
- Q5.** Should Ontario harmonize with the federal reporting under the federal Production Order (which sets out reporting and verification requirements) and the federal OBPS (output based pricing system) (e.g., methods, threshold, verification)?
- Q6.** Should different stringency factors apply to fixed process and non-fixed process emissions?

APPENDIX A

Table 1: Sector Average Emission Intensities

Item	Specified GHG activity or component of a specified GHG activity	Product produced or process parameter	Units	Sector Average Emission Intensity for fixed process emissions (BM _{p,i})	Sector Average Emission Intensity for Non-fixed process emissions (BM _{c,i})	Intensity units
1	Cement production - grey cement Production	Grey cement	Tonnes	0.505	0.311	Tonnes CO2e per tonne of grey cement produced
2	Iron and steel production	Liquid iron	Tonnes	1.034	0.324	Tonnes CO2e per tonne of liquid iron produced
3	Iron and steel production	BOF steel	Tonnes	0.149	-	Tonnes CO2e per tonne of BOF Steel produced
4	Iron and steel production	EAF steel	Tonnes	0.0844	-	Tonnes CO2e per tonne of EAF Steel produced
5	Iron and steel production	Coke	Tonnes	-	0.491	Tonnes CO2e per tonne of coke produced
6	Petroleum refining	CAN-CWB			0.0046	Emission allowances per Complexity-Weighted Barrel

Table 2: Performance Standards for Fossil Based Electricity, Thermal Energy Supply and Cogeneration

Item	Activity	Performance Standard	Units
1	Electricity production	420	Tonnes / GWh
2	Cogeneration	0.054897	Tonnes of CO2 / GJ of total energy output)
3	Thermal Energy	0.054897	Tonnes of CO2 / GJ of thermal energy output

APPENDIX B

Table 1: Proposed Methods for Other Covered Sectors

Method	Sector	Sector Description
Facility-Specific Emission Intensity	Chemical - Ammonia	Subsector of the chemical sector. Produces ammonia.
	Chemical - Carbon black	Subsector of the chemical sector. Produces carbon black.
	Chemical - Citric acid	Subsector of the chemical sector. Produces citric acid.
	Chemical - Hydrogen	Subsector of the chemical sector. Produces hydrogen. Separate from refining hydrogen producers.
	Chemical - MPMD	Subsector of the chemical sector. Produces 2-Methylpentamethylenediamine (MPMD), a compound used in the production of plastics, adhesives, and as an additive in many other products.
	Chemical - Nylon	Subsector of the chemical sector. Produces nylon.
	Chemical - Petrochemical	Subsector of the chemical sector. Produces (poly)ethylene, styrene, lubricants and other products from petroleum feedstocks.
	Chemical - Vaccine	Subsector of the chemical sector. Produces vaccines.
	Food - Sugar	Subsector of the food sector. Produces refined white sugar.
	Industrial, Food, and Fuel Ethanol	Produces ethanol for use in industrial, food, and fuel applications.
	Lime	Production of lime products.
	Metal - Tubes and Steel (From Scrap)	Production of tubes and steel products from scrap metal.
	Mineral - Glass	Produces glass containers such as jars.
	Mineral - Gypsum	Produces gypsum panels.
	Mineral - Mineral and Glass Wool	Produces insulation products made of mineral wool or glass fibers.
	Mineral - Salt	Produces salt products such as ice melters or culinary salt.
	Mineral Products - Brick	Produces bricks and masonry products.
	Natural Gas Liquids	Fractionation of natural gas to product liquid fuels.
	Pulp & Paper	Produces pulp and or paper products.
	White Cement	Produces white cement.

Method	Sector	Sector Description
Energy Use Intensity	Automotive and Vehicle	Automotive or vehicle parts and assembly.
	Chemical - Other	Subsectors of the chemical sector which are not already named.
	Food and Beverage - Other	Food and beverage product manufacturers which are not already named.
	Greenhouses	Production of food and crops within covered structures.
	Institutions	Various institutions such as schools, hospitals, government organizations.
	Metal - Other	Treating, processing, and manufacturing of various metals and metal products for aerospace, automotive, and other applications.
	Mining	Mineral and metal mining.
	Oil Seeds	Processing of oil seeds such as soybeans and canola for use in various food ingredients and animal feeds.
	Natural Gas Transmission Pipelines	Transmission of natural gas
Historical Facility Average Emission Limits	Non-Ferrous Metal Smelting, Refining (e.g. Nickel, Copper)	Smelting and refining of non-ferrous metals such as nickel and copper.
Specified Performance Standards	District Heating	Produces heat and steam for commercial, residential, institutional, industrial process or any other uses.
	Electricity	Generates electricity from fossil fuels.

APPENDIX C: Details of Proposed Methods for Covered Sectors

Annual Emissions Limit for Sectors with Sector Based Performance Standard

$$A_{OBS} = (\sum_{i=1}^n PS_i \times Product_i) - (steam\ import \times 0.054897)$$

Where:

A_{OBS} is the annual emission limit based on the sector based performance standards alone

$$PS_i = [(Direct\ Emission + Steam\ Import \times 0.054897) \div Product] \times SF$$

- **PS** is sector average performance standard (e.g., tonnes per unit of product) for product “i”
- **Direct Emission** (t CO₂e): based on average of several years (e.g., 2015-2017)
- **Steam Import** (GJ): only when needed
- **0.054897** (t CO₂e/GJ steam) – based on a 90% efficient steam boiler
- **Product**: average production for historical years (e.g., 2015-2017)
 - units of mass (e.g., tonnes, kg),
 - unit of volume (m³, litre, barrels),
 - unit of area (e.g., m² of boards),
 - counts of products (e.g., vehicles, engines),
 - other possible metrics.
- **SF**: stringency factor

Note the historical years that are used in determination of the performance standard will be the more recent years based on data availability

Annual Emission Limit Based on Energy use Intensity

$$A_{energy_j} = (EI_j + NBF \times 0.049317) \times (Intensity_{base}/Intensity_j)_{opt-in} \times SF$$

Where:

- A_{energy_j} is the energy related emissions for the regulated facility for the year “j”
- EI_j is the eligible energy input (GJ) not used for electricity generation or district heating at the facility in year “j” (GJ).
- **0.049317** is the emission factor for natural gas
- $Intensity_{base}$ is the average direct fossil fuel emissions intensity in the base year (t CO₂e/tonne product for 2015-2017)
- $Intensity_j$ is the direct fossil fuel emissions intensity in year “j”
- **opt-in** means optional application of this term for regulated facility that chooses to opt-in to transition to a historical facility intensity
- **SF** Stringency Factor for non-fixed process emissions
- **j** is the year for which the limit is being determined