Greenhouse Gas Inventory – Atlas Salt Inc.

Final Report

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Executive Summary

Stantec Consulting Ltd. (Stantec) was retained by Atlas Salt Inc. (Atlas Salt) to prepare a greenhouse gas (GHG) emissions inventory in relation to an environmental impact assessment (EIA) registration being prepared for a new underground salt mine, the Great Atlantic Salt Project (the Project), located near St. George's, Newfoundland. The purpose of the GHG inventory is to estimate the direct and indirect GHG emissions expected from the Project's construction and operation activities.

The methodology used for the Atlas Salt GHG emissions inventory follows the requirements and recommendations of the Newfoundland and Labrador (NL) Department of Environment and Climate Change in place for reporting under the NL Management of Greenhouse Gas Act and its regulations. The NL Management of Greenhouse Gas Regulations under the Management of Greenhouse Gas Act apply to industrial facilities that emit more than 25,000 tonnes CO2e per year from Scope 1 emissions (onsite direct emissions). Total Scope 1 emissions during construction are estimated to be 4,375 tonnes CO2e per year. Total Scope 1 emissions during operation are estimated to be 79 tonnes CO2e per year. Based on these estimates, the NL *Management of Greenhouse Gas Regulations* under the *Management of Greenhouse Gas Act* would not apply to the Project.

Scope 2 emissions and some Scope 3 emissions are also presented herein.

1.0 INTRODUCTION

Stantec Consulting Ltd. (Stantec) was retained by Atlas Salt Inc. (Atlas Salt) to prepare a greenhouse gas (GHG) emissions inventory in relation to an environmental impact assessment (EIA) registration being prepared for a new underground salt mine, the Great Atlantic Salt Project (the Project), located near St. George's, Newfoundland.

The Project is located within a block of claims totalling 7,100 hectares (ha) and comprises the development of an underground salt mine with decline access and an initial production capacity of 2.5 million tonnes (t) of rock salt per year. Key facilities will be sized for an expansion to 4.0 million t per year (Mtpa). The product will be crushed salt with a minimum grade of 95% sodium chloride for the road de-icing market. All mining, crushing, and sizing facilities will be located within the underground mine. The product will be transported by conveyor 2.5 kilometres (km) to a dedicated storage and port facility and loaded onto ships for destination markets on the east coast of the United States, Québec, and the maritime provinces.

The purpose of the GHG emissions inventory is to estimate the direct and indirect GHG emissions expected from the Project's construction and operation activities. The emissions estimates are compared to the NL Management of Greenhouse Gas Regulations threshold to confirm whether the Regulations are applicable to the Project.

This report provides:

- Details on the estimation methodologies
- Details of sources of information used in the estimates
- A summary of assumptions and limitations
- A summary of the results of the GHG emissions estimates.

2.0 METHODOLOGY & SCOPE

2.1 OVERVIEW

The methodology used for the Atlas Salt GHG emissions inventory follows the requirements and recommendations of the Newfoundland and Labrador (NL) Department of Environment and Climate Change in place for reporting under the NL Management of Greenhouse Gas Act and its regulations.

2.2 GHG EMISSION CATEGORIES

The GHG emissions inventory includes both direct and indirect sources of GHG emissions during construction and operation of the Project. The direct emissions (also referred to as Scope 1 emissions) include GHGs from direct sources onsite, such as diesel fuel combustion. The indirect emissions (also referred to as Scope 2 emissions) include GHGs from energy use onsite that is generated by a third party offsite, such as purchased electricity.

The Project is also required as part of the EIA registration to quantify GHG emissions by source for activities outside the Project boundary, such as on-road, air, and marine transportation, solid waste disposal, and transportation of substantive purchased services from providers outside the Project boundary (e.g., use of marine vessels from a marine port facility). These are considered other indirect emissions (also referred to as Scope 3) and would not be considered towards the NL or Environment Canada and Climate Change (ECCC) reporting requirements; however, these emissions estimates were requested as part of the EIA registration requirements.

Table 1 lists of the sources of GHG emissions expected from the construction and operation of the Project, by reporting scope.

Table 1 Scopes of GHG Emissions

Scopes	Sources	Construction	Operation
Scope 1	Direct GHG Emissions	• Stationary combustion (heating underground with propane heaters) • Mobile equipment combustion (on-road and off-road mining equipment for site preparation) • Transportation of aggregate to site	• Mobile equipment combustion (diesel on-road and off-road mining equipment)
Scope 2	Indirect GHG Emissions	• Electricity use from the NL electrical grid	• Electricity use from the NL electrical grid
Scope 3	Other Indirect GHG Emissions	• Substantive transportation sources (shipping major equipment to site from Europe during construction; however, insufficient information to estimate at this time)	• Substantive transportation sources (shipping product to market)

2.2.1 Construction Sources

For construction, GHG sources include diesel equipment used for development of aboveground and underground infrastructure. The underground portion of the Project would be heated by temporary propane heaters. Aggregate is assumed to be sourced locally and trucked to site using diesel fueled trucks.

Atlas Salt will prioritize using local accommodations for the labour force; however, a temporary camp may be required. Some propane and electricity would be consumed at the temporary camp, if constructed. These GHG emissions have been estimated separately since labour force accommodations have not yet been confirmed (see Section A.3 in the Appendix).

Scope 2 emissions during construction would occur from electricity used by the Project. The majority of the underground infrastructure development would be done using battery electric equipment. Scope 2 emissions during construction are estimated based on estimates for initial electricity use as the electric equipment is phased in for underground development.

Emissions from Scope 1 and Scope 2 sources were estimated where feasible based on preliminary details provided by Atlas Salt. Publicly available emission factors and good practice guidelines were used to develop the GHG emissions inventory.

The shipping of supplies and major equipment during construction would result in some Scope 3 GHG emissions; however, sufficient information is not currently available to estimate these emissions. It is expected that these emissions would be less than Scope 3 shipping emissions estimated for annual GHG emissions from product shipping during operation.

2.2.2 Operation Sources

For operation, GHG emissions from the mine are primarily Scope 2 for mine equipment (i.e., electricity use) as most of the mining equipment will be battery electric. Regarding Scope 1 emissions during operation, only two pieces of mining equipment will be diesel fueled, a high back scaler and a skid steer loader. GHG emissions from these diesel equipment and Scope 2 GHG emissions have been estimated. Note that the estimates presented for Scope 2 emissions are using current emissions intensity for electricity generation in Newfoundland which is relatively low compared to many Canadian jurisdictions and is expected to decrease further over time.

Scope 3 indirect GHG emissions during operation would result mainly from shipping product. Atlas Salt expects to ship product to Québec and the eastern United States, as well as some local Newfoundland use. Based on the provided breakdown of product sale locations, Stantec estimated Scope 3 emissions for the marine shipments. Scope 3 emissions for local product delivery in NL were not estimated as they are not expected to be substantive in comparison to marine shipments and would be similar to emissions from trucking salt around the province currently. Product shipping is expected to be the largest source of Scope 3 emissions during operation; reagent shipping was also included and is a much smaller annual tonnage. Other requirements such as periodic equipment replacement and maintenance are expected to be much less than the emissions from product shipping. Scope 3 emissions from product shipping are, therefore, included in the inventory; other Scope 3 emissions during operation are omitted from the inventory.

2.3 GHG ESTIMATION METHODS

To simplify the GHG reporting process, emissions from each of the specific GHGs are multiplied by their global warming potential (GWP), which represents the equivalent amount of CO_2 that would have to be released to have approximately the same warming effect on the atmosphere. For example, a release of one tonne of CO_2 is equivalent to one tonne of CO_2 equivalent (CO_2e). The release of one tonne of CH_4 is approximately equivalent to 28 tonnes of CO_2e.

The latest available 100-year GWPs from the Intergovernmental Panel on Climate Change (AR5 Synthesis Report) were used in the GHG inventory calculations (IPCC 2014).

A summary of the relevant GHGs and their respective GWPs are presented in Table 2.

Table 2 Summary of Global Warming Potentials

Greenhouse Gas	Global Warming Potential (100-year)
Carbon Dioxide - CO_2	1
Methane - CH_4	28
Nitrous Oxide - N_2O	265
Source: IPCC (2014)	

2.4 EMISSION FACTORS

The GHG emissions are calculated using emissions factors, which specify the amount of CO_2e produced per unit of energy (i.e., fuel or electricity) consumed. The emissions factor is then multiplied by the total fuel consumed or total electricity consumed and the GWP to determine the total amount of CO_2e produced. For example:

*CO_2 (kg) = Fuel Consumed (L) * coefficient for fuel type (kg of CO_2/L) * GWP*

*CH_4 (kg) = Fuel Consumed (L) * coefficient for fuel type (kg of CH_4/L) * GWP*

*N_2O (kg) = Fuel Consumed (L) * coefficient for fuel type (kg of N_2O/L) * GWP*

*CO_2e (kg) = Electrical Energy Consumed (kWh) * coefficient for NL grid power (kg of CO_2e/kWh)*

The emission factors typically depend on the equipment consuming the fuel and which fuel is being consumed. Since electricity can be produced via different methods, emission intensity will vary by region. The emission intensities and emission factors used in this report are provided in Appendix A and were obtained from multiple sources:

- United States Environmental Protection Agency (US EPA) Motor Vehicle Emission Simulator (MOVES) model (US EPA 2014)
- Fuel combustion emission factors and electricity emission intensity were obtained from the 2023 National Inventory Report (ECCC 2023)
- International Maritime Organization (IMO) Fourth IMP Greenhouse Gas Study (IMO 2020)

2.5 DATA COLLECTION

Data for the GHG inventory was retrieved directly from Atlas Salt in the form of spreadsheets, reports, and email correspondence. The assumptions, raw data, and references are detailed in Appendix A.

3.0 RESULTS

Table 3 provides a summary of GHG emissions estimates for construction and operation. Calculation details are provided in Appendix A.

Table 3 Summary of Annual GHG Emissions – Atlas Salt

Phase	Activity	GHG Emissions (t CO_2e)			
		Scope 1 (Direct)	Scope 2 (Indirect)	Scope 3 (Other Indirect)	Total Scope 1 + Scope 2
Construction (Annual)	Site Preparation	282	-	-	**282**
Construction (Annual)	Underground Propane*	4,030	-	-	**4,030**
Construction (Annual)	Transportation of Aggregate to Project Site	63	-	-	**63**
Construction (Annual)	Electricity	-	1,791	-	1,791
Total Construction (Annual)		**4,375**	**1,791**	-	**6,166**
Operation (Annual)	Electricity	-	2,293	-	**2,293**
Operation (Annual)	Equipment - Diesel Fuel	79	-	-	**79**
Operation (Annual)	Marine Transportation of Reagent	-	-	8	**-**
Operation (Annual)	Marine Transportation of Product	-	-	113,572	**-**
Total Operation (Annual)		**79**	**2,293**	**113,580**	**2,373**
* Propane will be used for the fan heaters only during the first year of construction, over a period of approximately 192 days					

Total Scope 1 emissions during construction are estimated to be 4,375 tonnes CO_2e per year. Construction is planned to be completed over 4 years. This estimate of annual emissions is considered conservative as propane use in the underground development is only planned for year 1 of construction. Total Scope 2 emissions during construction are estimated to be 1,791 tonnes CO_2e per year. Total Scope 3 emissions from construction were not estimated; however, based on the requirements for shipping during construction, it is expected that Scope 3 emissions during construction would be less than those estimated annually for operation.

Total Scope 1 emissions during operation are estimated to be 79 tonnes CO_2e per year. Total Scope 2 emissions during operation are estimated to be 2,293 CO_2e per year.

Total Scope 3 emissions from operation were estimated to be 113,580 tonnes CO_2e per year. Scope 3 emissions are indirect third-party emissions that would be ‘owned’ by other entities.

With Newfoundland and Labrador's exceptionally low GHG intensity electricity of just 17 g CO_2e/kWh, compared to the Canadian average of 110 g CO_2e/kWh combined with integrating state-of-the-art battery electric technologies to drastically reduce diesel consumption compared to traditional mining methods, we estimate that their operations will remain well below the GHG emission thresholds set by both provincial and federal guidelines, aligning with the best in the industry.

The NL *Management of Greenhouse Gas Regulations* under the *Management of Greenhouse Gas Act* apply to industrial facilities that emit more than 25,000 tonnes CO_2e per year from Scope 1 emissions (onsite direct emissions). Based on the estimates, this regulation would not apply to the Project.

4.0 CLOSURE

This report has been prepared for the sole benefit of Atlas Salt (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

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US EPA (United States Environmental Protection Agency). 2014. Motor Vehicle Emission Simulator (MOVES). Available at: https://www.epa.gov/moves/moves-onroad-technical-reports#moves2014

APPENDIX A

GHG Emissions Calculations – Details and Supporting Data

This appendix includes details on the information used to estimate the GHG emissions associated from the construction and operation of the proposed Project, including activity data, assumptions, and emission factors.

A.1 CONSTRUCTION

Site Preparation

The assumptions that were used in calculating GHG emissions from aboveground site preparation are detailed below.

- These calculations are a high-level GHG emissions estimate, assuming typical construction equipment.
- The activity data were not provided by the Proponent because it was unavailable. Stantec's internal site preparation calculator was used to determine the equipment types, number of units, horsepower, and operating hours for the grubbing and topsoil/overburden removal parts of site preparation during construction, which is based on type of terrain (assumed to be relatively flat), hectares grubbed/graded (assumed to be 45 hectares, based on the estimated size of the Project site terrace, roads, port facility), and distance below surface level to average grade (assumed 2 metres).
- Emissions from N2O are expected to be a magnitude of order less than emissions from CO2 and CH4 and are, therefore, estimated to be approximately zero during construction.

The total Scope 1 emissions during site preparation are estimated to be 278 t CO_2e from the operation of diesel construction equipment (Table A-1), and 4.5 t CO_2e (Table A-2) from the operation of gasoline 4X4 pickup trucks, for a total of 282 t CO_2e per year of construction.

Table A-1 Estimated GHG Emissions from Aboveground Site Preparation, Diesel Construction Equipment

Construction Equipment - Diesel					Emission Factors (US EPA 2014)		Emissions		
					CO_2	CH_4	CO_2	CH_4	CO_2e
Activity/ Equipment	**Number of Units**	**Operating Hours Total (h)**	**Horsepower (hp)**	**Fuel Consumption (L/h)**	**grams/ hour (g/h)**	**g/h**	**t**	**t**	**t**
Grubbing:									
D8T crawler tractor	2	1,227	310	48.9	26,258	1.05	32.23	0.001	32
345/349 excavator	2	1,227	345	47.5	73,833	1.84	90.61	0.002	91
740 Articulated Truck	4	2,455	474	39.85	132,889	3.27	326.18	0.01	326
General Site Crew:									
D6T crawler tractor	1	614	200	29.25	15,842	0.73	9.72	0.0004	10
Cat 428E backhoe/loader	1	614	100	7.15	12,704	0.56	7.80	0.0003	8
740 Articulated Truck	2	1,227	474	39.85	132,889	3.27	163.09	0.004	163
311D excavator	1	614	79	8	21,544	0.51	13.22	0.0003	13
Fuel truck	2	1,227	600	19	132,889	3.27	163.09	0.004	163
Light Plants	18	11,045	6	5	2,770	0.26	30.60	0.003	31
Water Management Crew:									
Cat 428E backhoe/loader	1	614	100	7.15	12,704	0.56	7.80	0.0003	8
311D excavator	1	614	79	8	32,219	0.74	19.77	0.0005	20
Tandem Dump Truck	1	614	600	19	132,889	3.27	81.55	0.002	82
Road Maintenance Crew:									
Cat 16M Grader	1	614	297	28.5	73,167	1.85	44.90	0.001	45
Cat 140M Grader	1	614	183	17	44,557	1.18	27.34	0.001	27
Cat 950K Loader	1	614	210	21.75	15,842	0.73	9.72	0.0004	10
Water Truck	1	614	600	19	132,889	3.27	81.55	0.002	82
Total Construction Period (4 Years)									**1,110**
One Year of Construction									**278**

Table A-2 Estimated GHG Emissions from Aboveground Site Preparation, Pickup Trucks

Trucks - Gasoline Fuel						Emission Factors (ECCC 2023)		Emissions		
						CO_2	CH_4	CO_2	CH_4	CO_2e
Activity/Equipment	**Number of Units**	**Operating Hours Total (h)**	**Assumed Operating Speed (km/h)**	**Fuel Economy (L/ 100 km)**	**Total Fuel (L)**	**g CO_2/L**	**g CH_4/L**	**t**	**t**	**t**
4x4 Pickup Trucks, Total Construction Period (4 Years)	1	2,455	20	15.9	7,805	2,307	0.111	18.01	0.001	**18**
									One Year of Construction	**4.5**
Note: Fuel economy (L/100 km) for 4X4 trucks was estimated using the Natural Resources Canada (NRCan) Fuel Consumption Ratings Tool[1]										

[1] NRCan Fuel Consumption Ratings Tool is available at: https://fcr-ccc.nrcan-rncan.gc.ca/en

Propane

During the construction period, the underground portion of the Project would be heated by temporary propane heaters. The total Scope 1 emissions associated with these activities are estimated to be 4,030 t CO_2e per year Table A-3).

Table A-3 Estimated GHG Emissions from Propane Consumption During Construction

Fuel Type	Fuel Volume (L)	Emission Factor (ECCC 2023)	t CO_2e	
		t CO_2e/L	Emissions Total Construction Period (4 Years)	Emissions One Year of Construction
Propane for fan heaters in underground (14 MMBTU)	2,659,780	0.001515	4,030	4,030
		Total	**4,030**	**4,030**
Note: Propane consumption for underground fan heaters is estimated to be 14 MMBTU only during the first year of construction, over a period of approximately 192 days (24 hours per day).				

Transportation of Aggregate

The assumptions that were used in calculating GHG emissions from the transportation of aggregate to the Project site are detailed below.

- Assumed the density of the aggregate is 2,000 kg/m^3 [2]
- Assumed the aggregate is transported 30 km by a typical large dump truck (which can carry 28,000 lbs, or 12.7 tonnes)[3]
- The fuel economy of the dump truck is assumed to be 39.2 L/100 km (6 miles per gallon)[4]

The total Scope 1 emissions associated with the transportation of aggregate are estimated to be 63 t CO_2e per year (Table A-4).

[2] https://www.sciencedirect.com/topics/engineering/dry-density
[3] https://www.badgertruck.com/heavy-truck-information/dump-truck-carrying-capacity/#:~:text=On%20average%2C%20large%20dump%20trucks,or%206.5%20to%207.5%20tons
[4] https://www.badgertruck.com/heavy-truck-information/how-much-does-a-dump-truck-cost/#:~:text=Most%20dump%20trucks%20get%20around,average%20weekly%20mileage%20of%202%2C500

Table A-4 Estimated GHG Emissions from the Transportation of Aggregate During Construction

Aggregate									Emission Factor (ECCC 2023)	CO_2e	
Volume (m^3)	Density (kg/m^3)	Mass (kg)	Mass (tonnes)	Distance Travelled (km) (Round Trip)	Fuel Economy (L/ 100 km)	Total Number of Trips	Total Distance Travelled (km)	Fuel Consumption (L)	t CO_2e/L	Emissions Total Construction Period (4 Years)	Emissions One Year of Construction
25,000	2,000	50,000,000	50,000	60	39.2	3,937	236,220	92,598	0.00272	**252**	**63**

Electricity

Scope 2 emissions during construction would occur from electricity used by battery electric equipment, which is estimated to be 12,027kW per year. The total Scope 2 emissions associated with the consumption of electricity are estimated to be 1,791 t CO_2e per year (Table A-5).

Table A-5 Estimated GHG Emissions from Electricity Consumption – Construction

Phase	Consumption (kW) Per Year	Consumption (MWh)	Emission Factor (t CO_2e/MWh) (ECCC 2023)	Annual GHG Emissions (t CO_2e)
Construction	12,027	105,357	0.017	**1,791**

A.2 OPERATION

Diesel Fuel

During operation, only two pieces of mining equipment will be diesel fuelled. The total Scope 1 emissions associated with the operation of this equipment are estimated to be 79 t CO_2e per year (Table A-6.

Table A-6 Equipment - Diesel Fuel

				Emission Factor (ECCC 2023)	Emissions
Equipment	**Fuel Economy (L/h)**	**Usage (hours per year)**	**Total Volume of Diesel (L)**	**t CO_2e/L**	**t CO_2e (Annual)**
High Back Scaler	75.54	300	22,662	0.0027	**61**
Skid Steer Loader	9.9	700	6,930	0.0027	**19**
Total GHG Emissions					**79**

Electricity

Scope 2 emissions during operation would occur from electricity used by the Project, which is estimated to be 15,400 kW per year (and a total of 134,904 MWh, assuming 8,760 hours per year of use). The total Scope 2 emissions associated with the consumption of electricity are estimated to be 2,293 t CO_2e per year (Table A-7).

Table A-7 Estimated GHG Emissions from Electricity Consumption – Operation

Phase	Consumption (kW) Per Year	Consumption (MWh)	Emission Factor (t CO_2e/MWh) (ECCC 2023)	Annual GHG Emissions (t CO_2e)
Operation	15,400	134,904	0.017	**2,293**

Marine Transportation

The shipping distances from the port facility to the expected destinations for the product were estimated to be 650 nautical miles (nm) to Québec and 900 nm to the eastern United States[5].

The assumptions that were used in calculating GHG emissions from marine shipping are detailed below.

- Assumed an empty ship (no cargo from the Project) is half the weight of a full ship
- The emission factors used only account for carbon dioxide emissions; methane and nitrous oxide emissions would be small in comparison (estimated to be approximately 5% of the total CO2 emissions)
- One reagent, yellow prussiate of soda (YPS), will be used for operation. The Facility's consumption of YPS is expected to be 188 tonnes per year (i.e., 0.007% of total product that will be shipped out). The emissions associated with the shipping of YPS have been excluded from the calculations because they are small in comparison to the weight of product being shipped.

The Scope 3 indirect GHG emissions associated with shipping product on marine vessels are presented in Table A-8

[5] www.shiptraffic.net

Table A-8 Estimated GHG Emissions from Marine Vessel Shipping – Operation

								GHG Emissions ($t CO_2$/year)		
Activity	**Vessel**	**Port**	**Shipping Distance (nm) (One Way)**	**Tonnage Deadweight (dwt) (tonnes)**	**Tonnage Empty (tonnes)**	**Emission Factor (gCO_2/dwt. nm)[6]**	**# Trips assuming 20,000 tonnes per trip**	**Full Load (Delivery)**	**Empty Load (Return)**	**Total Round Trip**
Ship Product - Operation (US East Coast)	40,000 dwt vessel	US East Coast	900	40,000	20,000	22.8	66.67	54,720	27,360	**82,080**
Ship Product - Operation (Québec)	40,000 dwt vessel	Québec	650	40,000	20,000	22.8	35.42	20,995	10,497	**31,492**
									Total	**113,572**

[6] International Maritime Organization, Fourth IMO Greenhouse Gas Study, 2020, Table 61

A.3 POTENTIAL CONSTRUCTION CAMP

Some propane and electricity would be consumed at a temporary camp, if constructed for the Project. These GHG emissions have been estimated separately since labour force accommodations have not yet been confirmed.

Propane

The total Scope 1 emissions that could be associated with propane consumption at a temporary camp are estimated to be 363 t CO_2e per year (Table A-9).

Table A-9 Estimated GHG Emissions from Propane Consumption During Construction – Potential Construction Camp

Fuel Type	Fuel Volume (L)	Emission Factor (ECCC 2023)	t CO_2e	
		t CO_2e/L	Emissions Total Construction Period (4 Years)	Emissions One Year of Construction
Propane at Camp	958,300	0.001515	1,452	**363**
Note: Propane at the camp assumed for approximately 45 months (1,369 days), at 700 L per day.				

Electricity

The total Scope 2 emissions that could be associated with the consumption of electricity at a temporary camp are estimated to be 56 t CO_2e per year (Table A-10).

Table A-10 Estimated GHG Emissions from Electricity Consumption – Construction

Phase	Consumption (kW) Per Year	Consumption (MWh)	Emission Factor (t CO_2e/MWh) (ECCC 2023)	Annual GHG Emissions (t CO_2e)
Construction	378	3,311	0.017	**56**