

CleanBC Industrial Incentive Program

Oil and Gas Sector Guidance

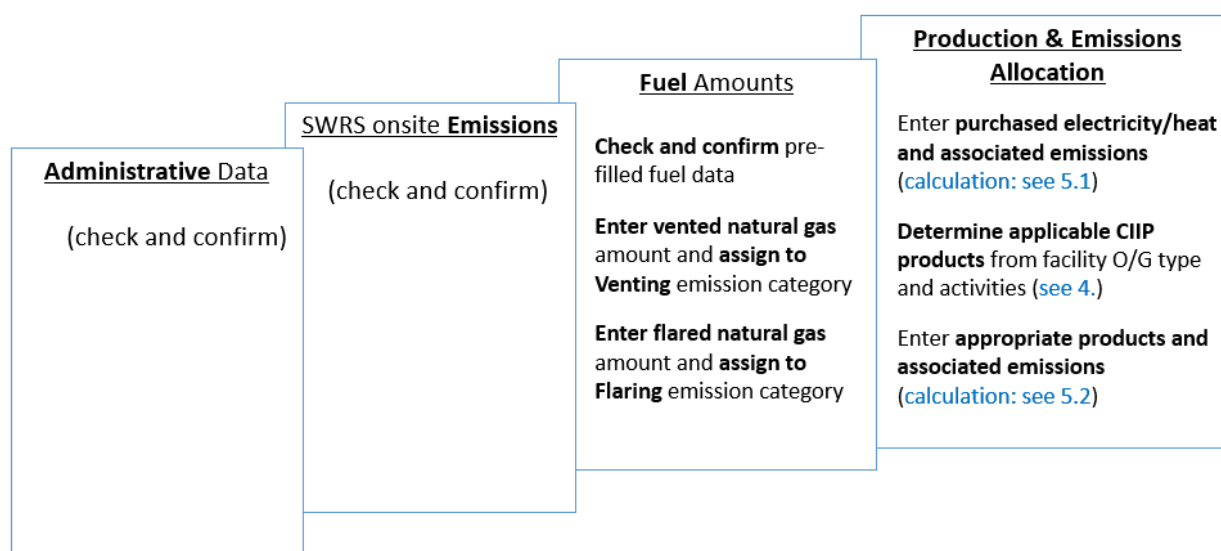
1. Applicable NAICS codes:

- **NAICS – 211110: Oil and Gas Extraction (except oil sands)**
- **NAICS – 486210: Pipeline Transportation of Natural Gas**

Sub-Sector	CIIP Product
Natural Gas Processing Plants	Processing sour gas – oil-equivalent
Natural Gas Compressor Stations	Processing sweet gas – oil-equivalent
	Compression, centrifugal – energy consumed
Upstream Oil/Gas – other than above	Compression, reciprocating – energy consumed
	Upstream oil/gas: Other

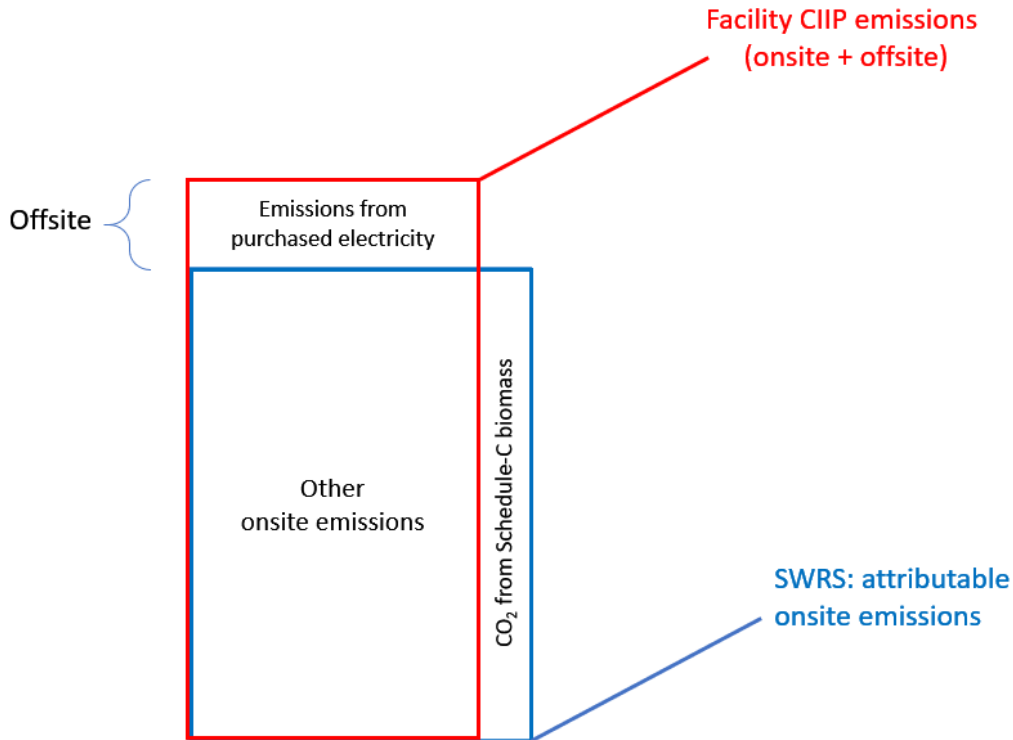
2. Quick Summary – Main Steps in CIIP application

- 2.1 Complete and submit a facility emission report in the Single Window Reporting System (SWRS)
- 2.2 Complete and submit a CIIP application (it is pre-filled with SWRS data where applicable)



(calculation) steps are detailed in section 5. Calculation Methodologies below.

3. Facility Emissions for CIIP purposes



For the Facility emission total for CIIP purposes:

- Facility onsite emissions CO₂ from Schedule C biomass are excluded, and
- Facility offsite emissions from purchased electricity are included.

CIIP Facility Emissions	= SWRS attributable Emissions - CO ₂ from Schedule C biomass + Emissions from Purchased Electricity
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Or, equivalently,

$$E_{Facility}^{CIIP} = E_{Attr.}^{SWRS} - E_{CO2bioC}^{SWRS} + E_{Purchased}^{Electr.}$$

Facility onsite emissions are pre-filled in the CIIP application with data submitted through the SWRS system.

Facility offsite emissions associated with purchased electricity must be calculated from electricity amount purchased. Both amounts and emissions are entered in the *Production and Emissions Allocation* section of the CIIP application.

4. Completing a CIIP Application

The CIIP application has four sections. Where possible, the *Administrative*, *SWRS Onsite Emissions* and *Fuels* sections are pre-populated with data reported through the SWRS system. Applicants must review, confirm, and, if applicable, update this information and also enter production and emissions allocation information in the *Production and Emissions Allocation* section.

Administrative Data

Most information in the administrative section will be pre-populated from SWRS.

- Review pre-populated data for accuracy
- Enter the BC Corporate Registry number as it appears on orgbook.gov.bc.ca

NOTE: The BC Corporate Registry number and the operator's legal name on the CIIP application must match the entry on OrgBook. The incentive payment will be issued to the legal business name as it appears on the CIIP application.

- Please ensure all mailing addresses follow the [Canada Post address format](#)
- Enter at least one application contact. The Primary Application Contact field will be pre-populated based on the user who starts an application; please confirm or edit as applicable. This will be the primary contact CAS will use for all application-related correspondence: questions, application status changes, review results, etc. A Secondary Application Contact can be added, if applicable
- Choose the primary NAICS code that the facility operates under from the available list. The NAICS codes in the pre-populated list reflect the sectors eligible to apply for CIIP. You will not be able to enter a NAICS code that is not on the list. The production information required to be entered in the *Production and Emissions Allocation* section will depend on the NAICS code selection

If you believe your facility's sector is eligible but your NAICS code is not on the list, please contact the CIIP team at GHGRegulator@gov.bc.ca.

SWRS Onsite Emissions

This section is pre-filled with data from the facility's SWRS report. Please review and confirm. If the information needs updating, this likely means that the SWRS report has to be updated first.

Fuels

This section is pre-filled with data from the facility's SWRS report related to onsite combustion. Please review and confirm. If the pre-filled information needs updating, this likely means that the SWRS report has to be updated first.

Entering Vented Natural Gas amount

- From the 'Fuel name' dropdown menu, select 'Natural gas'.
 - Note that this is a required entry separate from the pre-filled 'Natural gas' fuel associated with General Stationary Combustion, despite the same fuel name
- Enter the amount of vented natural gas (in m³) and, from the emission category dropdown menu, select 'Venting'.

The fuel usage reported for vented natural gas must be consistent with the total volume of natural gas corresponding to the following SWRS venting emission sources only:

- NG Distribution: NG continuous high bleed devices venting
- NG Distribution: NG continuous low bleed devices venting
- NG Distribution: NG intermittent devices venting
- NG Distribution: NG pneumatic pumps venting
- Onshore NG Transmission Compression/Pipelines: NG continuous high bleed devices venting
- Onshore NG Transmission Compression/Pipelines: NG continuous low bleed devices venting
- Onshore NG Transmission Compression/Pipelines: NG intermittent devices venting
- Onshore NG Transmission Compression/Pipelines: NG pneumatic pumps venting
- Onshore Petroleum and NG Production: NG continuous high bleed devices venting
- Onshore Petroleum and NG Production: NG continuous low bleed devices venting
- Onshore Petroleum and NG Production: NG intermittent devices venting
- Onshore Petroleum and NG Production: NG pneumatic pump venting

Entering Flared Natural Gas amount

- From the 'Fuel name' dropdown menu, select 'Natural gas'.
 - Note that this is a required entry separate from the pre-filled 'Natural gas' fuel associated with General Stationary Combustion, despite the same fuel name
- Enter the amount of flared natural gas (in m³) and, from the emission category dropdown menu, select 'Flaring'.

The fuel usage reported for flared natural gas must be consistent with the volume of natural gas as used in WCI 353 (d) and WCI 363 (d) for calculating the associated flaring emissions.

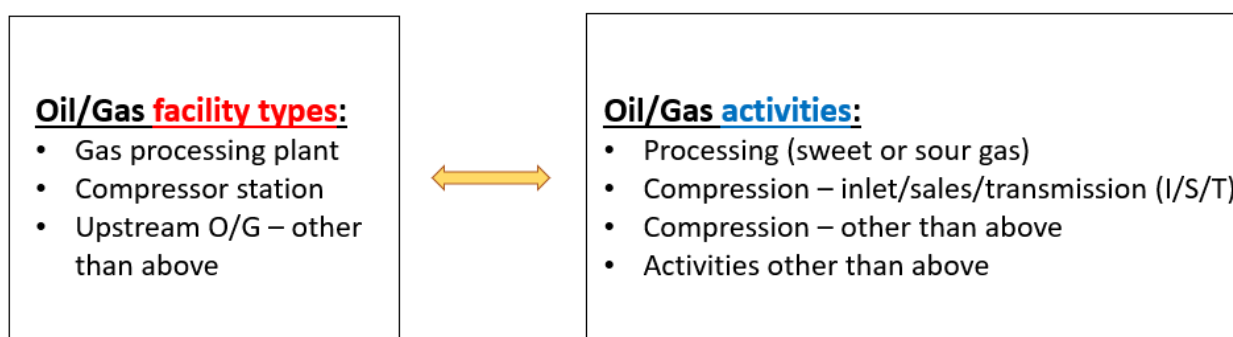
Production & Emissions Allocation

NOTE: The ministry provides a calculator spreadsheet with the appropriate calculation formulas built in, to assist in calculations at this step of the CIIP application process (available [at this link](#)).

To enter data as required in this section, first select 'Purchased Electricity' then the products as applicable based on the O/G facility type and its activities (see below), from the 'Product or Service' dropdown menu.

- Enter purchased electricity (in GWh)
 - enter 0 if not applicable
- Calculate and enter the emissions associated with purchased electricity, using the calculator (see section 5.1 below for details)

For CIIP purposes, there are five distinct combinations of oil/gas facility types and activities:



CASE 1: Gas processing plant, no I/S/T compression (could have other compression)

- Only one (1) product applicable depending on gas processed:
 - If sour gas: Processing sour gas – oil-equivalent
 - If sweet gas: Processing sweet gas – oil-equivalent
- Select the one processing product, as applicable
- Use calculator to calculate oil-equivalent production (m³OE) (see section 5.2 below for details)
- Allocate all CIIP emissions (including for non-I/S/T compression) to that one product

CASE 2: Gas processing plant with I/S/T compression (and could have other compression)

- 1 processing and 1 or 2 compression products applicable
- Select the one processing product:
 - If sour gas: Processing sour gas – oil-equivalent
 - If sweet gas: Processing sweet gas – oil-equivalent
- Then select the I/S/T compression product(s), as applicable
- Use calculator to calculate oil-equivalent production (m³OE), total energy generated, and energy consumed (MWh) for centrifugal/reciprocating compression (see section 5.2 below for details)
- Use calculator to allocate total CIIP facility emissions between the products (see section 5.2 below for details)

CASE 3: Compressor station, or other facility with > 2/3 Emissions from I/S/T compression

- 1 or 2 compression products applicable:
 - Compression, centrifugal – energy consumed
 - Compression, reciprocating – energy consumed
- Use calculator to calculate total energy generated, and energy consumed (MWh) for centrifugal/reciprocating compression see section 5.2 below for details)
- If two products, use calculator to allocate total CIIP facility emission between the products; otherwise allocate all CIIP emissions to the one product (see section 5.2 below for details)

CASE 4: Upstream-other facility, no I/S/T compression

- Only one (1) product applicable: Upstream oil/gas: Other
- Use calculator to determine total CIIP facility emissions and skip the rest of the calculator (no throughput or other activity information is required for this product)
- Allocate all CIIP emissions to that one product

CASE 5: Upstream-other facility with ≤ 2/3 Emissions from I/S/T compression

- 1 upstream-other and 1 or 2 compression products applicable
- Use calculator to calculate total energy generated, and energy consumed (MWh) for centrifugal/reciprocating compression (see section 5.2 below for details)
- Use calculator to allocate total CIIP facility emissions between the products (see section 5.2 below for details)

NOTE: In CASE 1 and CASE 2 (gas processing plant), CIIP applicants must determine if the processed gas is sweet or sour based on information of the mole percentage composition of the input gas. At minimum, the following components must be included: CH₄, C₂, C₃₊, H₂S, CO₂ and H₂O. Based on the annual average composition, then, the following definitions apply:

- Sour gas: If hydrogen sulfide (H₂S) mole percentage is greater than or equal to two percent
- Sweet gas: If hydrogen sulfide (H₂S) mole percentage is less than two percent

Allocating CIIP emissions to facility production

- Total CIIP facility emissions (determined as in section 3. above) are allocated to the applicable products as determined using the calculator:

$$E_{Facility}^{CIIP} = E_{processing} + E_{centrComp} + E_{reciprComp} + E_{upstream\ oil/gas_other}$$

Summary

Review your application for accuracy, review the terms and conditions, and submit the application.

The system will automatically perform some checks for consistency. If inconsistencies are found, the application will show a warning message, highlighting the issue requiring attention. To address any highlighted inconsistencies, you must go back to the relevant application section/tab and either correct the reported values or provide an explanation by entering a comment in the relevant section.

Additionally, the system may detect errors in your application, such as missing data. These errors must be corrected in order to submit an application. In certain exceptional cases when the issue cannot be addressed through the application system, you will have the ability to override the error message by providing an explanation and then submit the application.

Any unresolved warnings or errors may delay the processing of your application.

5. Calculation Methodologies

Unless explicitly stated otherwise in CIIP guidance, quantification and reporting of greenhouse gas emissions and related information under CIIP must comply with the *Greenhouse Gas Industrial Reporting and Control Act* (GGIRCA) and the Greenhouse Gas Emission Reporting Regulation (GGERR), including with the referenced in GGERR Western Climate Initiative (WCI) quantification methodologies.

The [WCI methodologies](#) typically applicable to upstream oil and gas facilities are:

- WCI.020 General Stationary Combustion
- WCI.040 Electricity Generation
- WCI.350 Natural Gas Transmission and Distribution
- WCI.360 Petroleum and Natural Gas Production and Natural Gas Processing

A CIIP applicant must first submit an emission report in SWRS (SWRS report) complying with GGIRCA and GGERR and using the WCI methodologies. A CIIP application is then pre-filled where possible with applicable information from the SWRS report.

5.1 Calculating emissions associated with purchased grid electricity

The ministry provides a calculator spreadsheet with the appropriate calculation formulas built in, to assist in calculations at this step of the CIIP application process (available [at this link](#)).

In the calculator on tab 'Power', in the section on Purchased Electricity, select the applicable electrical grid (Integrated or Fort Nelson) from the pulldown menu in cell E11. This will cause the appropriate electricity intensity factor in tCO₂e/GWh to be displayed in cell G11.

In the blue cell, enter the amount of purchased electricity (in GWh).

Emissions associated with purchased grid electricity are then automatically calculated and displayed in cell G13, in tonnes CO₂e. For example:

Purchased Electricity

INPUT each variable listed below:

Purchased Electricity

	Electrical Grid:		Amount	Units
Emissions Intensity Factor of Grid	Integrated Grid	EIF _{El.Grid}	40.10	tCO ₂ e/GWh
Amount of electricity purchased		Q _{EL_PURCHASED}	300.00	GWh
Emissions from Purchased Electricity		E _{EL_PURCHASED}	12,030.00	tCO ₂ e

Choose grid from dropdown menu

Enter the amount of emissions from purchased grid electricity in the CIIP application.

The calculator uses the following methodology to determine emissions associated with purchased grid electricity:

If

$EIF^{El.Grid}$ (selection) is the grid electricity emission factor for the selected grid and applicable year, in tCO₂e/GWh;

$Q^{Electr.}_{Purchased}$ (input) is the quantity of purchased grid electricity, in GWh;

$E^{Electr.}_{Purchased}$ are the emissions associated with purchased grid electricity, in tCO₂e.

Then

$$E_{Purchased}^{Electr.} = EIF^{El.Grid} * Q_{Purchased}^{Electr.}$$

where $EIF^{El.Grid}$ data comes from the published [electricity emission intensity factor for grid-connected entities](#) for the selected grid for applicable year.

5.2 Calculating production and allocating emissions

The ministry provides a calculator spreadsheet with the appropriate calculation formulas built in, to assist in calculations at this step of the CIIP application process (available [at this link](#)).

5.2.1 CASE 1: Gas processing plant, no I/S/T compression

In the calculator on tab ‘General’, in the section ‘Type of O/G Facility and SWRS Emission Data’, select CASE 1 from the from the pulldown menu in cell C12.

In the blue cells, enter onsite emissions form the SWRS report by emission category, in tCO2e.

Using this emissions information and the previously calculated emissions associated with purchased electricity (section 5.1 above), the calculator determines the total facility emissions for CIIP purposes in cell H17.

For example:

Type of O/G Facility and SWRS Emission Data																	
<p>SELECT Facility CASE as defined in the Guidance :</p> <p>Facility : CASE 1: Gas processing plant, no I/S/T compression</p> <p>CASE 1: Gas processing plant, no I/S/T compression (could have other compression) CASE 2: Gas processing plant with I/S/T compression (and could have other compression) CASE 3: Compressor station, or other facility with > 2/3 Emissions from I/S/T compression CASE 4: Upstream-other facility, no I/S/T compression CASE 5: Upstream-other facility with ≤ 2/3 Emissions from I/S/T compression</p>	<p>INPUT Emission Data from SWRS report by category:</p> <table border="1"> <thead> <tr> <th>Emission Category</th> <th>Tonnes (CO2e)</th> </tr> </thead> <tbody> <tr> <td>General stationary combustion</td> <td>200,000.00</td> </tr> <tr> <td>Flaring</td> <td>100,000.00</td> </tr> <tr> <td>Flaring</td> <td>50,000.00</td> </tr> <tr> <td>Fugitive</td> <td>125,000.00</td> </tr> <tr> <td>Waste and wastewater</td> <td>-</td> </tr> <tr> <td>Total On-Site</td> <td>475,000.00</td> </tr> <tr> <td>Total CIIP emissions including purchased electricity</td> <td>476,203.00</td> </tr> </tbody> </table>	Emission Category	Tonnes (CO2e)	General stationary combustion	200,000.00	Flaring	100,000.00	Flaring	50,000.00	Fugitive	125,000.00	Waste and wastewater	-	Total On-Site	475,000.00	Total CIIP emissions including purchased electricity	476,203.00
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General stationary combustion	200,000.00																
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Waste and wastewater	-																
Total On-Site	475,000.00																
Total CIIP emissions including purchased electricity	476,203.00																

Next, in the calculator on tab ‘General’, in the section Oil Equivalent Production (for Gas processing plants only)’, in the blue cells:

- Enter the annual weighted average high heating value (HHV), in GJ/e³m³, of the processed marketable natural gas
- Enter the quantity of the following products in the listed units:
 - Natural gas, in e³m³ (thousands cubic metres)
 - Liquid propane, in m³ (cubic metres)
 - Liquid ethane, in m³ (cubic metres)
 - Liquid butane, in m³ (cubic metres)
 - Pentanes+, in m³ (cubic metres)

Based on this information and the conversion factors, the calculator then determines the total gas-processing production for the facility, in units of m³OE (cubic metres oil-equivalent). For example:

Oil Equivalent Production (for Gas processing plants only)

INPUT production information and HHV of marketable natural gas if required:

Input HHV of the marketable natural gas :		39.50	GJ/e ³ m ³		
Product	Unit	Production	Conversion Factor	m ³ OE	
Natural Gas	e ³ m ³	2,000.00	1.026	2,051.92	
Liquid Propane	m ³	1,500.00	0.66	990.00	
Liquid Ethane	m ³	1,500.00	0.45	675.00	
Liquid Butane	m ³	1,000.00	0.74	740.00	
NGL-mix	m ³	500.00	0.72	360.00	
Pentanes+	m ³	400.00	0.85	340.00	
Total Oil-Equivalent Production:				5,156.92	m³OE

Enter the production amount and the associated total CIIP facility emissions in the CIIP application.

Cubic metres of oil equivalent (m³OE) is a unit of energy based on the energy released by combusting one cubic metre (m³) of crude oil¹.

The conversion factor for natural gas depends on the HHV as follows²:

$$Conv_Factor_{NG} = 0.987 * \left(\frac{HHV_{NG}}{38} \right)$$

5.2.2 CASE 2: Gas processing plant with I/S/T compression

In the calculator on tab 'General', in the section 'Type of O/G Facility and SWRS Emission Data', select CASE 2 from the from the pulldown menu in cell C12.

In the blue cells, enter onsite emissions form the SWRS report by emission category, in tCO₂e.

Using this emissions information and the previously calculated emissions associated with purchased electricity (section 5.1 above), the calculator determines the total facility emissions for CIIP purposes in cell H17.

For example:

¹ One barrel (42 US gallons) of crude oil is assumed to contain 5.8 MBTU, where 1 BTU = 1055.056 J. Converting to metric units yields 1 m³OE = 38.4894 GJ energy.

² The conversion factor for natural gas of 0.987 is based on an HHV_{NG} of 38 GJ/e³m³ of marketable gas.

Type of O/G Facility and SWRS Emission Data

SELECT Facility CASE as defined in the Guidance :

Facility : **CASE 2: Gas processing plant with I/S/T**
CASE 1: Gas processing plant, no I/S/T compression (could have other compression)
CASE 2: Gas processing plant with I/S/T compression (and could have other compression)
CASE 3: Compressor station, or other facility with > 2/3 Emissions from I/S/T compression
CASE 4: Upstream-other facility, no I/S/T compression
CASE 5: Upstream-other facility with ≤ 2/3 Emissions from I/S/T compression

INPUT Emission Data from SWRS report by category:

Emission Category	Tonnes (CO ₂ e)
General stationary combustion	200,000.00
Venting	100,000.00
Flaring	50,000.00
Fugitive	125,000.00
Waste and wastewater	-
Total On-Site	475,000.00
Total CIIP emissions including purchased electricity	476,203.00

Next, in the calculator on tab 'General', in the section Oil Equivalent Production (for Gas processing plants only)', in the blue cells:

- Enter the annual weighted average high heating value (HHV), in GJ/e³m³, of the processed marketable natural gas
- Enter the quantity of the following products in the listed units:
 - Natural gas, in e³m³ (thousands cubic metres)
 - Liquid propane, in m³ (cubic metres)
 - Liquid ethane, in m³ (cubic metres)
 - Liquid butane, in m³ (cubic metres)
 - Pentanes+, in m³ (cubic metres)

Based on this information and the conversion factors, the calculator then determines the total gas-processing production for the facility, in units of m³OE (cubic metres oil-equivalent). For example:

Oil Equivalent Production (for Gas processing plants only)

INPUT production information and HHV of marketable natural gas if required:

Input HHV of the marketable natural gas :		39.50	GJ/e ³ m ³	
Product	Unit	Production	Conversion Factor	m ³ OE
Natural Gas	e ³ m ³	2,000.00	1.026	2,051.92
Liquid Propane	m ³	1,500.00	0.66	990.00
Liquid Ethane	m ³	1,500.00	0.45	675.00
Liquid Butane	m ³	1,000.00	0.74	740.00
NGL-mix	m ³	500.00	0.72	360.00
Pentanes+	m ³	400.00	0.85	340.00
Total Oil-Equivalent Production:				5,156.92 m ³ OE

Cubic metres of oil equivalent (m³OE) is a unit of energy based on the energy released by combusting one cubic metre (m³) of crude oil³.

The conversion factor for natural gas depends on the HHV as follows⁴:

$$Conv_Factor_{NG} = 0.987 * \left(\frac{HHV_{NG}}{38} \right)$$

Next, in the calculator on tab 'Power',

(a) if direct metering data of electrical and mechanical power generation is available,

in the section 'Onsite Energy Generation (if direct metering is available)', in the blue cells:

- Enter total onsite electric power generation, in MWh
- Enter total onsite mechanical power generation, in MWh
- Enter the total emissions associated with all onsite power generation, in tCO₂e

NOTE: Total onsite power generation emissions should equal to the general stationary combustion (GSC) emissions from all engines and turbines, or to the GSC emissions less the emissions from boilers and heaters.

(b) If direct metering data of electrical and mechanical power generation is not available,

- Enter the total emissions associated with all onsite power generation, in tCO₂e

NOTE: Total onsite power generation emissions should equal to the general stationary combustion (GSC) emissions from all engines and turbines, or to the GSC emissions less the emissions from boilers and heaters.

In the section 'Onsite Energy Generation estimation (if direct metering is not available)', for each engine/turbine, enter appropriate data in the blue cells using either method A or method B, as follows:

- Use method A if either power generation is known (fill out column F) or input fuel consumption is known (fill out columns D and E)
- Use method B if estimating power generation from rated power, runtime, and load factor

Based on this information, the calculator then determines the total electrical and mechanical energy onsite generation and purchased electricity in MWh.

³ One barrel (42 US gallons) of crude oil is assumed to contain 5.8 MBTU, where 1 BTU = 1055.056 J. Converting to metric units yields 1 m³OE = 38.4894 GJ energy.

⁴ The conversion factor for natural gas of 0.987 is based on an HHV_{NG} of 38 GJ/e³m³ of marketable gas.

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For example:

Onsite Energy Generation (if direct metering is available)

INPUT Power Generated on-site, in MWh (if direct metering data is available)

If the following data is not available, leave cells blank and use the on-site power generation calculator below

Onsite Electric power generation	60,000	MWh
Onsite Mechanical power generation	30,000	MWh
Total On-site	90,000	MWh

INPUT On-site energy generation related emissions

Equal to general stationary combustion emissions from all Engines and Turbines, or;
General combustion emissions minus the emissions from boilers and heater.

Emission associated with onsite power	100,000	tCO ₂ e
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Total Electrical/Mechanical energy onsite generation + purchased electricity (MWh) :	120,000.00
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Next, in the calculator on tab 'Compression', for each compressor determine if input energy consumed is quantified using method A - if either power generation or input fuel consumption is known – or method B - if estimating power generation from rated power, runtime, and load factor.

Then in the applicable table, for each compressor:

- Enter compressor name/ID in column C
- Select compressor type from the dropdown menu in column B
- Enter applicable data in the blue cells:
 - If method A power generation, fill out column G and leave columns E and F blank
 - If method A fuel consumption, fill out columns E and F and leave column G blank
 - If method B, fill out columns E, F, and G

Based on this information, the calculator then determines the total energy consumed by centrifugal compression and that consumed by reciprocating compression, in MWh.

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For example:

Method A: Energy input to compression is measured separately

Use this method when the input fuel consumption of the engine/turbine is known (Fill columns E and F).
If the power consumed by each compressor is known, fill Column G and leave columns E and F blank.

Compressor Name/ID	Compressor Type	Fuel consumption (1)	Fuel HHV (2)	Electrical energy consumption (MWh)	Centrifugal - energy consumed (MWh)	Reciprocal - energy consumed (MWh)
comp1	Centrifugal			3,000.00	3,000.00	-
comp27- recip	Reciprocating			4,000.00	-	4,000.00
id#9	Reciprocating			2,000.00	-	2,000.00
	select type Centrifugal Reciprocating				-	-
					3,000.00	6,000.00
					centrifugal	reciprocating

(1) Fuel consumption in appropriate units (e3m3 for gaseous fuel, m3 for liquid fuel)
(2) HHV in appropriate units (GJ/e3m3 for gaseous fuel, GJ/m3 for liquid fuel)

Method B: Compressor rated power, compressor runtime, load factors.

Electrical energy (Motor driven) and Mechanical energy (Engine/Turbine driven).

Compressor Name/ID	Compressor Type	Compressor Rated Power (MW)	Compressor Runtime (hours)	Load Factor	Centrifugal - energy consumed (MWh)	Reciprocal - energy consumed (MWh)
comp.34	Centrifugal	2.00	8,000.00	1.00	16,000.00	-
comp 36 r	Reciprocating	3.00	8,000.00	0.90	-	21,600.00
comp 14	Reciprocating	4.00	8,000.00	0.90	-	28,800.00
					16,000.00	50,400.00
					centrifugal	reciprocating

Total Energy consumed for centrifugal compression (MWh)	19,000.00
Total Energy consumed for reciprocating compression (MWh)	56,400.00

Finally, based on the previously entered and calculated information, the calculator determines and displays on tab 'General' in section 'Emissions allocation' the emissions allocated to each applicable product.

For example:

Emissions allocation

Emission allocated to gas processing	412,613.78	tCO2e
Emission allocated to centrifugal compression	16,023.81	tCO2e
Emission allocated to reciprocating compression	47,565.41	tCO2e
Emission allocated to other oil and gas	-	tCO2e

Enter the total production amounts and respective allocated emissions for each, in the CIIP application.

5.2.3 CASE 3: Compressor station, or other facility with > 2/3 Emissions from I/S/T compression

In the calculator on tab ‘General’, in the section ‘Type of O/G Facility and SWRS Emission Data’, select CASE 3 from the from the pulldown menu in cell C12.

In the blue cells, enter onsite emissions form the SWRS report by emission category, in tCO2e.

Using this emissions information and the previously calculated emissions associated with purchased electricity (section 5.1 above), the calculator determines the total facility emissions for CIIP purposes in cell H17.

For example:

Type of O/G Facility and SWRS Emission Data		INPUT Emission Data from SWRS report by category:	
SELECT Facility CASE as defined in the Guidance :			
Facility : CASE 3: Compressor station, or other facility with	CASE 1: Gas processing plant, no I/S/T compression (could have other compression)	General stationary combustion	200,000.00
	CASE 2: Gas processing plant with I/S/T compression (and could have other compression)	Venting	100,000.00
	CASE 3: Compressor station, or other facility with > 2/3 Emissions from I/S/T compression	Flaring	50,000.00
	CASE 4: Upstream-other facility, no I/S/T compression	Fugitive	125,000.00
	CASE 5: Upstream-other facility with ≤ 2/3 Emissions from I/S/T compression	Waste and wastewater	-
		Total On-Site	475,000.00
		Total CIIP emissions including purchased electricity	476,203.00

'Upstream O/G - other' facilities are: Aggregated facilities, batteries, gas well pads, gathering pipelines, liquid separation facilities, liquid hubs, water hubs, and pipeline aggregates

Next, in the calculator on tab ‘Power’,

(a) if direct metering data of electrical and mechanical power generation is available, in the section ‘Onsite Energy Generation (if direct metering is available)’, in the blue cells:

- Enter total onsite electric power generation, in MWh
- Enter total onsite mechanical power generation, in MWh
- Enter the total emissions associated with all onsite power generation, in tCO2e

NOTE: Total onsite power generation emissions should equal to the general stationary combustion (GSC) emissions from all engines and turbines, or to the GSC emissions less the emissions from boilers and heaters.

(b) If direct metering data of electrical and mechanical power generation is not available,

- Enter the total emissions associated with all onsite power generation, in tCO2e

NOTE: Total onsite power generation emissions should equal to the general stationary combustion (GSC) emissions from all engines and turbines, or to the GSC emissions less the emissions from boilers and heaters.

In the section ‘Onsite Energy Generation estimation (if direct metering is not available)’, for each engine/turbine, enter appropriate data in the blue cells using either method A or method B, as follows:

- Use method A if either power generation is known (fill out column F) or input fuel consumption is known (fill out columns D and E)
- Use method B if estimating power generation from rated power, runtime, and load factor

Based on this information, the calculator then determines the total electrical and mechanical energy onsite generation and purchased electricity in MWh.

For example:

Onsite Energy Generation (if direct metering is available)

INPUT Power Generated on-site, in MWh (if direct metering data is available)

If the following data is not available, leave cells blank and use the on-site power generation calculator below

Onsite Electric power generation	60,000	MWh
Onsite Mechanical power generation	30,000	MWh
Total On-site	90,000	MWh

INPUT On-site energy generation related emissions

Equal to general stationary combustion emissions from all Engines and Turbines, or, General combustion emissions minus the emissions from boilers and heater.

Emission associated with onsite power	100,000	tCO ₂ e
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Total Electrical/Mechanical energy onsite generation + purchased electricity (MWh) :	120,000.00
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Next, in the calculator on tab ‘Compression’, for each compressor determine if input energy consumed is quantified using method A - if either power generation or input fuel consumption is known – or method B - if estimating power generation from rated power, runtime, and load factor.

Then in the applicable table, for each compressor:

- Enter compressor name/ID in column C
- Select compressor type from the dropdown menu in column B
- Enter applicable data in the blue cells:
 - If method A power generation, fill out column G and leave columns E and F blank
 - If method A fuel consumption, fill out columns E and F and leave column G blank
 - If method B, fill out columns E, F, and G

Based on this information, the calculator then determines the total energy consumed by centrifugal compression and that consumed by reciprocating compression, in MWh.

For example:

Method A: Energy input to compression is measured separately

Use this method when the input fuel consumption of the engine/turbine is known (Fill columns E and F).
If the power consumed by each compressor is known, fill Column G and leave columns E and F blank.

Compressor Name/ID	Compressor Type	Fuel consumption (1)	Fuel HHV (2)	Electrical energy consumption (MWh)	Centrifugal - energy consumed (MWh)	Reciprocal - energy consumed (MWh)
comp1	Centrifugal			3,000.00	3,000.00	-
comp27- recip	Reciprocating			4,000.00	-	4,000.00
id#9	Reciprocating			2,000.00	-	2,000.00
	select type Centrifugal Reciprocating				-	-
					3,000.00	6,000.00
					centrifugal	reciprocating

(1) Fuel consumption in appropriate units (e3m3 for gaseous fuel, m3 for liquid fuel)
(2) HHV in appropriate units (GJ/e3m3 for gaseous fuel, GJ/m3 for liquid fuel)

Method B: Compressor rated power, compressor runtime, load factors.

Electrical energy (Motor driven) and Mechanical energy (Engine/Turbine driven).

Compressor Name/ID	Compressor Type	Compressor Rated Power (MW)	Compressor Runtime (hours)	Load Factor	Centrifugal - energy consumed (MWh)	Reciprocal - energy consumed (MWh)
comp.34	Centrifugal	2.00	8,000.00	1.00	16,000.00	-
comp 36 r	Reciprocating	3.00	8,000.00	0.90	-	21,600.00
comp 14	Reciprocating	4.00	8,000.00	0.90	-	28,800.00
					16,000.00	50,400.00
					centrifugal	reciprocating

Total Energy consumed for centrifugal compression (MWh)	19,000.00
Total Energy consumed for reciprocating compression (MWh)	56,400.00

Finally, based on the previously entered and calculated information, the calculator determines and displays on tab 'General' in section 'Emissions allocation' the emissions allocated to each applicable product.

For example:

Emissions allocation

Emission allocated to gas processing	-	tCO2e
Emission allocated to centrifugal compression	119,998.10	tCO2e
Emission allocated to reciprocating compression	356,204.90	tCO2e
Emission allocated to other oil and gas	-	tCO2e

Enter the total production amounts and respective allocated emissions for each, in the CIIP application.

5.2.4 CASE 4: Upstream-other facility, no I/S/T compression

In the calculator on tab 'General', in the section 'Type of O/G Facility and SWRS Emission Data', select CASE 4 from the from the pulldown menu in cell C12.

In the blue cells, enter onsite emissions form the SWRS report by emission category, in tCO2e.

Using this emissions information and the previously calculated emissions associated with purchased electricity (section 5.1 above), the calculator determines the total facility emissions for CIIP purposes in cell H17.

For example:

Type of O/G Facility and SWRS Emission Data		INPUT Emission Data from SWRS report by category:	
SELECT Facility CASE as defined in the Guidance :			
Facility :	CASE 4: Upstream-other facility, no I/S/T	Emission Category	Tonnes (CO2e)
	CASE 1: Gas processing plant, no I/S/T compression (could have other compression)	General stationary combustion	18,000.00
	CASE 2: Gas processing plant with I/S/T compression (and could have other compression)	Venting	1,500.00
	CASE 3: Compressor station, or other facility with > 2/3 Emissions from I/S/T compression	Flaring	1,000.00
	CASE 4: Upstream-other facility, no I/S/T compression	Fugitive	1,000.00
CASE 5: Upstream-other facility with ≤ 2/3 Emissions from I/S/T compression	Waste and wastewater	-	
		Total On-Site	21,500.00
		Total CIIP emissions including purchased electricity	22,703.00

'Upstream O/G - other' facilities are: Aggregated facilities, batteries, gas well pads, gathering pipelines, liquid separation facilities, liquid hubs, water hubs, and pipeline aggregates

Skip the rest of the calculator and enter the total CIIP facility emissions in the CIIP application.

5.2.5 CASE 5: Upstream-other facility with ≤ 2/3 Emissions from I/S/T compression

In the calculator on tab ‘General’, in the section ‘Type of O/G Facility and SWRS Emission Data’, select CASE 5 from the from the pulldown menu in cell C12.

In the blue cells, enter onsite emissions form the SWRS report by emission category, in tCO2e.

Using this emissions information and the previously calculated emissions associated with purchased electricity (section 5.1 above), the calculator determines the total facility emissions for CIIP purposes in cell H17.

For example:

Type of O/G Facility and SWRS Emission Data		INPUT Emission Data from SWRS report by category:	
SELECT Facility CASE as defined in the Guidance :			
Facility :	CASE 5: Upstream-other facility with ≤ 2/3 Emissions	Emission Category	Tonnes (CO2e)
	CASE 1: Gas processing plant, no I/S/T compression (could have other compression)	General stationary combustion	24,000.00
	CASE 2: Gas processing plant with I/S/T compression (and could have other compression)	Venting	1,500.00
	CASE 3: Compressor station, or other facility with > 2/3 Emissions from I/S/T compression	Flaring	1,500.00
	CASE 4: Upstream-other facility, no I/S/T compression	Fugitive	1,200.00
	CASE 5: Upstream-other facility with ≤ 2/3 Emissions from I/S/T compression	Waste and wastewater	-
		Total On-Site	28,200.00
		Total CIIP emissions including purchased electricity	28,601.00

'Upstream O/G - other' facilities are: Aggregated facilities, batteries, gas well pads, gathering pipelines, liquid separation facilities, liquid hubs, water hubs, and pipeline aggregates

Next, in the calculator on tab ‘Power’,

(a) if direct metering data of electrical and mechanical power generation is available,

in the section ‘Onsite Energy Generation (if direct metering is available)’, in the blue cells:

- Enter total onsite electric power generation, in MWh
- Enter total onsite mechanical power generation, in MWh
- Enter the total emissions associated with all onsite power generation, in tCO2e

NOTE: Total onsite power generation emissions should equal to the general stationary combustion (GSC) emissions from all engines and turbines, or to the GSC emissions less the emissions from boilers and heaters.

(b) If direct metering data of electrical and mechanical power generation is not available,

- Enter the total emissions associated with all onsite power generation, in tCO2e

NOTE: Total onsite power generation emissions should equal to the general stationary combustion (GSC) emissions from all engines and turbines, or to the GSC emissions less the emissions from boilers and heaters.

In the section ‘Onsite Energy Generation estimation (if direct metering is not available)’, for each engine/turbine, enter appropriate data in the blue cells using either method A or method B, as follows:

- Use method A if either power generation is known (fill out column F) or input fuel consumption is known (fill out columns D and E)
- Use method B if estimating power generation from rated power, runtime, and load factor

Based on this information, the calculator then determines the total electrical and mechanical energy onsite generation and purchased electricity in MWh.

For example:

Onsite Energy Generation (if direct metering is available)

INPUT Power Generated on-site, in MWh (if direct metering data is available)

If the following data is not available, leave cells blank and use the on-site power generation calculator below

Onsite Electric power generation	20,000	MWh
Onsite Mechanical power generation	15,000	MWh
Total On-site	35,000	MWh

INPUT On-site energy generation related emissions

Equal to general stationary combustion emissions from all Engines and Turbines, or; General combustion emissions minus the emissions from boilers and heater.

Emission associated with onsite power	20,000	tCO ₂ e
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Total Electrical/Mechanical energy onsite generation + purchased electricity (MWh) :	45,000.00
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Next, in the calculator on tab ‘Compression’, for each compressor determine if input energy consumed is quantified using method A - if either power generation or input fuel consumption is known – or method B - if estimating power generation from rated power, runtime, and load factor.

Then in the applicable table, for each compressor:

- Enter compressor name/ID in column C
- Select compressor type from the dropdown menu in column B
- Enter applicable data in the blue cells:
 - If method A power generation, fill out column G and leave columns E and F blank
 - If method A fuel consumption, fill out columns E and F and leave column G blank
 - If method B, fill out columns E, F, and G

Based on this information, the calculator then determines the total energy consumed by centrifugal compression and that consumed by reciprocating compression, in MWh.

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For example:

Method A: Energy input to compression is measured separately

Use this method when the input fuel consumption of the engine/turbine is known (Fill columns E and F).
If the power consumed by each compressor is known, fill Column G and leave columns E and F blank.

Compressor Name/ID	Compressor Type	Fuel consumption (1)	Fuel HHV (2)	Electrical energy consumption (MWh)	Centrifugal - energy consumed (MWh)	Reciprocal - energy consumed (MWh)
comp1	Centrifugal			3,000.00	3,000.00	-
comp27-recip	Reciprocating			4,000.00	-	4,000.00
id#9	Reciprocating			2,000.00	-	2,000.00
	select type Centrifugal Reciprocating					
					3,000.00	6,000.00

(1) Fuel consumption in appropriate units (e3m3 for gasous fuel, m3 for liquid fuel) centrifugal
(2) HHV in appropriate units (GJ/e3m3 for gasous fuel, GJ/m3 for liquid fuel) reciprocating

Method B: Compressor rated power, compressor runtime, load factors.

Electrical energy (Motor driven) and Mechanical energy (Engine/Turbine driven).

Compressor Name/ID	Compressor Type	Compressor Rated Power (MW)	Compressor Runtime (hours)	Load Factor	Centrifugal - energy consumed (MWh)	Reciprocal - energy consumed (MWh)
comp.34	Centrifugal	2.00	1,200.00	1.00	2,400.00	-
comp 36 r	Reciprocating	3.00	1,000.00	0.90	-	2,700.00
comp 14	Reciprocating	2.00	1,000.00	0.90	-	1,800.00
					2,400.00	4,500.00

centrifugal reciprocating

Total Energy consumed for centrifugal compression (MWh)	5,400.00
Total Energy consumed for reciprocating compression (MWh)	10,500.00

Finally, based on the previously entered and calculated information, the calculator determines and displays on tab 'General' in section 'Emissions allocation' the emissions allocated to each applicable product.

For example:

Emissions allocation

Emission allocated to gas processing	-	tCO2e
Emission allocated to centrifugal compression	2,448.12	tCO2e
Emission allocated to reciprocating compression	4,760.23	tCO2e
Emission allocated to other oil and gas	21,392.65	tCO2e

Enter the total production amounts and respective allocated emissions for each, in the CIIP application.