

# TIER Conventional Oil and Gas Flaring Benchmark Fall 2023 Webinar



Conventional Oil and Gas  
Climate Regulation and Carbon Markets  
Alberta Environment and Protected Areas  
September 15, 2023



Alberta

# Agenda

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- Aggregate Emissions Covered in TIER
- Aggregate Facilities Program Background
- 2023 Benchmark Applications
- 2023 AQM Flaring Methodologies
- Q & A on 2023 Flaring

# Aggregate Emission Coverage in TIER

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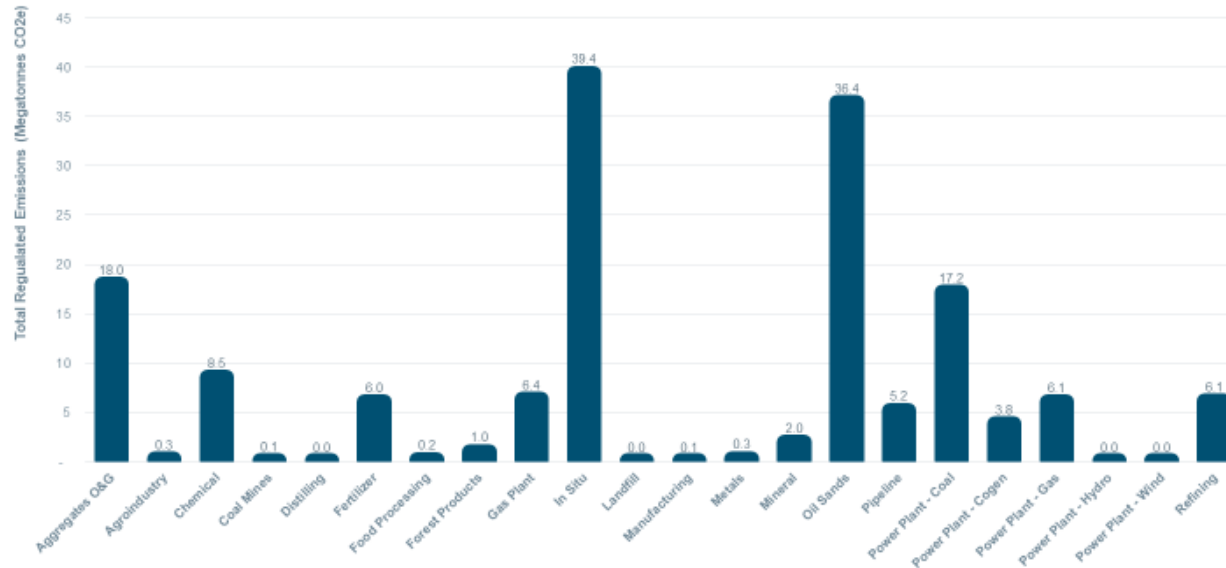
# Aggregate Total Regulated Emissions

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Year	Megatonnes of carbon dioxide equivalent (CO <sub>2</sub> e)
2020	18
2021	18.7
2022	19.4

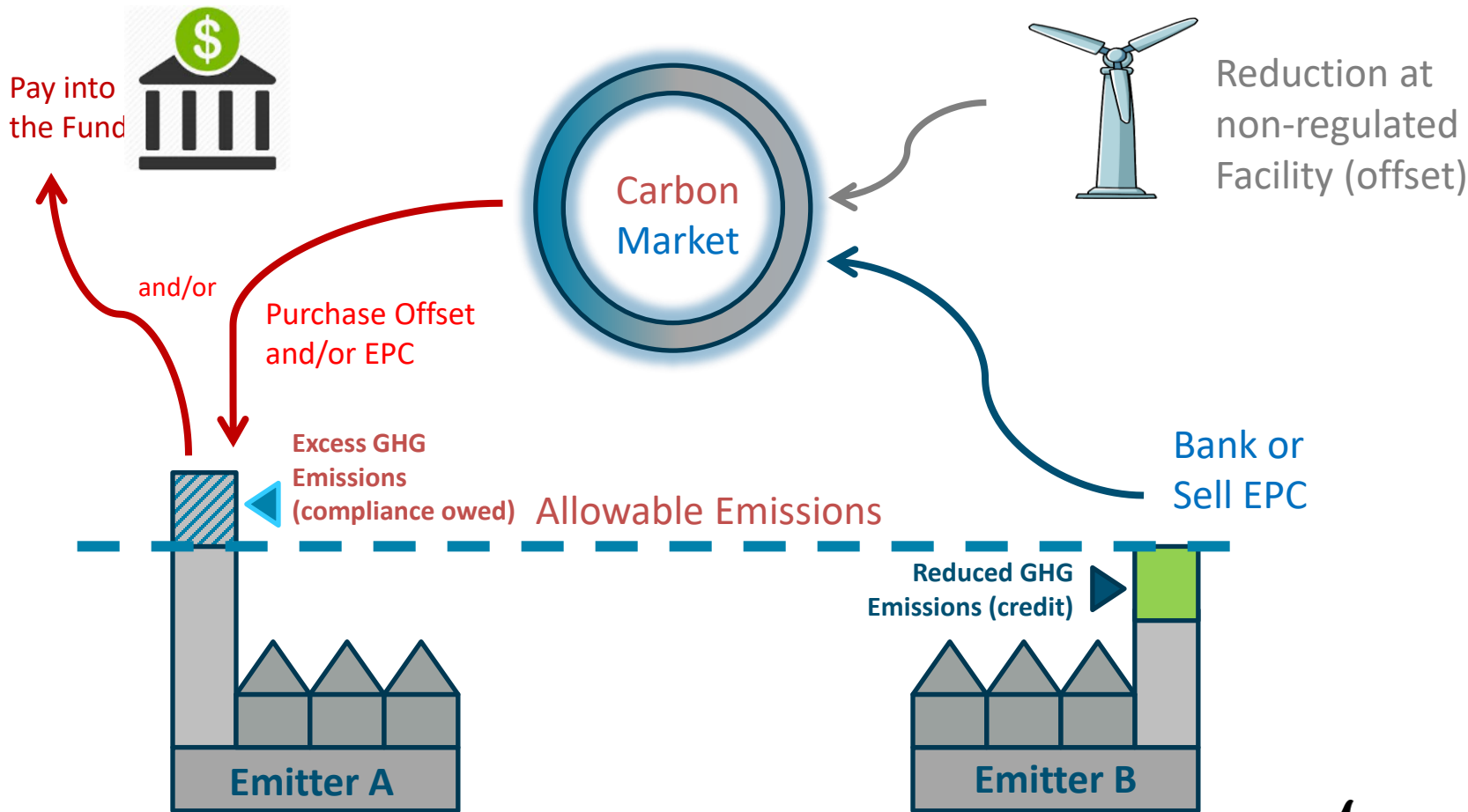
# First Aggregate Year Coverage: 2020

## Total Regulated Emissions by Sector



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## Flaring Methodology & Engagement Outcomes; AQM Section 15.3

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- **Method 15-11:** CO<sub>2</sub> and CH<sub>4</sub> emissions with flaring gas default emission factors
- **Method 15-12:** CO<sub>2</sub> and CH<sub>4</sub> emission with flaring gas analysis
- **Method 15-13:** Flaring N<sub>2</sub>O emissions
- Quarterly sampling
- Emission factors for acid gas and N<sub>2</sub>O
- Revision of Facility-Specific Benchmark (FSB) applications

# TIER

## Aggregate Facility Program

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## Enrollment



# TIER Aggregate Program Objectives

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- Conventional Oil and Gas facilities regulated under TIER can apply for exemption from the federal fuel charge
- Maintaining provincial industry competitiveness
- Reducing GHG emissions
- Provincial jurisdiction over industrial emissions
- Voluntary enrollment with compliance obligation requirement
- Emission performance credits potential

# Elements of the Program

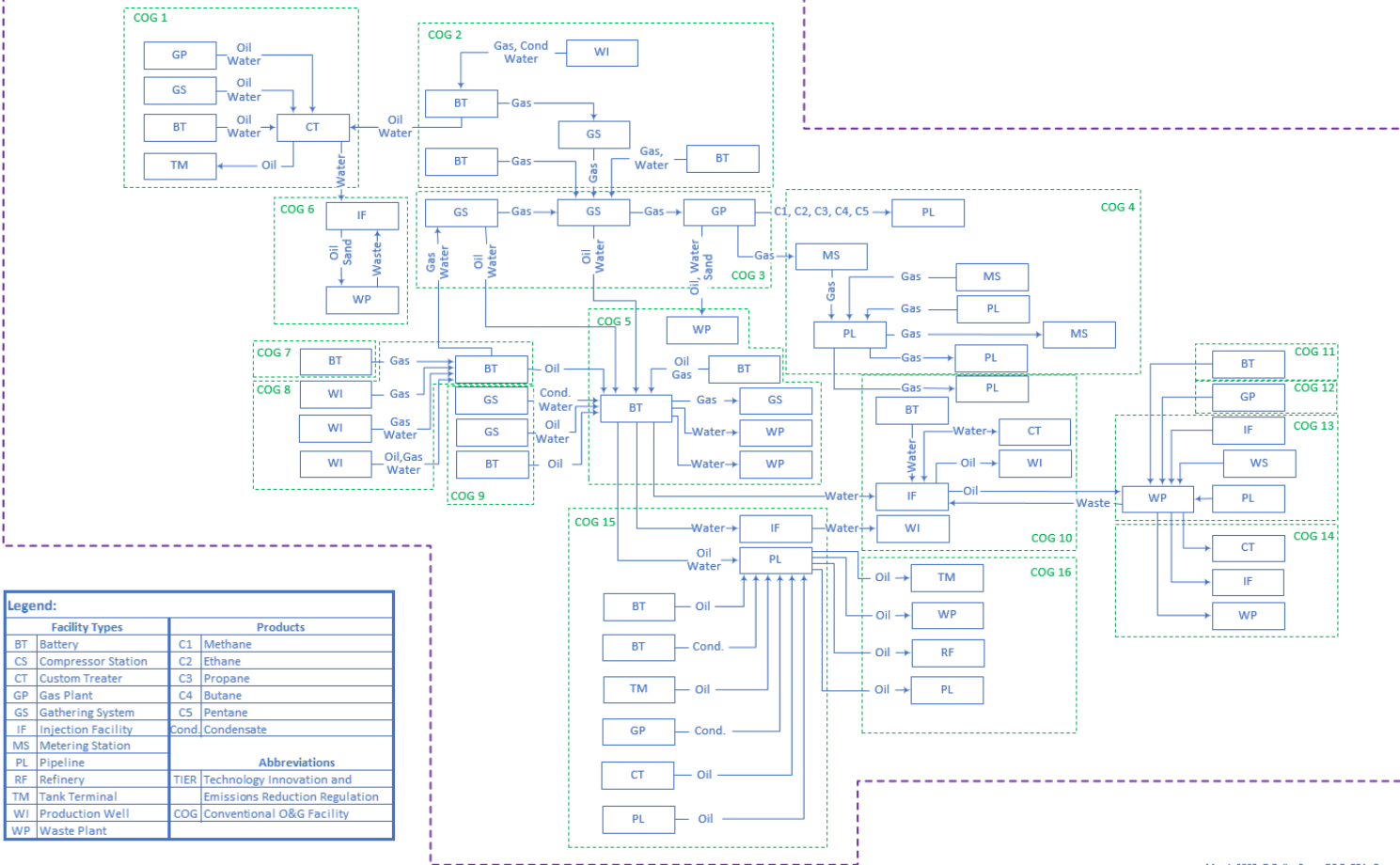
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- The building block of the Aggregate program is the “Conventional Oil and Gas facility” (COG).
- A COG can be comprised of a single facility or 2 or more contiguous, adjacent facilities that are operated in an integrated manner and have the same person responsible.
- An “Aggregate Facility” – a group of two or more conventional oil and gas facilities designated as such upon an application of the person responsible and approved by the director.

# TIER AGGREGATE FACILITY

## Example

### Aggregate Facility



# Specifics Of the Program

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- **Calendar year based coverage**
  - Facilities registered in an aggregate on January 1 will require compliance reporting for the entire calendar year within the same aggregate.
  - Facilities added to an aggregate during the year will require reporting for the entire calendar year within the same aggregate.
  - Removal of facilities from an aggregate or revocation of aggregate occurs on December 31 for upcoming year.
  
- **Section 25(1) – Duty to notify director**
  - Change in person responsible for the whole aggregate
  - Change in person responsible for a facility within the aggregate
  - Updating Temporary Facility ID to Petrinex issued facility ID
  - Exceeding 100,000 tCO<sub>2</sub>e / year
  - Aggregate Facility Notification Form

# TIER Aggregate Information in Petrinex

- Project underway to incorporate TIER Aggregate IDs and TIER Person Responsible into Petrinex database and the Infrastructure File.

**PETRINEX**  
CANADA'S PETROLEUM INFORMATION NETWORK

Quick List ▾ Monthly ▾ Infrastructure ▾ Admin Functions ▾

### Query Facility Information

Facility ID:  As of Date:

Facility Name:

**Go**

Experimental Confidential: No  
Returned Gas Eligible For Gas Credits  
Credit On Fuel: No  
Credit on Gas Lift: No  
NGL Transportation Region: 4

**TIER Aggregate ID:**  
**TIER Aggregate PR:**

Operational Status: ACTIVE  
Operator:

Facility Infrastructure-AB.CSV - Excel

AH	AJ	AK	AL	AM
MPFacilityType	EnergyDevelopmentCategory	OrphanWellFlg	TierAggregateID	TierAggregatePR

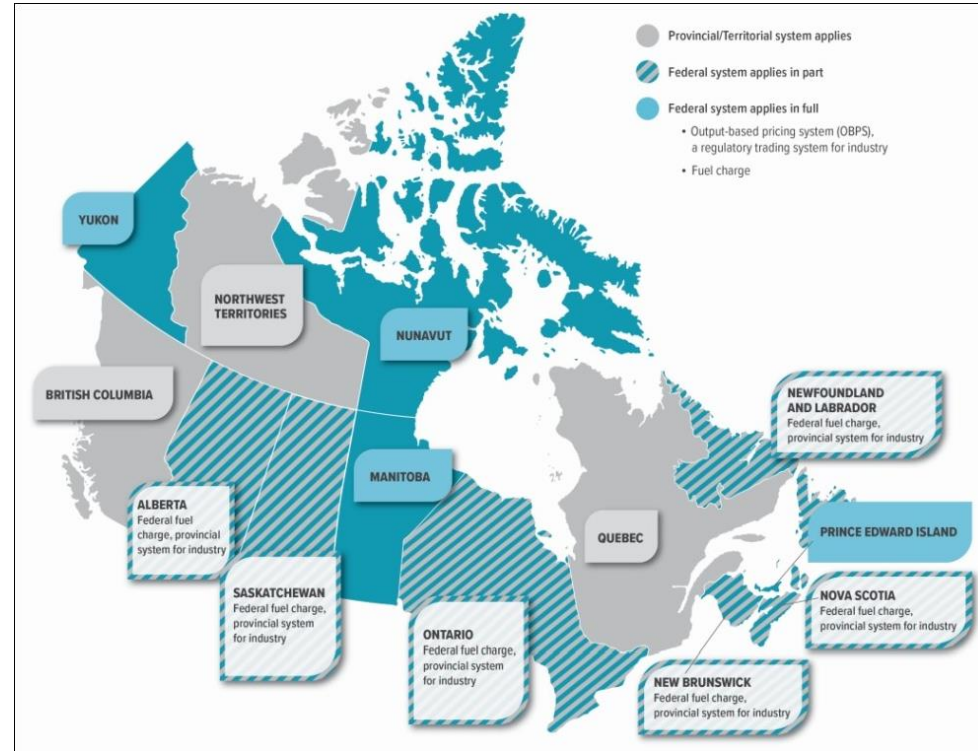
# Application Deadlines

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Upcoming Deadlines	Request
November 15, 2023	Application for adding a facility to an existing aggregate facility and creating a new aggregate for 2023 ( <i>new for 2023</i> )
December 1, 2023	Application for removal of a facility from an existing aggregate facility or revocation for 2024
December 1, 2023	Volumetric data (including Flaring) submission to inform the 2023 Facility-Specific Benchmark
June 30, 2024	Compliance Report for 2023

# Federal Fuel Charge Program Links

- Fuel Charge Relief: Facilities subject to Alberta provincial carbon pricing systems
  - <https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/fuel-charge-relief-provincial-carbon-pricing-systems/alberta.html>
- Fuel Charge Relief: Facilities subject to provincial carbon pricing systems across Canada
  - <https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/fuel-charge-relief-provincial-carbon-pricing-systems.html>
- Fuel Charge Regulation
  - <https://laws-lois.justice.gc.ca/eng/regulations/SOR-2018-12187/FullText.html>
- Contact ECCC
  - [ptintegrationpt@ec.gc.ca](mailto:ptintegrationpt@ec.gc.ca)



# Benchmarking with Flaring Emissions

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# Director's Default Method

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- Default emission factors: rich gas and **ACGAS\***, un-assisted flaring
  - \* Updated September 26, 2023 to incorporate acid gas EF
- Petrinex volumes (ActivityID = FLARE)
- Population Change adjustments to emissions utilizing both SFC and flare volumes
- Adjustments to previously reported emissions due to the new GWPs
- Issued in spring

# 2023 Population Change Adjustments

- Example FSB letter supporting workbook (ref. yrs 2019, 2020, 2021)

**Table 1: Petrinex volumes for compliance years**

ComplianceYear	SummedActivityID	2019	2020	2021
2020 CoR	DISP	101341.5738	112957.5306	100354.3373
2020 CoR	FUEL	4137.5	3985.6	3358.4
2020 CoR	PROD, PROC, FRAC	64365.986	77928.8875	68874.7623
2020 CoR	REC	41181.962	39826.0685	35788.7039
2021 CoR	DISP	91637.4779	95260.9428	88703.6515
2021 CoR	FUEL	3883.9	3549.4	3318.9
2021 CoR	PROD, PROC, FRAC	56967.0717	64085.7923	57961.6601
2021 CoR	REC	38585.4109	35466.5698	34982.3493
2023 CoR	DISP	98516.1115	106862.4647	98906.3349
2023 CoR	FUEL	3999.3	3683.3	3479.6
2023 CoR	PROD, PROC, FRAC	62329.9167	70523.2056	63998.6688
2023 CoR	REC	40247.9571	40943.8889	39596.3471

**Table 2: Data used for calculating ratios of 2022 to past fuel intensities**

Item	2019	2020	2021	2023
CoR Issued_Fuel	4137.5	3985.6	3318.9	
CoR Issued_Production Accounting	64365.986	77928.8875	57961.6601	
Past Fuel to Production Intensity (a.k.a, "i" as in Cha	0.064280845	0.051144064	0.057260265	
2023CoR_Fuel	3999.3	3683.3	3479.6	
2023CoR_Production Accounting	62329.9167	70523.2056	63998.6688	
2023CoR_(Fuel) to Production Intensity (a.k.a, "icast	0.06416341	0.052228199	0.054369881	
Ratio (icast/i)	0.998173087	1.021197668	0.949521997	
Benchmark Unit				PROD, PROC, FRAC

# 2023 GWP Adjustments

- Example GWP adjustments (Petrinex emissions)

Fuel Consumption Methodology	CO2 Emissions Methodology	CH4, N2O Emissions Methodology	Petrinex Fuel Volume (m <sup>3</sup> )	Carbon dioxide (CO <sub>2</sub> ) Tonnes	Methane (CH <sub>4</sub> ) Tonnes	Nitrous oxide (N <sub>2</sub> O) Tonnes	Tonnes (in CO <sub>2</sub> e)
Method 15-1	Method 15-4	Method 15-9	658,600.0000	1,534.5380	4.2150	0.0395	1,661.6898
Method 15-1	Method 15-4	Method 15-9	3,200.0000	7.4560	0.0205	0.0002	8.0252
Method 15-1	Method 15-4	Method 15-9	2,200.0000	5.1260	0.0141	0.0001	5.5107
Method 15-1	Method 15-4	Method 15-9	6,800.0000	15.8440	0.0435	0.0004	17.0507
Method 15-1	Method 15-4	Method 15-9	0.0000	0.0000	0.0000	0.0000	
Method 15-1	Method 15-4	Method 15-9	1,642,500.0000	3,827.0250	10.5120	0.0986	4,119.1929
Method 15-1	Method 15-4	Method 15-9	1,600.0000	3.7280	0.0102	0.0001	4.0128
Method 15-1	Method 15-4	Method 15-9	0.0000	0.0000	0.0000	0.0000	

$$\sum CO_2 \times 1 + \sum CH_4 \times 28 + \sum N_2O \times 265 = \text{new Total Petrinex Emissions}$$

- Similar treatment for non-Petrinex emissions

# Benchmark Application Changes

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- Aggregate Facility Specific Benchmark Application Form
  - Flaring columns in section B1
  - Multi-year
  - Flaring section B3 (granularity by gas and technology)
  - Benchmark Unit ( $r_{agg}$ )
- Aggregate Facility Benchmark Unit Request Form & Aggregate Facility Reference Years Notification Form
  - Justification section

# Benchmark Tightening Rates

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- Reduction target consists of a basic target and annual tightening rate for a year

	2022	2023	2024	2025	2026
$RT_{SFC}$	10%	12%	14%	16%	18%
$RT_{FL}$	N/A	10%	12%	14%	16%

# 2023 Facility Specific Benchmarks

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- 2023 compliance year: *(new for 2023)*

$$FSB = \frac{\sum_{y=1}^m \sum_{i=1}^n \left[ \left( E_{SFC_{i,y}} + E_{CO2_{i,y}} \right) \times (1 - RT_y) + E_{FLR_{i,y}} \times (1 - RT_{y,F}) \right]}{\sum_{y=1}^m \sum_{i=1}^n P_{i,y}}$$

$E_{SFC_{i,y}}$  - stationary fuel combustion for COG “i” in year “y”

$E_{CO2_{i,y}}$  - exported CO2 from COG “i” in year “y”

$E_{FLR_{i,y}}$  - flaring emissions for COG “i” in year “y”

$P_{i,y}$  - total product volume for COG “i” in year “y”

$RT_y$  - stationary fuel combustion reduction target for year “y”

$RT_{y,F}$  - flaring reduction target for year “y”,

# Benchmark Application Form

## Section B: Emissions and Production Information

### Petrinex ID Level Emissions Totals

Report in this section, fuel and flare volumes reported in Petrinex and their associated GHG emissions.

Reference Year(s)	Stationary Fuel Combustion					Flaring		
	Fuel Volume (m <sup>3</sup> )	Carbon dioxide (CO <sub>2</sub> ) Tonnes	Methane (CH <sub>4</sub> ) Tonnes	Nitrous oxide (N <sub>2</sub> O) Tonnes	Emissions, Tonnes (in CO <sub>2</sub> e)	Flare Volume (m <sup>3</sup> )	Carbon dioxide (CO <sub>2</sub> ) Tonnes	Methane (Tonnes)
NA								
NA								
NA								
<b>Total</b>								

### Petrinex ID Level Emissions

Please list all the conventional oil and gas (COG) facilities of the aggregate for which there was fuel (including zero volumes) reported in Petrinex. If any COG facility has more than one Petrinex site that reported fuel in Petrinex, please use one row for each Petrinex site indicating the same TIER Facility name and TIER Facility ID in the corresponding columns.

Petrinex Level Emissions						Reference Year 1							
TIER_FacilityName	TIER_FACILITYID	Petrinex ID (e.g., ABBT12345)	SFC Fuel Consumption Methodology	SFC CO <sub>2</sub> Emissions Methodology	SFC CH <sub>4</sub> , N <sub>2</sub> O Emissions Methodology	Flaring CO <sub>2</sub> , CH <sub>4</sub> Emissions Methodology	Flaring N <sub>2</sub> O Emissions Methodology	Petrinex SFC Fuel Volume (m <sup>3</sup> )	SFC Carbon dioxide (CO <sub>2</sub> ) Tonnes	SFC Methane (CH <sub>4</sub> ) Tonnes	SFC Nitrous oxide (N <sub>2</sub> O) Tonnes	SFC Emissions, Tonnes (in CO <sub>2</sub> e)	Petrinex Flare V

- Verification required
- Submission accepted to December 1

\* Updated September 26, 2023 to incorporate acid gas EF. The value of 2.5920 assumes acid gas volume = 0. The value would vary depending on the proportion of acid gas volume.

Petrinex SFC Fuel Volume (m <sup>3</sup> )	SFC Carbon dioxide (CO <sub>2</sub> ) Tonnes	SFC Methane (CH <sub>4</sub> ) Tonnes	SFC Nitrous oxide (N <sub>2</sub> O) Tonnes	SFC Emissions, Tonnes (in CO <sub>2</sub> e)	Petrinex Flare Volume (m <sup>3</sup> )	Flaring Carbon dioxide (CO <sub>2</sub> ) Tonnes	Flaring Methane (CH <sub>4</sub> ) Tonnes	Flaring Nitrous oxide (N <sub>2</sub> O) Tonnes	Flaring Emissions, Tonnes (in CO <sub>2</sub> e)
1,000	2.3300	0.0064	0.000060	2.5251	1,000	2.2800	0.01083	0.000033	2.5920*

Director's Default EFs in tonnes CO<sub>2</sub>e per e<sup>3</sup>m<sup>3</sup> fuel or flare volumes



# Benchmark Unit tab of the Form

## Section B: Aggregate Facility Benchmark Unit

### Option 1 – Benchmark Unit from Predetermined Options

#### Predetermined Petrinex Production Accounting Units

If applying for a Benchmark Unit from Option 1, select the preferred benchmark unit from the predetermined options listed below. Please refer to Section 9.1.2 of the Standard for Developing Benchmarks for details about the predetermined benchmark units.

Options	Activity ID	Activity Unit	Year(s)	Production Accounting to TRE Correlation ( $r_{AQ2}$ )	Production Accounting to SFC Correlation ( $r_{AQ2\_SFC}$ )	Production Accounting to Flaring Correlation ( $r_{AQ2\_F}$ )
Production	PROD, PROC, FRAC	m3 OE	NA			
			NA			
			NA			
			All			

Note: Correlation coefficients of production accounting to total regulated emissions will be the primary metric for review. However, if flaring emissions do not have a significant correlation with production accounting, flaring emissions may be excluded from the correlation assessment, i.e., production accounting to SFC emissions would become the primary metric.



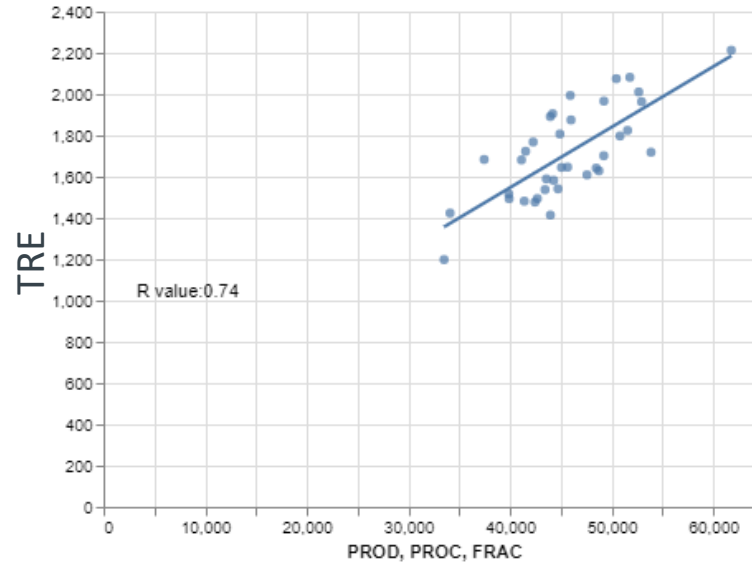
# Selecting a Benchmark Unit

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- Option 1 - Utilizing one of the following benchmark units:
  - production (PROD, PROC, FRAC)
  - disposition (DISP) or
  - receipts (REC)of specified energy products, expressed in m<sup>3</sup> oil equivalent volumes.
- Option 2 – Utilizing an alternative benchmark unit derived from any other Petrinex activity category using a single or multi-products. Multi-variable linear regression would be used in the latter case.

# An example scatter plot of emissions against prod

- TIER Standard for Developing Benchmarks (Section 9)
- Alberta GHG Quantification Methodologies (Chapter 15)



An example of a fair/good benchmark unit

# Benchmark Unit Assessment

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- Correlation coefficient to evaluate the representativeness of a benchmark unit:

$$r_{Agg} = \frac{\sum_{i=1}^{12k} (P_{Agg_i} - \bar{P}_{Agg}) \times (CO_{2_i} - \overline{CO_2})}{\sqrt{\sum_{i=1}^{12k} (P_{Agg_i} - \bar{P}_{Agg})^2} \times \sqrt{\sum_{i=1}^{12k} (CO_{2_i} - \overline{CO_2})^2}}$$

$P_{Agg_i}$  - aggregate's production based on the selected unit in month "i"

$\bar{P}_{Agg}$  - aggregate's average monthly production over 12 x k months period

k – number of reference years

$CO_{2_i}$  - aggregate's emission in month "i"

$\overline{CO_2}$  - aggregate's average monthly emissions over 12 x k months period

- (check the function `correl()` in Excel, `corr()` in Python, `cor()` in R)

# 2023 Flaring Quantification Methodologies

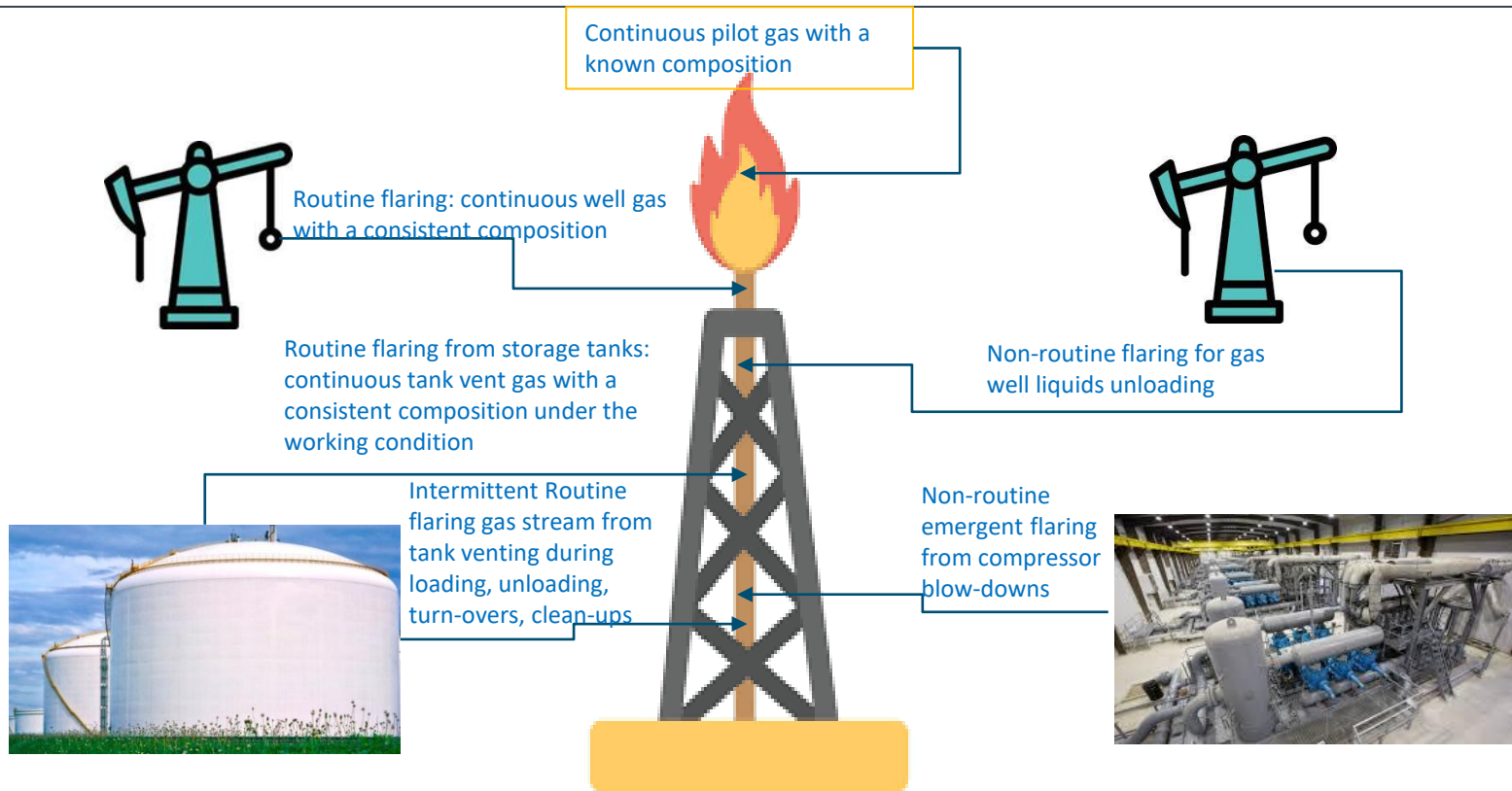


Figure: An Example of Multiple Flaring Streams

# Method 15-11: CO<sub>2</sub> and CH<sub>4</sub> with Default Emission Factors

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- Default EFs are provided based on pre-selected flaring gas compositions:
  - Sales gas
  - Rich gas
  - Acid gas
  - Non-Variable Gas (Methane, Ethane, Propane and Butane)
- Three default flaring efficiencies: Unassisted, Assisted and Incinerator
- Works for multiple flare gas streams

## Method 15-12: CO<sub>2</sub> and CH<sub>4</sub> emission with flaring gas analysis

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- Meet the minimum required volume - measured 60% of total flare gas by volume
- Works for multiple flare streams: measured or unmeasured; constant or variable compositions
- Sampling frequency: quarterly samples in the compliance year for all measured gas
- Three default flaring efficiencies only
- Non-measured flare gas
- Use sales gas EF if no samples in the benchmark years for 2023 benchmarking

# Method 15-13: Flaring N<sub>2</sub>O emissions

Default N<sub>2</sub>O emission factors are assumed to be independent of the flare combustion efficiencies and dependent on flare gas type. N<sub>2</sub>O Emissions factors are provided in the Table 15-9 and applicable to all flaring types including incinerators, oxidizers, or other external combustion units (e.g. enclosed combustors). N<sub>2</sub>O EFs are in gaseous condition and volume used should be in standard condition.

**TABLE 15-9: DEFAULT N<sub>2</sub>O EMISSION FACTORS FOR DIFFERENT FLARE GAS TYPES**

Flare Gas Type	N <sub>2</sub> O	
	(g/m <sup>3</sup> )	(g/MJ)
Hydrocarbon gas (sales gas and rich gas) <sup>1</sup>	0.033	0.00087
100% Ethane (C <sub>2</sub> ) <sup>2</sup>	0.033	0.00050
100% Propane (C <sub>3</sub> ) <sup>2</sup>	0.033	0.00035
100% Butane (C <sub>4</sub> ) <sup>2</sup>	0.033	0.00027
Other Flare gas (not covered above) <sup>3</sup>	0.0066	-

# Contact the Department

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Conventional Oil and Gas  
Climate Regulation and Carbon Markets  
Alberta Environment and Protected Areas

**TIER Conventional Oil and Gas Website:** <https://www.alberta.ca/conventional-oil-and-gas.aspx>

- Email: [AEP.GHG@gov.ab.ca](mailto:AEP.GHG@gov.ab.ca)
- Request an in-person meeting at 3535 Research Road N. W., Calgary
- Request an MS Teams meeting



# Questions