

Carbon Competitiveness Incentive Regulation

Benchmarks For Natural Gas Plants

December 2018

Government Of Alberta
Industry Sector Standards

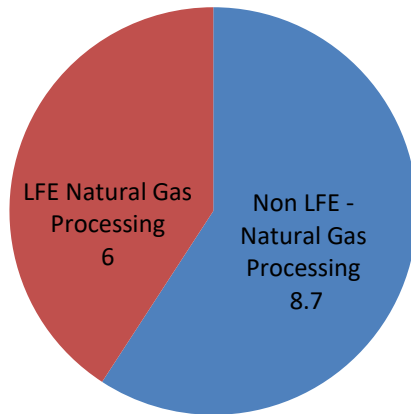
Overview

- Background and Sector overview
- Benchmarking Data Collection
- Benchmarking Results
- Economic Analysis
- Final Gas Plants Benchmarks

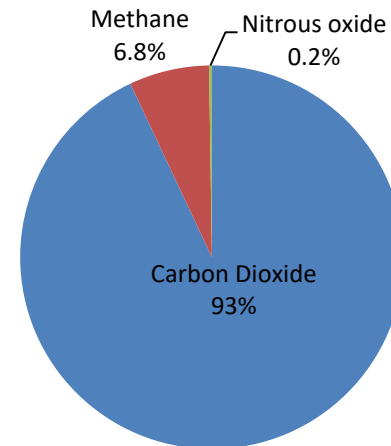
Sector Overview

- Majority of facilities are not large final emitters (LFEs).
- 33 out of about 500 natural gas processors are LFEs and subject to carbon pricing (~25% of production).
- LFE facilities employ about 1400 people.
- Natural Gas Processing sub-sector emitted 14.7 MT CO₂e in 2015
- Natural Gas LFE's emits approx. 6 MT of CO₂e per year (4.4 % of LFE emissions)

Natural Gas Processing Sub-Sector Emissions (in Mt CO₂e)



Natural Gas Processing Greenhouse Gas Emissions - by Gas Type



Background

- Up until the end of 2017, facilities were regulated under the Specified Gas Emitters Regulation.
 - Subject to facility-specific reduction targets.
- The CCIR came into effect on January 1, 2018.
 - Due to data constraints, interim facility-specific benchmarks were assigned until sector-based benchmarks could be developed.
- Alberta Climate Change Office (ACCO) collected data from industry throughout 2018, and developed sector-based benchmarks using a modular approach.
 - The new benchmarks were implemented in November 2018.

Background

- Natural gas processing facilities not covered under the CCIR are temporarily exempt from the Carbon Levy Regulation.
 - A significant number of natural gas facilities with emissions below the CCIR threshold of 100,000 tonnes of CO₂e are expected to opt in to the CCIR when the carbon levy exemption ceases in 2023.
- There are no direct comparisons to a sector-based emissions intensity benchmark for natural gas processing in other Canadian jurisdictions.
 - In the European Union, facilities receive a fuel/heat facility-specific approach.
 - California has a single benchmark for conventional oil and gas, and one for natural gas liquids; however, there is no differentiation for complexity, as there is less variance among facilities.

Stakeholder Engagement

- ACCO regularly consulted with the industry on both the facility level and through the sector's professional associations including CAPP (Canadian Association of Petroleum Producers)
 - CCIR engagement process in 2016/17.
 - December 2017 - webinar introducing the CCIR to the oil and gas sector General
 - February 2018 - gas plant-specific webinar, discussing interim benchmarks
 - October 2018 – Meeting with CAPP on new benchmarks for gas plants
 - Various facility based individual meetings and conference calls throughout 2018
 - November 2018 – Sector wide webinar on introduction of new benchmarks for gas plants

Benchmarking Data Collection

Benchmarking Modules

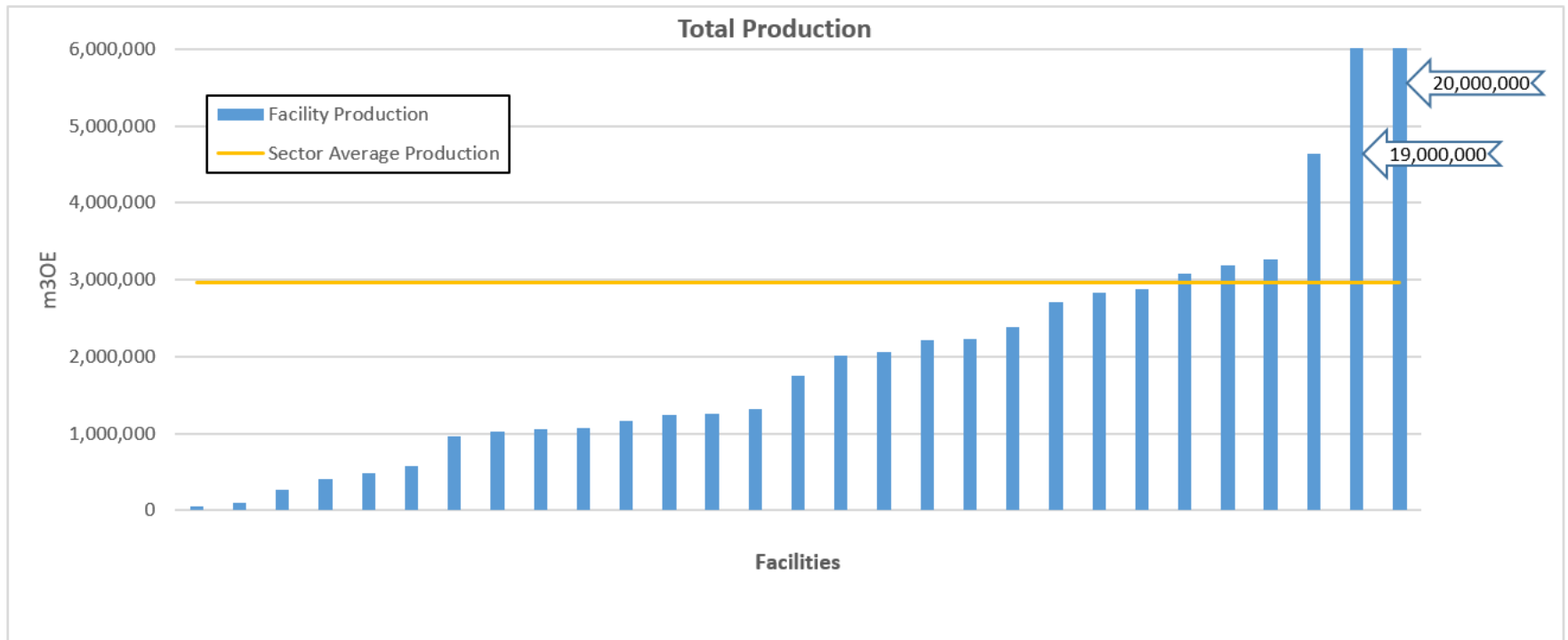
Modules
Inlet Compression
Dehydration
Amine Sweetening
Total Refrigeration
Fractionation
Stabilization
Sales Compression
Sulphur Plant
Acid Gas Injection
Ethane Extraction
Cavern Storage
CO2 Plant
Flaring, Venting, Fugitives, Other
Formation CO2
Co/Power Generation

- 29 LFE Gas Processing facilities voluntarily participated in the benchmarking exercise
- 15 Different modules were identified within Gas Processing facilities and production/emission data was collected for each.
- 13 modules are specific to an individual process
- 2 modules (*Formation CO2* and *Flaring, Venting, Fugitives, Other*) are general plant wide modules.
- Benchmarks have been calculated for 13 modules with the exception of *Co/Power Generation* (already exists as 0.37 tCO2e/MWh) and *Cavern Storage* (not enough facilities with this module to establish a benchmark).

Distribution of Modules

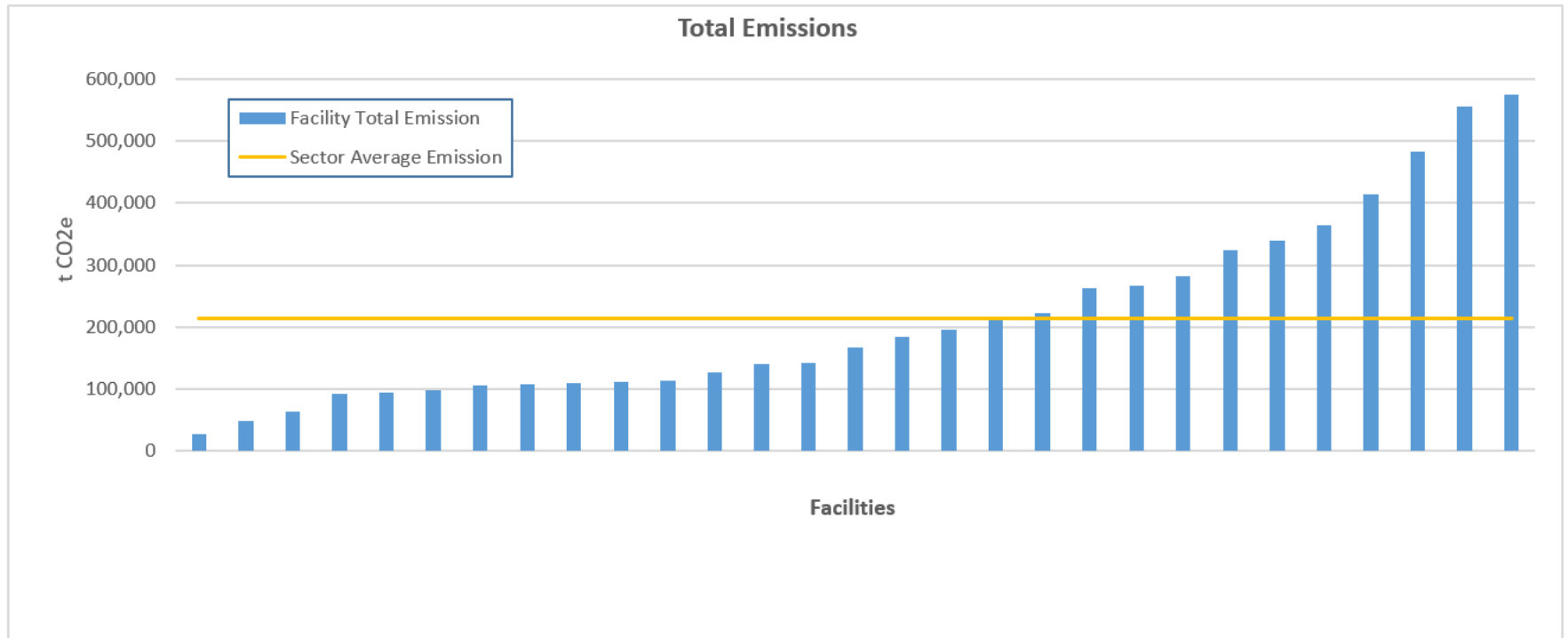
	Inlet Compression	Dehydration	Amine Sweetening	Total Refrigeration	Fractionation	Stabilization	Sales Compression	Co/Power Generation	Sulphur Plant	Acid Gas Injection	Ethane Extraction	Cavern Storage	CO2 Plant	Flaring, Venting, Fugitives	Formation CO2
Facility 1	•	•	•	•			•			•				•	•
Facility 2	•	•	•	•		•	•	•		•				•	•
Facility 3	•	•	•	•		•	•	•		•				•	
Facility 4	•	•	•	•	•	•	•	•	•				•	•	•
Facility 5	•	•	•	•		•	•		•					•	•
Facility 6	•	•												•	
Facility 7	•	•	•	•			•							•	•
Facility 8	•	•	•	•		•	•		•	•				•	•
Facility 9	•	•		•		•	•							•	
Facility 10					•									•	
Facility 11							•				•			•	•
Facility 12	•	•	•	•	•	•				•				•	•
Facility 13	•	•	•	•	•	•			•					•	•
Facility 14	•	•	•	•	•	•	•	•	•				•	•	•
Facility 15	•	•	•	•		•	•		•					•	•
Facility 16	•	•	•	•	•	•			•					•	•
Facility 17	•	•	•	•		•	•	•						•	•
Facility 18	•	•		•		•	•	•						•	•
Facility 19		•		•			•							•	•
Facility 20	•	•		•		•	•							•	•
Facility 21					•		•				•			•	•
Facility 22			•		•							•		•	
Facility 23	•	•	•	•		•		•	•					•	•
Facility 24		•	•	•		•	•		•					•	•
Facility 25	•	•	•	•	•	•	•		•					•	•
Facility 26	•	•				•		•						•	•
Facility 27		•	•	•		•			•					•	•
Facility 28	•	•	•	•	•	•	•		•					•	•
Facility 29		•	•	•	•	•	•		•					•	•

Facilities Production



Note: Cubic meter of oil equivalent (m3OE) is a unit of energy based on the approximate energy released by burning one m3 of crude oil. It is used as a way of combining production/throughput into a single measure.

Total Emissions per Facility

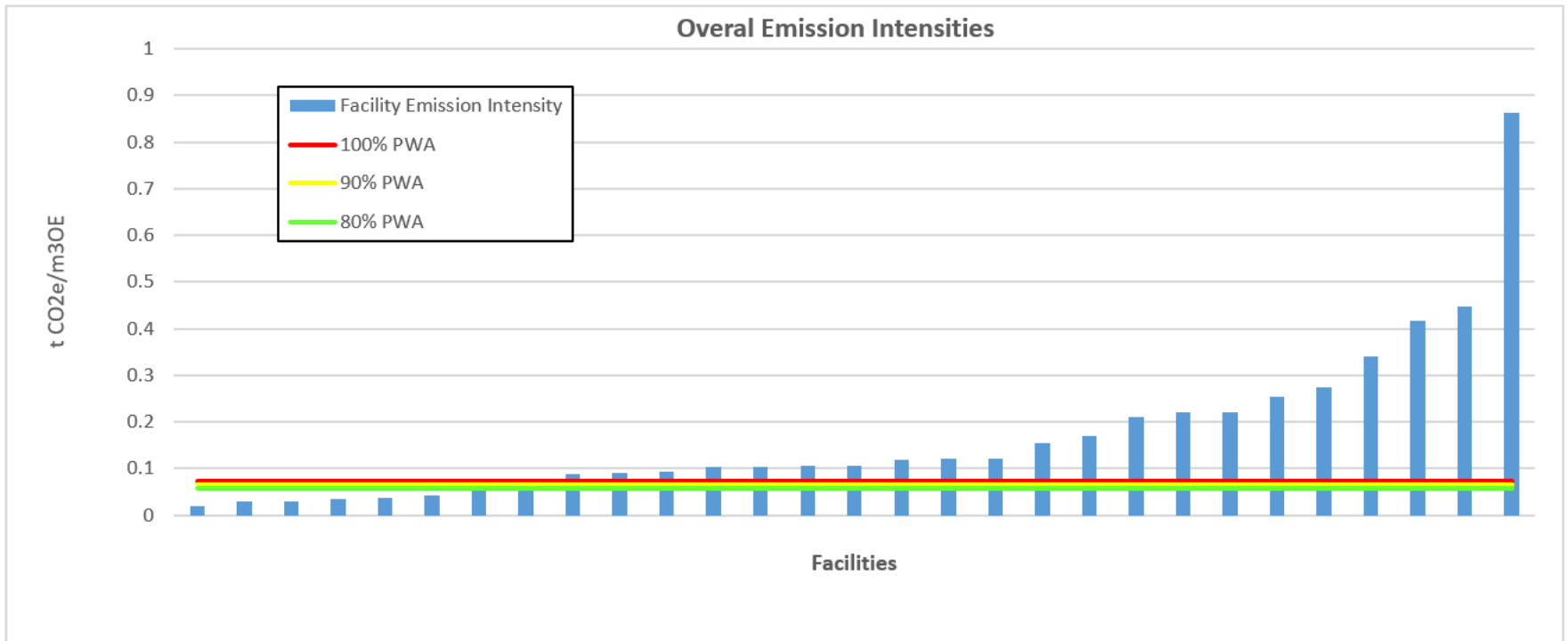


Note: Total emissions above include indirect emissions.

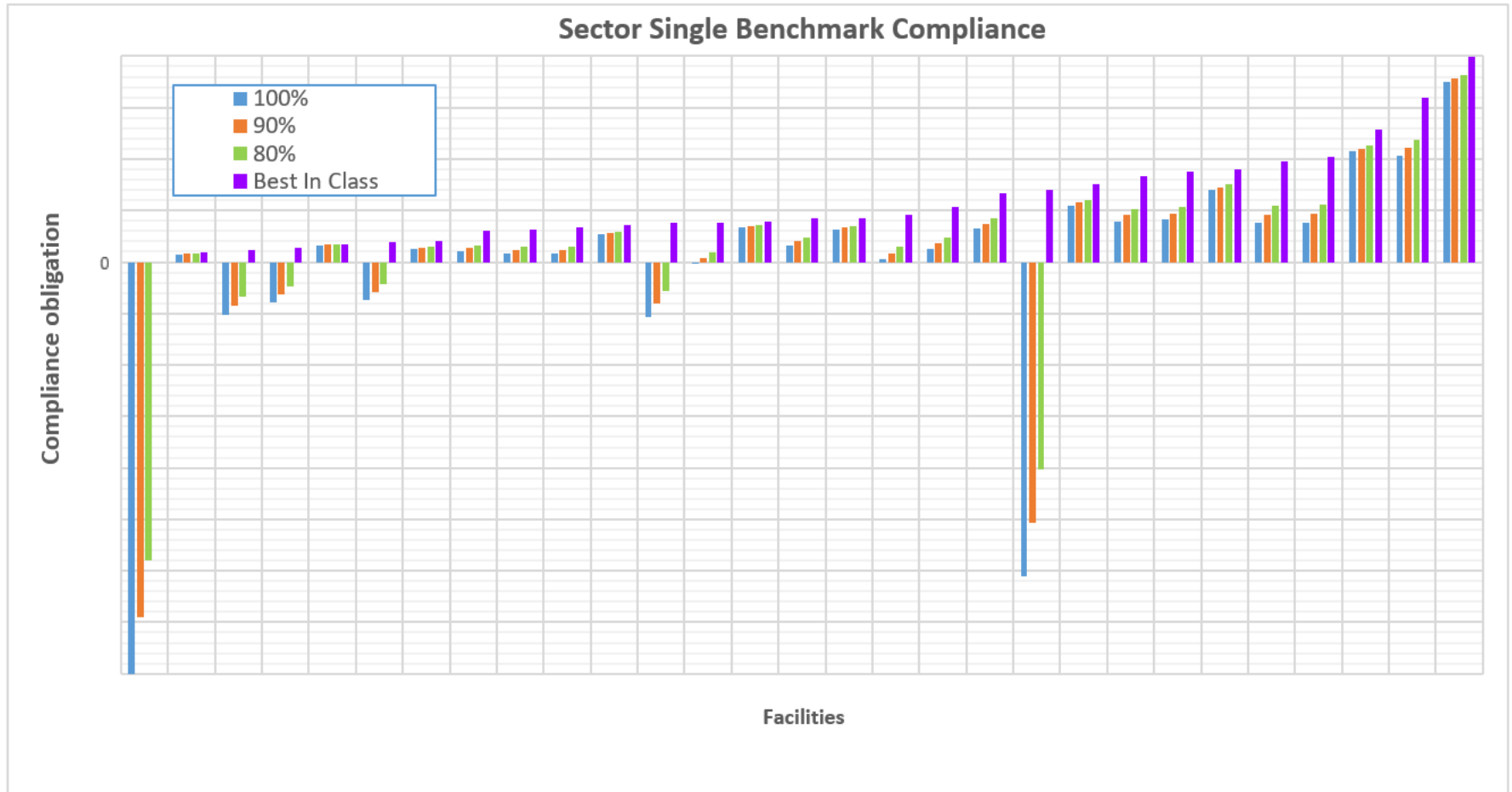
Benchmarking Results

Sector Single Benchmark

Facility Based Emission Intensities



Single Benchmark Compliance Overview

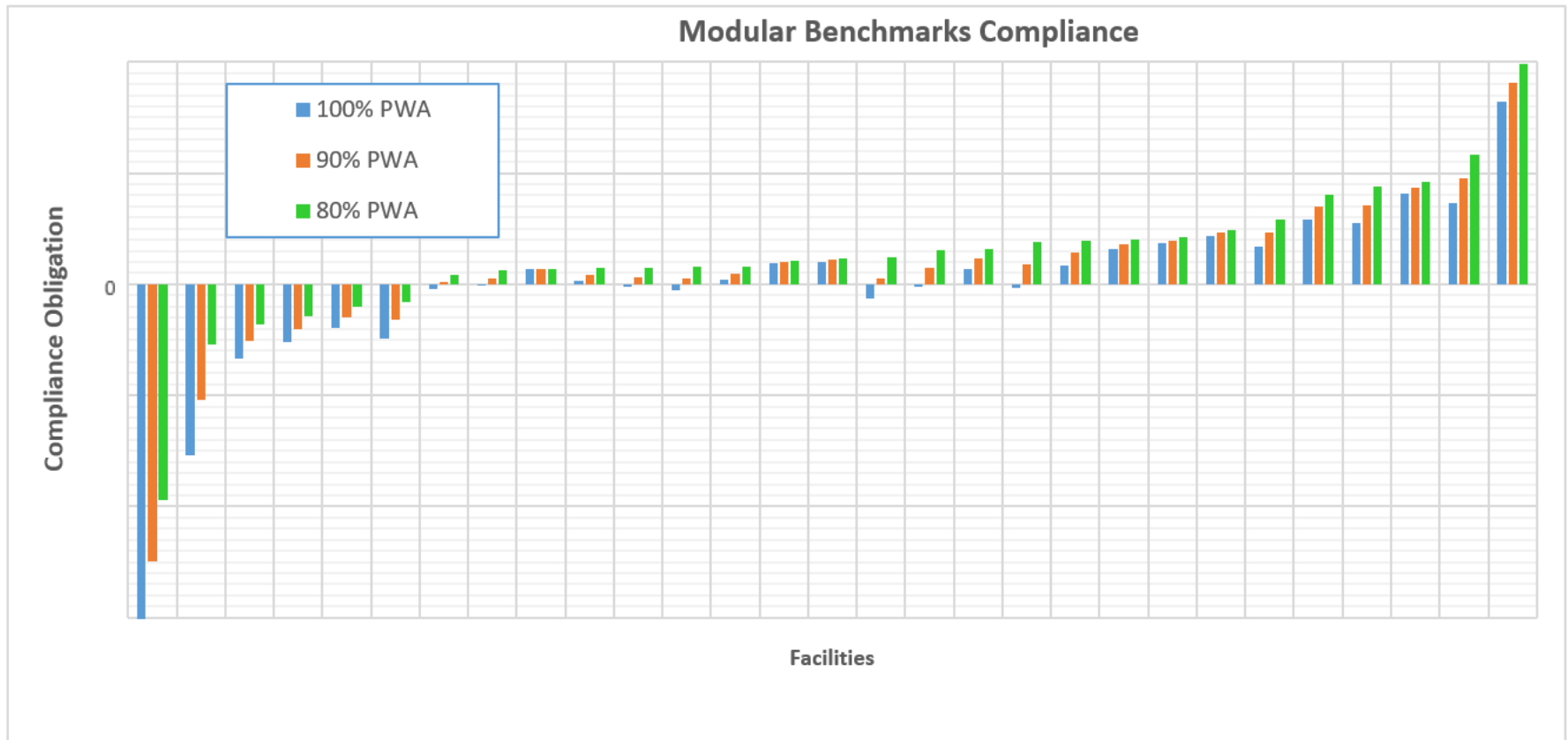


NOTE: No Transition Allocation was accounted for.

Benchmarking Results

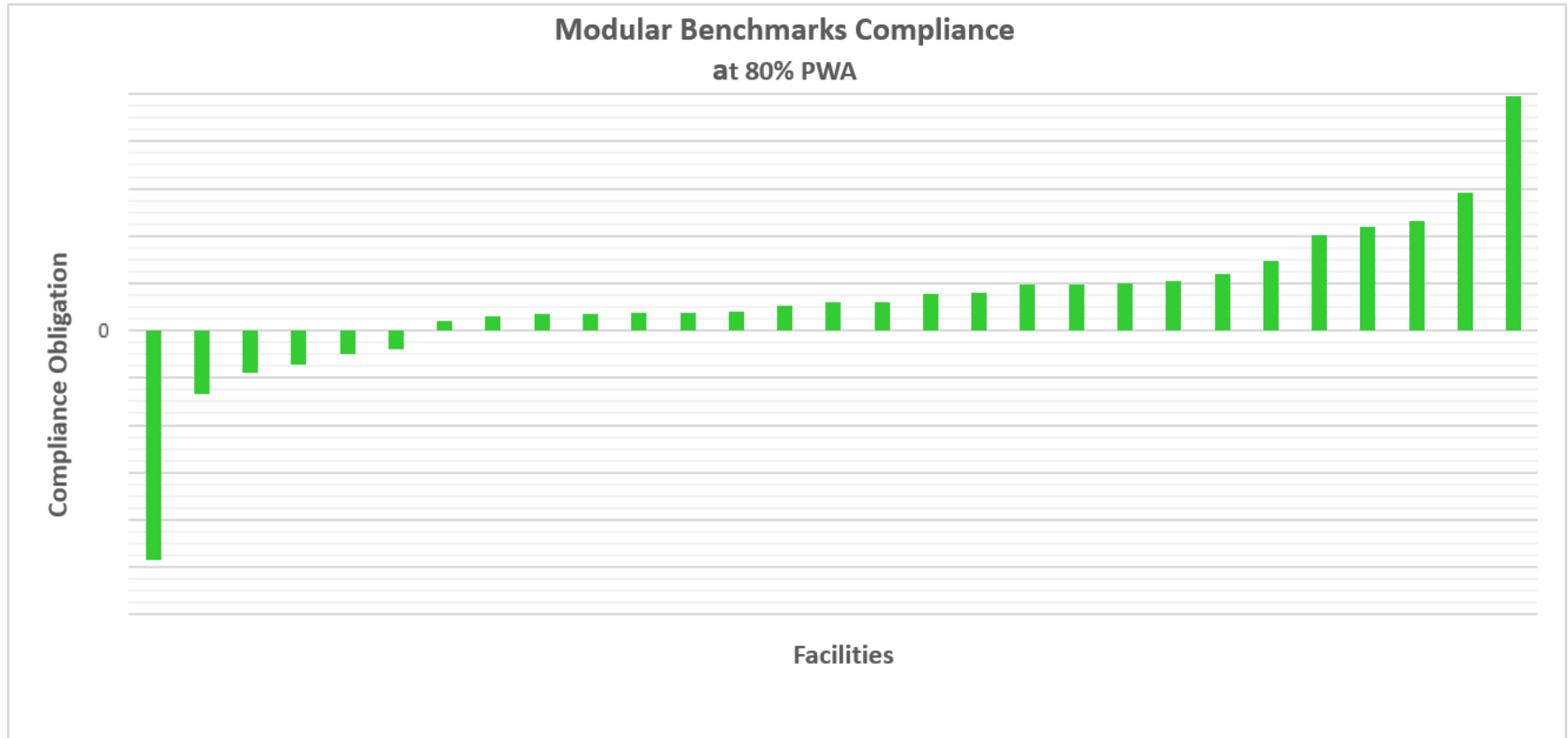
Modular Benchmarks

Modular Benchmarks Compliance Overview

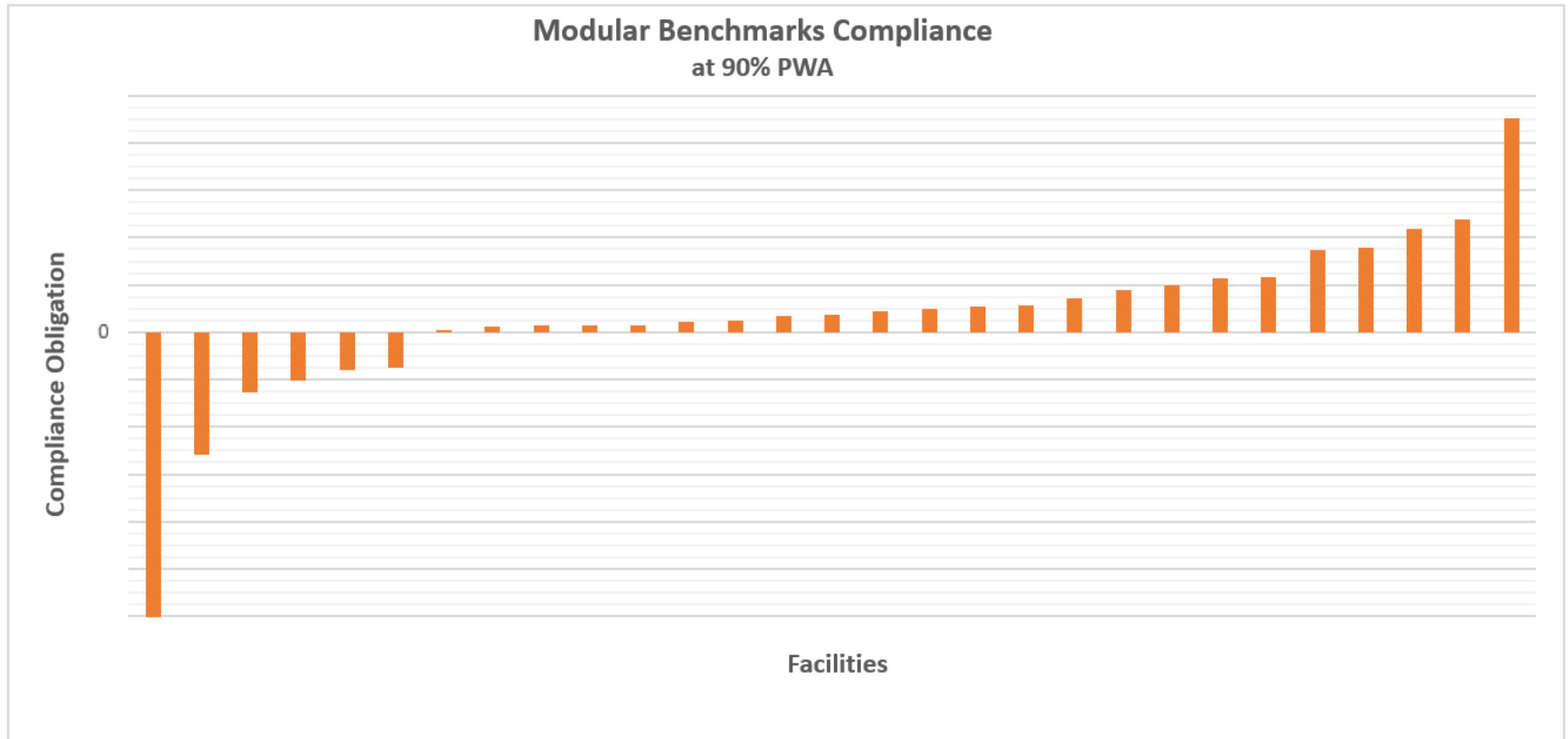


NOTE: No Transition Allocation was accounted for.

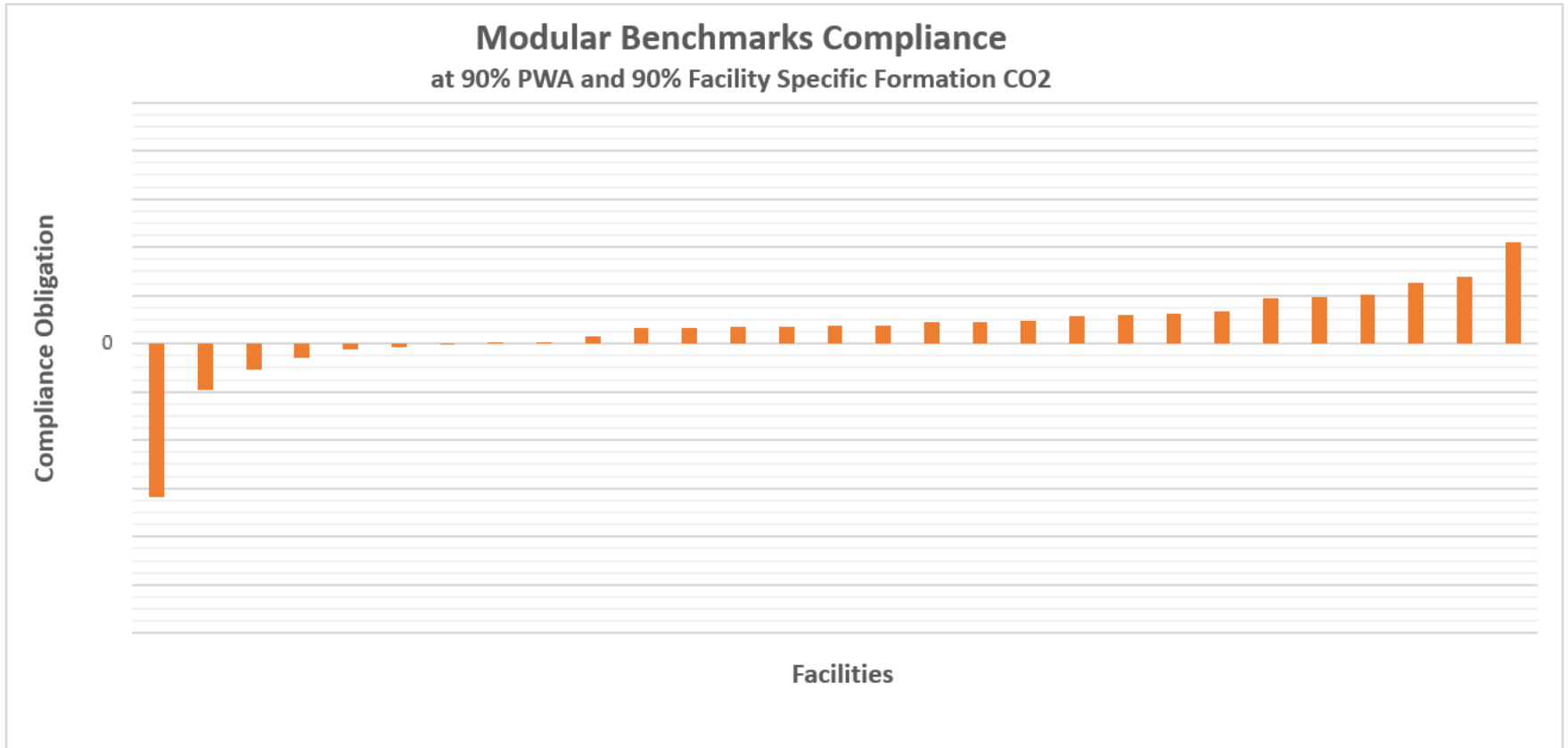
Modular Benchmarks Compliance Overview



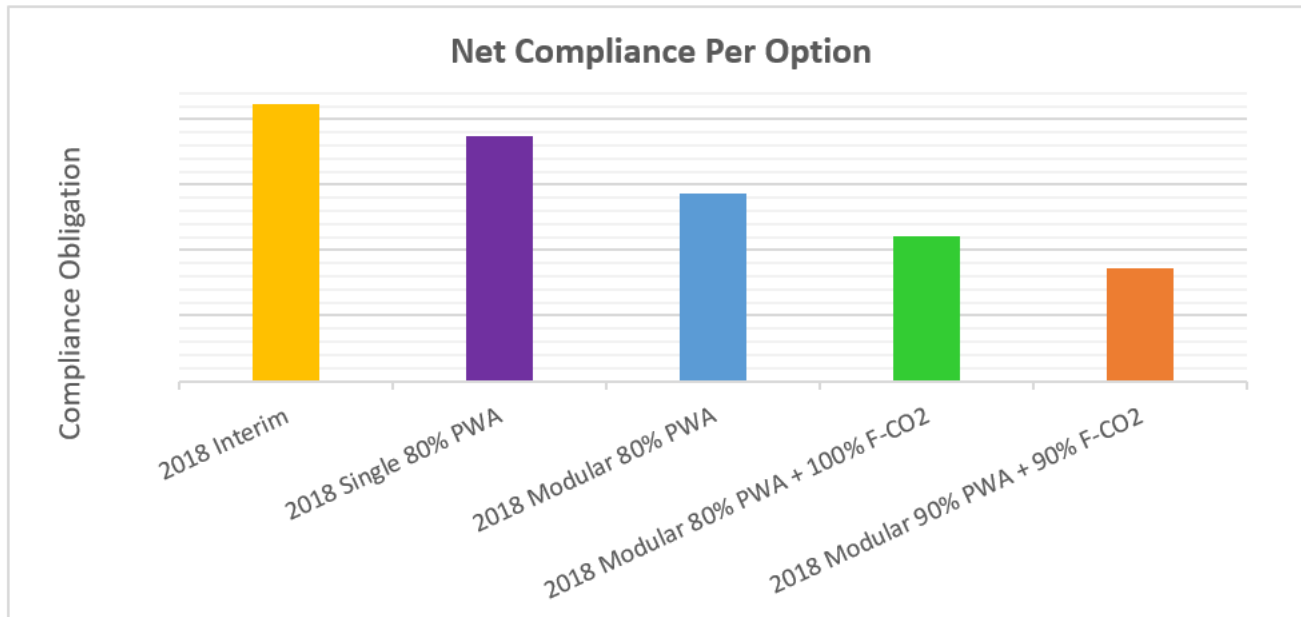
Modular Benchmarks Compliance Overview



Modular Benchmarks Compliance Overview



Compliance Cost Overview



NOTE: No Transition Allocation was accounted for.

Final Gas Plants Benchmarks

Natural Gas Processing Benchmarks

Benchmarks Type: **Modular , 90% PWA, 90% Facility Historic Based formation CO2**

Natural Gas Processing Benchmark Factors								
Module		Inlet Compression	Dehydration	Amine Sweetening	Total Refrigeration	Fractionation	Stabilization	Sales Compression
Units		Tonnes CO2e/e3m3	Tonnes CO2e/e3m3	Tonnes CO2e/e3m3	Tonnes CO2e/e3m3	Tonnes CO2e/m3OE	Tonnes CO2e/m3OE	Tonnes CO2e/e3m3
Weighting Factors (Average Module Intensities)	100% PWA	0.0330	0.0025	0.0304	0.0183	0.0414	0.0554	0.0214
Effective Average Module Intensities	90% PWA	0.0297	0.0022	0.0274	0.0165	0.0373	0.0498	0.0192

Module		Sulphur Plant	Acid Gas Injection	Ethane Extraction	CO2 Plant	Flaring, Venting, Fugitives	Formation CO2
Units		Tonnes CO2e/tonnes sulphur	Tonnes CO2e/e3m3 acid gas	Tonnes CO2e/m3OE	Tonnes CO2e/e3m3 CO2	Tonnes CO2e/m3OE	Tonnes CO2e/m3OE
Weighting Factors (Average Module Intensities)	100% PWA	0.4249	0.3960	0.1251	0.1881	0.0045	N / A
Effective Average Module Intensities	90% PWA	0.3824	0.3564	0.1126	0.1693	0.0040	90% Facility Historically Based

Note: PWA - Poduction Weighted Average

Alberta Gas Processing Index (ABGPI)

- ABGPI is the sum of the products of the individual module weighting factors with the facility's corresponding throughput or production for each module:

$$\text{ABGPI} = \Sigma(w_i * p_i) \quad [\text{tCO}_2\text{e}]$$

where

w_i – weighting factor for module i

p_i – production/throughput for module i

- Natural Gas Processing benchmark is determined as:

$$B = 0.9 \frac{\text{tonnes CO}_2\text{e}}{\text{ABGPI}}$$

- Formation CO₂ emissions are allocated on a facility-specific basis separately from the ABGPI.
- The methodology for quantification of the ABGPI will be provided in the Quantification Methodologies for the CCIR and the Specified Gas Reporting Program.

End Of The Presentations