LNG Updates Under Consideration for 2019 GHGI

EPA Workshop

October 17, 2018

OVERVIEW

- Current GHGI Methodology
- Available GHGRP Subpart W Data
- National Activity Data Sources
- National Emissions Estimates
- Stakeholder Feedback Topics

CURRENT GHGI METHODOLOGY

- Storage station counts based on EIA publication
  - Not updated after year 2003
  - Satellite storage stations (no liquefaction) are assumed to have 1/3 equipment of complete storage stations
- Terminal counts based on FERC data
  - Import terminals are assumed to have 2/3 equipment of complete storage stations
  - Export terminals have only recently been constructed and are not considered in the current GHGI methodology
- CH_4 EFs are based on the 1996 GRI/EPA study data for underground natural gas storage and transmission compressor stations
  - EFs include station fugitives, reciprocating and centrifugal compressor vented and leak emissions, compressor exhaust, and station venting (i.e., blowdowns)
  - An assumed ratio of CO_2-to-CH_4 gas content is used to calculate CO_2 EFs

Available GHGRP Data

- LNG storage stations and terminals have been reporting to GHGRP since 2011
- Facilities are not defined by sub-segment as in the current GHGI (e.g., satellite vs. complete storage facility)
- Reporting requirements changed in RY2015
  - All flare emissions are reported RY2015 forward (included prior to RY2015 only if associated with compression)
  - Therefore EPA has generally focused analysis on RY2015-2016 data for consistency
- Of ~95 storage stations, 8 facilities reported to GHGRP during 2011-2016
- Of ~12 terminals, 9 facilities reported to GHGRP during 2011-2016
- For both segments, key observations in reported data include:
  - Total reported segment emissions are dominated by a few facilities
  - Several facilities report zero total emissions under subpart W, but report combustion emissions under subpart C

LNG Storage: Subpart W Emissions Data

GHGRP Reported Emission Sources and Totals

Emission Source	CO_2 (mt)		CH_4 (mt)	
	2015	2016	2015	2016
Equipment Leaks	1	0	59	112
Flare Stacks	259	2,507	2	18
Reciprocating Compressors	0.2	1	8	23
Total	**260**	**2,507**	**70**	**152**

Facility-Level Emission Factor Comparison

Data Source	EF (mt/facility)	
	CO_2	CH_4
Current GHGI	34	1,006
Subpart W RY2015-2016	213	17

- Note, this preliminary analysis considers all station types combined—EPA seeks stakeholder feedback on whether it is appropriate and supported by available data to define station sub-types

LNG Terminals: Subpart W Emissions Data

GHGRP Reported Emission Sources and Totals

Emission Source	CO_2 (mt)		CH_4 (mt)	
	2015	2016	2015	2016
Blowdowns	1	811	53	18,045
Centrifugal Compressors	0	0	570	1
Equipment Leaks	0	0	27	40
Flare Stacks	77,420	97,940	268	339
Reciprocating Compressors	17	1	534	48
Total	**77,455**	**98,753**	**1,451**	**18,472**

Facility-Level Emission Factor Comparison

Data Source	EF (mt/facility)	
	CO_2	CH_4
Current GHGI	38	1,098
Subpart W RY2015-2016	13,554	1,533

- Note, this preliminary analysis considers all terminal types combined—EPA seeks stakeholder feedback on whether it is appropriate and supported by available data to define terminal sub-types

Compressor Exhaust & LNG Storage Blowdown Emissions

- For compressor exhaust CH_4, EPA is considering implementing a similar approach as used in other recent natural gas systems updates
  - Develop per-station activity factors of MMhp-hr from engines and turbines, from GHGRP
  - Pair with existing GHGI EFs, specific to natural gas industry engines and turbines (rather than subpart C generic combustion EFs)
- LNG storage blowdown emissions are not required to be reported under GHGRP; therefore, EPA seeks stakeholder feedback on an approach for estimating such emissions (e.g., use current GHGI EFs or terminal GHGRP data as surrogate)

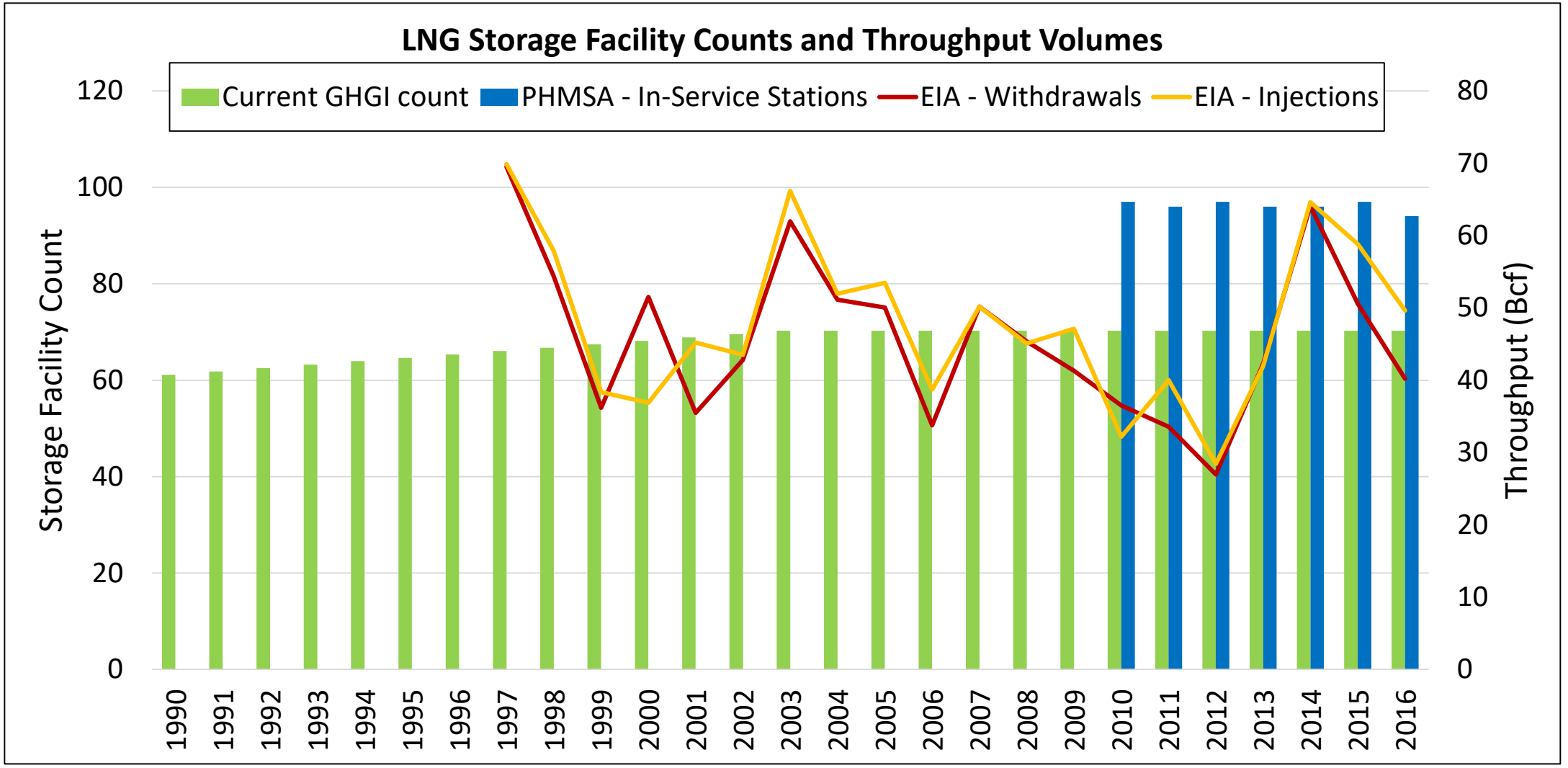
Alternative Throughput-Based Approach

- EPA considered an alternative to the current approach, in which national emissions might be estimated using throughput-based EFs and activity (e.g., withdrawals, import/export volumes in lieu of station counts)
- EPA did not identify a discernable trend between subpart W emissions, activity, station type, and subpart C emissions (as a surrogate to reflect compressor utilization)
  - For example, the storage reporter with the second-highest subpart W CH_4 emissions is the second-smallest station in terms of capacity, had the lowest withdrawal volume, and is a satellite station (which generally have less equipment than a peak shaving station)
  - The highest reported subpart W emissions from a terminal are not from the most active terminal
- A throughput-based approach was not further considered in the current analysis
  - However EPA seeks stakeholder feedback on this topic, and later slides illustrate throughput and facility counts over time, for consideration

LNG Storage: National Activity Data

- National LNG storage database maintained by PHMSA provides in-service station counts and storage capacity from year 2010 forward
  - In 2016, PHMSA identified 94 storage stations
  - Includes classification of station type—peak shaving, satellite, base load, mobile/temporary, or "other" (not included in GHGRP reporting)
- Historical system injections and withdrawals (from 1997 through 2016) are available from EIA; station counts are not reported in this source
- EPA is considering supplementing the current GHGI activity (which relies on point estimates specific to years 1993 and 2003) with PHMSA station counts to increase accuracy of recent year estimates
  - For this approach, EPA could apply linear interpolation from the current year 2003 counts to the year 2010 PHMSA counts and use PHMSA data going forward
- EPA also seeks feedback on whether the national total station count should take into account stations with less complexity, for example counting satellite stations as a fraction of a peak shaving facility, similar to the current GHGI methodology

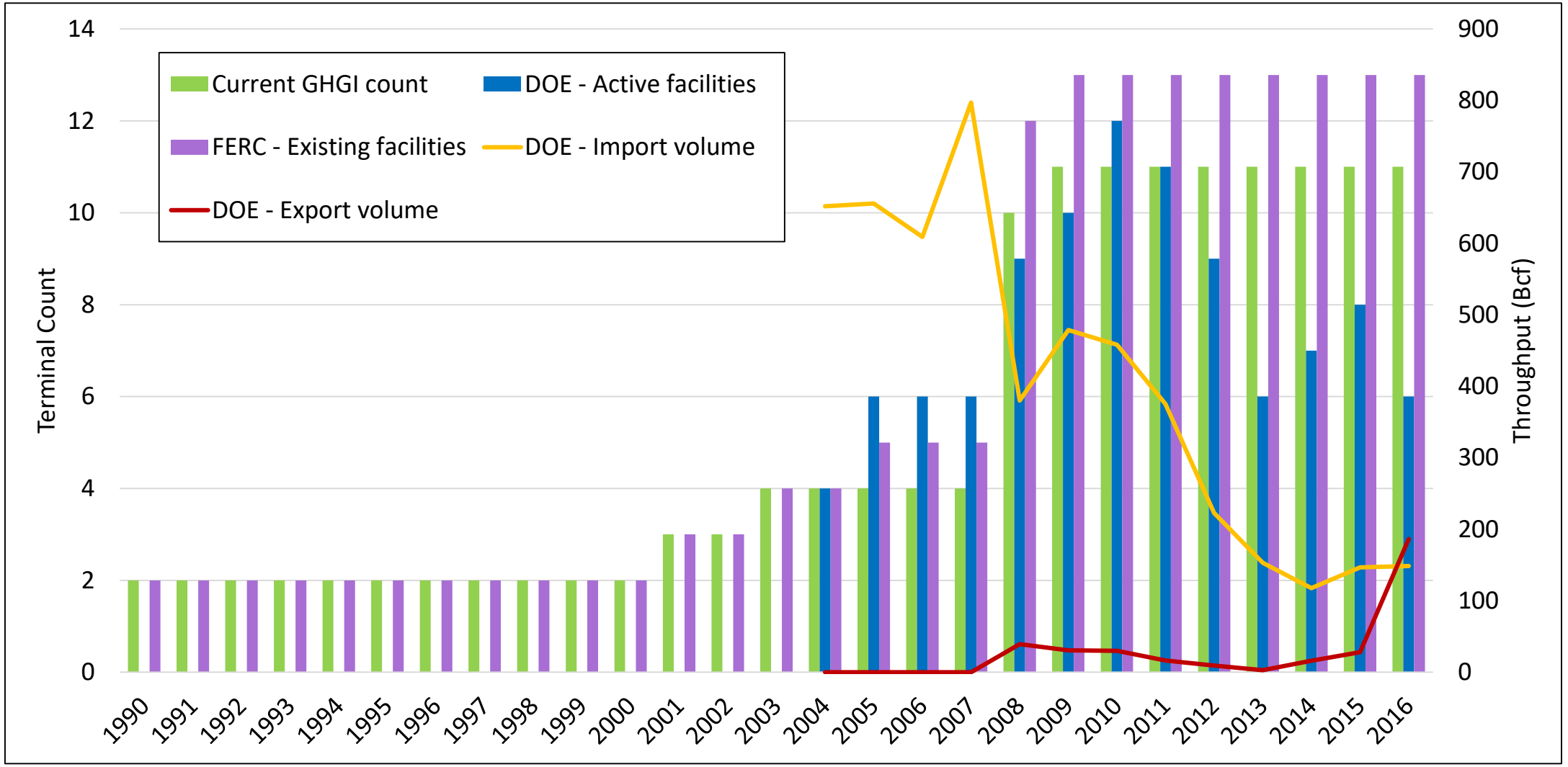
LNG Storage: Activity Trends



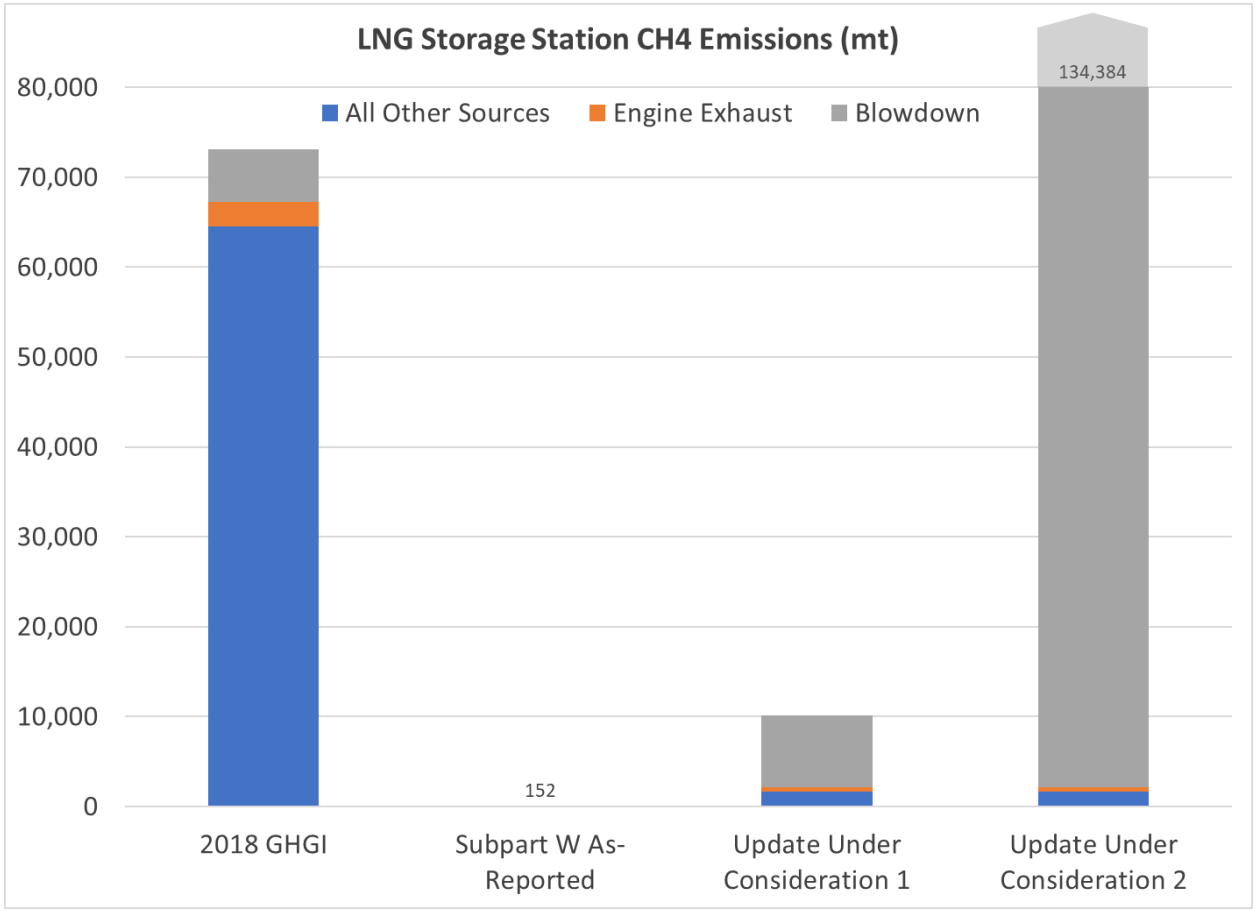
LNG Terminals: National Activity Data

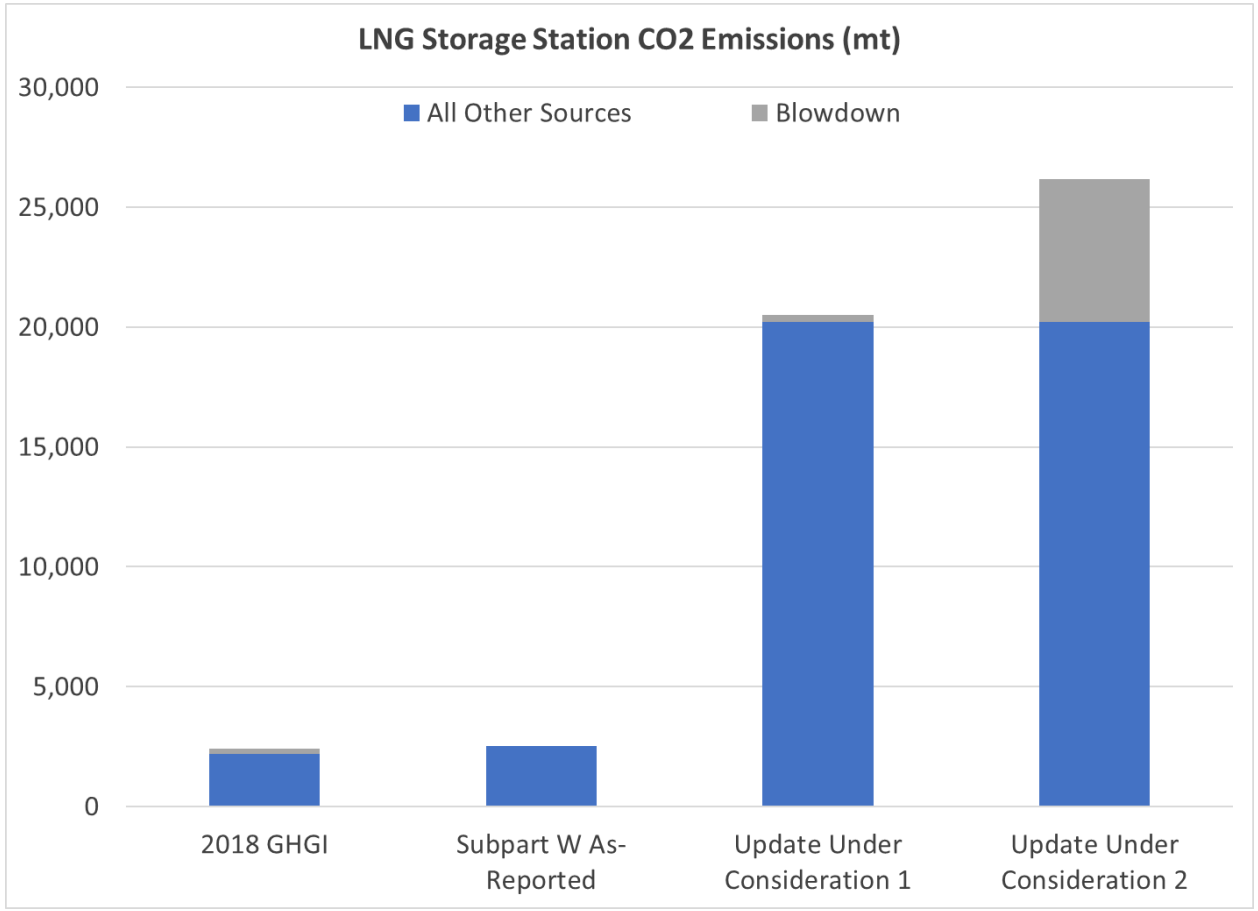
- The current GHGI data source for terminal counts, FERC, documents existing import and export facilities (including inactive facilities)
- DOE publishes annual estimates of terminal-specific import and export activity, available from year 2004 forward
- Based on available data, all existing terminals were active until 2008, after which there is a mix of active and inactive terminals
- EPA is considering whether it is most appropriate to use total *existing* terminal counts or only the *active* terminals counts in order to calculate national emissions over the time series

LNG Terminals: Activity Trends



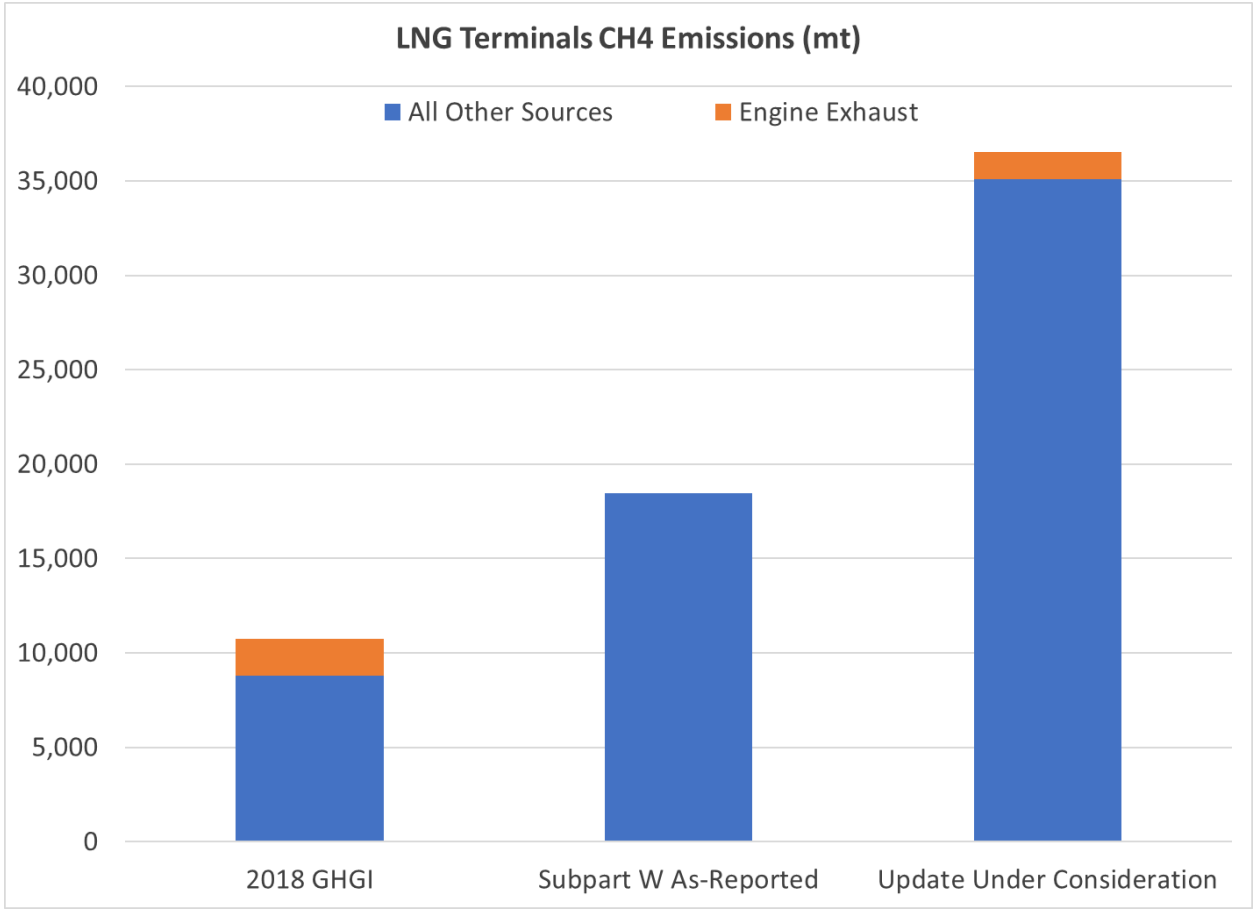
LNG Storage: National Emissions, Year 2016

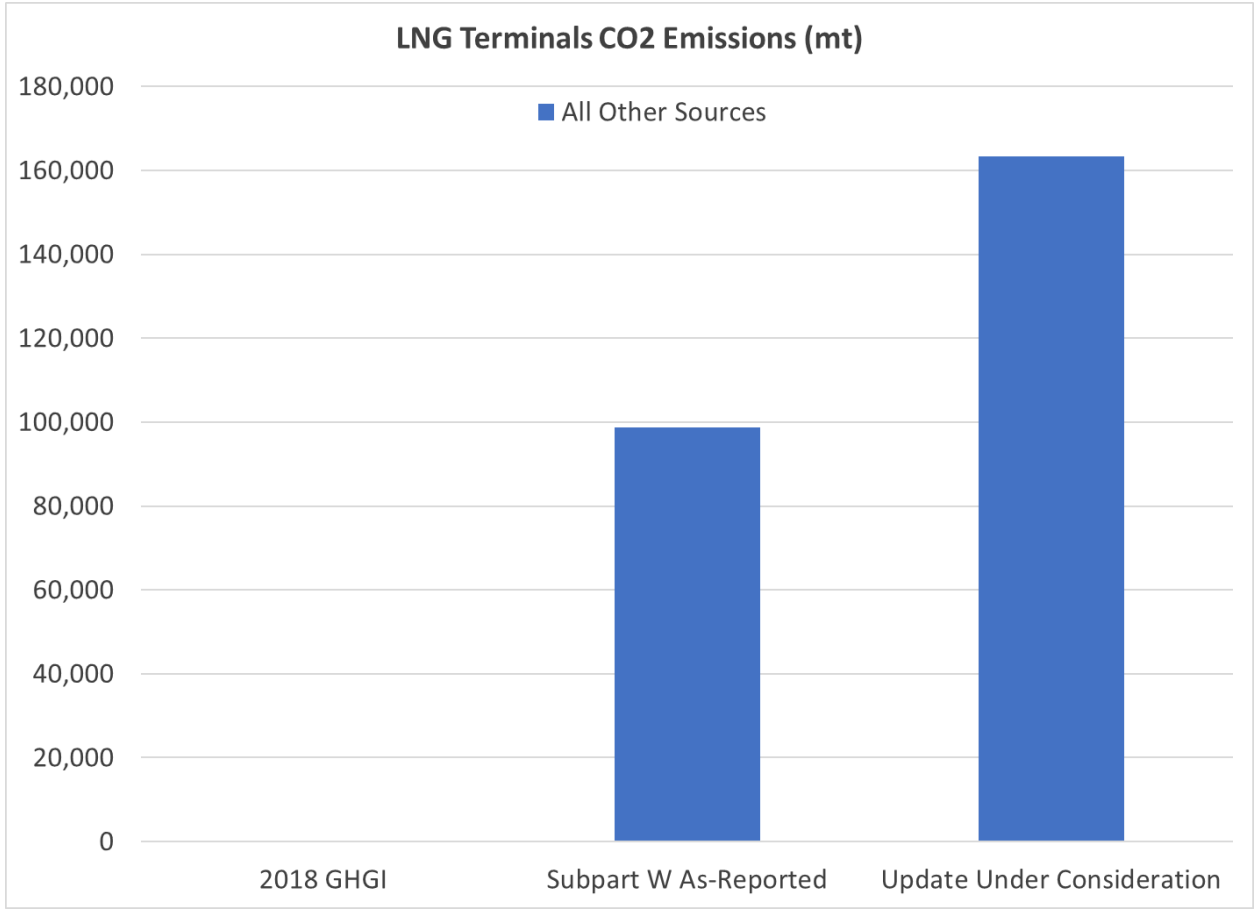




- For updates under consideration, count of in-service storage stations from PHMSA = 95 (versus 70 in current GHGI)
- Update #1: Blowdown EF and engine exhaust EF from current GHGI, paired with updated activity data
- Update #2: Blowdown EF from RY2015-2016 subpart W terminals data

LNG Terminals: National Emissions, Year 2016





- For update under consideration, count of total terminals from FERC = 12 (versus 8 in current GHGI)
- Update under consideration: Engine exhaust EF from current GHGI, paired with updated activity data

Stakeholder Feedback Topics

1. General incorporation of GHGRP data. For example, how should EPA use the RY2011 – RY2016 subpart W data to calculate EFs? Are emission source-specific EFs warranted, or is it appropriate for EPA to develop facility-level EFs using subpart W data due to the minimal emissions from LNG facilities?
2. Accounting for different facility types, both in terms of EF development and national activity. For LNG storage, subpart W did not show a clear relationship between station type and emissions (e.g., a satellite station had larger emissions than peak shaving stations). For LNG terminals, import and export facilities could be handled separately.

PHMSA LNG Storage Station Data, Year 2016

Sources	Station Count	Avg. Storage Capacity (Mcf)
Base Load	2	13,681
Mobile/Temporary	2	0
Other	2	511,221
Peak Shaving	68	1,114,808
Satellite	20	84,774
Total	**94**	**835,669**

Stakeholder Feedback Topics (Cont.)

3. Should EPA use the current GHGI EFs for early years of the time series (i.e., GRI data) or apply the subpart W EFs to all years of the time series?
4. Subpart W does not collect blowdown emissions data from LNG storage facilities. Should EPA apply the current GHGI EF for blowdowns, or use terminal blowdown data from GHGRP?
5. Should EPA consider an updated approach for estimating compressor exhaust emissions from LNG storage stations and terminals? For other segments in natural gas systems that have been recently revised to incorporate GHGRP or other recent data (gas processing, transmission, and distribution) EPA has retained parts of the existing GHGI methodology for this source (i.e., engine and turbine EFs in mt CH_4/MMHp-hr) instead of wholly incorporating GHGRP data.

Refer to EPA memo posted online for additional detail