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EPA Greenhouse Gas Reporting Rule Proposed Amendments to 40 CFR 98

On June 21, 2022 a second draft of the proposed amendments to 40 CFR 98 (Greenhouse Gas Reporting Rule) was published in the [Federal Register](#). These proposed amendments are in the public comment period through August 22, 2022.

These amendments are extensive and have significant impact for those who are Subpart W reporters.

We have written a short summary of some of the key items that you can [read here](#).

If you have any questions or would like to discuss these rules with us, please don't hesitate to contact us.

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Greenhouse Gas Reporting Rule 40 CFR Part 98 PROPOSED AMENDMENTS

Draft Published: [6/21/2022 in the Federal Register](#)

Public Comment Period: 6/21/2022 – 8/22/2022

Summary

On June 21st the EPA published a second draft of the proposed amendments to the Greenhouse Gas Reporting Rule that contained adjustments based on stakeholder feedback from the initial draft's public comment period. This new draft will also go through a 60-day public comment period. There is not currently a public hearing scheduled. If one is requested the hearing will be held on July 6, 2022.

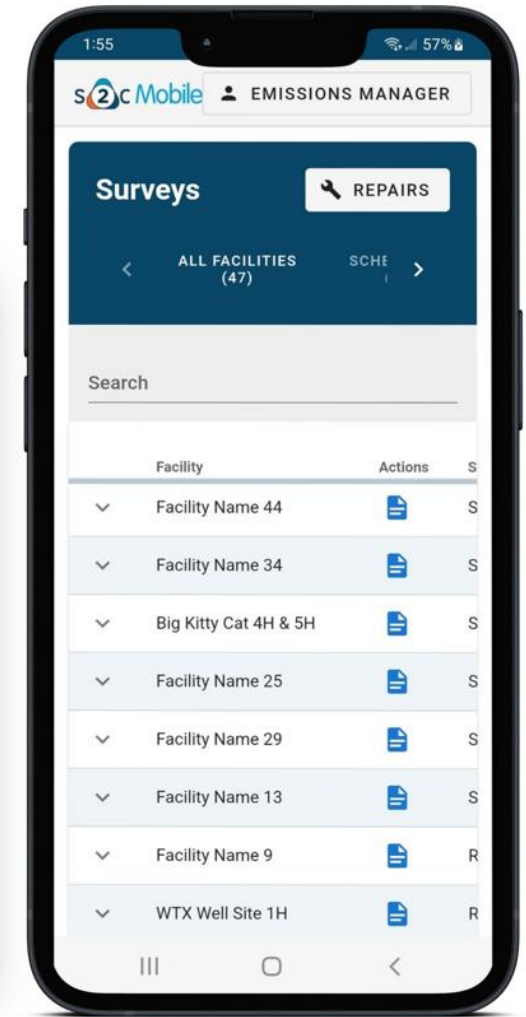
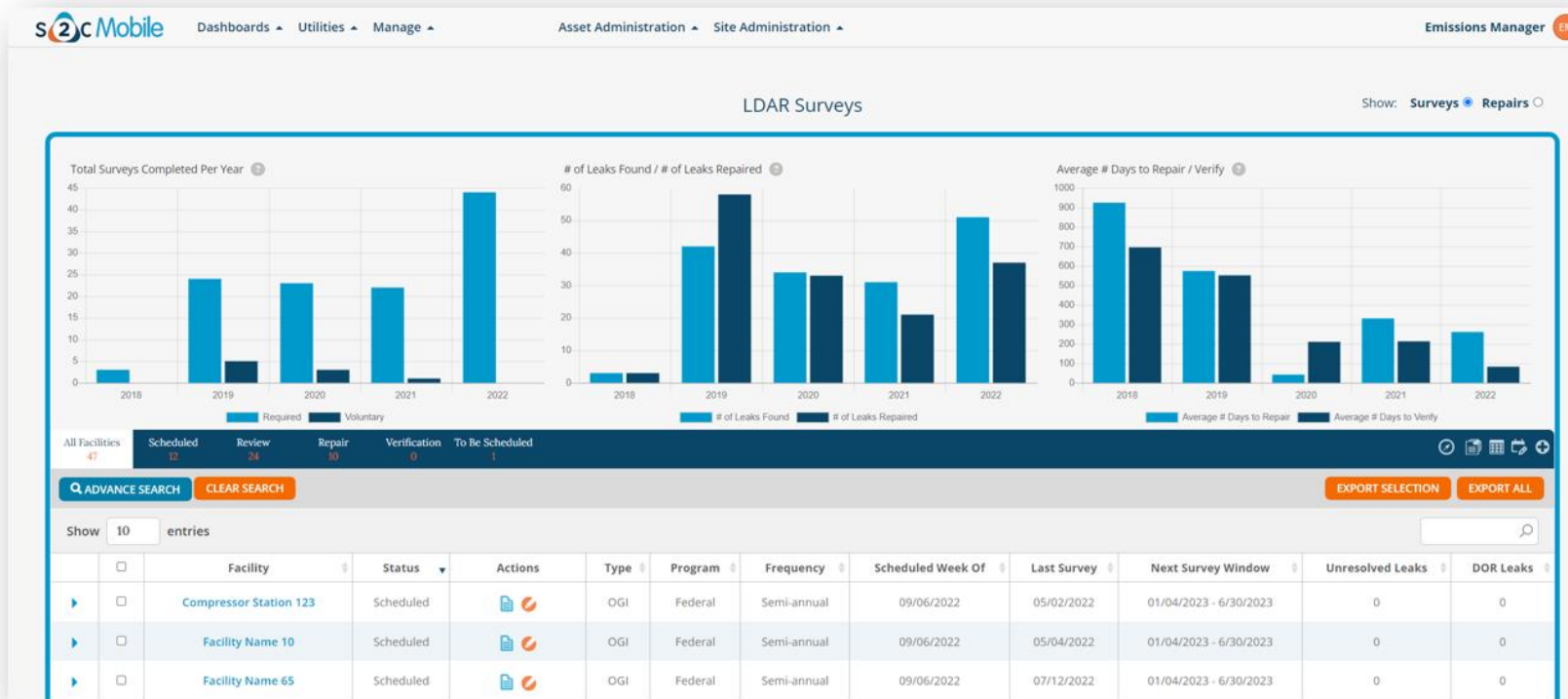
The amendments are extensive, touching on 23 different subparts within the rule. The lengthy preamble discusses in detail what the proposed changes are and is helpful to identifying more specifically what the amendments are within the proposed rule text. It is significant to note that the assessed impacts of these amendments outlined in section VII. of the preamble are largely associated with the oil and gas sector that report under Subpart W.

The amendments include a new subpart, Subpart VV – Geological Sequestration of Carbon Dioxide with Enhanced Oil Recovery Using ISO 27916, that is not anticipated to create any new reporters, but will be a different reporting option for those who have previously reported under Subpart RR or Subpart UU should they choose to utilize the new subpart VV.

In an effort to collect more accurate data, there is a proposed change for compressor driver engines to report

What We Do - LDAR Workflow as a Service

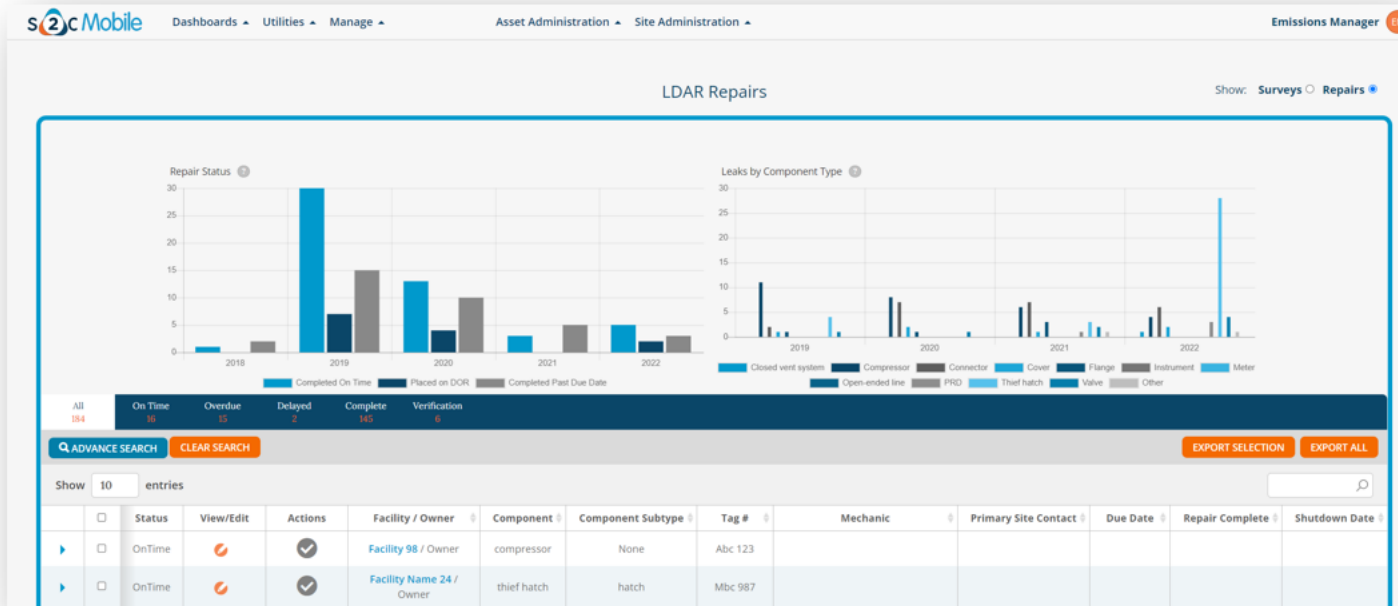
LDAR inspection and repair data is captured in the field and stored in a centralized database that allows for full management of the inspection and repair schedule. Data can be used as part of determining the overall compliance status of a facility.



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What We Do - LDAR Workflow as a Service

Leaks can be managed from their own dashboard within the LDAR workflow. All data will roll up into reports for OOOOa, GHG reporting, voluntary programs or any other report needed.



LDAR Report

Report Type:

All

All

General

Leak Details

EPA NSPS OOOOa- Site Information

EPA NSPS OOOOa- Fugitive Survey

EPA NSPS OOOOa- Fugitive Found

Survey Dashboard Report

Repair Dashboard Report

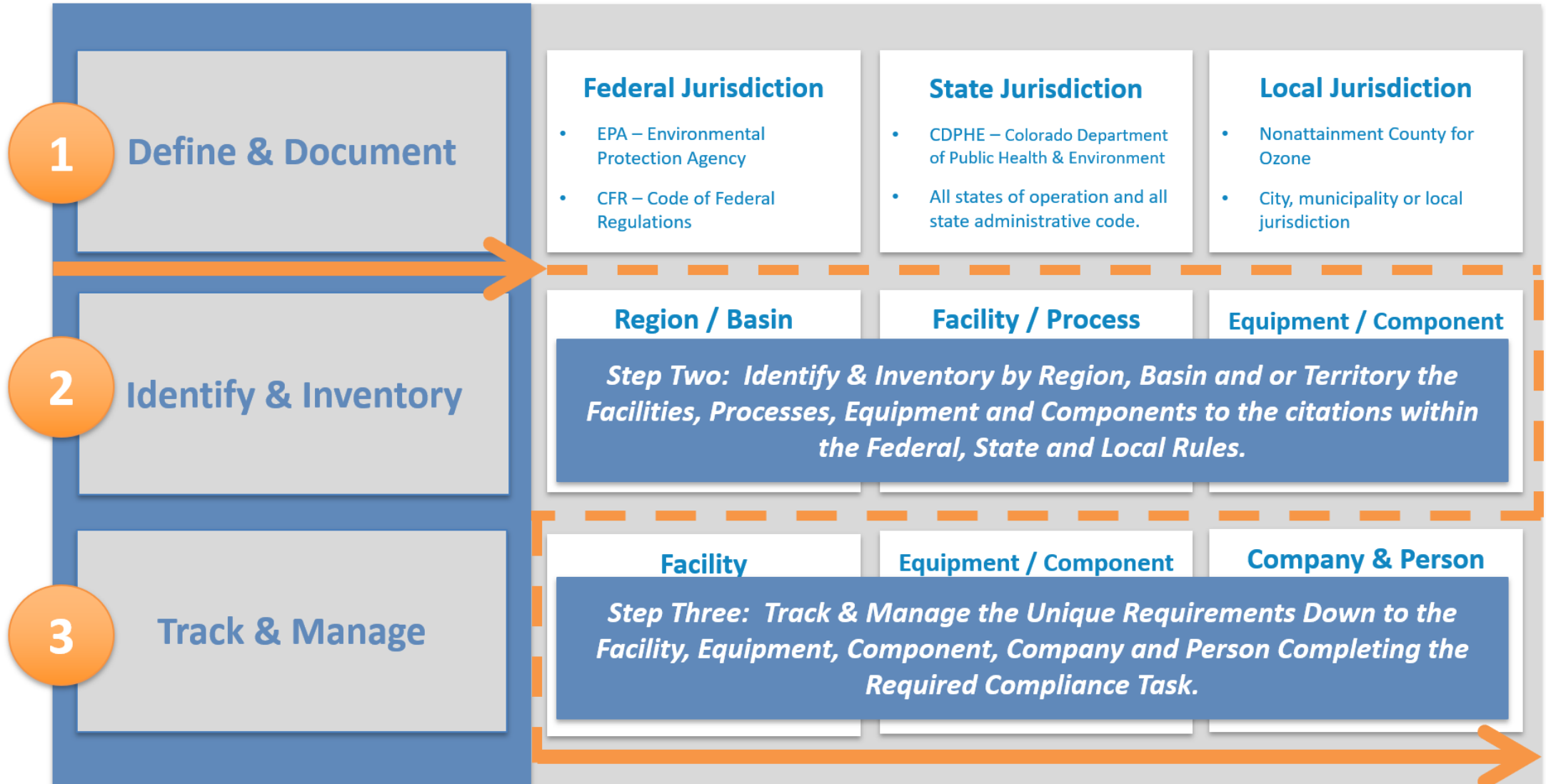
No Selection

Include Inactive Facilities.

Export To CSV

Clear

Our Process & Foundation of Service

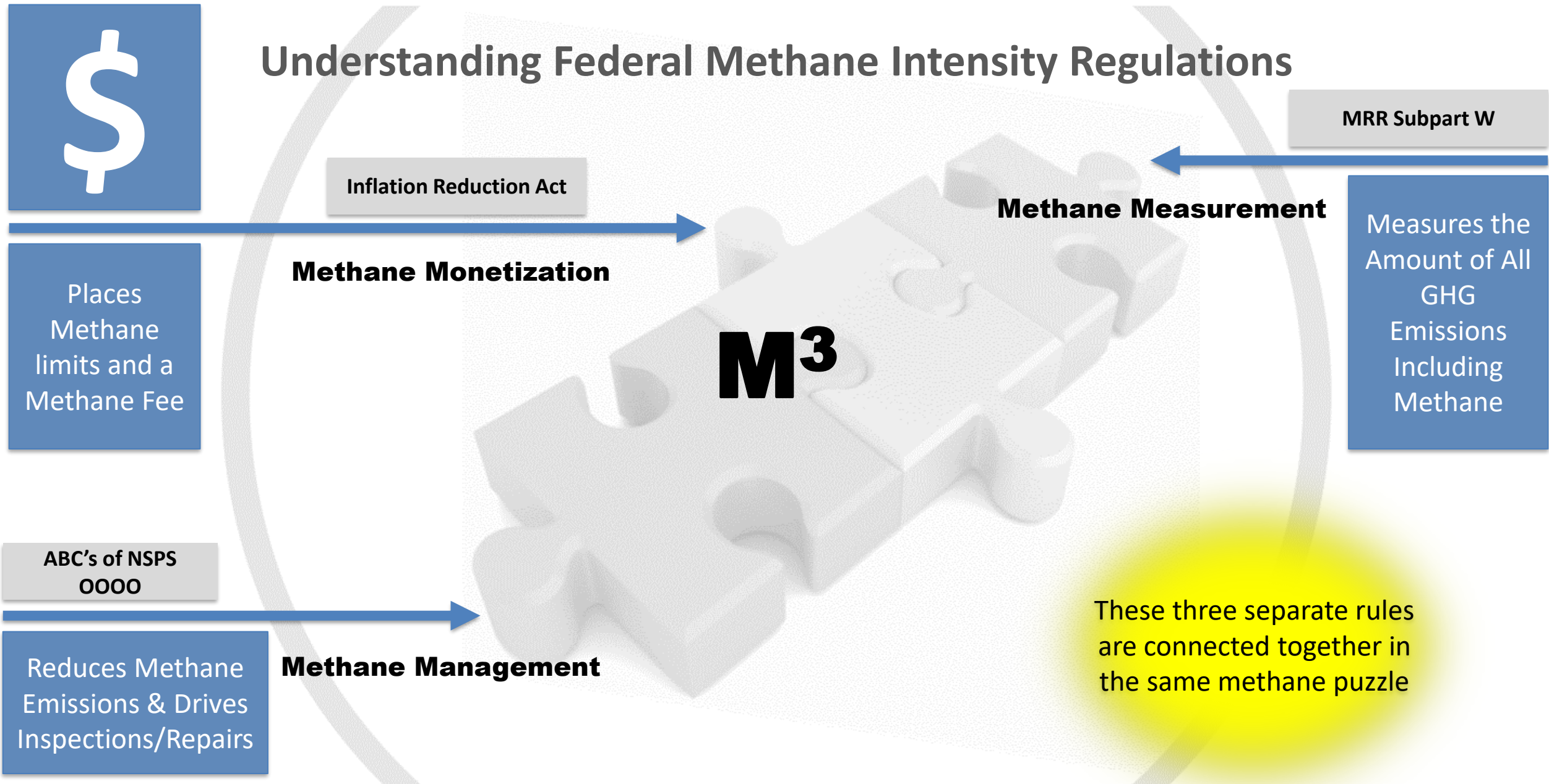


US Methane Emissions Policy Overview

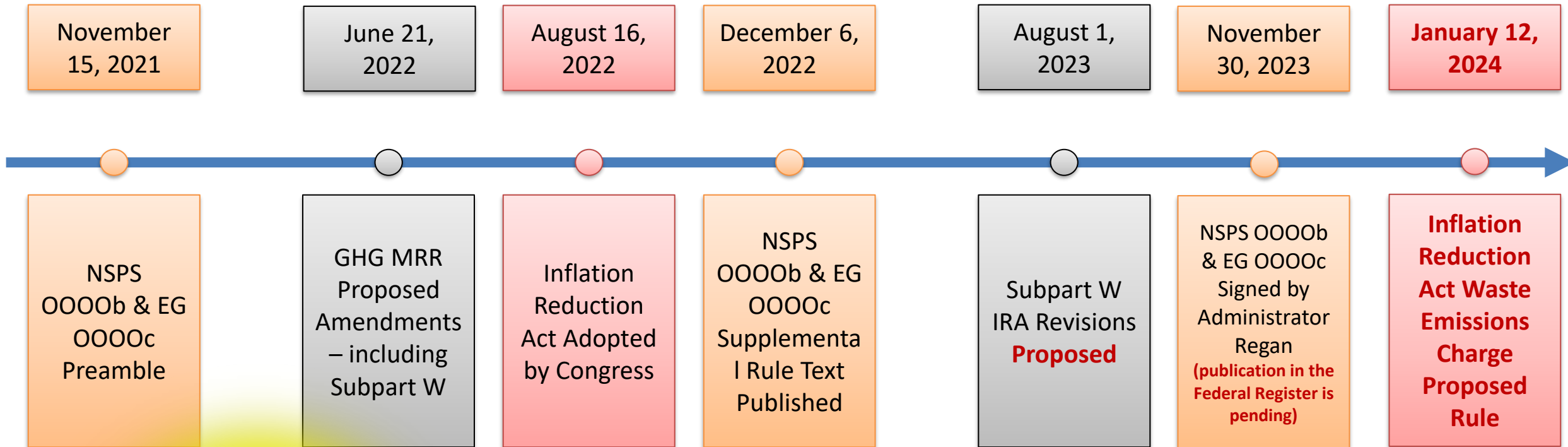
Understanding M3:
The Management, Measurement & Monetization of Methane:

Brian Kromer & MaryBeth Clifford

Understanding Federal Methane Intensity Regulations



Methane Intensity Timeline of Change



1,000,000 comments to NSPS changes but less than 100 to Subpart W

<https://www.epa.gov/inflation-reduction-act/waste-emissions-charge>

The Inflation Reduction Act

1 of M3 = Methane Monetization

Inflation Reduction Act is Methane Monetization

Waste Emissions Charge or Methane Fee (This is a TAX):

- 2024 - \$900 / mT
- 2025 - \$1,200 / mT
- 2026 - \$1,500 / mT

Methane Intensity Targets:

- Onshore/Offshore Gas
 - 0.20% of Gas Sent to Sale
- Onshore/Offshore Oil
 - 10 Metric Tons per Million Barrels
- Gathering, Boosting, Gas Processing & LNG
 - 0.05% of Gas Sent to Sale
- Compressor, Pipelines & Storage
 - 0.11% of Gas Sent to Sale

Emissions are 8 times to 25 times higher today

Understanding the Scale of the Waste Emissions Threshold

“In 2022, U.S. production grew by 3.6% to a new all-time high of 94.7 billion cubic feet per day (BCF/d). This new record eclipsed the previous record set in 2021. The U.S. retained a commanding 24.2% share of global production, followed by Russia (15.3% share) and Iran (6.4% share).”

<https://www.forbes.com/sites/rpapier/2023/08/30/us-natural-gas-production-sets-new-record-high/?sh=6d55871919a2>

- 94,700 MMcf/day (34.57 Tcf/year)
 - 0.20% waste emissions threshold
 - 189 MMcf/day is the industries total waste emissions threshold.
 - 483,326 natural gas wells producing in the United States (EIA).
 - That’s only 391 cubic foot a day per well on average across all wells.

<https://www.eia.gov/energyexplained/natural-gas/data-and-statistics.php>

IRA – are there any loopholes?

- **Exemption** – Charges will not be imposed on emissions that exceed the waste emissions threshold if such emissions are caused by unreasonable delay in permitting of gathering or transmission infrastructure needed for offtake of increased volume.
- **Regulatory Compliance Exemption** – Charges will not be imposed on a facility when *“methane emissions standards and plans...have been approved and are in effect in all States with respect to the applicable facilities and compliance with requirements...will result in equivalent or greater emissions reductions as would be achieved by the proposed ‘Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review’ (86 Fed. Reg. 63110 (Nov. 15, 2021), if such rule had been finalized and implemented.”*

<https://thehill.com/wp-content/uploads/sites/2/2022/08/Inflation-Reduction-Act-of-2022.pdf>

How & when is the waste emission fee (tax) calculated?

- The fee, as it currently stands, will apply to the 2024 reporting year for MRR Subpart W reporters.
- EPA has **not** yet published its **FINAL** guidance for how this fee will be calculated (https://www.epa.gov/system/files/documents/2024-01/wec_proposal_preamble_rule.pdf)
- What we do know:
 - It will be based on the data reported in annual MRR Subpart W report
 - Calculated on a basin-level (not a site-specific level)
 - Charge “shall be equal to the product obtained by multiplying the number of metric tons of methane emissions reported...for the applicable facility that exceed the applicable annual waste emissions threshold.”
 - Reporters can net emissions between facilities.

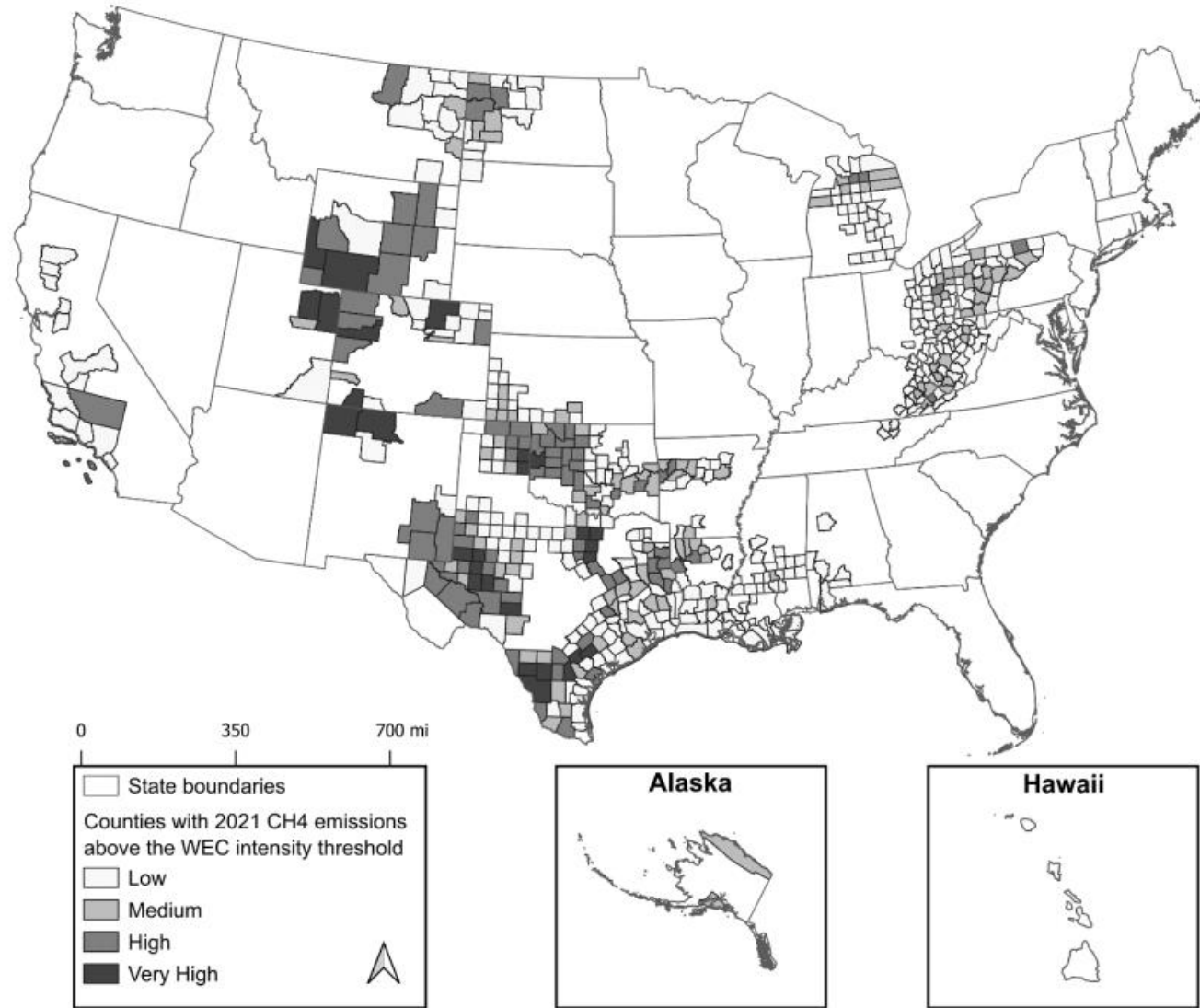


Figure 9-1 Map of the counties identified as having emissions from facilities that are expected to owe the Waste Emissions Charge

Source: EPA January 12, 2024, Regulatory Impact Analysis Page 119 https://www.epa.gov/system/files/documents/2024-01/wec_ria.pdf

The Mandatory GHG Reporting Rule & Subpart W

2 of M3 = Methane Measurement

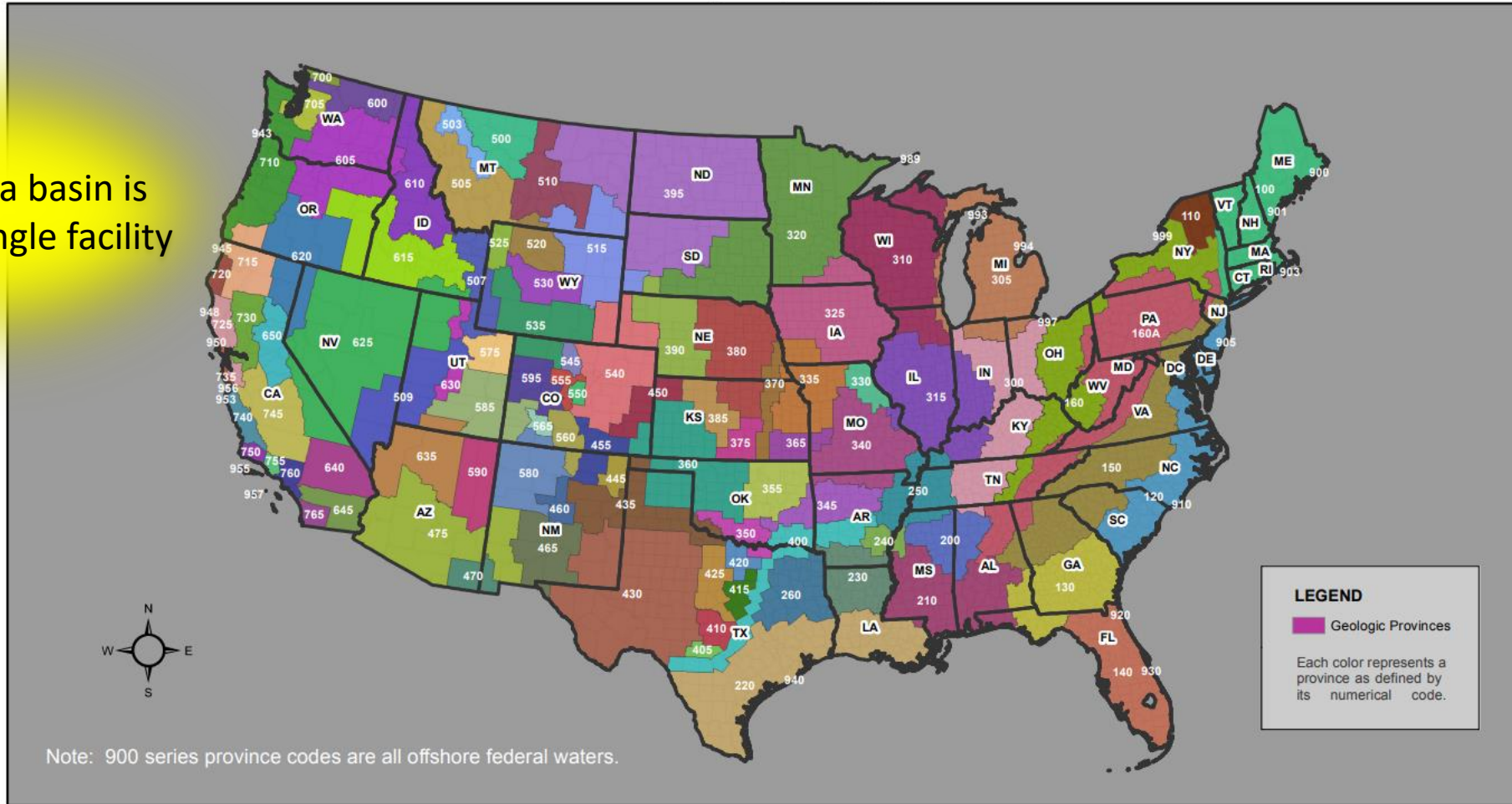
What is the Mandatory Reporting Rule for GHG's?

MRR (Mandatory Reporting Rule)

- Purpose: To gather and centralize data on GHG emissions from stationary sources nationwide (no emission control provisions)
- “Facility” reporting threshold is set at 25,000 mT CO₂e/yr ← That's only 893* mT/yr of Methane at GWP of 28
- Subpart W for Petroleum & Natural Gas Systems finalized Nov. 2010
- Data collection for Subpart W started 1/1/2011

Hydrocarbon Basins Used to Define Oil and Gas Production "Facilities" 40 CFR Part 98 Mandatory Reporting Rule for Greenhouse Gases

All activity in a basin is defined as a single facility



Notes:

1. "Basin" means geologic provinces as defined by the American Association of Petroleum Geologists (AAPG) Geologic Note: AAPG-CSD Geologic Provinces Code Map: AAPG Bulletin, Prepared by Richard F. Meyer, Laure G. Wallace, and Fred Wagner, Jr., Volume 75, Number 10 (October 1991) (incorporated by reference, see 98.7) and the Alaska Geologic Province Boundary Map, Compiled by the American Association of Petroleum Geologists Committee on Statistics of Drilling in Cooperation with the USGS, 978 (incorporated by reference, see 98.7).

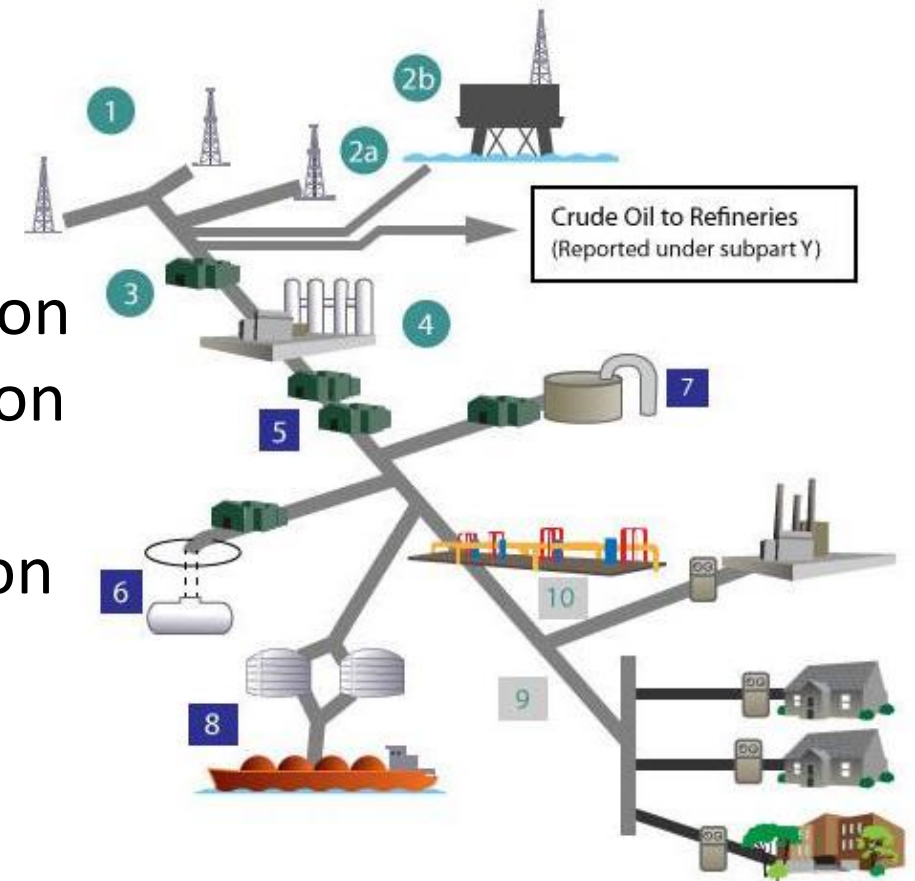
2. Part 98 GHG Mandatory Reporting - Definitions for Subpart W Petroleum and Natural Gas Systems:

"Facility" under the Part 98 Subpart W GHG reporting rules for onshore oil and natural gas production means all petroleum or natural gas equipment on a well pad or associated with a well pad and CO2 EOR operations that are under common ownership or common control including leased, rented, or contracted activities by an onshore petroleum and natural gas production owner or operator and that are located in a single hydrocarbon basin as defined in 98.238. Where a person or entity owns or operated more than one well in a basin, then all onshore petroleum and natural gas production equipment associated with all the wells that the person or entity owns or operates in the basin would be considered ONE facility.

3. Geographic shapefiles provided courtesy of the American Association of Petroleum Geologists (AAPG), AAPG Bulletin Volume 75, No. 10, October 1991 (see note 1).

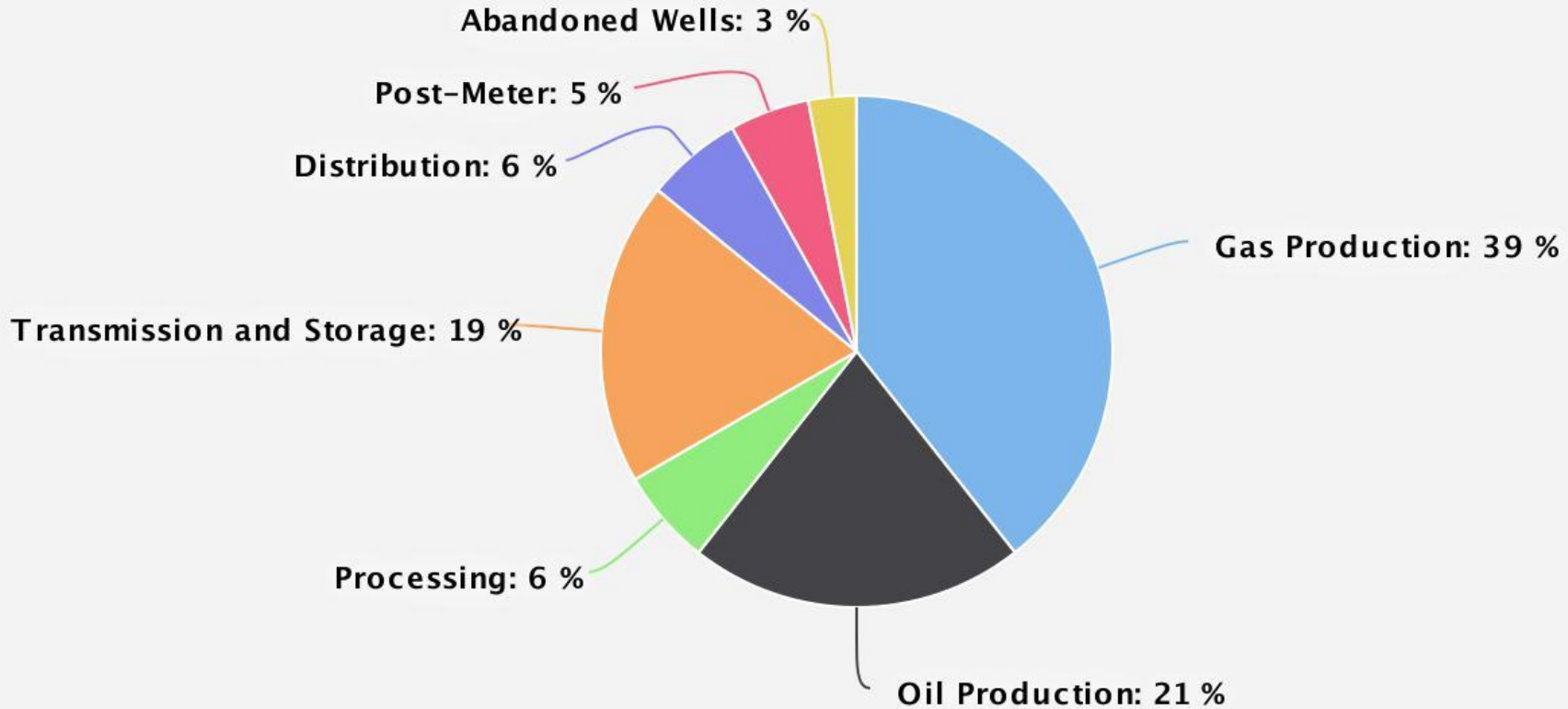
What Oil & Gas Segments does Subpart W apply to?

- Offshore petroleum and natural gas production
- Onshore petroleum and natural gas production
- Onshore natural gas processing
- Onshore natural gas transmission compression
- Underground natural gas storage
- LNG storage
- LNG import / export equipment
- Natural gas distribution
- Onshore petroleum and natural gas gathering and boosting
- Onshore natural gas transmission pipeline



2021 Oil and Gas Methane Emissions by Segment (~239 MMTCO₂e)

Source: Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990 – 2021, US EPA, April, 2023

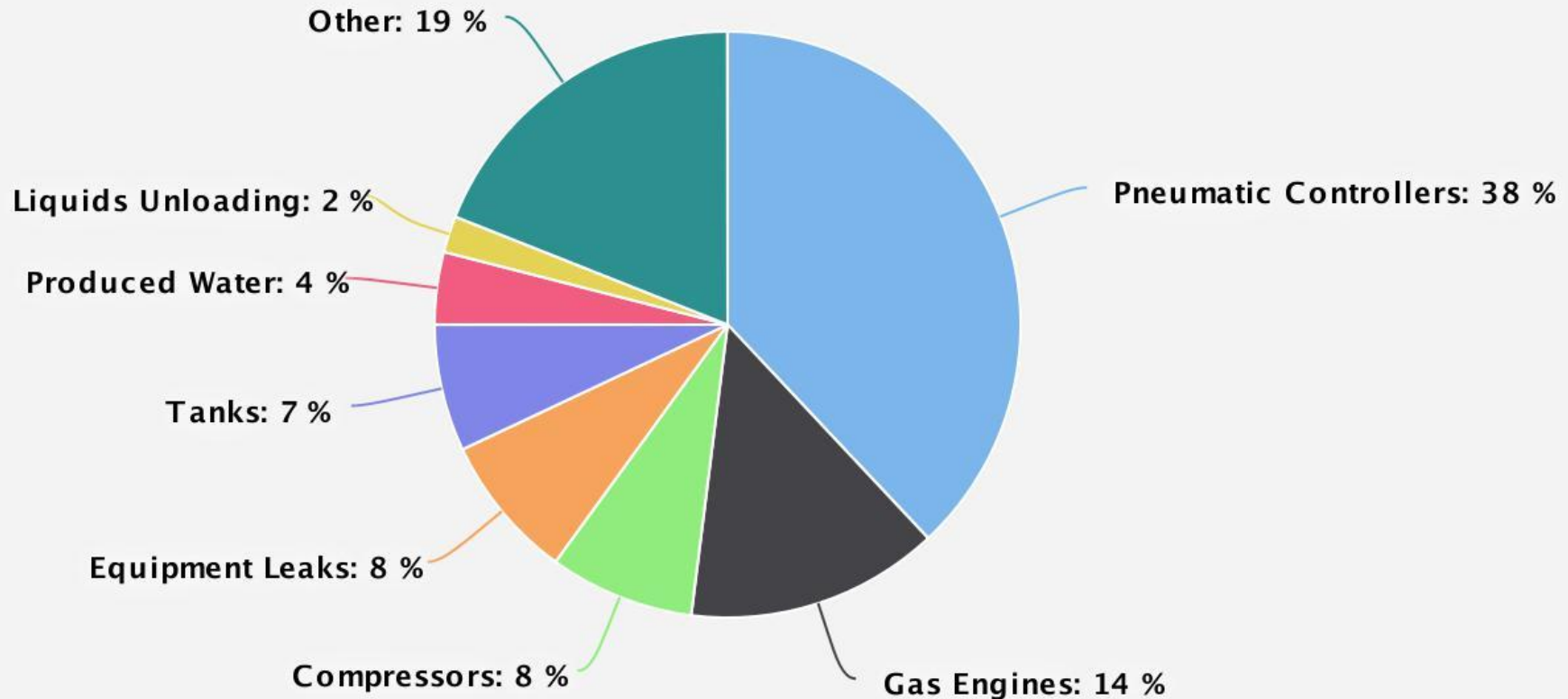


<https://www.epa.gov/natural-gas-star-program/estimates-methane-emissions-segment-united-states>

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2021 Oil and Gas Production (~143 MMTCO₂e)

Source: Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990 - 2021, US EPA, April, 2023

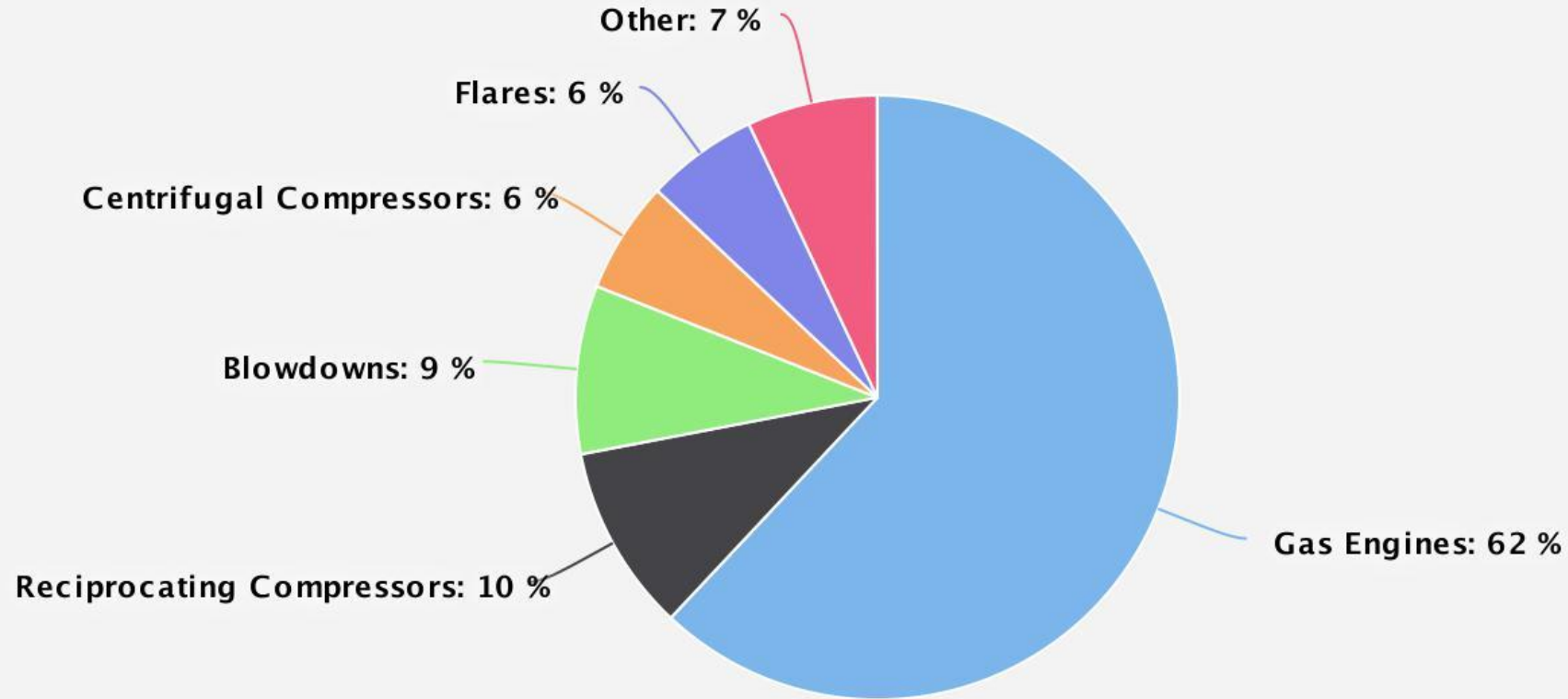


<https://www.epa.gov/natural-gas-star-program/estimates-methane-emissions-segment-united-states>

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2021 Gas Processing (~14 MMTCO₂e)

Source: Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990 – 2021, US EPA, April, 2023

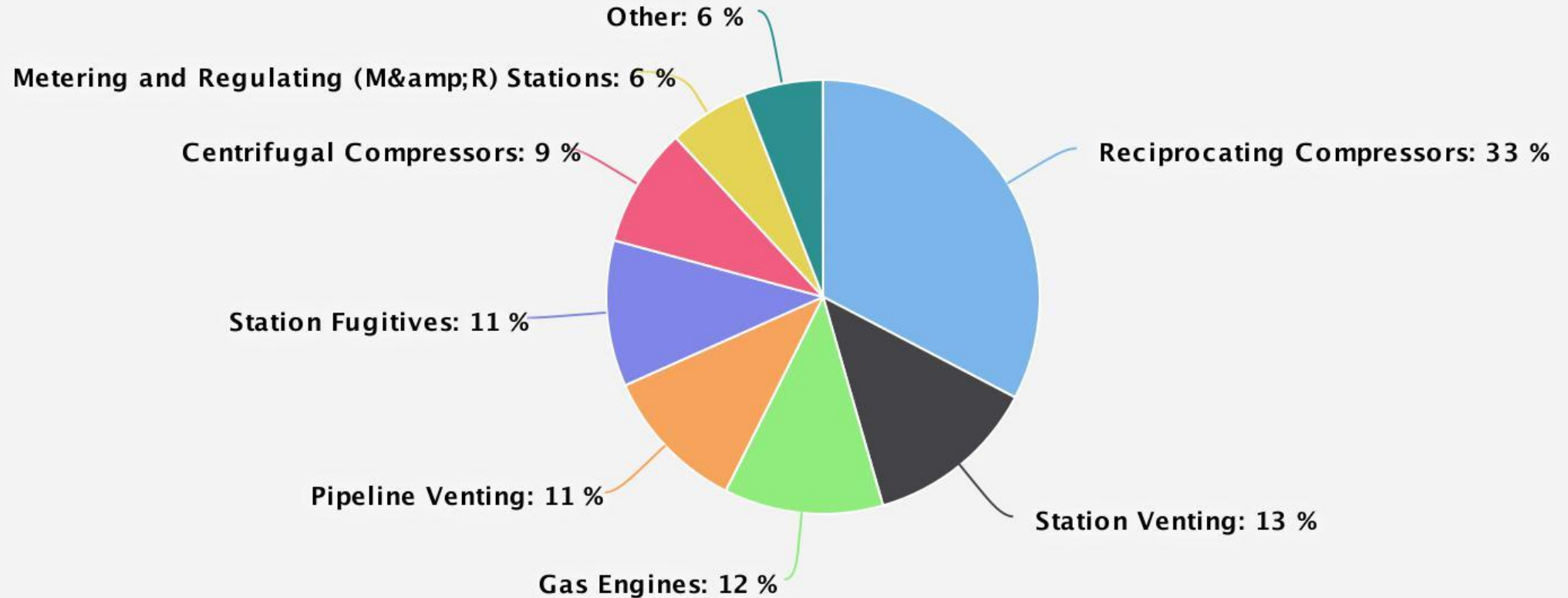


<https://www.epa.gov/natural-gas-star-program/estimates-methane-emissions-segment-united-states>

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2021 Gas Transmission and Storage (~45 MMTCO₂e)

Source: Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990 – 2021, US EPA, April, 2023

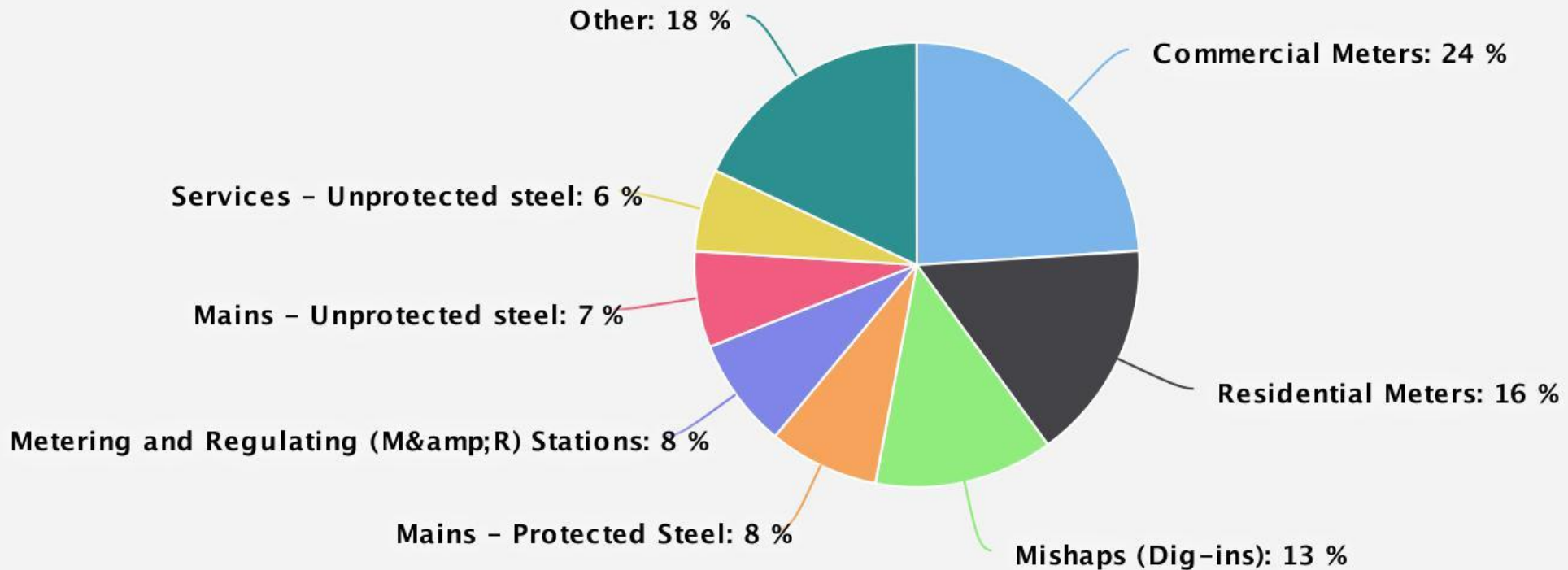


<https://www.epa.gov/natural-gas-star-program/estimates-methane-emissions-segment-united-states>

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2021 Gas Distribution (~15 MMTCO₂e)

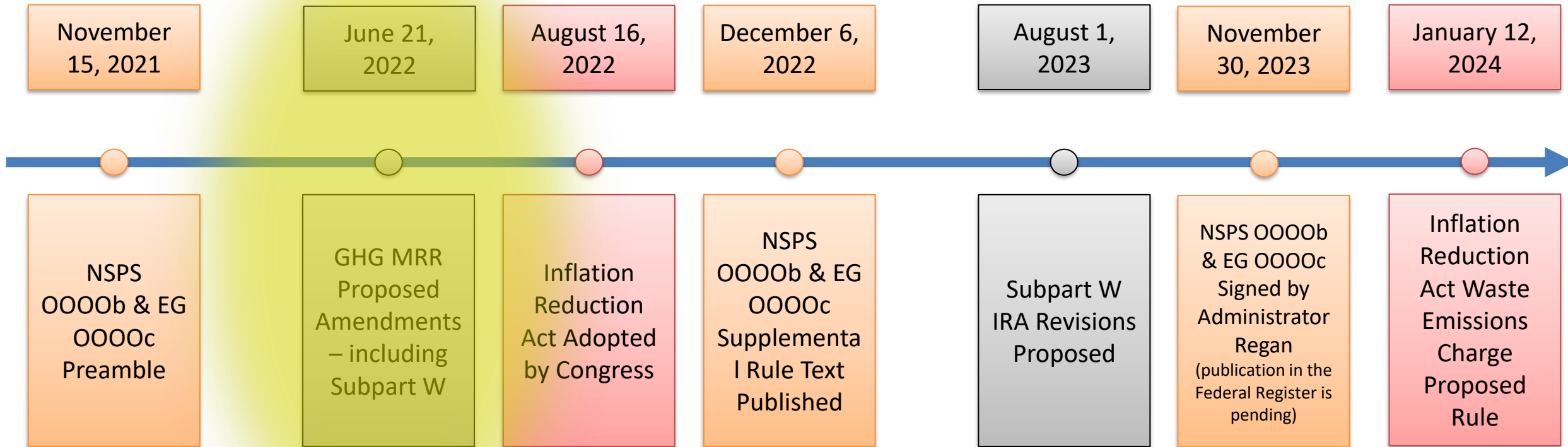
Source: Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990 – 2021, US EPA, April, 2023



<https://www.epa.gov/natural-gas-star-program/estimates-methane-emissions-segment-united-states>

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Methane Intensity Timeline of Change



2022 – EPA proposed amendments for multiple subparts

- A - General Provisions
- C – Stationary Fuel Combustion Sources
- G – Ammonia Manufacturing
- H – Cement Production
- I – Electronics Manufacturing
- N – Glass Production
- P – Hydrogen Production
- Q – Iron & Steel Production
- S – Lime Manufacturing
- W – Petroleum & Natural Gas Systems**
- X – Petrochemical Production
- Y – Petroleum Refineries
- BB – Silicon Carbide Production
- DD – Electrical Transmission & Distribution
- FF – Underground Coal Mines
- GG – Zinc Production
- HH – Municipal Solid Waste Landfills
- NN – Suppliers of Natural Gas and Natural Gas Liquids
- OO – Suppliers of Industrial Greenhouse Gases
- PP – Suppliers of Carbon Dioxide
- SS – Electrical Equipment Manufacture or Refurbishment
- UU – Injection of Carbon Dioxide
- VV – Geologic Sequestration of Carbon Dioxide with Enhanced Oil Recovery Using ISO 27916 (NEW subpart)

The Subpart W 2022 proposed amendments are being withdrawn and are now a new rulemaking item in 2023

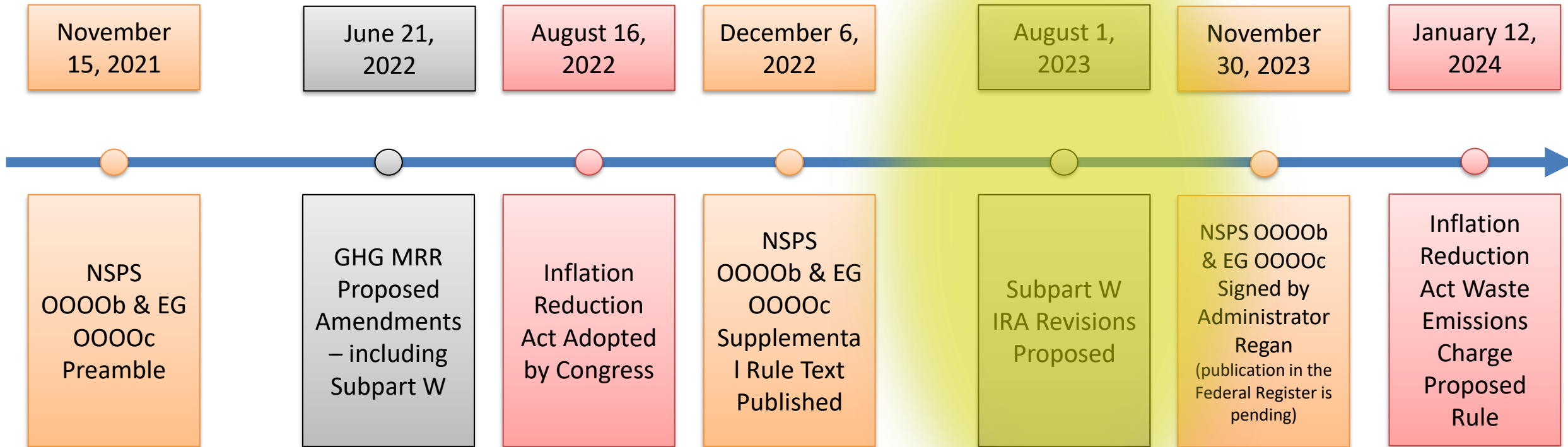
Table 7. Total Incremental Burden by Subpart (\$2017/year)^a

Subpart	Labor Costs		Capital and O&M
	Initial Year	Subsequent Years	
C - General Stationary Fuel Combustion Sources			
Facilities Reporting only to Subpart C	\$70,732	\$70,732	
Facilities Reporting to Subpart C plus another subpart	\$94,999	\$94,999	
G - Ammonia Manufacturing	\$250	\$250	
H - Cement Production	\$3,655	\$3,655	
I - Electronics Manufacturing ^b	\$19,056	\$17,839	\$50
N - Glass Production	\$818	\$818	
P - Hydrogen Production	\$628	\$628	(\$1,536)
Q - Iron and Steel Production	\$1,454	\$1,454	
S - Lime Manufacturing	\$1,351	\$1,351	
W - Petroleum and Natural Gas Systems	\$1,211,076	\$1,211,076	\$8,667
X - Petrochemical Production	\$528	\$528	
Y - Petroleum Refineries	\$801	\$801	
BB - Silicon Carbide Production	\$20	\$20	
DD - Electrical Equipment Use	\$7,106	\$7,106	
GG - Zinc Production	\$20	\$20	
HH - Municipal Solid Waste Landfills	\$3,297	\$3,297	
OO - Suppliers of Industrial Greenhouse Gases	\$810	\$810	
PP - Suppliers of Carbon Dioxide	\$629	\$629	
SS - Electrical Equipment Manufacture or Refurbishment	\$338	\$338	
UU ^c	(\$1,831)	(\$1,831)	(\$100)
VV ^d	\$1,833	\$3,355	\$200
Total ^e	\$1,417,591	\$1,417,446	\$7,281

^a Includes estimated increase or decrease in costs following implementation of revisions in RY2023.

^b Average subsequent year labor costs for Subpart I. Subpart I subsequent year costs include \$17,252 in Year 2 and \$17,526 in Year 3.

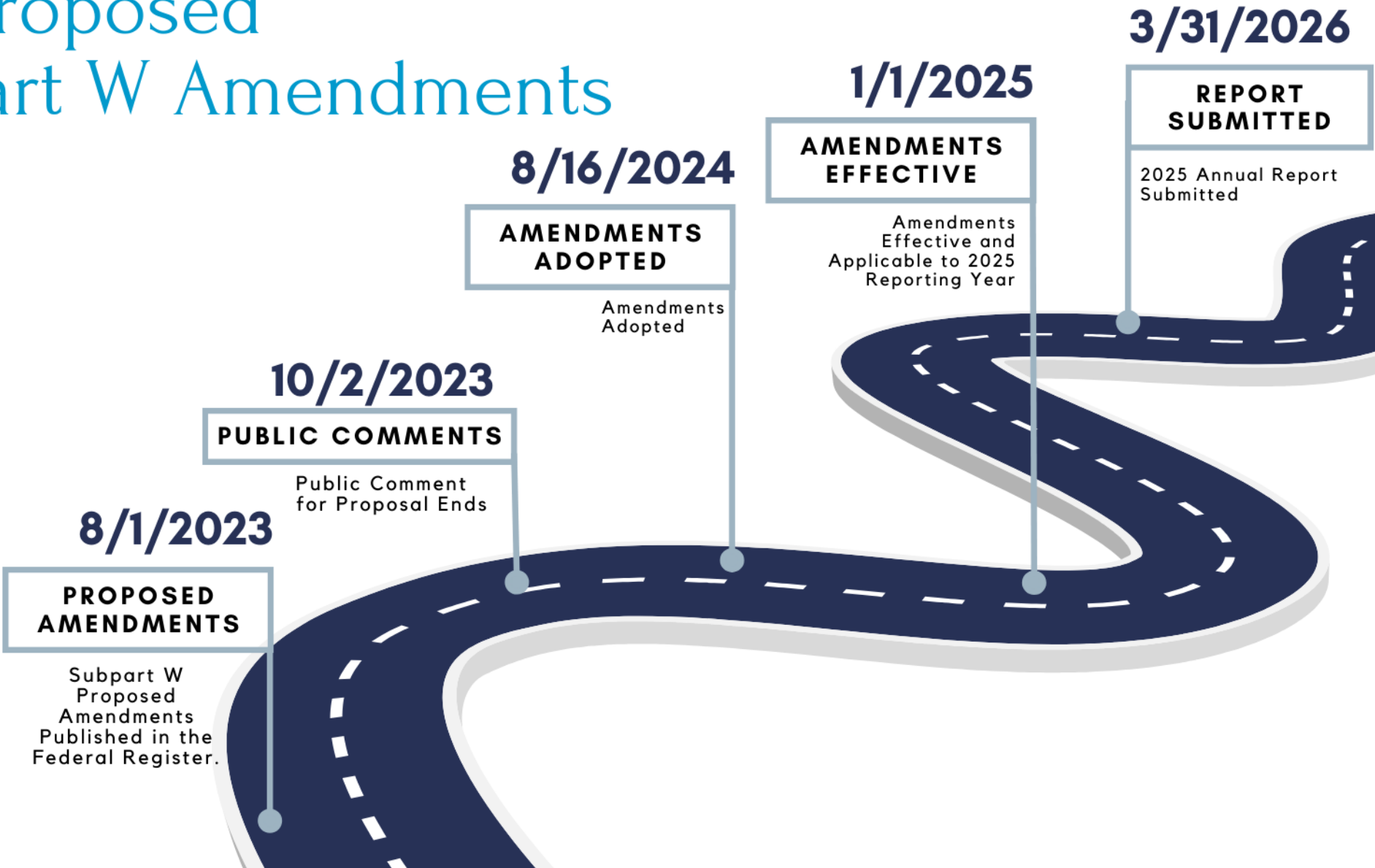
Methane Intensity Timeline of Change



2023 EPA Proposed Revised Subpart W Amendments

- Only impacts the GHG MRR Subpart W as required by the Inflation Reduction Act (IRA).
- Carry through the proposed 2022 changes plus some adjustments in response to the public comments made to the 2022 amendments.
- Moves toward site-specific measurement vs. use of default factors
- Revises many of the emission factors based on studies

EPA Proposed Subpart W Amendments



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Source Category § 98.233 / §98.233 proposed	New / Existing	Revisions	Emission Factors
Natural gas pneumatic device venting (a)	Existing	<ul style="list-style-type: none"> - Add processing and distribution segments - Use of direct measurement for intermittent bleed devices - Default factors for low- and high-bleed devices 	Table W-1
Natural gas driven pneumatic pump venting (c)	Existing		Table W-1
Acid gas removal (AGR) vents and nitrogen removal unit (NRU) vents* (d)	Existing / New*	<ul style="list-style-type: none"> - Add Nitrogen Removal Units* for onshore production, gathering & boosting, processing, LNG storage, & LNG import/export segments - Acid Gas Removal add LNG storage & LNG import/Export segments 	
Dehydrator vents (e)	Existing	Add transmission & underground storage segments	Table W-1
Well venting for liquids unloadings (f)	Existing		
Well venting during completions and workovers with hydraulic fracturing (g)	Existing		

Proposed NOT Final

Source Category § 98.233 / §98.233 proposed	New / Existing	Revisions	Emission Factors
Gas well venting during completions and workovers without hydraulic fracturing (h)	Existing		
Blowdown vent stacks (i)	Existing	Add industry segments to include onshore production, underground storage, LNG storage, and distribution segments	
Hydrocarbon liquids and produced water storage tanks (j)	Existing	Addition of produced water tanks for onshore production, gathering & boosting, and processing segments	
Condensate storage tanks (k)	Existing		
Well testing venting and flaring (l)	Existing		
Associate gas venting and flaring (m)	Existing		
Flare stack emissions (n)	Existing	<ul style="list-style-type: none"> - Measure gas flow & composition - Tiered approach to efficiency values 	
Centrifugal compressor venting (o)	Existing		Proposed NOT Final
Reciprocating compressor venting (p)	Existing		

Source Category § 98.233 / §98.233 proposed	New / Existing	Revisions	Emission Factors
Equipment leak surveys (q)	Existing	<ul style="list-style-type: none"> - Option for use of direct measurement - Revisions to default factors, nearly all factors increased - Addition of undetected leak factor (k) to adjust for undetected leaks 	Tables W-2, W-4, W-6
Equipment leaks by population count (r)	Existing		
Offshore petroleum and natural gas production facilities(s)	Existing		
GHG volumetric emissions using actual conditions (t)	Existing		
GHG volumetric emissions at standard conditions (u)	Existing		
GHG mass emissions (v)	Existing		
EOR injection pump blowdown (w)	Existing		Proposed NOT Final

Source Category § 98.233 / §98.233 proposed	New / Existing	Revisions	Emission Factors
EOR hydrocarbon liquids dissolved CO ₂ (x)	Existing		Accountability through IMEO / MARS
Other large release events (y)	New	<ul style="list-style-type: none"> - Super-emitter program reporting - All industry segments 	
Onshore petroleum and natural gas production, onshore petroleum and natural gas gathering and boosting, and natural gas distribution combustion emissions (z)	Existing	<ul style="list-style-type: none"> - Addition of combustion (methane) slip factors for RICE 2SLB, 4SLB, 4SRB and Turbines - Site-specific test data in lieu of Subpart C factors - Default factors required for sources using field gas that does not meet the definition of § 98.238 	Table W-7
Drilling mud degassing (dd)	New	Onshore production segment	
Crankcase venting (ee)	New	All industry segments except for offshore production	

Proposed NOT Final



19 Added Definitions – a few of the key ones:

Proposed NOT Final

New Definitions

Atmospheric pressure storage tank

means a vessel (excluding sumps) operating at atmospheric pressure that is designed to contain an accumulation of crude oil, condensate, intermediate hydrocarbon liquids, or produced water and that is constructed entirely of non-earthen materials (e.g., wood, concrete, steel, plastic) that provide structural support. Atmospheric pressure storage tanks include both fixed roof tanks and floating roof tanks. Floating roof tanks include tanks with either an internal floating roof or an external floating roof.

Centralized oil production site

means any permanent combination of one or more hydrocarbon liquids storage tanks located on one or more contiguous or adjacent properties that does not also contain a permanent combination of one or more compressors that are part of the onshore petroleum and natural gas gathering and boosting facility that gathers hydrocarbon liquids from multiple well-pads. A centralized oil production site is a type of gathering and boosting site for purposes of reporting under § 98.236.

Crankcase venting

means the process of venting or removing blow-by from the void spaces of an internal combustion engine outside of the combustion cylinders to prevent excessive pressure build-up within the engine. This does not include ingestive systems that vent blow-by into the engine where it is returned to the combustion process.

New Definitions continued

Gathering & boosting site

means a single gathering compressor station as defined in this section, centralized oil production site as defined in this section, gathering pipeline site as defined in this section, or other fence-line site within the onshore petroleum and natural gas gathering and boosting industry segment.

Gathering compressor station

means any permanent combination of one or more compressors located on one or more contiguous or adjacent properties that are part of the onshore petroleum and natural gas gathering and boosting facility that move natural gas at increased pressure through gathering pipelines or into or out of storage. A gathering compressor station is a type of gathering and boosting site for purposes of reporting under § 98.236.

Other large release event

means any planned or unplanned uncontrolled release to the atmosphere of gas, liquids, or mixture thereof, from wells and/or other equipment that result in emissions for which there are no methodologies in § 98.233 other than under 98.233(y) to appropriately estimate these emissions. Other large release events include, but are not limited to, well blowouts, well releases, pressure relief valve releases from process equipment other than hydrocarbon liquids storage tanks, storage tank cleaning and other maintenance activities, and releases that occur as a result of an accident, equipment rupture, fire, or explosion. Other large release events also include failure of equipment or equipment components such that a single equipment leak or release has emissions that exceed the emissions calculated for that source using applicable methods in § 98.233(a) through (s), (w), (x), (dd), or (ee) by the threshold in § 98.233(y)(1)(ii).

Proposed
NOT Final

Methane Slip for Internal Combustion Equipment

(added in under (z) for *Onshore petroleum and natural gas production, onshore petroleum and natural gas gathering and boosting, and natural gas distribution combustion emissions*)

Table W-7 to Subpart W of Part 98—Default Methane Emission Factors for Internal Combustion Equipment

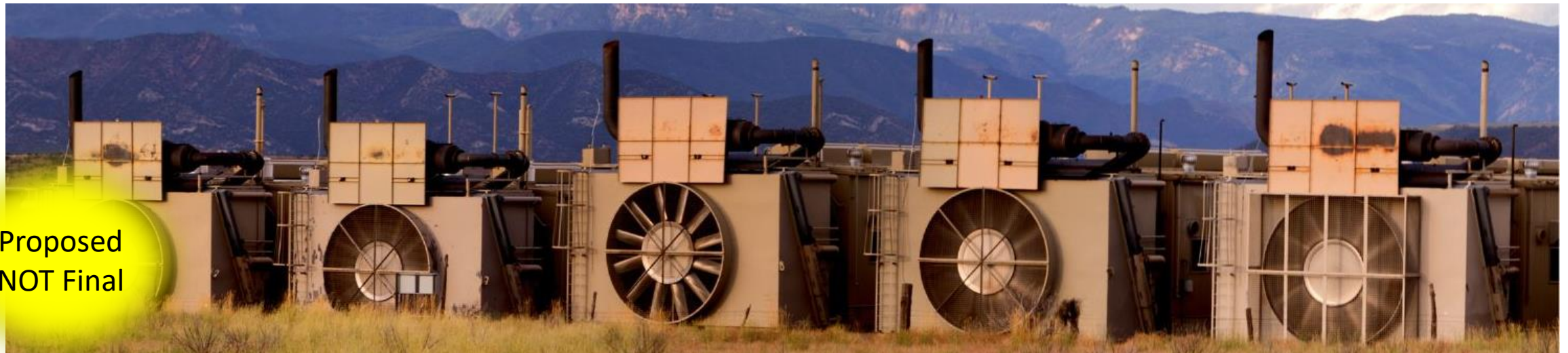
Internal Combustion Equipment Type	Emission factor (kg CH ₄ /mmBtu)
Reciprocating Engine, 2-stroke lean-burn	0.658
Reciprocating Engine, 4-stroke lean-burn	0.522
Reciprocating Engine, 4-stroke rich-burn	0.045
Gas Turbine	0.004

Crankcase Emissions – NEW section (ee)

$$E_{CH_4} = EF \times GHG_{CH_4} \times Count \times T \quad (\text{Eq. W-45})$$

Where:

- ECH₄ = Annual total volumetric emissions of CH₄ from crankcase venting on reciprocating internal combustion engines or gas turbines, in standard cubic feet.
- EF = Emission factor for crankcase venting on reciprocating internal combustion engines or gas turbines, in standard cubic feet gas per hour per crankcase vent. Use 2.28 standard cubic feet gas per hour per crankcase vent.
- GHG_{CH₄} = Average concentration of CH₄ in the gas stream entering reciprocating internal combustion engines or gas turbines. If the concentration of CH₄ is unknown, use the concentration of CH₄ in the gas stream either using engineering estimates based on best available data or as defined in paragraph (u)(2) of this section.
- Count = Total number of crankcase vents on reciprocating internal combustion engines or gas turbines.
- T = Total operating hours per year for reciprocating internal combustion engines or gas turbines with crankcase vents.



Proposed
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Reported under Subpart C or Subpart W??

If adopted as proposed in 2023

Proposed NOT Final

This Federal Register Notice was signed on June 30, 2023, and the Agency is submitting it for publication in the Federal Register. While we have taken steps to ensure the accuracy of this Internet version of the document, it is not the official version. Please refer to the official version in a forthcoming Federal Register publication, which will appear on the Government Printing Office's website (<https://www.govinfo.gov/app/collection/fr>) and on Regulations.gov (<https://www.regulations.gov>) in Docket No EPA-HQ-OAR-2023-0234. Once the official version of this document is published in the Federal Register, this version will be removed from the Internet and replaced with a link to the official version.

Apart from onshore natural gas transmission pipeline facilities, all facilities subject to subpart W must include combustion emissions in their annual report. As noted in section III.S.1 of this preamble, facilities in the Onshore Petroleum and Natural Gas Production, Onshore Petroleum and Natural Gas Gathering and Boosting, and Natural Gas Distribution industry segments must calculate combustion emissions in accordance with 40 CFR 98.233(z) and report emissions under subpart W. Facilities in the remaining industry segments (*i.e.*, Offshore Petroleum and Natural Gas Production, Onshore Natural Gas Processing, Onshore Natural Gas Transmission Compression, Underground Natural Gas Storage, LNG Storage, and LNG Import and Export Equipment) are required to calculate combustion emissions in accordance with the provisions of 40 CFR 98.33 and report emissions under subpart C.

- **Subpart W:**
 - Onshore petroleum and natural gas production
 - Onshore gathering and boosting
 - Natural gas distribution
- **Subpart C:**
 - Offshore petroleum and natural gas production
 - Onshore natural gas processing
 - Onshore natural gas transmission compression
 - Underground storage
 - LNG storage
 - LNG import/export equipment

NSPS 0000, NSPS 0000a, NSPS 0000b & EG 0000c

3 of M3 = Methane Management

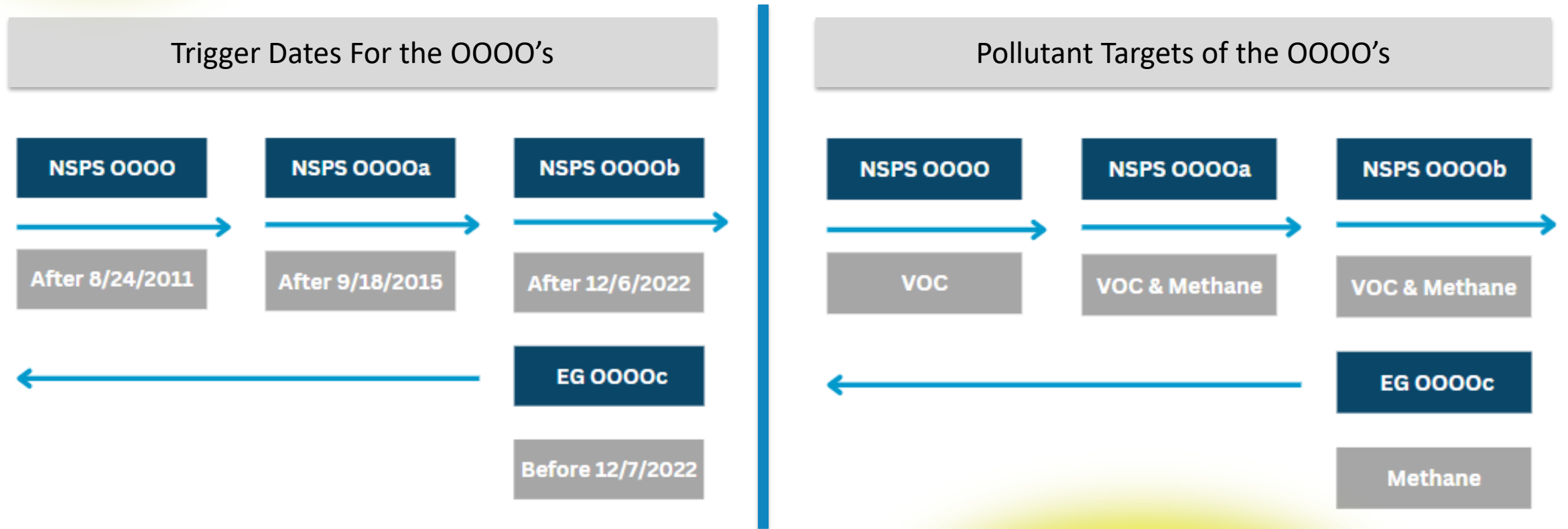
A brief history of the OOOOs

- **NSPS OOOO** originally adopted [8/16/2012](#). Amended in [2016](#) in conjunction with the adoption of OOOOa. Amended again in [2020](#) along with OOOOa amendments.
- **NSPS OOOOa** originally adopted [6/3/2016](#). Amended in [2018](#). Amended in 2020 with the [Policy](#) and [Technical](#) Amendments. In 2021 the CRA rescinded the [Policy](#) amendments. November [2021](#) there were new proposed amendments that are not yet adopted.
- **NSPS OOOOb** was initially proposed in November [2021](#). Supplementary rule text was proposed in December [2022](#). This final draft was signed by Administrator Regan [11/30/2023](#) and is pending publication in the Federal Register.
- **EG OOOOc** was initially proposed in November [2021](#) along with NSPS OOOOb. It also had supplementary rule text proposed in December [2022](#). This final draft was signed by Administrator Regan [11/30/2023](#) and is pending publication in the Federal Register.



Simple model of facility date

OOOO Applicability



States have 24 months to submit SIPs and then 36 months to implement their SIPs for EG OOOOc

What does OOOO regulate?

The purpose of OOOO is to control and reduce **VOC**. It specifically applies to facilities constructed, reconstructed or modified between **August 25, 2011 and September 18, 2015**.

OOOO Affected Facility	Production (Well Site)	Gathering	Gas Processing
Hydraulically Fractured Wells	X		
Centrifugal Compressors		X	X
Reciprocating Compressors		X	X
Pneumatic Controllers	X	X	X
Pneumatic Pumps	X		X
Storage Vessels	X	X	X
Sweetening Units			X
Super-Emitter Program	X	X	X

What does OOOOa regulate?

The purpose of OOOOa is to control and reduce **VOC and GHG emissions**. It specifically applies to facilities constructed, reconstructed or modified between **September 19, 2015 and December 6, 2022**

OOOOa Affected Facility	Production (Well Site)	Gathering	Gas Processing	Transmission & Storage
Hydraulically Fractured Wells	X			
Centrifugal Compressors		X	X	X
Reciprocating Compressors		X	X	X
Pneumatic Controllers	X	X	X	X
Pneumatic Pumps	X		X	
Storage Vessels	X	X	X	X
Fugitive Emissions	X	X	X	X
Sweetening Units			X	
Super-Emitter Program	X	X	X	X

What Does OOOOb Regulate?

The purpose of OOOOb is to control and reduce **VOC and GHG emissions**. It specifically applies to facilities constructed, reconstructed or modified **after December 6, 2022**:

OOOOb Affected Facility	Production	Gathering	Gas Processing	Transmission & Storage
Hydraulically Fractured Wells	X			
Compressors	X	X	X	X
Fugitive Emissions	X	X	X	X
Liquids Unloading	X			
Pneumatic Controllers	X	X	X	X
Pneumatic Pumps	X	X	X	X
Storage Vessels	X	X	X	X
Sweetening Units	X	X	X	X
Associated Gas from Oil Wells	X			
Super-Emitter Program	X	X	X	X

What Does OOOOc Regulate?

The purpose of OOOOc is to control and reduce **GHG emissions** and will be implemented through State Implementation Plans (SIPs) that must meet or exceed the requirements in the Model Rule in EG OOOOc. It specifically applies to facilities constructed, reconstructed or modified **on or before December 6, 2022**:

OOOOc Affected Facility	Production	Gathering	Gas Processing	Transmission & Storage
Compressors	X	X	X	X
Fugitive Emissions	X	X	X	X
Liquids Unloading	X			
Pneumatic Controllers	X	X	X	X
Pneumatic Pumps	X	X	X	X
Storage Vessels	X	X	X	X
Sweetening Units	X	X	X	X
Associated Gas from Oil Wells	X			
Super-Emitter Program	X	X	X	X

What kind of well site??

Single wellhead only

- Wellhead only well site

Small site

- no more than one piece of certain major production and processing equipment, and associated meters and yard piping. Small well sites cannot include any controlled storage vessels (or controlled tank batteries), control devices, or natural gas-driven pneumatic controllers.

Multi-wellhead only

- Two or more wellheads on a single pad, no additional equipment or tanks



Well site with major production & processing equipment (for the purposes of §60.5397b)

- One or more **controlled** storage vessels or tank batteries
- One or more control devices
- One or more natural gas-driven process controllers or pumps
- 2 or more pieces of major production/processing equipment not specified above (compressors, separators, dehydrators, heater/treaters)

Comparison of Reciprocating Compressor Requirements

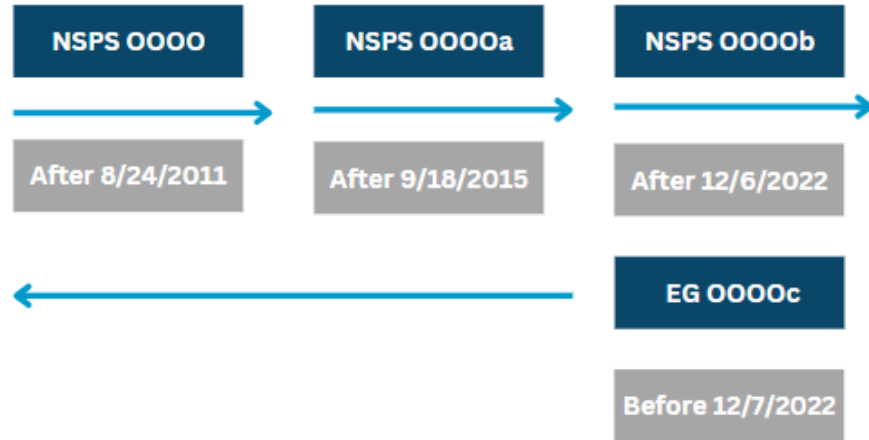
Facility Type	0000	0000a	0000b	0000c
Well sites (as defined in 0000/a)	N/A	N/A		
Well sites (as defined in 0000b/c)			N/A	N/A
Centralized Production Facility			Annual flow rate measurement*†	Annual flow rate measurement*†
Compressor Station	Replace rod packing every 3 years or 26,000 hrs [†]	Replace rod packing every 3 years or 26,000 hrs [†]	Annual flow rate measurement*†	Annual flow rate measurement*†

* Leak rate of ≥ 2 scf/m requires that the rod packing be replaced.

† Option to route emissions to a process or control device via closed vent system.



Reciprocating Compressor Applicability



- **NSPS 0000/0000a:** replace rod packing every 26,000 hrs or 3 years, **or** route to a process
- **NSPS 0000b:** conduct annual flow rate measurement, replace rod packing when leak rate exceeds 2 scfm, **or** route to a process or control device



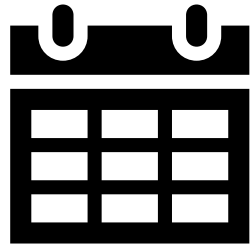
Well Sites remain
EXEMPT
from rod packing
requirements under
0000b

Comparison of Pneumatic Requirements

Facility Type	0000	0000a	0000b	0000c
Pneumatic Controllers			Process Controllers	
Natural Gas Processing Plant	Zero VOC emissions	Zero VOC emissions	Zero methane & VOC emissions	Zero methane & VOC emissions
All other facility types	<6 scf/h VOC emissions	<6 scf/h VOC emissions	Zero methane & VOC emissions[†]	Zero methane emissions[†]
Pneumatic Pumps			Natural Gas-driven Pumps	
Natural Gas Processing Plant	N/A	Emission rate of zero	Zero methane & VOC emissions	Zero methane & VOC emissions
Well Sites	N/A	Reduce emissions by 95%	Zero methane & VOC emissions[†]	Zero methane & VOC emissions[†]
Centralized Production Facility			Zero methane & VOC emissions[†]	Zero methane & VOC emissions[†]
Compressor Stations	N/A	N/A	Zero methane & VOC emissions[†]	Zero methane & VOC emissions[†]
Transmission & Storage	N/A	N/A	Zero methane & VOC emissions[†]	Zero methane & VOC emissions[†]

† If you comply by routing the emissions to a process, emission must be routed through a closed vent system. If you comply by using a self-contained natural gas-driven pneumatic controller, it must operate with no detectable emissions.

* Unless able to meet the exception provided in §60.5393b(b) based on technical infeasibility



Fugitive Emissions Monitoring Monitoring Frequencies Compared

Facility Type	0000		0000a		0000b		0000c	
	AVO	OGI	AVO	OGI	AVO**	OGI	AVO**	OGI
Well Site* (0000/0000a definition)	N/A	N/A	N/A	Semiannual				
Single wellhead or small site					Quarterly	N/A	Quarterly	N/A
Multi-wellhead					Quarterly	Semiannual	Quarterly	Semiannual
Well site with major production/processing equipment					Bimonthly	Quarterly	Bimonthly	Quarterly
Centralized production facility					Bimonthly	Quarterly	Bimonthly	Quarterly
Compressor Station	N/A	N/A	N/A	Quarterly	Monthly	Quarterly	Monthly	Quarterly
Natural Gas Processing Plant (§60.5400)	Follow requirements under NSPS VVa				NA	Bimonthly	NA	Bimonthly

* **Well site** means one or more surface sites that are constructed for the drilling and subsequent operation of any oil well, natural gas well, or injection well. For purposes of the fugitive emissions standards at [§ 60.5397a](#), well site also means a separate tank battery surface site collecting crude oil, condensate, intermediate hydrocarbon liquids, or produced water from wells not located at the well site (e.g., centralized tank batteries).

** Conduct an inspection using auditory, visual, olfactory, **OR any other detection method (e.g. OGI).**

Advanced Methane Measurement

There is the opportunity to utilize advanced methane measurement technologies for periodic and/or continuous monitoring in place of the required OGI or Method 21 screening of fugitive emissions components. These advanced technologies must first be approved by the EPA and then the owner/operator must submit a notice to EPA of the adoption of alternative standards prior to utilizing an alternative monitoring method.

Periodic Monitoring

Table 1 – Minimum Screening	Table 2 – Minimum Screening	Minimum Detection Threshold
Quarterly	Semiannual	≤1 kg/hr
Bimonthly	Triannual	≤2 kg/hr
Bimonthly + annual OGI	Triannual + Annual OGI	≤10 kg/hr
Monthly	Quarterly	≤5 kg/hr
Monthly + Annual OGI	Quarterly + Annual OGI	≤15 kg/hr
	Bimonthly	≤15 kg/hr

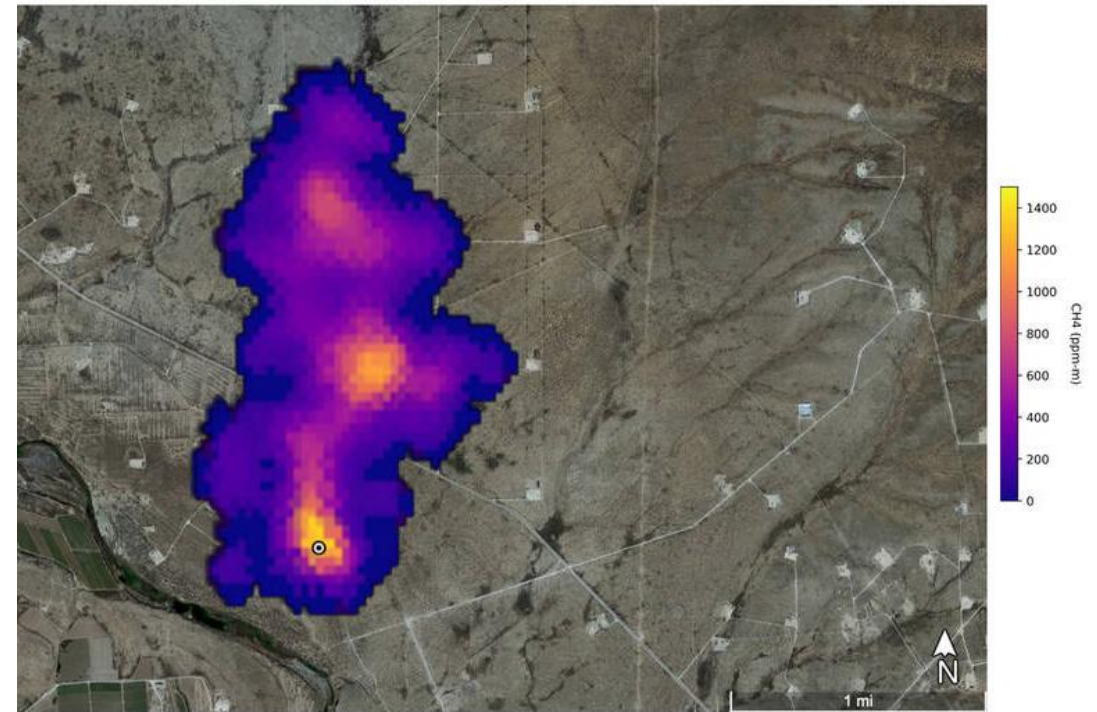
Continuous Monitoring

Facility Type	90-day rolling average action level*	7-day rolling average action level
Wellhead only	1.2 kg/hr	15 kg/hr
Well sites with major equipment (including small sites)	1.6 kg/hr	21 kg/hr
Centralized Production Facilities		
Compressor Stations		
*Above site-specific baseline emissions		

Super-Emitter Events

- Defined as a quantified emission rate $>100\text{kg/hr}$ of methane.
- EPA Certified 3rd Parties can participate using an EPA approved method.
- Events are reviewed by EPA and posted to a website* and provided to the operator.
- Operators have 5 days from notification to respond and initiate investigation.

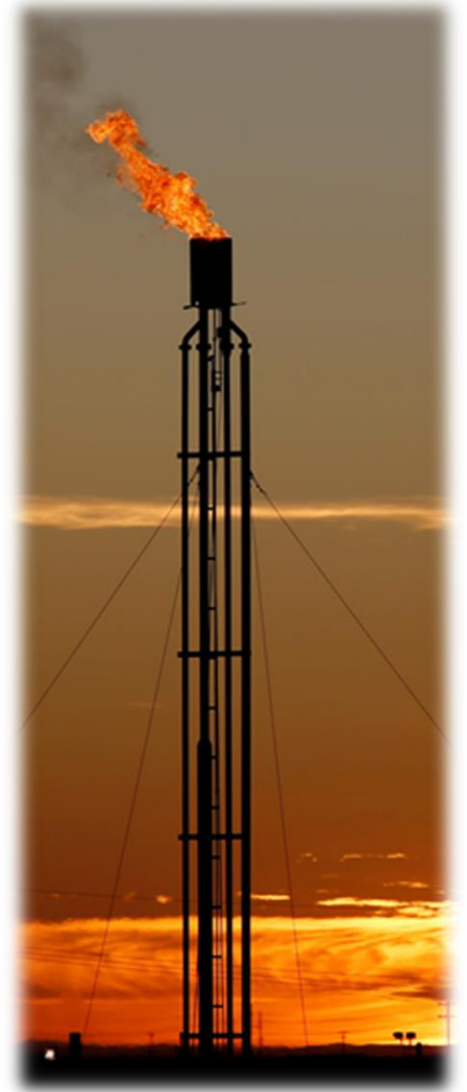
* www.epa.gov/super-emitter



- Investigation must be completed within 15 days of notification and submit a report of the investigation through the Super-Emitter Program Portal.

Control Devices

- Combustion Device (flares, enclosed combustors, thermal oxidizer, etc.)
 - Operate with no visible emissions
 - Monthly Method 22 inspection
 - Maintain NHV of gas sent to the device at or above applicable limits
 - Must reduce mass content of methane and VOC in the gases vented to the device by 95% by weight or greater
 - Initial compliance test required by either the manufacturer or the owner/operator with subsequent testing every 5 years.
- Vapor Recovery Device or other non-destructive control device
 - Must reduce mass content of methane and VOC in the gases vented to the device by 95% by weight or greater



Interim Compliance Requirements

	Interim Time Period Ends	Interim Compliance Requirements
Process Controllers	1 year from effective date	<p>§60.5390b(b)(1)-(3)</p> <ul style="list-style-type: none"> Continuous bleed controllers must have a bleed rate less than or equal to 6 scfh Intermittent controllers must not vent during idle periods and must be monitored as per 60.5397b Reduce methane and VOC emissions by 95% by routing to a control device via a closed vent system
Associated Gas Wells – commenced construction between the effective date and 2 years after the effective date	2 years from effective date	<p>§60.5377b(f)</p> <ul style="list-style-type: none"> Route associated gas to a control device that reduces methane and VOC emissions by at least 95%
Associated Gas Wells – commenced construction between 12/6/22 and the effective date	2 years from effective date	<p>§60.5377b(f)</p> <ul style="list-style-type: none"> Route associated gas to a control device that reduces methane and VOC emissions by at least 95%
Advanced Methane Measurement	2 years from effective date	<p>§60.5398b(b)(1)(ii)</p> <ul style="list-style-type: none"> If you use an approved alternative test method with a minimum aggregated detection threshold ≤ 3 kg/hr you may conduct periodic screening quarterly.

Initial & Annual Reporting

- Initial compliance report due 90 days after the end of the initial compliance period, which begins 60 days after publication in the Federal Register and ends 1 year after that date.
- Subsequent reporting will be due by the same date each year.
- Will be electronic through CEDRI (like OOOOa)
- Expanded reporting for some sources and new reporting for some sources
- Reporting requirements can be found under §60.5420b(b)(1) through (14)

Key Definitions

- **Centralized Production Facility** – one or more storage vessels and all equipment at a single surface site used to gather, for the purpose of sale or processing to sell, crude oil, condensate, produced water, or intermediate hydrocarbon liquid from one or more offsite natural gas or oil production wells. This equipment includes, but is not limited to, equipment used for storage, separation, treating, dehydration, artificial lift, combustion, compression, pumping, metering, monitoring, and flowline. Process vessels and process tanks are not considered storage vessels or storage tanks. A centralized production facility is located upstream of the natural gas processing plant or the crude oil pipeline breakout station and is a part of producing operations.
- **Fugitive Emissions Component** – any component that has the potential to emit fugitive emissions of methane or VOC at a well site, centralized production facility, or compressor station, including valves, connectors, pressure relief devices, open-ended lines, flanges, covers and closed vent systems not subject to §60.5411b, thief hatches or other openings on a storage vessel not subject to §60.5395b, compressors, instruments, meters, and in yard piping.
- **Fugitive Emissions** – are defined as **any indication of visible emissions observed from a fugitive emissions component using optical gas imaging** or an instrument reading of 500 parts per million (ppm) or greater using Method 21 of appendix A-7 to this part.

Key Definitions Cont.

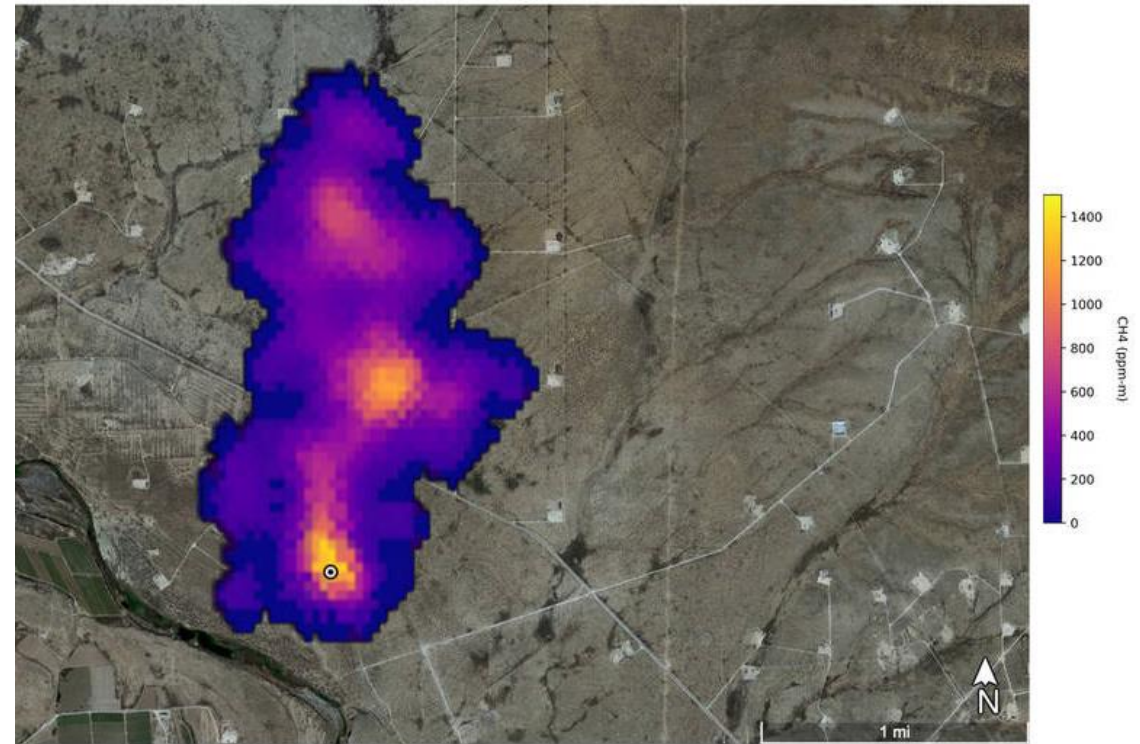
- **Major Production and Processing Equipment** - means reciprocating or centrifugal compressors, glycol dehydrators, heater/treaters, separators, and storage vessels collecting crude oil, condensate, intermediate hydrocarbon liquids, or produced water, for the purpose of determining whether a well site is a wellhead only well site.
- **Multi-wellhead Only Site** – means a well site that contains two or more wellheads and no major production and processing equipment
- **Small Well Site** –for purposes of the fugitive emissions standards in §§60.5397b and 60.5398b, a well site that contains a single wellhead, no more than one piece of certain major production and processing equipment, and associated meters and yard piping. Small well sites cannot include any controlled storage vessels (or controlled tank batteries), control devices, or natural gas-driven pneumatic controllers.
- **Wellhead Only Well Site** – for the purposes of the fugitive emissions standards at §60.5397b, a well site that contains one or more wellheads and no major production and processing equipment.

A Global Methane Model

The Role of 3rd Parties

Super-Emitter Events

- Defined as a quantified emission rate >100kg/hr of methane.
- 3rd Parties can participate (satellites, planes, mobile detection, etc.)
- Notification is provided to the owner/operator and the EPA and made publicly available on a special website.
- Within 5 days initiate a root cause analysis (likely using OGI)
- Within 10 days fix the problem or complete initial corrective action
- Within 15 days after completing corrective actions, submit a report
- Reports will be made publicly available on the special website



Subpart W Large Release Event
is the corresponding mechanism
that requires the reporting of the
super-emitter program

United Nations IMEO and MARS initiatives are a Global LDAR Program

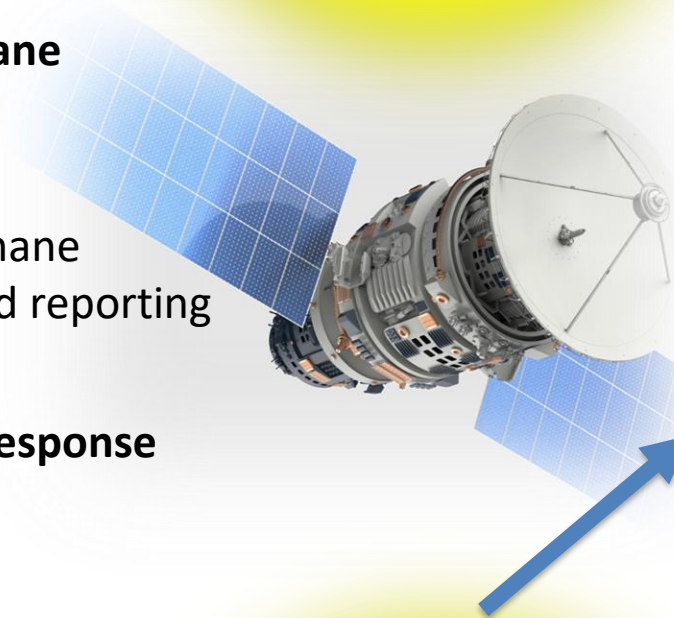
IMEO = International Methane Emissions Observatory

- Gathering all global methane emissions inventories and reporting

MARS = Methane Alert & Response System

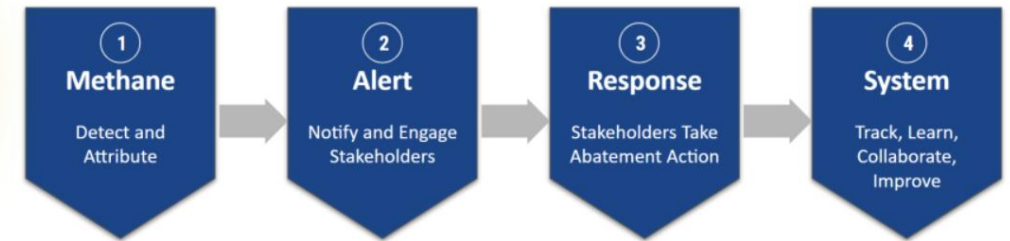
- Leveraging multiple satellite programs to track global methane emissions

MARS can detect and report a super emitter & large methane releases



MARS Alert will notify & engage agencies of jurisdiction

MARS has four components:



- **Component 1: Detect & Attribute:** IMEO will coordinate with the Committee on Earth Observation Satellites and work with existing global mapping satellites (ESA TROPOMI) to identify very large methane plumes and methane hot spots and conduct further analysis using other satellites (e.g. ASI PRISMA; ESA Sentinel-2; NASA Landsat; DLR EnMAP) and datasets to enable attribution of the event to a specific source.
- **Component 2: Notify & Engage:** IMEO will work directly and through partners to notify relevant governments and companies to large emission events happening in or near their jurisdictions or operations and will continue this engagement as more information becomes available.
- **Component 3: Stakeholders Take Abatement Action:** It will be up to the notified stakeholders to determine how best to respond to the notified emissions and share their actions with MARS to show initiative. As appropriate, MARS partners will be available to provide support services at this stage, e.g. assistance with assessing mitigation opportunities and support for mitigation actions.
- **Component 4: Track, Learn, Collaborate, Improve:** IMEO will continue to monitor the event location for future emissions as mitigation efforts proceed. Once the MARS system is fully operational, IMEO and partners will make data and analysis publicly available between 45 and 75 days post detection. IMEO will foster collaboration across the MARS ecosystem to draw lessons from these notified events that can be applied to improve MARS and methane action in general.

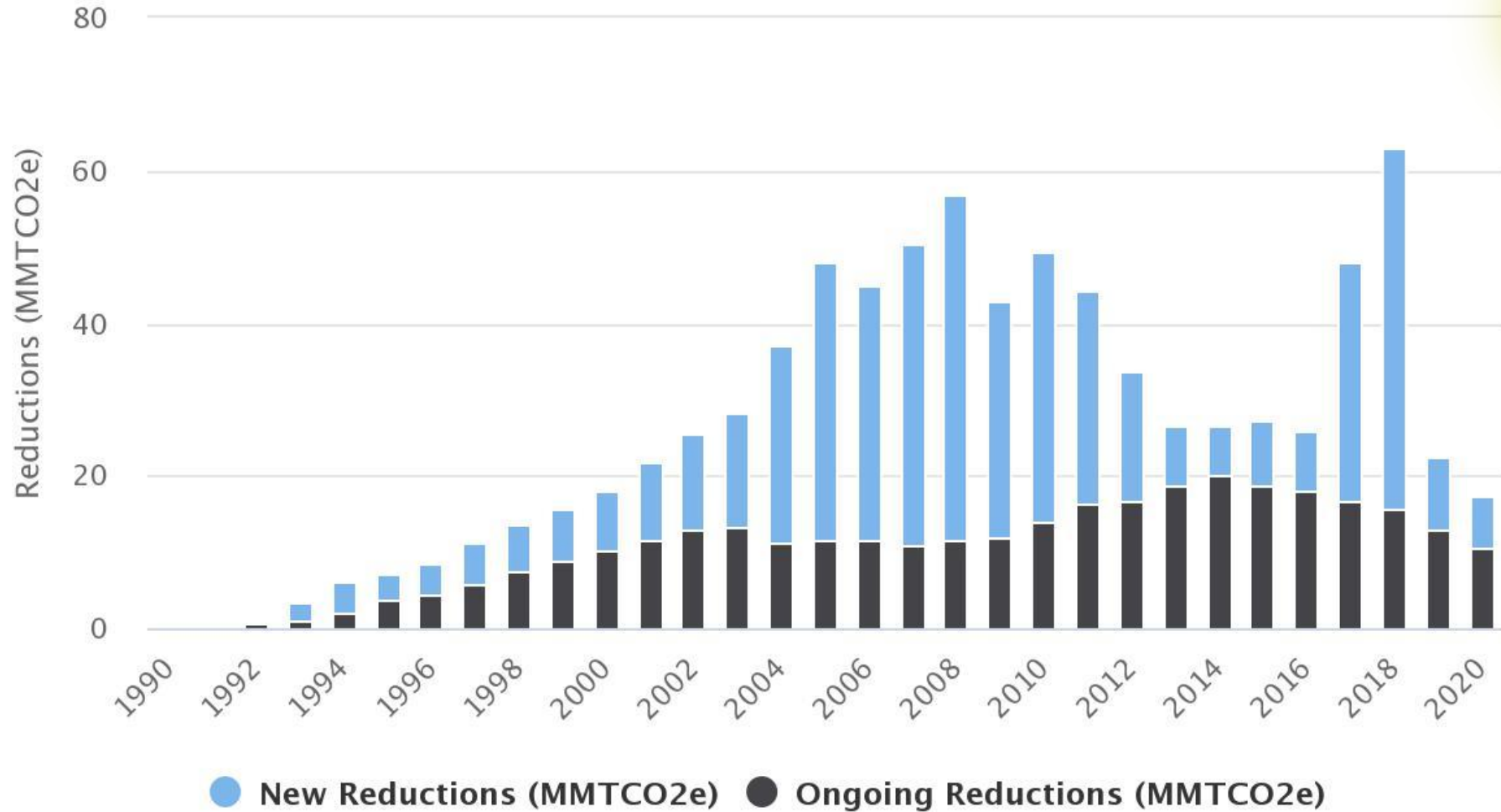
Source: <https://www.unep.org/explore-topics/energy/what-we-do/methane/imeo-action/methane-alert-and-response-system-mars>

Best Management Practices

Building a Methane Intensity Strategy

Annual Reductions by Year (MMTCO2e)

Segment(s): Distribution, Gathering and Processing, Production and Transmission



824.3 MMT

<https://www.epa.gov/natural-gas-star-program/celebrating-nearly-30-years-natural-gas-star-partnership>

Understanding the Scale of Emissions Reductions in STAR

“In 2019, humans emitted more than 35 billion tons of carbon dioxide (CO₂) into the atmosphere by burning fossil fuels.”



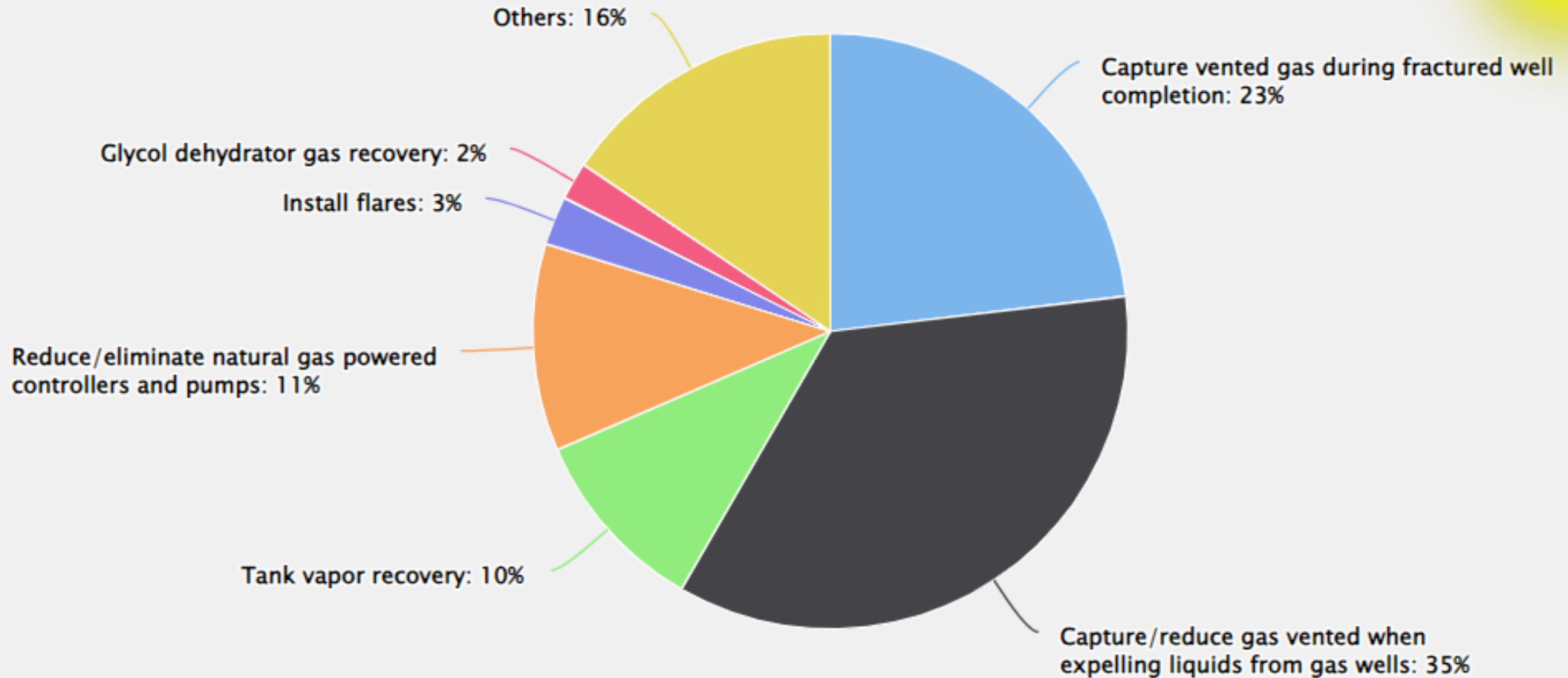
(35,000 MMT CO₂e)

- So, 824 MMT CO₂e is 2.3% of global carbon footprint from burning fossil fuels in 2019
- So, 824 MMT CO₂e is the equivalent of the emission from 164,800,000 cars in , or almost 5.5 million cars per year on average over 30 years.

<https://climate.mit.edu/ask-mit/how-much-ton-carbon-dioxide>

Production Emission Reduction Technologies (% of MMTCO₂e)

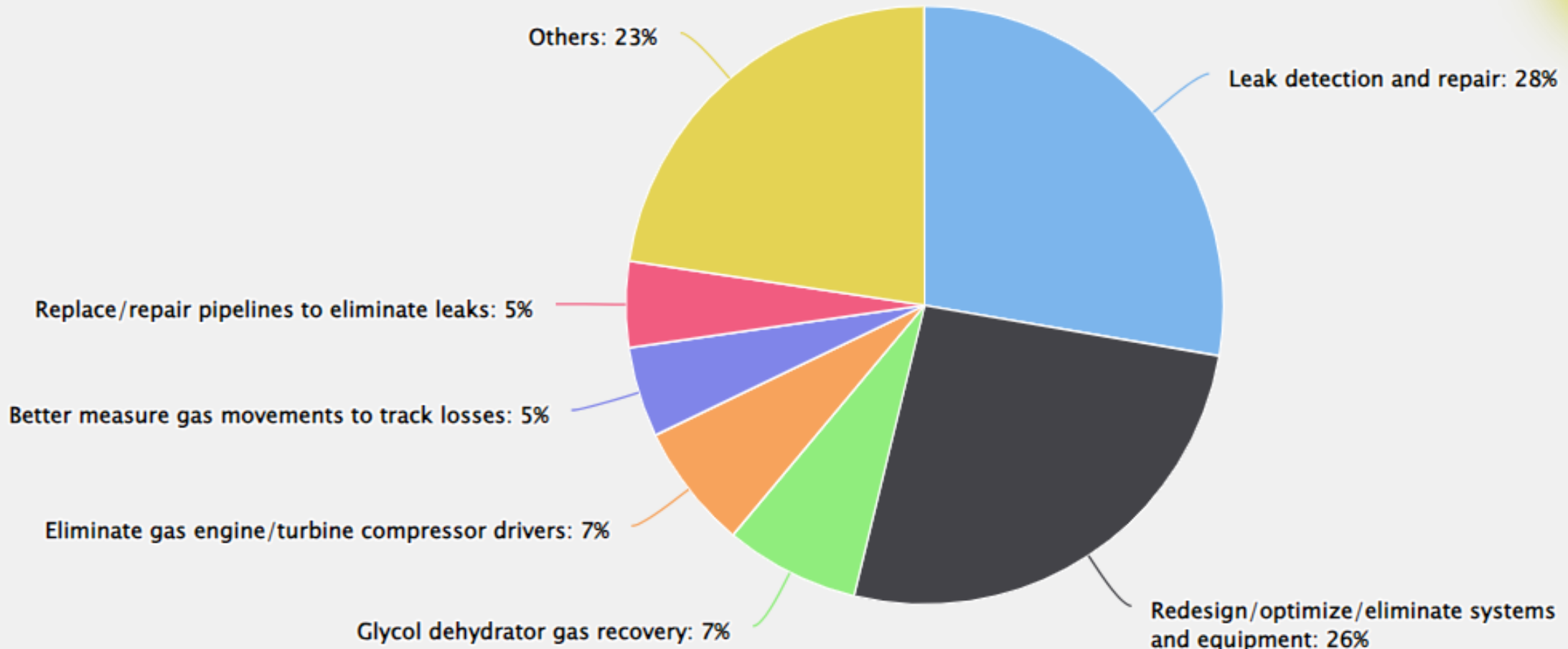
594 MMT



<https://www.epa.gov/natural-gas-star-program/celebrating-nearly-30-years-natural-gas-star-partnership>

Gathering and Processing Emission Reduction Technologies (% of MMTCO₂e)

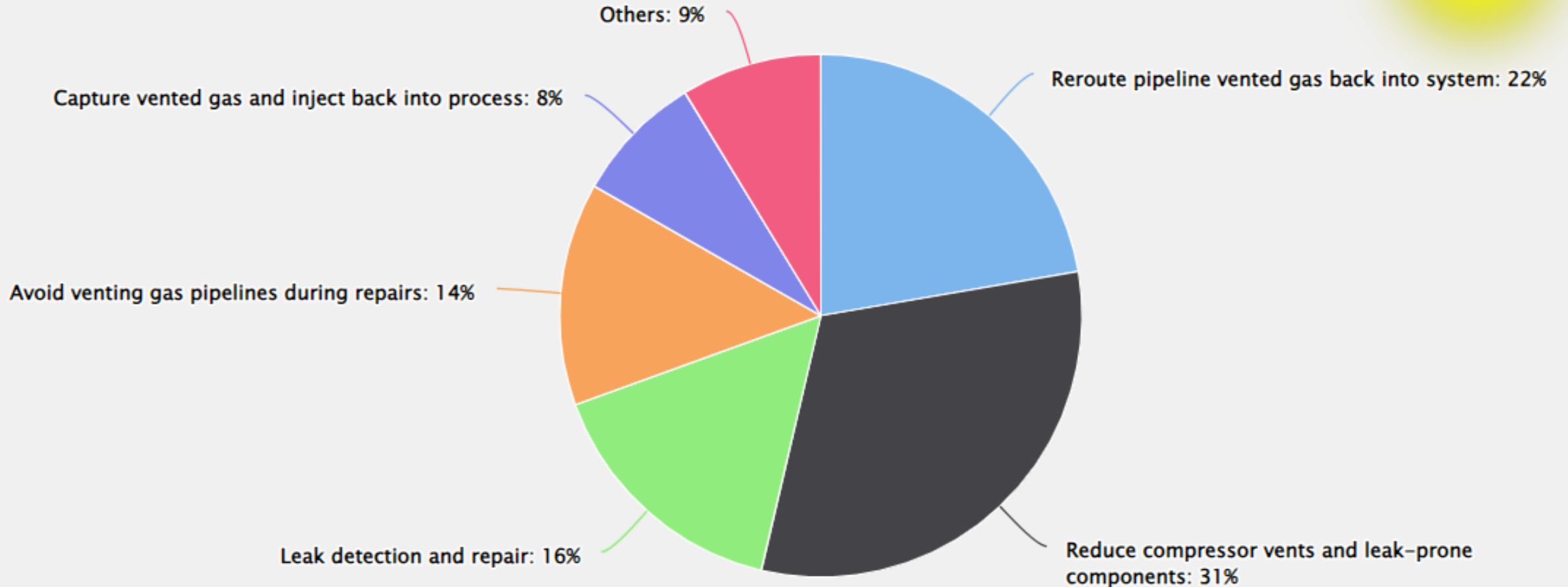
25.8 MMT



<https://www.epa.gov/natural-gas-star-program/celebrating-nearly-30-years-natural-gas-star-partnership>

Transmission Emission Reduction Technologies (% of MMTCO₂e)

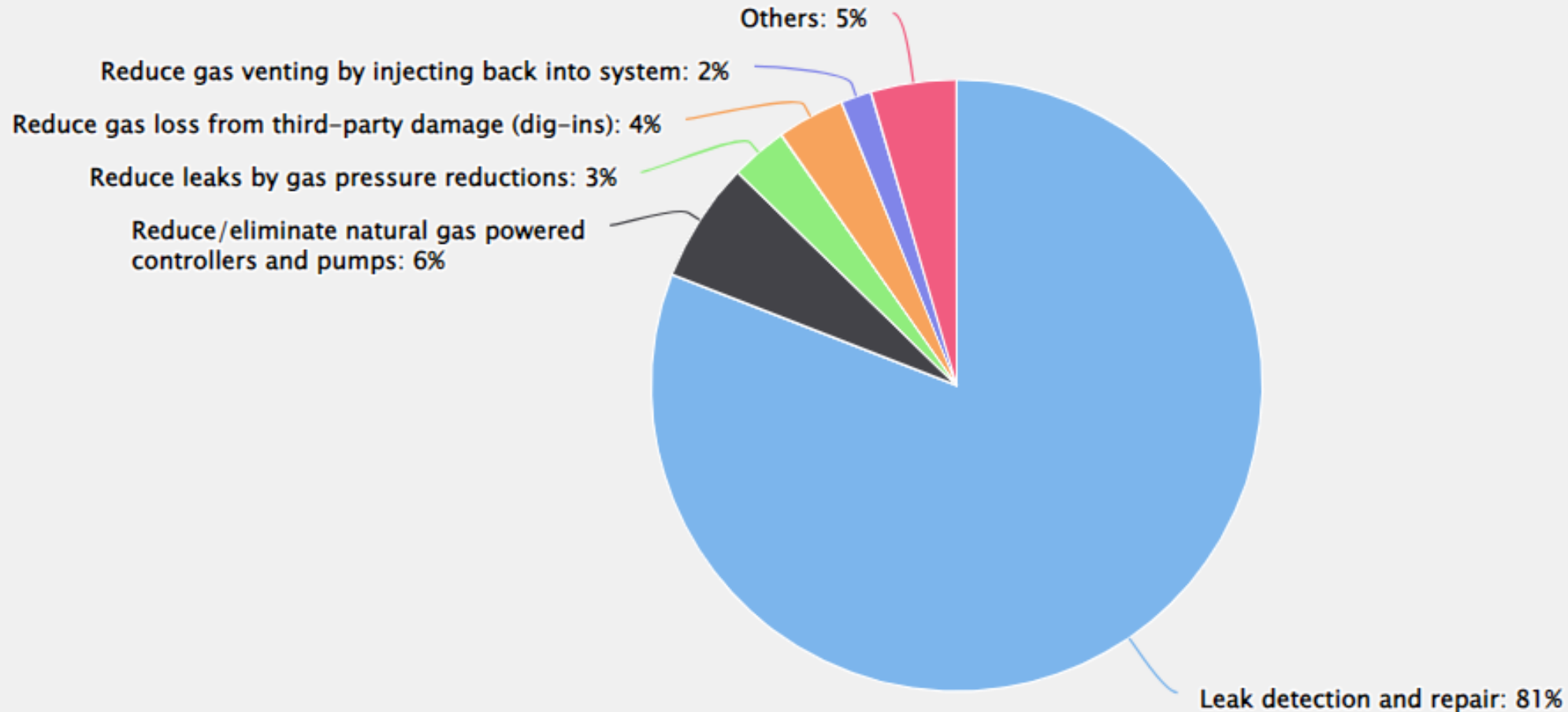
186 MMT



<https://www.epa.gov/natural-gas-star-program/celebrating-nearly-30-years-natural-gas-star-partnership>

Distribution Emission Reduction Technologies (% of MMTCO₂e)

18.5 MMT



<https://www.epa.gov/natural-gas-star-program/celebrating-nearly-30-years-natural-gas-star-partnership>

Conclusion & Questions

Methane is a Modern Imperative

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