



# Proposed 0000b & EG 0000c Version 2 Published Nov 11th, 2022

LDAR & Equipment Requirements:

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# 0000b - Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After November 15, 2021



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# 0000b - Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After November 15, 2021



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# §60.5365b Am I subject to this Subpart?



## Owner of one or more of the affected facilities (See below) for which you commence construction, modification, or reconstruction after November 15, 2021

- (a) **Well affected facility**: for well completions. Same as modification in Fugitive emissions for well sites
- (b) **Centrifugal compressor affected facility**: @ well site not affected facility, @ Centralized Production Facility (CPF) is affected facility.
- (c) **Reciprocating compressor affected facility**: @ well site not affected facility, @ Centralized Production Facility (CPF) is affected facility.
- (d) **Pneumatic controller affected facility**: modification is # increased by 1 or more
- (e) **Storage vessel affected facility**: which is a tank battery that has VOC PTE > 6 TPY or Methane PTE > 20TPY
- (f) **Process unit affected facility**: Unit in an onshore gas plant
- (g) **Sweetening unit affected facility**: If it processes natural gas (onshore or offshore), size limit < 2 long-tons of H<sub>2</sub>S.
- (h) **Pneumatic pump affected facility**: NG driven diaphragm or piston pump @ a well site, CPF, Onshore NGPP or compressor station. modification is # increased by 1 or more
- (i) **Fugitive emission affected facility**: The collection of components at a well site, CPF, or compressor station
- (j) **Super-emitter affected facility**: Individual well site, CPF or Compressor Station with emissions detected using remote detection methods able to quantify 100kg/hr or greater



# §60.5370b When Must I Comply With This Subpart?

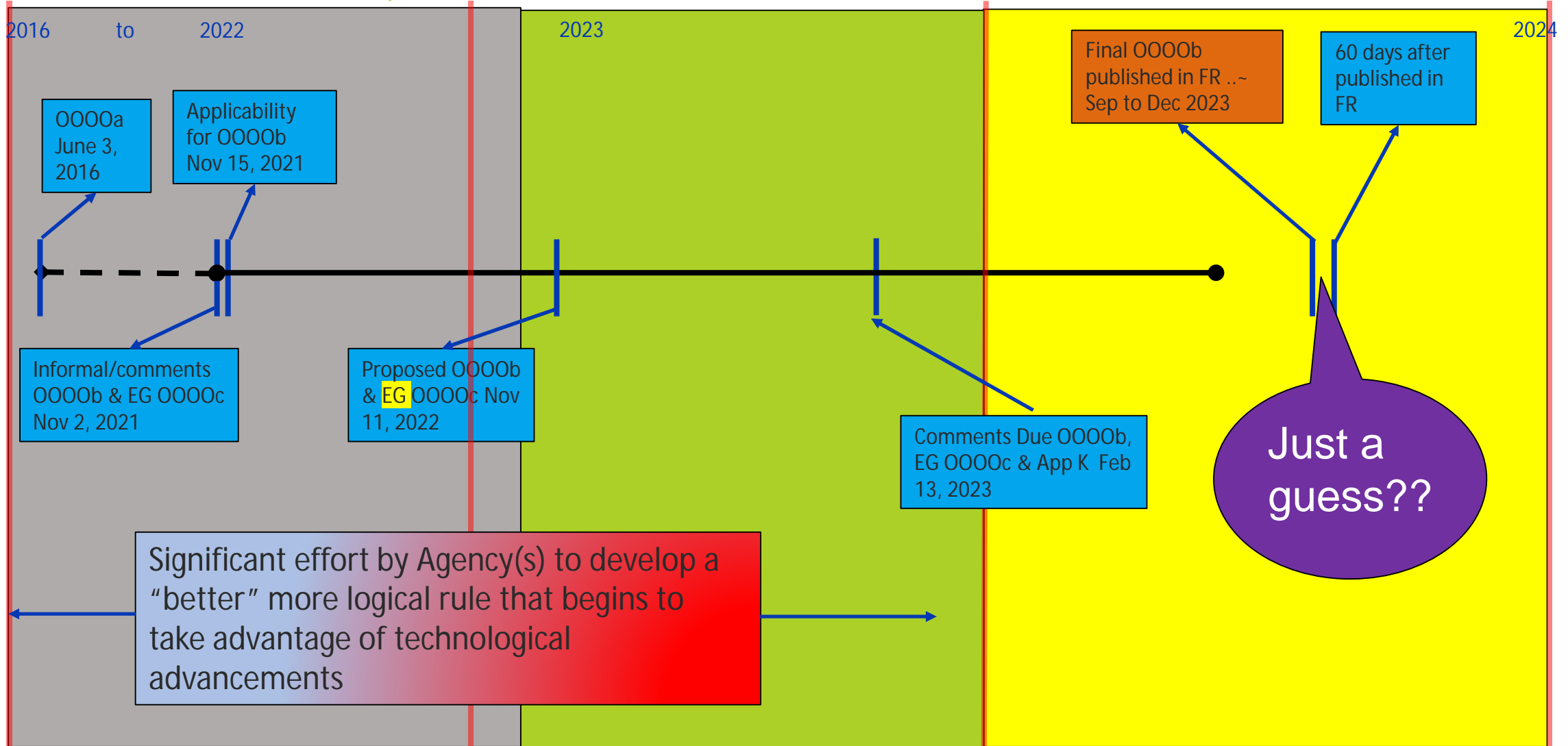


You must be in compliance with the standards of this subpart no later than **[INSERT DATE 60 DAYS AFTER PUBLICATION OF FINAL RULE IN THE FEDERAL REGISTER]** or upon initial startup, whichever is later, except as specified in paragraph (a)(1) of this section for **reciprocating compressor affected facilities**, paragraphs (a)(2) and (3) of this section for **storage vessel affected facilities**, and paragraph (a)(4) for **process unit equipment affected facilities** at onshore natural gas processing plants.

- (a) **Reciprocating compressor affected facility**: You have 8760 hours after date above to perform your 1<sup>st</sup> volumetric flow rate measurement
- (b) **Process unit affected facility**: For new sources (built after date above) as soon as practicable but no later than 180 days after initial startup. Existing modified in the interim (Nov 15, 2021 to date above) you have 60 days from date above to be in compliance.



# OOOOa, OOOOb & EG OOOOc Timeline





# 0000a, 0000b & EG 0000c Timing



Rule	<u>APPLICABILITY</u> When it was Constructed (or reconstructed/modified)	Rule Applied
NSPS 0000	NOTE: NO OGI for 0000 After August 23, 2011 and on or before September 18, 2015	NSPS Issued in 2012 (Referred to as 0000) *Note: Existing sources built on or before November 15, 2021, will become subject to state plans under the Emissions Guidelines (EG 0000c) once SIP's take effect.
NSPS 0000a	After September 18, 2015 and on or before November 15, 2021	NSPS Issued in 2016 (Referred to as 0000a) *Note: Existing sources built on or before November 15, 2021, will become subject to state plans under the Emissions Guidelines (EG 0000c) once SIP's take effect
NSPS 0000b	After November 15, 2021	NSPS that will be finalized in 2023 (Referred to as 0000b) *Note: Existing sources built on or before November 15, 2021, will become subject to state plans under the Emissions Guidelines (EG 0000c) once those take effect
SIP/FIP EG 0000c	State must submit a Plan (SIP) by 18 months after published in Fed. Reg. Must be in compliance 36 months after SIP submittal	NOTE: 0000b = EG 0000c or are the same *Note: Existing sources built on or before November 15, 2021, will become subject to state plans under the Emissions Guidelines (EG 0000c) once SIP's take effect So, we are looking at 4.5 years after EG 0000c is published in Fed. Reg. Assume Nov of 2023 Publication: May of 2028 essentially all existing O & G sources will be regulated



# §60.5371b What are My Requirements to Address Super-Emitter Emissions Events?



§60.5371b(a) ***Qualifications for Notification*** – If in the administrator’s judgement “someone” demonstrates expertise in one of the remote detection technologies below the administrator will approve that third-party notifier as eligible (a list will be created) to submit a notification to an owner or operator.

- Satellite Detection of Methane Emissions, Remote sensing aircraft, Mobile Monitoring platforms

## §60.5371b(b) ***Notification of Super-Emitter Emission Events***

- Notify As Soon As Practicable, with documentation and sampling protocols that the technology used can detect methane emissions of **100 kg/hr or greater**
- Rate detected with any associated uncertainty bounds from sampling protocol, meta data, weather conditions during survey
- Certification, signed and dated with the following STATEMENT: “I certify that I meet the qualifications of a notifier under 40 CFR 60.5371b(a) and that the emission detection information included in this notification was collected and interpreted as described in this notification. Based on my professional knowledge and experience, and inquiry of personnel involved in the collection and analysis of the data, the certification submitted herein is true, accurate, and complete”. **Will be made publicly available on website.**





# §60.5371b What are My Requirements to Address Super-Emitter Emissions Events?



§60.5371b(c) **Addressing Super-Emitter Emission Events** – Within 5 days initiate root-cause analysis (RCA) process, 10 days to complete RCA.

- OGI LDAR, M21 LDAR, AMT LDAR, VRU inspection, Visual inspection of Thief Hatches, Dump Valves, Flares & Pneumatics

§60.5371b(d) **Corrective Action Plans for Additional Analysis** – If you cannot fix in 10 days or are notified by a “notifier” of an event from same emission source .. Additional documentation in plan on how it will be addressed, any additional measures taken and a schedule for any additional measures to be taken. You must submit plan to administrator.

§60.5371b(e) **Reporting Requirements** – Document results, statement reading: “I certify that the information provided in this report regarding notification, root cause, and corrective action of the specified super-emitter emissions event was prepared under my direction or supervision. I further certify that the root cause analysis and corrective actions were conducted, and this report was prepared pursuant to the requirements of §60.5371b(c) and (d). Based on my professional knowledge and experience, and inquiry of personnel involved in the assessment, the certification submitted herein is true, accurate, and complete.” ... and information must be submitted in §60.5420 annual report

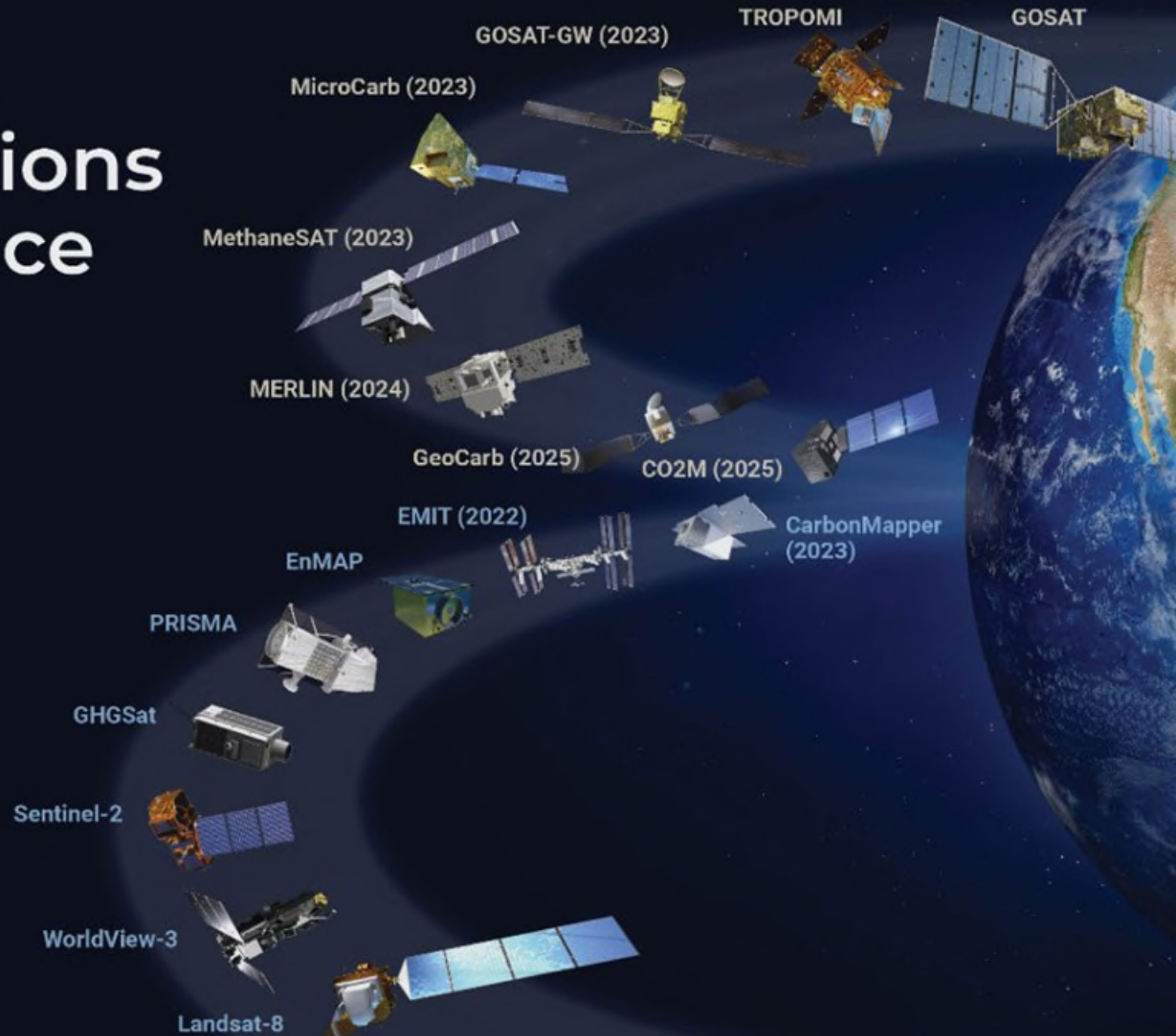


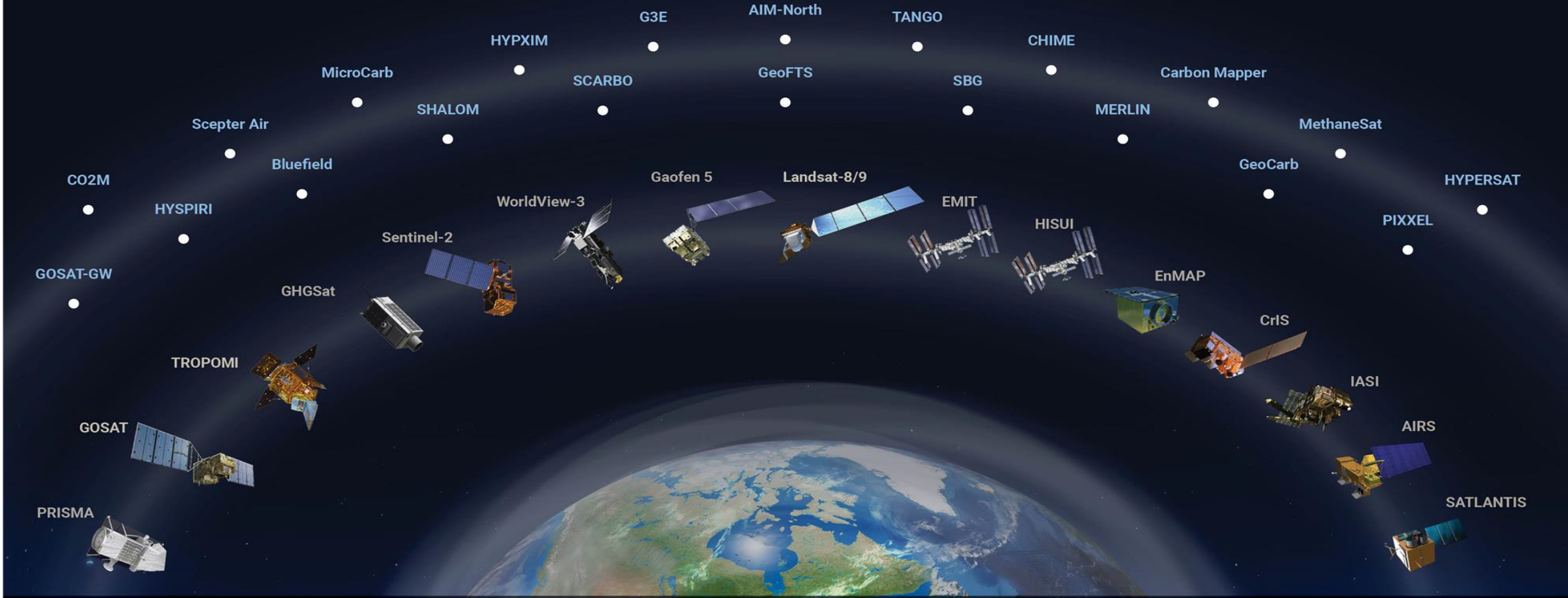
# Examples of Satellite Systems

## Methane Observations from Space

Area flux mappers

Point source imagers





# Methane Observations from Space

Operational Future

EarthScape™  
by GeoSapiient



# §60.5385b What GHG and VOC Standards Apply to Reciprocating Compressor Affected Facilities?

NGPP, CS,  
CPF & **None**  
@ well sites



Either **1) §60.5385b(a) thru (c)**: perform initial and annual volumetric flow rate measurements of rod packing vents or **2) §60.5385b(d)**: collect emissions from rod packing vents through a Closed Vent System (CVS) going to process. Compliance Level: 2 SCFM (~ 56 l/m)

**Must be tested in OPERATING or STANDBY PRESSURIZED mode §60.5385b(b)(1)&(2)**

## **For reciprocating compressor rod packing equipped with an open-ended vent line**

- 1<sup>st</sup> volumetric flow measurement within 8760 operational hours, Thereafter, volumetric flow measurement within 8760 hours of previous measurement event
  - High Volume sampler according to §60.5386b(b)(1)(i) or Temporary or permanent meter using §60.5386b(b)(1)(ii)
  - Screen for OGI leaks and if emissions present use above to test for flow. If no OGI emissions present, you may assume volumetric measurements are zero. §60.5386b(b)(1)(iii)
  - High Volume sampler according to §60.5386b(b) or (c). (Note: Increased quality control for use of Hi Volume sampler)

## **For reciprocating compressor rod packing NOT equipped with an open-ended vent line**

- 1<sup>st</sup> volumetric flow measurement within 8760 operational hours. Thereafter, volumetric flow measurement within 8760 hours of previous measurement event
- Use OGI or Method 21 for closed distance pieces ..annual leak detection or survey (areas leaking from enclosure area), §60.5385b(b)(2)(i). If emissions present, determine volumetric flow rate using Flow meter, Hi Vol or Alternative method
- High Volume sampler according to §60.5386b(b) or (c). (Note: Increased quality control for use of Hi Volume sampler)

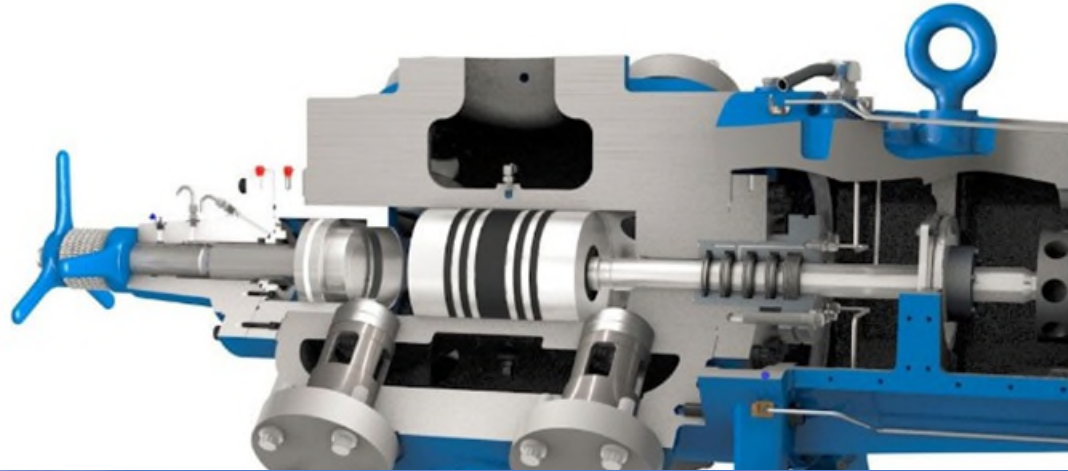
## **For manifolded reciprocating compressor rod packing vents**

- Measure at a single point downstream of all inputs and/or if practicable prior to comingling



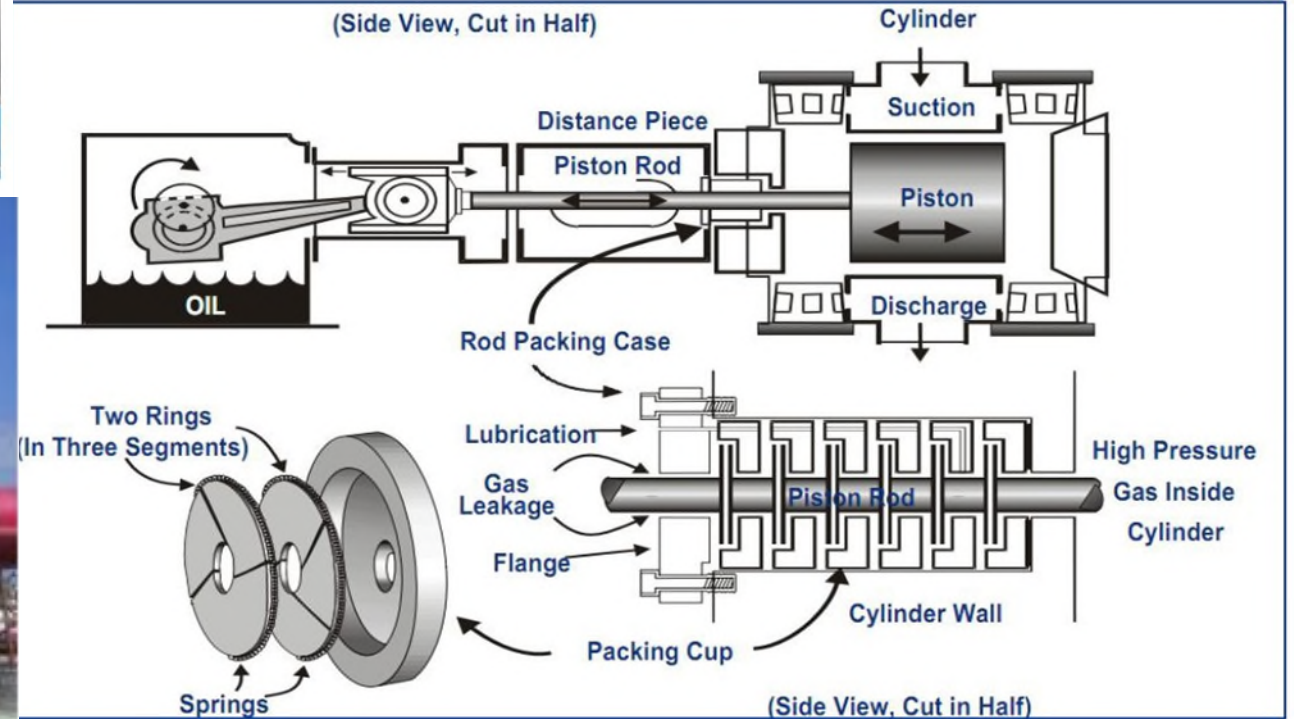
# §60.5385b What GHG and VOC Standards Apply to Reciprocating Compressor Affected Facilities?

NGPP, CS,  
CPF & **None**  
@ well sites



## Reducing Methane Emissions From Compressor Rod Packing Systems (Cont'd)

Exhibit 1: Typical Compressor Rod Packing System





# §60.5386b What test methods and procedures must I use for my reciprocating compressor affected facilities?



Either OGI or Method 21 (500 ppmv) to screen for emissions or leaks from the reciprocating compressor rod packing. **§60.5386b(a)**

- OGI can be either compliant with §60.5397b or Appendix K **§60.5386b(a)(1)(i)&(ii)**
- Vol Flow rate meter must be calibrated annually according to Method 2d **§60.5386b(b)**

Hi Vol use and procedures **§60.5386b(c)**

You must develop procedures and includes procedures in monitoring plan **§60.5386b(c)(1)&(2)**

- Must have a methane sensor that meets requirements below: **§60.5386b(c)(3)**
- Selective to methane with minimal interference > 2.5% for the sum of responses **§60.5386b(c)(3)(i)**
- Must have a range over entire expected concentrations **§60.5386b(c)(3)(ii)**
- Measurements once every second **§60.5386b(c)(3)(iii)**
- Large volume to capture emissions with capability to measure every second **§60.5386b(c)(4)**



# §60.5386b What test methods and procedures must I use for my reciprocating compressor affected facilities? continued



## Calibration of Methane sensors: §60.5386b(c)(5)

- Initially and semiannually determine linearity at 4 points, must <5% value:§60.5386b(c)(5)(i)(A)
- Prior & end of day calibration: low and a Mid point, must <5% value:§60.5386b(c)(5)(i)(B)
- Flow meters calibrated annually according to Method 2D:§60.5386b(c)(5)(ii)

## Sampling Procedures: §60.5386b(c)(6)

- Operate according to manufacturers specs:§60.5386b(c)(6)(i)
- Determine background for a minimum of 1 minute:§60.5386b(c)(6)(ii)
- Adjust flow such that concentration > 2ppmv above background level, sample for a minimum of 1 minute record flow rate in SCFM & concentration in ppmv with date/time:§60.5386b(c)(6)(iii)
- Standard conditions are defined as 20°C (68°F) and 760 mm Hg (29.92” Hg).
- Calculate leak rate according to below:§60.5386b(c)(6)(iv)

$$Q = \frac{CH4S - CH4B}{1000000}$$

- CH4S – Sample CH<sub>4</sub> concentration, CH4B Background CH<sub>4</sub> concentration, Q = CH<sub>4</sub> emission Rate
- Must collect 3 separate one-minute measurements (<10% diff) , determine average:§60.5386b(c)(6)(v)



# Definition: Fugitive Emissions Component



- NEW: means 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.
- OLD: Fugitive emissions component means any component that has the potential to emit fugitive emissions of methane or VOC at a well site or compressor station, including but not limited to connectors, pressure relief devices, open-ended lines, flanges, covers and closed vent systems not subject to §60.5411a, thief hatches or other openings on a controlled storage vessel not subject to §60.5395a, compressors, instruments, and meters. **Devices that vent as part of normal operations, such as natural gas-driven pneumatic controllers or natural gas-driven pumps, are not fugitive emissions components, insofar as the natural gas discharged from the device's vent is not considered a fugitive emission.** Emissions originating from other than the vent, such as the thief hatch on a controlled storage vessel, would be considered fugitive emissions.





# §60.5397b What GHG and VOC standards apply to fugitive emissions components affected facilities?



You must monitor and repair all fugitive emissions components in accordance with this section.

## §60.5397b(a)

You must develop a fugitive emissions monitoring plan §60.5397b(b),(c)&(d)

- Frequency of surveys, Technique (OGI, M21 or Alt), Man. & Model of equipment, techniques and procedures identifying and repairing leaks, techniques and procedures for verification of repair, record retention, verification of OGI specs, max viewing procedures for distance, wind speed procedures, adequate thermal background, adverse conditions & interferences, OGI procedure to ensure components are included in inspection

You shall observe each fugitive emissions component §60.5397b(e)

5 different types of facilities:

- Single Wellhead and Small Sites
- Wellhead only Sites  $\geq$  2 Wellheads
- Wellsites (ie. Batteries)
- Central Production Facilities
- Compressor Stations

**Small Well Site:** a well site that contains a single wellhead, no more than one piece of certain major production and processing equipment

**Centralized production facility:** means 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.



# §60.5397b What GHG and VOC standards apply to fugitive emissions components affected facilities? **continued**



## 0000b Inspection Frequency Requirements

Type of Facility	Initial Survey	AVO Inspection	Instrument Inspection	$\Delta T$ between Inspection AVO/OGI
Single Wellhead & Small Sites	AVO	QTLY	N/A	Not Codified
Wellhead Only Sites ( $\geq 2$ wellheads)	OGI	QTLY	Semiannual	Not Codified/4 Months
Well Sites (Batteries)	OGI	Bimonthly	QTLY	Not Codified/60 Days
Centralized Production Facilities	OGI	Bimonthly	QTLY	Not Codified/60 Days
Compressor Stations	OGI	Monthly	QTLY	Not Codified/60 Days



# §60.5397b What GHG and VOC standards apply to fugitive emissions components affected facilities? continued



## 0000b Repair and Verification Requirements

Type of Facility	Repair	Verification
Single Wellhead & Small Sites	found	Instrument Inspection Final Repair Verification 30 days after 1st Repair Attempt
Wellhead Only Sites (>= 2 sites)	found	30 days after 1st Repair Attempt
Well Sites (Batteries) & Centralized Production Facilities	found	30 days after 1st Repair Attempt
Compressor Stations	found	30 days after 1st Repair Attempt

**NOTE: Final Repair must include a Pa**

§60.5397b(h)(3): If the repair is technically infeasible, would require a vent blowdown, a compressor station shutdown, a well shutdown or well shut-in, or would be unsafe to repair during operation of the unit, the repair must be completed during the next scheduled compressor station shutdown for maintenance, scheduled well shutdown, scheduled well shut-in, after a scheduled vent blowdown, **or within 2 years**, whichever is earliest. A vent blowdown is the opening of one or more blowdown valves to depressurize major production and processing equipment, other than a storage vessel.



## §60.5398b What alternative GHG and VOC standards apply to fugitive emissions components affected facilities and covers and closed vent systems? **Periodic Alt**

**If you meet the standards:** You may use an alternative standard or means for compliance such as technologies that use [periodic monitoring](#) {§60.5398b(b)} or [technologies that employ continuous monitoring](#) {§60.5398b(c)} or any other [approved alternative test method](#) {§60.5398b(d)} as long as you properly provide notification {§60.5398b(a)} to administrator.

**Notification: §60.5398b(a)** You must notify administrator in first annual report following implementation.

**(#1) Periodic Screening: §60.5398b(b)** You must develop a monitoring plan for site(s) using periodic screening alternative: **§60.5398b(b)(1)**

That includes at a minimum:

list of site(s): **§60.5398b(b)(1)(i) thru (viii)**

- Identity of technology, contact for entity, frequency of screenings, equipment info; repair procedures and timeframes, verification time frames and procedures, recordkeeping info
- you must screen within 90 days of initial production or modification or
- no later than the final date of screening for previous method if switching to Alternative



# §60.5398b What Alternative GHG and VOC standards apply to fugitive emissions components affected facilities and covers and closed vent systems? Periodic continued

**Ongoing Frequencies: §60.5398b(b)(3)** You must choose appropriate screening frequency for the detection levels shown in Tables 1 & 2 below

- If table 1 or 2 require Annual OGI must be performed within 12 calendar months after initial screening and with in 12 months for subsequent OGI inspections **§60.5398b(b)(3)(ii)**
- If required to OGI inspect because a leak is found, that OGI inspection will meet the requirements for an annual OGI inspection if required for that site. Next OGI inspection required with 12 calendar months from this inspection **§60.5398b(b)(3)(iii)**

**Table 1 to Subpart OOOOb of Part 60—Alternative Technology Periodic Screening Frequency at Well Sites, Centralized Production Facilities, and Compressor Stations Subject to AVO Inspections with Quarterly OGI or EPA Method 21 Monitoring**

Minimum Screening Frequency	Minimum Detection Threshold of Screening Technology*
Quarterly + Annual OGI	≤1 kg/hr
Bimonthly	≤2 kg/hr
Bimonthly + Annual OGI	≤10 kg/hr
Monthly	≤4 kg/hr
Monthly + Annual OGI	≤30 kg/hr

\*Based on a probability of detection of 90%

**Table 2 to Subpart OOOOb of Part 60—Alternative Technology Periodic Screening Frequency at Well Sites and Centralized Production Facilities Subject to AVO Inspections and/or Semiannual OGI or EPA Method 21 Monitoring**

Minimum Screening Frequency	Minimum Detection Threshold of Screening Technology*
Semiannual	≤1 kg/hr
Triannual	≤2 kg/hr
Triannual + Annual OGI	≤5 kg/hr
Quarterly + Annual OGI	≤15 kg/hr
Monthly + Annual OGI	≤30 kg/hr

\*Based on a probability of detection of 90%



## §60.5398b What alternative GHG and VOC standards apply to fugitive emissions components affected facilities and covers and closed vent systems? Periodic continued



### Alternative periodic repair requirements if leak is found: §60.5398b(b)(4)

Within 5 days of screening, you must receive results: **§60.5398b(b)(4)(i)**

If confirmed, you must: **§60.5398b(b)(4)(ii)**

- OGI survey entire site: **§60.5398b(b)(4)(ii)(A)**
- Including Covers & close vent systems: **§60.5398b(b)(4)(ii)(B)&(C)**

You must repair within 30 days of periodic screening above: **§60.5398b(b)(4)(iii)**

If leak was due to a failure of a control device must initiate a Root cause analysis:  
**§60.5398b(b)(4)(iv)**

If leak was due to a failure of a cover or closed vent system must initiate a Root cause analysis:  
**§60.5398b(b)(5)**

You must maintain records and submit reports: **§60.5398b(b)(6)&(7)**



## §60.5398b What alternative GHG and VOC standards apply to fugitive emissions components affected facilities and covers and closed vent systems? Continuous Alt



**(#2) Continuous Monitoring: §60.5398b(c)** You must develop a monitoring plan for site(s) using continuous monitoring alternative:

For this section continuous monitoring means the ability of a measurement system to determine and record a valid mass emissions rate of methane at least once every 12-hour block: **§60.5398b(c)(1)**

- Sensitivity at least an order of magnitude less than action-level defined in §60.5398b(c)(4)(iii): **§60.5398b(c)(1)(i)**
- Health of devices checked at least every 6 hours; **§60.5398b(c)(1)(ii)**
- Must continuously collect data except as below: **§60.5398b(c)(1)(iii)**
  - 12 month rolling average downtime > 10%: **§60.5398b(c)(1)(iii)(A)**
  - Downtime – failure to transmit or out-of-control: **§60.5398b(c)(1)(iii)(B)**
  - Considered out-of-control or down until a passed QA check; **§60.5398b(c)(1)(iii)(C)**
  - Must calculate downtime each month: **§60.5398b(c)(1)(iii)(D)**

Must develop a fugitive emissions monitoring plan; **§60.5398b(c)(2)**

- See §60.5398b(c)(2)(i) thru (xi) ...standard stuff, similar to the periodic plan requirements. Should be developed by provider.

**Begin continuous monitoring: §60.5398b(c)(3),**

- you must screen within 120 days of initial production or modification §60.5398b(b)(2)(i) thru(iv) or
- no later than the final date of screening for previous method if switching to Alternative: §60.5398b(b)(2)(v)



## **§60.5398b What alternative GHG and VOC standards apply to fugitive emissions components affected facilities and covers and closed vent systems? Cont. continued**



### **Action levels: §60.5398b(c)(4)**

- Wellhead only well site: **§60.5398b(c)(4)(i)**
  - Rolling 90-day average action-level is 1.2 kg/hr (2.6 lbs/hr) **§60.5398b(c)(4)(i)(A)**
  - The rolling 7-day average action level is 15 kg/hr (34 lbs/hr) **§60.5398b(c)(4)(i)(B)**

### **Action levels: §60.5398b(c)(4) continued:**

Wellsite with major production, including Small Wellsites, CPF & Compressor Stations: **§60.5398b(c)(4)(ii)**

- Rolling 90-day average action-level is 1.6 kg/hr (3.6 lbs/hr) **§60.5398b(c)(4)(ii)(A)**
- The rolling 7-day average action level is 21 kg/hr (46 lbs/hr) **§60.5398b(c)(4)(ii)(B)**

Calculate emission rate: **§60.5398b(c)(5)**

- Each day calculate average daily emission rate **§60.5398b(c)(5)(i)**
- At the end of the day recalculate 7 day rolling average **§60.5398b(c)(5)(ii)**
- At the end of each day recalculate 90 day rolling average **§60.5398b(c)(5)(iii)**

Within 5 days initiate root cause analysis if action level exceeded **§60.5398b(c)(6)(i)** and completed within 30 days **§60.5398b(c)(6)(ii)**

If corrective action not successful, plan must describe what additional measures proposed to reduce emissions **§60.5398b(c)(7)**

You must maintain records and submit reports: **§60.5398b(c)(8)&(9)**





## §60.5400b What GHG and VOC standards apply to process unit equipment affected facilities?



- OOOOb (M21 no longer considered BSER for Onshore NGPP)
- Get rid of 10% VOC exemption .... ie. Include residue gas (inlet to outlet) [§60.5400b\(a\)](#)
- BSER for Equipment Leaks will be Bimonthly OGI monitoring conducted in accordance with [Appendix K](#). [§60.5400b\(b\)](#)
- Still have Weekly Visual requirements for pumps [§60.5400b\(c\)](#)
- Still have PRD inspection after release requirement [§60.5400b\(d\)](#)
- OEL equipment standard included [§60.5400b\(e\)](#)
- CVS and Control devices [§60.5400b\(f\)](#) OGI allowed [§60.5416b\(b\)\(1\)](#) (within 30 days of startup) [§60.5416b\(a\)\(1\)\(i\)](#)
- Heavy liquids components and PRD's in LL (standard language, if leak is found) [§60.5400b\(g\)](#)
- 5 days 1<sup>st</sup> attempt, 15 days final repair [§60.5400b\(h\)](#)
- If using OGI, find a leak .... And if a DTM by def.: no 1<sup>st</sup> attempt required, still 15 days final repair [§60.5400b\(h\)\(2\)](#)
- As an alternative you may use M21: [§60.5401b](#) or essentially 2016 NSPS OOOOa or VVa w/o 10% VOC exemption for those who prefer M21. [Method 21 program is still acceptable.](#)



# Review/Opinion

- Overall, we have frequent required AVO & more frequent OGI for Oil and Gas (Upstream) .... “taking inspections cradle to grave”
- Flexibility to use approved technologies Periodic & Continuous options.
- We have a Super-Emitter “Rule” ... We’ll see on this!!
- Looking at Rod-Packing Vents annually; maybe Hi Volume Sampler.
- NGPP OGI (Appendix K) now BESR, M21 is still allowed
- Appendix K (Biggest impact for Contractor and In-house Operators) ..... **If you use it!!!!**
- All Existing sources will be regulated by the middle of 2028. According to “google” over 1 million O&G sites



# Thank You & Questions??????



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