



# Greenhouse Gas Reporting 2011

OIL AND GAS SYSTEMS



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7/27/2011

# Agenda

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- Using an Applicability Tool
- Calculating an Emission
- Best Available Monitoring Methods

# What Are We Doing?

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- Creating an inventory of assets
- Collecting facility and operational data
- Measuring certain emissions
- Calculating greenhouse gas (GHG) emissions
- Reporting Threshold: Submitting annual reports to EPA for facilities which emit **>25,000 Metric Tons GHG**

*1 MT=1,000 Kilograms=2,200 Lbs=1.1 “Normal” Tons*

# What Are We Doing ?

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- **AKA: Mandatory Reporting Rule (MRR)**
- Other industries: 2010 data for 2011 reporting
- O & G Systems data collection began 1/1/11

# Why Are We Doing It ??

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- Supreme court: **CO<sub>2</sub> = air pollutant**; Clean Air Act
- EPA: **CO<sub>2</sub> dangerous**; endangerment finding:  
<http://www.epa.gov/climatechange/endangerment.html>.
- **40 CFR Part 98** Subpart W O&G Systems
- Implemented and enforced by EPA
- **NO TCEQ INVOLVEMENT, DADBLAMMIT!!**

# When Are We Doing It ??

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- November 2010 Subpart W Finalized
- January 1, 2011 Data collection began
- April 1, 2011 Monitoring Plans were in place
- **July 31, 2011 Best Available Monitoring Method (BAMM) extension request, if appropriate, maybe....more later**
- January 30, 2012 Certificate of Representation due
- **March 31, 2012 Annual Report Due via online e-GGRT system (proposed for extension)**

# What's So Hard About It??

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- It's new – few ready solutions
- Finding or measuring and managing a large data set
- Delving into many aspects of operations – sometimes data collection requires us to do something we don't normally do, bother people we don't usually bother
- More of a production task than an environmental task
- It's not going away soon



# What is CO<sub>2</sub>e?

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- Equivalent to Global Warming Potential (GWP)
- Potential to trap heat in atmosphere
- Relates other gas to CO<sub>2</sub>

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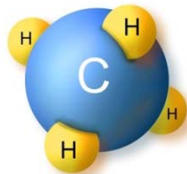
# Using an Applicability Tool

7/27/2011

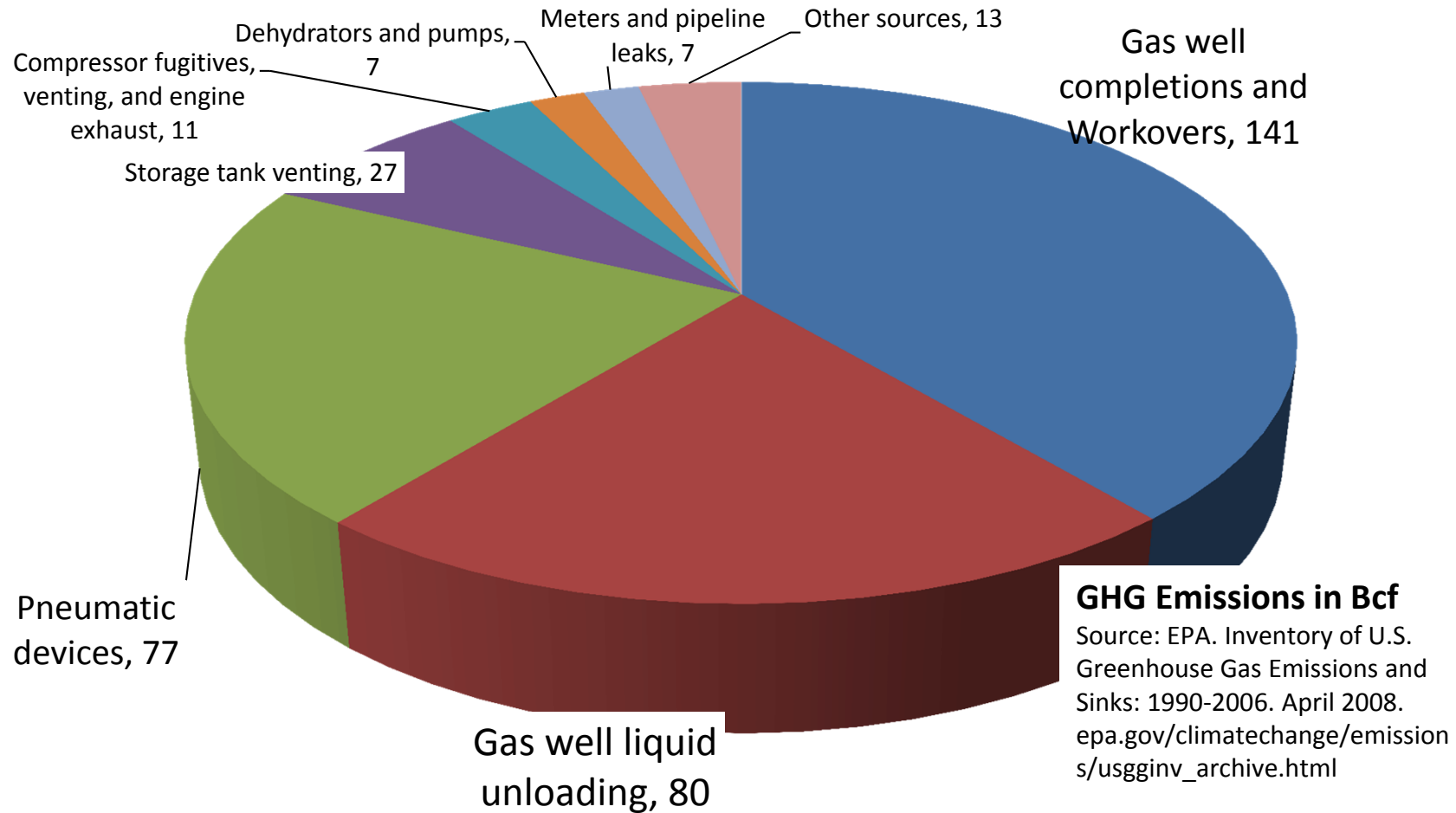
# What is CO<sub>2</sub>e?



Carbon Dioxide	CO <sub>2</sub>	Fossil Fuel Fossil Fuel Combustion	1CO <sub>2</sub> e
Methane	CH <sub>4</sub>	Fossil Fuel	21 CO <sub>2</sub> e
Nitrous Oxide	N <sub>2</sub> O	Fossil Fuel Combustion (flares)	310 CO <sub>2</sub> e



# Oil and Gas GHG Sources (in Bcf)



# What is a Production Facility?

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- **Reporting is facility based** - *an onshore production “facility”* includes all emission source types on a well pad or associated with a well pad that are *under common ownership* or control in a **single hydrocarbon basin**.

- Basin as defined by AAPG

*So....multiple production fields in a single basin are combined...more likely to exceed threshold.*

# What is a Processing Facility?

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- **Other than** production (*e.g. processing*) “facilities” are defined as being located *on contiguous* property under *common* ownership/control. This is the traditional def.

*So...some processing facilities on non-contiguous/controlled properties could be treated separately, less likely to exceed thresholds.*

# What if we don't do this?

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- Violation of the MRR is a violation of the **Clean Air Act**
- Each **day** of a violation constitutes a **separate** violation
- A **violation** includes failure to:
  - report GHG emission
  - collect data needed to calculate GHG emissions
  - continuously monitor and test as required
  - retain records verifying the amount of GHG Emission
  - calculate GHG emissions following the methodologies specified in the subpart

# Subpart W Categories

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- Onshore petroleum and NG production
- Onshore NG processing plants
- Onshore NG transmission compression
- Offshore petroleum and NG Production
- Underground natural gas storage
- LNG storage and import/export equipment
- NG distribution



# Production Definition

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*Onshore petroleum and natural gas production* pertains to all equipment on a well pad or associated with a well pad including compressors, generators, or storage facilities, portable non-self propelled equipment on a well pad or associated with a well pad (including well drilling and completion equipment, workover equipment, gravity separation equipment, auxiliary non-transportation related equipment , and leased, rented or contracted equipment) used in the production, extraction, recovery, lifting, stabilization, separation or treating of petroleum and/or natural gas (including condensate). This equipment also includes associated storage or measurement vessels and EOR operations using CO<sub>2</sub>.

# Gas Processing Definition

*Onshore natural gas processing* (§98.232) refers to separating and recovering NGLs and/or other non-methane gases and liquids from a stream of produced natural gas using equipment performing one or more of the following processes: oil and condensate removal, water removal, separation of natural gas liquids, sulfur and carbon dioxide removal, fractionation of NGLs, or other processes, and also the capture of CO<sub>2</sub> separated from natural gas streams. This segment also includes all residue gas compression equipment owned or operated by the natural gas processing facility, whether inside or outside the processing facility fence. This source category includes all processing facilities that fractionate **and those that do not fractionate with throughput of 25 MMscf per day or greater.**

*So... an isolated (non-contiguous/non-controlled) compression facility of <25MMscf per day would not be “in” **if not fractionating.***

# Multiple Sources:

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## 17 Production and 7 Processing

- Well testing venting and flaring
- Other gas venting and flaring
- Flare stack emissions
- Fugitive emissions (valves, connectors, etc.)
- Combustion (heaters, reboilers, internal combustion)
- Natural gas pneumatic devices, controllers, & pumps
- Amine plant and dehydrator venting
- Well venting for liquids unloading
- Gas venting from completions and workovers (frac and non-frac wells)
- Production storage tanks

# Let Me Out of Here!

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**Exit** - cease reporting if annual emissions less than:

- 25,000 MT CO<sub>2</sub>e for 5 years; or
- 15,000 MT CO<sub>2</sub>e for 3 years
- Notify EPA that you will cease reporting and state the reason for the reduction

*So....once in the program you have committed to at least four years of detailed work!*

# Returning, Leaving for Good

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**Resume** - if future emissions exceed 25,000 MT, resume reporting immediately for that year

**Restart** - if you restart equipment, must report emissions regardless of proximity to 25,000 MT threshold

**Closure** - for closures, certify that all GHG emitting equipment has ceased

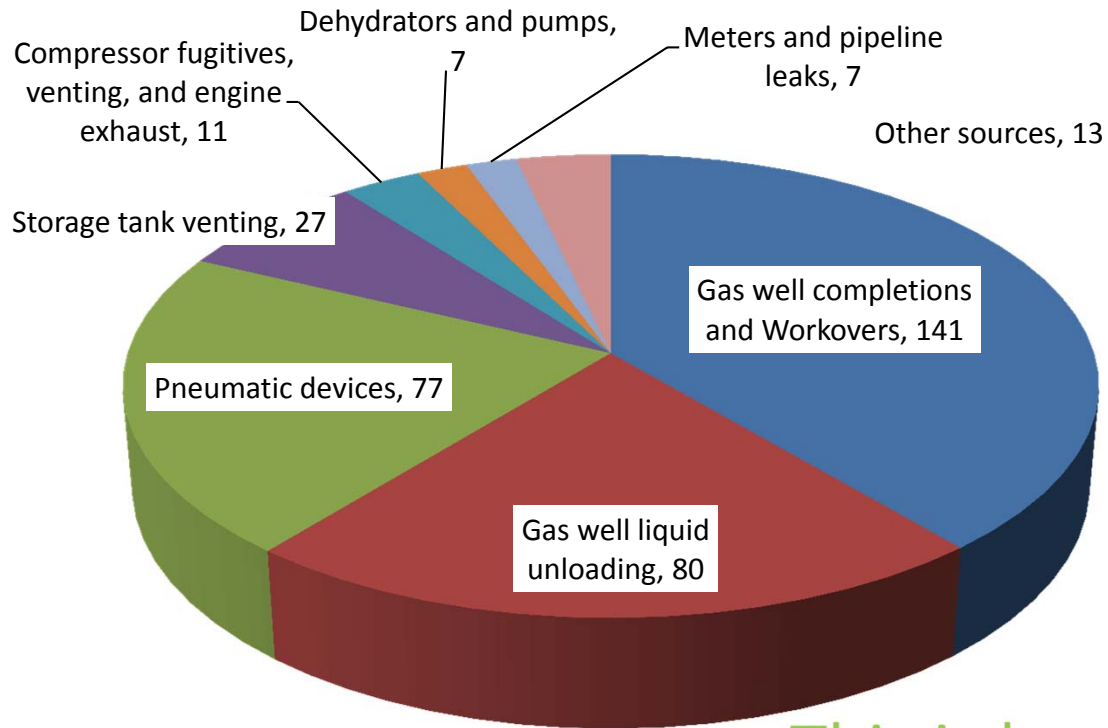
# Threshold Test

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## Applicability Tools

- Separate Tools for Processing and Production
- Quick, simple threshold test
- Optional
- Results may be overstated – Your results may vary
- Forms are locked – and no you can't borrow the key
- Applicability Tool Webpage  
<http://www.epa.gov/climatechange/emissions/GHG-calculator/index.html>

# What about that Pie Chart?



## GHG Emissions in Bcf

Source: EPA. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2006. April 2008. [epa.gov/climatechange/emissions/usgginv\\_archive.html](http://epa.gov/climatechange/emissions/usgginv_archive.html)

This is how the Applicability Tool figures emissions

# Let's Pretend

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A smallish production "facility" might include in one year:

- 40 operating oil and gas wells
- 20 produce 12 bbl oil/day
- 2 wellhead compressors running 90%
- 5 wells vented for liquids unloading during the year
- 4 wells drilled and 4 wells frac'd

Tool Says **25,600** MT CO<sub>2</sub>e emitted



# Single-Activity Emissions (Still Pretending)

- 1 gas well venting for hydraulic fracturing:  
= 3,707 MT CO<sub>2</sub>e (based on CH<sub>4</sub> in NG)
- 1 well vented for liquids unloading  
= 231 MT CO<sub>2</sub>e (based on CH<sub>4</sub> in NG) – Annually

*App Tool assumes that any well that is vented, is vented 31 times annually.  
See Technical Background Doc, App. B.*

# Single-Activity Emissions (Continuing to Pretend)

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- 1 Reciprocating wellhead compressor - **rod packing venting (NG)** running 90% = 2,018 MT CO<sub>2</sub>e
- 1 Reciprocating wellhead **compressor - combustion (CO<sub>2</sub>)**, running 90% = 1,385 MT CO<sub>2</sub>e  
*Rather than compressor count, this can also be calculated by field-wide hp-hrs*

# How are Emissions Calculated?

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- Engineering Calculations (Operational and/or analytical values input into equations)
- Equipment Counts and Population Emission Factors (EF): number of something x EF
- Direct Measurement - only some are mandatory (e.g., compressor venting for NG Processing and several other sectors)

# How the Tool uses EFs

## Data and Sources used in Emission Factor: Pneumatic Device and Pump Venting

	<b>Methane EF Sources</b>	<b>Methane EF Comments</b>
<b>Device</b>	GRI - 94 - Methane Emissions from the Natural Gas Industry, Vol 12, page no. 48, Table 4-6	433,257 Pneumatic Devices at 455,015 Gas Wells; 395,631 PDs at 525,000 Oil Wells
<b>Pump</b>	GRI - 94 - Methane Emissions from the Natural Gas Industry, Vol 13, page no. 27	1579 Pneumatic Pumps at 455,015 Gas Wells + 525,000 Oil Wells

# The Tool: Activity EF for Pneumatic Pumps and Devices

Activity Emission Factor – Per well average emissions from Pneumatic Devices and Pumps for an “average well”

Emission Source	Methane Emission Factor Equation [ <b>Device Average EF</b> x (num PDs/Num Wells)]	Result is Per well Activity EF for CH <sub>4</sub> used in Tool	CH <sub>4</sub> EF units
Device	EF= <b>14.4</b> x(828,888/980,015)	12.2	scf/hr /well CH <sub>4</sub>
Pump	EF= <b>10.33</b> x(1579/980,015)	0.02	scf/hr /pump CH <sub>4</sub>

**Device Average EF appears to be an “average” hourly emission for high, med and low-bleed PDs. Watch what happens in emission calcs - next section.**

# The Tool: Pneumatic Device Emissions

No. Wells x Hours per year x Emission factor x conversion

Emission Source	User Input Number of <b>Wells</b>	Multiply by hours per day x days per year	Activity EF	Conversion from scfd CH <sub>4</sub> to tons CO <sub>2</sub> e per year
Device	<b>525</b>	<b>24*365</b>	<b>12.22</b>	<b>0.000404</b>
Pump				
Field-wide PD Emissions		<b>22,660 MT CO<sub>2</sub>e</b>		

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# Calculating an Emission

# Example: Pneumatic Devices

The Recipe:

## 98.233 Calculating GHG emissions.

(a) *Natural gas pneumatic device venting:*

Calculate both CH<sub>4</sub> and CO<sub>2</sub> emissions from all 3 types pneumatic devices: Continuous high bleed, Continuous low bleed, and Intermittent bleed ***natural gas pneumatic devices*** using **Equation W-1:**

$$\text{Mass}_{s,i} = \text{Device Count} * \text{EF} * \text{GHG}_i * \text{Conv}_i * 24 * 365$$



# Look up EFs

**Mass<sub>s,i</sub>** = Annual mass GHG emissions, in metric tons CO<sub>2</sub>e per year at standard conditions from all **NG pneumatic device vents**, for GHG<sub>i</sub>.

**Count** = Total number of devices, **by type and by service**

**Device EF** = Look up: Table W-1A, Western U.S., gas service:

**High Bleed = 48**

**Intermediate = 17**

**Low = 2**

**scf/hr/component**

**GHG<sub>i</sub>** = Concentration of CH<sub>4</sub> or CO<sub>2</sub>, in produced NG.

**CH<sub>4</sub> = 0.6**

**CO<sub>2</sub> = 0.008**

**based on mass fraction analysis**

**Conv<sub>i</sub>** = Conversion from scf to MTCO<sub>2</sub>e:

**0.000410 for CH<sub>4</sub>**

**0.00005357 for CO<sub>2</sub>.**

# Calculate an Emission!!

Assume: 525 wells with PDs on each:

$$\text{Mass}_{s,i} = \text{Count} * \text{Device EF} * \text{GHGi} * \text{Conv} * 24 * 365$$

	High	Interm	Low	Total
Field-wide Device Count	12	1	1,100	
EF	48	17	2	
Mass <sub>s,i</sub> CH <sub>4</sub>	1,241	37	4,741	6,019
Mass <sub>s,i</sub> CO <sub>2</sub>	2	0	8	10
Field-wide PD actual emission				6,029 MT CO <sub>2</sub> e

Weighted average field-wide EF = 3.3, not 14.4: Tool overstated actual emission by 4.4x.

*Congratulations, you just calculated an emission!!*



# BAMM

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*...EPA's way of saying "Sorry for being so \*#@!! demanding"*

- BAMM supposed to allow time to get data collection and monitoring practices into place
- Allows methods **currently used** by the facility that do not meet the specifications of Subpart W  
Ex: Engineering calculations and other company records
- Must use Subpart W equations; certain parameters may be estimated
- BAMM without preapproval or with preapproval, depending on source.
- Original submittal date was April 30, which was too soon for many...

# April Amendment/BAMMM Memo

*Guidance Memo 4/20/11 – BAMMM revisions made final 4/25/11. (This memo has been revised to reflect subsequent proposals and now says July 2011, but retains original information. More to follow...)*

- Approved 4/25/11 **Automatic** BAMMM until Sept 30, 2011 for some sources, such as:

Well venting for completion and testing – this one causes us problems, so..... BAMMM friend!

- BAMMM by **Request** by July 31, 2011 for use until December 31, 2011 for others, for example:

**Processing** - Compressor vent emissions; Fugitive leak detection

**Processing & production**- AGR vents

# Updated April BAMM Memo

Environmental Protection  
Agency

## Subpart W: Best Available Monitoring Methods

Greenhouse Gas Reporting Program

July 2011

**NOTE: EPA issued a proposed rule on June 27, 2011 (76 FR 37300) that if finalized would further revise BAMM provisions referenced in this document to provide additional flexibility in the use of BAMM for all subpart W emission sources. For further details and for a copy of the publication please visit the following website:**

**<http://www.epa.gov/climatechange/emissions/subpart/w.html>**

# “BABAMM”

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June 27: CFR Proposal for ***Blanket Automatic BAMM*** across Subpart W

- As good as “***BABAMM*** “ sounds, there is a problem with the dates.....The June 27 proposal will still be out for comment on July 31, so what should we do?
- A solution has been provided.....

# “The July 31 Dilemma”

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*EPA published a 54 page “Additional Subpart W FAQs” in July. The “July 31 dilemma ” is addressed on page 52:*

**Q:** Referring to the June 27<sup>th</sup> BABAMM proposal, does EPA expect to have the issue of extending the July 31<sup>st</sup> deadline settled by that date?

**A:** Refers to 98.234.(f)(1) indicating "If the reporter anticipates the need for BAMM....for sources for which they need to petition EPA and the situation is ***unresolved*** at the time of the deadline, reporters should submit written **notice of this potential situation to EPA by the specified deadline ....**

***and***

*... EPA agrees that as of July 31, 2011, the circumstances surrounding the applicability of the deadline will be "**unresolved**" and that submitting a **notification of intent** would satisfy the rule requirements.*



# BAMM NOI

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*So, if the June 27 BABAMM proposal is not approved (and we won't know until after July 31), we would have covered ourselves under BAMM by request if we turn in an NOI by July 31.*

- It appears that a simple list of facilities would do, with identifying names, reference to the portion of the rule, and so on.
- Appears that we should send it to [MRRpetition@EPA.gov](mailto:MRRpetition@EPA.gov)
- And if not approved, look for EPA guidance as to what, if anything would be required to be submitted

# July 19 Proposal

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This proposal covers seven categories, including Petroleum and Natural Gas:

Technical Revisions: The 54-page FAQ covered many technical items which EPA agreed needed to be clarified or fixed. Some of these appear to be addressed in the July 19 Proposal

- There appear to be 11 **clarifications, amendments, and revisions** for Subpart W
- The Reporting Date would move to **September 28, 2012**

# Resources

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- The Subpart W page:  
<http://www.epa.gov/climatechange/emissions/subpart/w.html>
- The Rule on e-GOV (HTML, NOT PDF) <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=e84b6847ce504f9e66d20c3ec57e6475&rgn=div6&view=text&node=40:20.0.1.1.12.23&idno=40>
- Technical Background Document:  
[http://www.epa.gov/climatechange/emissions/downloads10/Subpart-W\\_TSD.pdf](http://www.epa.gov/climatechange/emissions/downloads10/Subpart-W_TSD.pdf)
- Checklists by Sector: Onshore Production:  
[http://www.epa.gov/climatechange/emissions/downloads10/Subpart-W\\_checklist\\_Onshore-Natural-Gas-Production.pdf](http://www.epa.gov/climatechange/emissions/downloads10/Subpart-W_checklist_Onshore-Natural-Gas-Production.pdf) There are several of these and they are especially helpful in preparing the Monitoring Plan and data collection forms
- Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2006. April 2008.  
[http://www.epa.gov/climatechange/emissions/usgginv\\_archive.html](http://www.epa.gov/climatechange/emissions/usgginv_archive.html)

# Happy Trails!



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