MMS GOADS and Offshore Methane Emissions

Lessons Learned from the
Natural Gas STAR Program

Shell Exploration & Production Company,
Chevron Corporation,
Offshore Operations Committee, and
Gulf Coast Environmental Affairs Group

Offshore Technology Transfer Workshop
New Orleans, Louisiana
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epa.gov/gasstar

MMS GOADS and Offshore Methane Emissions Agenda

- MMS GOADS-2000 Effort
- GOADS Offshore Emissions Sources
- EPA Analysis of Methane Emissions
- Opportunities for Methane Savings
- MMS GOADS-2005 Update
- MMS GOADS-2008 Effort

Source: Spring 2004 Partner Update

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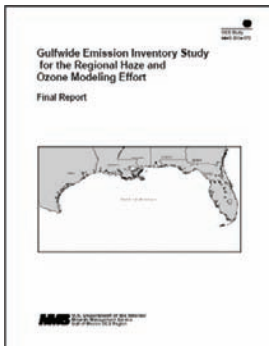
MMS GOADS-2000 Effort

- Minerals Management Service **G**ulfwide **O**ffshore **A**ctivities **D**ata **S**ystem (MMS GOADS-2000)
  - Goal to develop base year 2000 air emissions inventory for the Gulf of Mexico (GoM) Outer Continental Shelf (OCS)
  - Collected monthly activity data from platform emissions sources
  - Used published emission factors (EFs) or calculations for estimating emissions
    - CO, NO_x, SO_2, PM_{10}, $PM_{2.5}$, volatile organic compounds (VOC),
    - GHG emissions: CO_2, N_2O, CH_4



MMS 2004-072

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MMS GOADS-2000 Offshore Emissions Sources

- Detailed activity data collected from each platform

GOADS Emissions Source	Activity Units
Amine Units	MMscf gas throughput
Boilers/Heaters/Burners	Gallons fuel, Mscf fuel gas
Diesel and Gasoline Engines	Gallons fuel
Drilling Rigs	Gallons fuel, Mscf fuel gas
Flares	Mscf flared, Mscf pilot fuel gas
Fugitives	Component count
Glycol Dehydrators	Mscf gas throughput
Loading Operations	Bbl transferred
Losses from Flashing	Bbl transferred
Mud Degassing	Drilling days
Natural Gas Engines	Mscf fuel gas
Natural Gas Turbines	Mscf fuel gas
Pneumatic Pumps	scf vented
Pressure/Level Controllers	scf vented
Storage Tanks	Bbl transferred
Vents	Mscf vented

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MMS GOADS-2000 Effort Emission Factors

- GOADS-2000 was primarily a priority pollutant study
  - Some GOADS sources have EFs for total hydrocarbons (THC) or VOC rather than for methane
  - Some methane emissions were estimated using generic factors
- GOADS-2000 is a more complete data set than used in the 1996 GRI/EPA study, *Methane Emissions from the Natural Gas Industry*
- EPA chose to analyze the GOADS-2000 data for improving their *Inventory of US Greenhouse Gas Emissions and Sinks*

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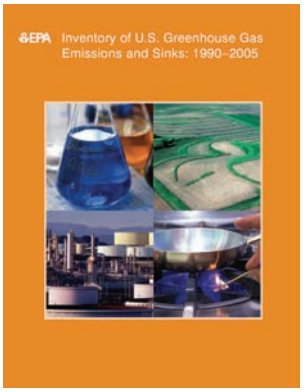
EPA Analysis of Methane Emissions

- EPA analysis relies on high level of detail in GOADS-2000 activity data
- EPA performed the following:
  - Evaluated GOADS methane EFs for each source and replaced with updated EFs
  - Classified platforms as shallow (<656 ft) or deep water
  - Classified platforms as gas- or oil-producing
  - Evaluated emissions statistically
- Results: Base year 2000 emissions per platform improves the EPA national methane emissions inventory



EPA national inventory

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Offshore Emissions Comparison

Inventory Model	GOADS Analysis	Methane Emissions (Bcf)	2003 US Inventory as published	Methane Emissions (Bcf)
Natural Gas Systems	Shallow Water Gas Platforms	12.05	Fugitives: GoM Off-shore Platforms	4.51
	Deep Water Gas Platforms	0.34	Fugitives: Rest of U.S. (offshore platforms)	0.01
			GoM Offshore Flaring	0.08
			GoM Offshore Well Venting	8.06
			ESD	0.63
GAS TOTAL		**12.39**		**13.29**
Petroleum Systems	Shallow Water Oil Platforms	19.89	Vented Offshore Platforms, GoM	0.8
	Deep Water Oil Platforms	2.09	Vented Offshore Platforms, Other Areas	0.01
			Fugitive Offshore Platforms, GoM	0.04
			Fugitive Offshore Platforms, Other Areas	0
			Combusted Offshore Platforms, GoM	0.28
			Combusted Offshore Platforms, Other Areas	0
			Platform Emergency Shutdowns	0.41
OIL TOTAL		**21.98**		**1.54**
TOTAL OFFSHORE		**34.37**		**14.83**

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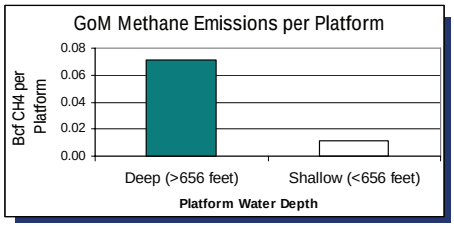
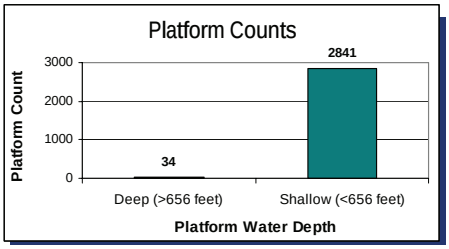
EPA Analysis: Methane Emissions by Platform Type

- On average, a deep water platform has more activity and higher methane emissions than a shallow water platform, but…





…most OCS emissions are from shallow water platforms, which are much more numerous

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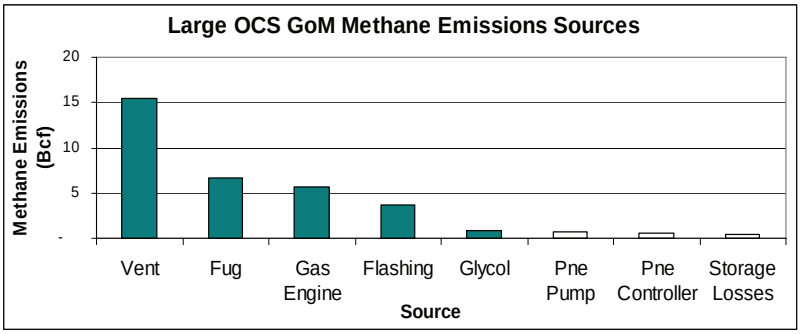
EPA Analysis: Largest Methane Emissions Sources, All OCS GoM

- Large sources can be targeted for reduction



  - Vent: routine or emergency releases from miscellaneous equipment that does not have its own GOADS source

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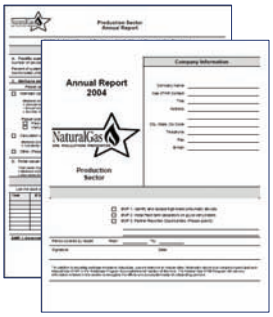
Methane Savings: GOADS and Natural Gas STAR

- Data already collected for GOADS can be used to examine potential methane savings
- Get credit for what you already accomplished: Report to Natural Gas STAR all voluntary methane reductions achieved
  - Low-bleed pneumatic devices (<6scf/hr)
  - Vapor recovery installations
  - Routing process vents and blowdowns to flares / vapor recovery / compressor suction / microturbines
  - Glycol dehydrator optimizations
  - Number of components for which leak inspection occurs
  - Centrifugal compressor dry seals



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Opportunities for Methane Savings

- Examine your platform and consider new projects to save methane
- Fugitive Emissions
  - Implement directed inspection and maintenance

Source: Leak Surveys Inc.

Source: GasTech

- Glycol Dehydrators
  - Optimize circulation
  - Install flash tanks
  - Pipe vents to VRU

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Opportunities for Methane Savings

- Natural Gas Engines
  - Install automated air/fuel ratio controllers

Source: REM Technology

Source: 2005 Annual Workshop, BP

- Process Vents
  - Route to microturbines
  - Route to vapor recovery
  - Route to fuel gas
  - Route to flare

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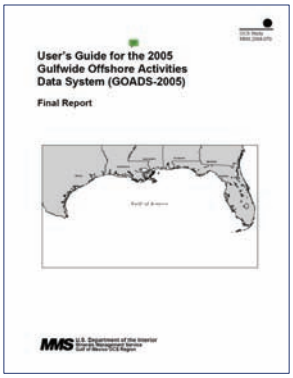
MMS GOADS-2005 Update

- MMS mandated that GoM offshore operators participate in annual surveys for 2000 AND 2005
  - GOADS-2005 was streamlined
    - Made software more user-friendly
      - Less data entry time; saves recurring information such as operator information, platform description, and equipment description
      - Less confusing interface
    - Gathered more detailed activity data
      - Equipment pressures, temperatures, throughputs, run times, etc.
      - Allows for more accurate emissions estimates
- Results: Available on gomr.mms.gov



Source: MMS

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GOADS-2005 Update: Example of Improved Data Collection

- Flashing losses
  - GOADS-2000 collected barrels transferred
  - GOADS-2005 collected:
    - Operating pressure of upstream vessel
    - Operating temperature of upstream vessel
    - Operating pressure of vessel
    - Operating temperature of vessel
    - Oil/condensate throughput
    - Gas-oil ratio
  - Allows versatility of more accurate calculation methods, such as the Vasquez-Beggs Equation

Source: Hy-bon Engineering

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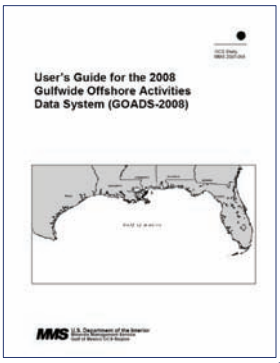
MMS GOADS-2008 Effort

- Why GOADS-*2008*?
  - 2000 wasn't on "cycle" with EPA efforts
  - 2005 wasn't a typical year due to hurricanes
- What structures will be included?
  - Only minor sources are exempt:
    - Living quarters
    - Caissons
    - Wellhead protectors
    - Other (description will be necessary)
- Where?
  - All structures west of 87° 30' west longitude



Source: MMS

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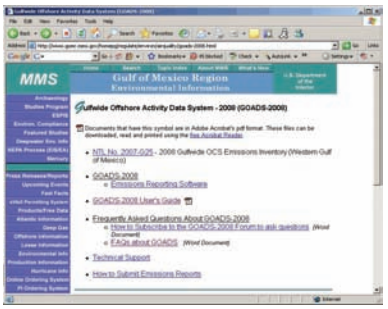
MMS GOADS-2008

- When will this be done?
  - Data collection from January 1 to December 31, 2008
  - All data must be submitted by April 17, 2009
- Software, FAQs, technical support, and more available on gomr.mms.gov
- Example new features:
  - Load "static" data from GOADS-2005
    - Request 2005 files from MMS first
  - File import and export
  - Flag inactive platforms



Source: MMS

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Conclusions

- Use GOADS studies to identify your existing voluntary methane savings and report to Natural Gas STAR
- Use GOADS studies to identify and reduce large methane emissions sources

GOADS Emissions Source	Methane Savings Activity
Fugitives	• Conduct/continue leak inspection • Centrifugal compressor wet seals • Reciprocating compressor rod packing replacement
Glycol Dehydrators	• Routing process vents and blowdowns to flares / vapor recovery / compressor suction • Optimize glycol dehydrators
Natural Gas Engines	• Install automated air/fuel controllers
Pressure/Level Controllers	• Low-bleed pneumatic devices (<6scf/hr)
Storage Tanks	• Vapor recovery installations
Vents	• Routing process vents and blowdowns to microturbines / flares / vapor recovery / compressor suction

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Discussion

- Have you used GOADS results to help identify emissions saving opportunities?
- How might you apply the results of this study to your specific operation?
- Questions?

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