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

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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
MMS GOADS-2000 Effort

- Minerals Management Service Gulfwide Offshore Activities Data System (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, NOx, SO2, PM10, PM2.5, volatile organic compounds (VOC),
- GHG emissions: CO2, N2O, CH4

MMS GOADS-2000 Offshore Emissions Sources

- Detailed activity data collected from each platform

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

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
**Offshore Emissions Comparison**

<table>
<thead>
<tr>
<th>Inventory Model</th>
<th>GOADS Analysis</th>
<th>Methane Emissions (Bcf)</th>
<th>2003 US Inventory as published</th>
<th>Methane Emissions (Bcf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Gas Systems</td>
<td>Shallow Water Gas Platforms</td>
<td>12.05</td>
<td>Fugitives: GoM Off-shore Platforms</td>
<td>4.51</td>
</tr>
<tr>
<td></td>
<td>Deep Water Gas Platforms</td>
<td>0.34</td>
<td>Fugitives: Rest of U.S. (offshore platforms)</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>GoM Offshore Flaring</td>
<td>0.08</td>
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<tr>
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<td></td>
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<td>GoM Offshore Well Venting</td>
<td>8.06</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>ESD</td>
<td>0.63</td>
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<tr>
<td>GAS TOTAL</td>
<td></td>
<td>12.39</td>
<td></td>
<td>13.29</td>
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<tr>
<td>Petroleum Systems</td>
<td>Shallow Water Oil Platforms</td>
<td>19.86</td>
<td>Vented Offshore Platforms, GoM</td>
<td>0.8</td>
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<tr>
<td></td>
<td>Deep Water Oil Platforms</td>
<td>2.00</td>
<td>Vented Offshore Platforms, Other Areas</td>
<td>0.01</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Fugitive Offshore Platforms, GoM</td>
<td>0.04</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Fugitive Offshore Platforms, Other Areas</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Combusted Offshore Platforms, GoM</td>
<td>0.28</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Combusted Offshore Platforms, Other Areas</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Platform Emergency Shutdowns</td>
<td>0.41</td>
</tr>
<tr>
<td>OIL TOTAL</td>
<td></td>
<td>21.96</td>
<td></td>
<td>1.54</td>
</tr>
<tr>
<td>TOTAL OFFSHORE</td>
<td></td>
<td>34.37</td>
<td></td>
<td>14.83</td>
</tr>
</tbody>
</table>

**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
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

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
Opportunities for Methane Savings

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

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

Opportunities for Methane Savings

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

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

Source: Leak Surveys Inc.
Source: GasTech
Source: REM Technology
Source: 2005 Annual Workshop, BP
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

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: MMS

Source: Hy-bon Engineering
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

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
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

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<thead>
<tr>
<th>GOADS Emissions Source</th>
<th>Methane Savings Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fugitives</td>
<td>☐ Conduct/continue leak inspection            ☐ Centrifugal compressor wet seals</td>
</tr>
<tr>
<td></td>
<td>☐ Reciprocating compressor rod packing replacement</td>
</tr>
<tr>
<td>Glycol Dehydrators</td>
<td>☐ Routing process vents and blowdowns to flares / vapor recovery / compressor suction</td>
</tr>
<tr>
<td></td>
<td>☐ Optimize glycol dehydrators</td>
</tr>
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<td>☐ Install automated air/fuel controllers</td>
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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?