

Year 2008 Gulfwide Emission Inventory Study

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Introduction

- BOEMRE is currently sponsoring the fifth air quality emissions inventory study effort for the Gulf of Mexico OCS, the *Year 2011 Gulfwide Emissions Inventory Study*
- The previous study, the *Year 2008 Gulfwide Emission Inventory Study*, was an update to the 2000 and 2005 Gulfwide inventories
- Like the 2005 inventory, the 2008 inventory corresponds with the U.S. EPA's onshore periodic emissions inventory
- The inventories are used by states and regional planning organizations for SIP demonstrations, and by BOEMRE in the NEPA process and air quality assessments

Pollutants Addressed

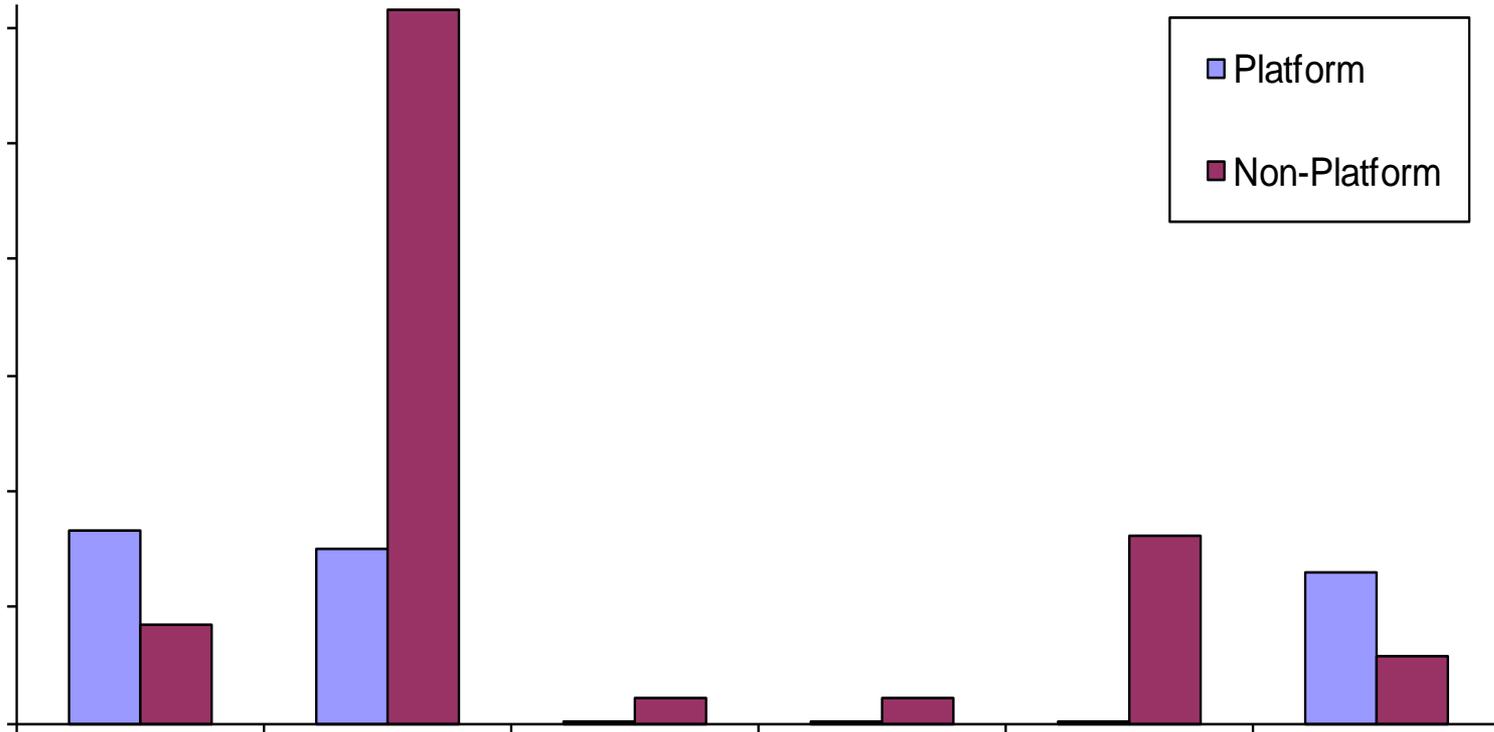
- Criteria pollutants
 - Carbon monoxide (CO)
 - Nitrogen oxides (NO_x)
 - Particulate matter (PM_{2.5} and PM₁₀)
 - Sulfur dioxide (SO₂)
 - Volatile organic compounds (VOC)
- Greenhouse gases
 - Carbon dioxide (CO₂)
 - Methane (CH₄)
 - Nitrous oxide (N₂O)
 - CO₂ equivalents (CO₂e)

Sources Addressed

- “Major” OCS Oil and Gas Production Platforms
- OCS Oil and Gas Production Non-platform Sources
 - Drilling rigs
 - Pipelaying vessels
 - Support helicopters
 - Support vessels
 - Survey vessels
- Non-OCS Oil and Gas Production Sources
 - Biogenic/geogenic sources
 - Commercial fishing vessels
 - CMVs
 - LOOP
 - Military vessels
 - Vessel lightering

Year 2008 Results – All Sources

Equipment/Source Category	CO	NO _x	PM ₁₀	SO ₂	VOC
Total Platform Emissions	82,651	75,117	689	1,028	65,423
Drilling Rigs	5,343	58,288	971	7,772	971
Pipelaying Vessels	2,186	10,535	398	1,789	398
Support Helicopters	13,636	1,114	217	275	2,693
Support Vessels	12,880	135,222	2,342	18,221	2,342
Survey Vessels	141	1,690	26	204	26
Total OCS Oil/Gas Production Source Emissions	116,837	281,966	4,643	29,289	71,853
Total Non-OCS Oil/Gas Production Source Emissions	8,432	100,880	7,004	52,022	22,442
Total Emissions (tpy)	125,269	382,846	11,647	81,311	94,295



Year 2008 Results – Platform Sources

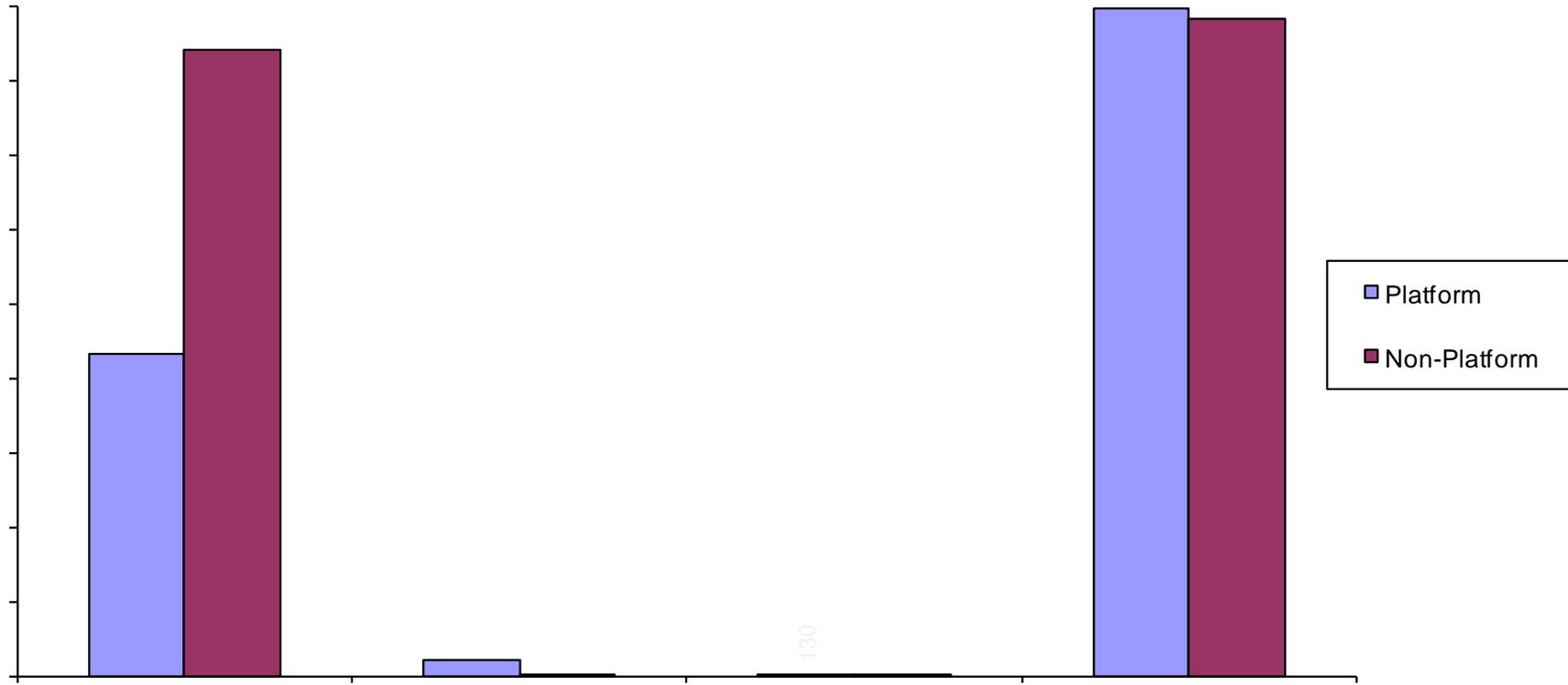
Equipment	CO	NO _x	PM ₁₀	SO ₂	VOC
Amine Units	0	0	0	3	1
Boilers/Heaters/Burners	716	1,482	26	9	46
Diesel Engines	1,816	7,463	308	715	353
Drilling Equipment	549	2,072	37	262	52
Combustion Flares	1,315	257	2	2	22
Fugitives	0	0	0	0	25,844
Glycol Dehydrators	0	0	0	0	2,573
Losses From Flashing	0	0	0	0	949
Mud Degassing	0	0	0	0	26
Natural Gas Engines	75,408	52,736	250	15	1,312
Natural Gas Turbines	2,847	11,107	66	21	73
Pneumatic Pumps	0	0	0	0	1,962
Pressure/Level Controllers	0	0	0	0	4,102
Storage Tanks	0	0	0	0	909
Cold Vents	0	0	0	0	27,013
Total Emissions (tpy)	82,651	75,117	689	1,028	65,423

Year 2008 Results – Non-Platform Sources

Source Category	CO	NO _x	PM ₁₀	SO ₂	VOC
Drilling Rigs	5,343	58,288	971	7,772	971
Pipelaying Vessels	2,186	10,535	398	1,789	398
Support Helicopters	13,636	1,114	217	275	2,693
Support Vessels	12,880	135,222	2,342	18,221	2,342
Survey Vessels	141	1,690	26	204	26
Total OCS Oil/Gas Production Sources	34,186	206,849	3,954	28,261	6,430
Biogenic/Geogenic Sources	0	0	0	0	14,358
Commercial Fishing Vessels	681	8,120	124	988	124
Commercial Marine Vessels	6,593	79,329	6,603	49,009	2,794
LOOP	136	1,832	33	219	613
Military Vessels	702	8,539	158	1,409	130
Vessel Lightering	320	3,060	86	397	4,423
Total Non-OCS Oil/Gas Production Sources	8,432	100,880	7,004	52,022	22,442
Total Non-Platform Emissions	42,618	307,729	10,958	80,283	28,872

Year 2008 GHG Results – All Sources

Equipment/Source Category	CO ₂	CH ₄	N ₂ O	CO ₂ e
Total Platform Emissions	8,685,393	439,917	130	17,963,933
Drilling Rigs	3,166,971	19	151	3,214,188
Pipelaying Vessels	712,570	8	31	722,348
Support Helicopters	1,373,574	N/A	N/A	1,373,574
Support Vessels	7,418,855	47	352	7,528,962
Survey Vessels	83,500	1	4	84,761
Total OCS Oil/Gas Production Source Emissions	21,440,863	439,992	668	30,887,766
Total Non-OCS Oil/Gas Production Source Emissions	4,084,948	1,882	1,998	4,743,850
Total Emissions (tpy)	25,525,811	441,874	2,666	35,631,616



Year 2008 GHG Results – Platform Sources

Equipment Type	CO ₂	CH ₄	N ₂ O	CO ₂ e
Amine Units	0	8	0	171
Boilers/heaters/burners	1,099,342	19	18	1,105,436
Diesel Engines	336,836	10	N/A	337,053
Drilling Equipment	106,873	N/A	N/A	106,873
Combustion Flares	422,696	446	7	434,352
Fugitives	0	106,418	0	2,234,786
Glycol Dehydrators	N/A	19,505	N/A	409,615
Losses From Flashing	475	20,890	0	439,169
Minor Sources	0	565	0	11,871
Mud Degassing	1	200	0	4,193
Natural Gas Engines	2,896,173	12,264	N/A	3,153,715
Natural Gas Turbines	3,818,697	299	104	3,857,248
Pneumatic Pumps	451	21,515	0	452,275
Pressure/level Controllers	589	32,256	0	677,967
Storage Tanks	0	901	0	18,919
Cold Vents	3,260	224,620	0	4,720,290
Total Emissions (tpy)	8,685,393	439,917	130	17,963,933

Year 2008 GHG Results – Non-Platform Sources

Source Category	CO ₂	CH ₄	N ₂ O	CO ₂ e
Biogenic and Geogenic Sources	2,284	1,874	1,948	645,518
Commercial Fishing	402,437	2	19	408,369
Commercial Marine Vessels	3,013,948	N/A	N/A	3,013,948
Drilling Rigs	3,166,971	19	151	3,214,188
LOOP	88,564	1	4	89,825
Military Vessels	417,677	3	20	423,940
Pipelaying Operations	712,570	8	31	722,348
Support Helicopters	1,373,574	N/A	N/A	1,373,574
Support Vessels	7,418,855	47	352	7,528,962
Survey Vessels	83,500	1	4	84,761
Vessel Lightering	160,038	2	7	162,250
Total Non-Platform Emissions	16,840,418	1,957	2,536	17,667,683

Comparison of 2008 and 2005 Emission Estimates for All Sources

Base Year	CO	NO _x	PM ₁₀	SO ₂	VOC
2008	125,269	382,846	11,647	81,311	94,295
2005	122,295	392,961	6,088	40,559	80,933
Percent Difference	2%	-3%	91%	100%	16%

Comparison of 2008 and 2005 Emission Estimates for Platform Sources

Base Year	CO	NO _x	PM ₁₀	SO ₂	VOC
2008	82,651	75,117	689	1,028	65,423
2005	89,813	82,581	746	1,961	51,241
Percent Difference	-8%	-9%	-8%	-47%	28%

Comparison of 2008 and 2005 Emission Estimates for Non-Platform Sources

Base Year	CO	NO _x	PM ₁₀	SO ₂	VOC
2008	42,618	307,729	10,958	80,283	28,872
2005	32,482	310,380	5,342	38,598	29,692
Percent Difference	31%	-1%	105%	108%	-3%

Comparison of 2008 and 2005 GHG Emission Estimates

Base Year	CO ₂	CH ₄	N ₂ O	CO ₂ e
2008 Platform Sources	8,685,393	439,917	130	17,963,933
2005 Platform Sources	8,848,779	214,499	130	13,393,537
Platform Percent Difference	-2%	105%	0%	34%
2008 Non-Platform Sources	16,849,307	1,958	2,536	17,667,683
2005 Non-Platform Sources	15,485,668	1,984	2,672	16,355,631
Non-Platform Percent Difference	9%	-1%	-5%	8%
Total Percent Difference	5%	104%	-5%	19%

Plans for the 2011 Inventory

- GOADS-2011
- Updated emission factors and emission estimation procedures for platform sources
- Improved data sources and methods for marine vessels
- Inclusion of offshore LNG ports
- Draft report: November 30, 2012
- Final report: June 15, 2013

Data Collection – Platform Sources

- GOADS-2011 program being used to collect monthly activity data from lessees and operators

<http://www.gomr.boemre.gov/homepg/regulate/environ/airquality/goads-2011.html>

- NTL issued September 15, 2010
- Workshop held October 13, 2010
- FAQs
- Year 2008 import files provided for “static” platform data
- Deadline for files April 18, 2012

Emission Estimation Procedures – Platform Sources

- Emission factors from EPA's AP-42, *Compilation of Air Pollutant Emission Factors*
- Emission estimation methods from the Emission Inventory Improvement Program (EIIP)
- Other recent studies
- AMINECalc and GLYCalc
- Monthly activity data QA'd; surrogates used as needed

Emission Estimation Procedures – Platform Sources

- Improvements needed in emission estimation methods:
 - Fugitives
 - Flares
 - Vents

Data Collection – Non-Platform Sources

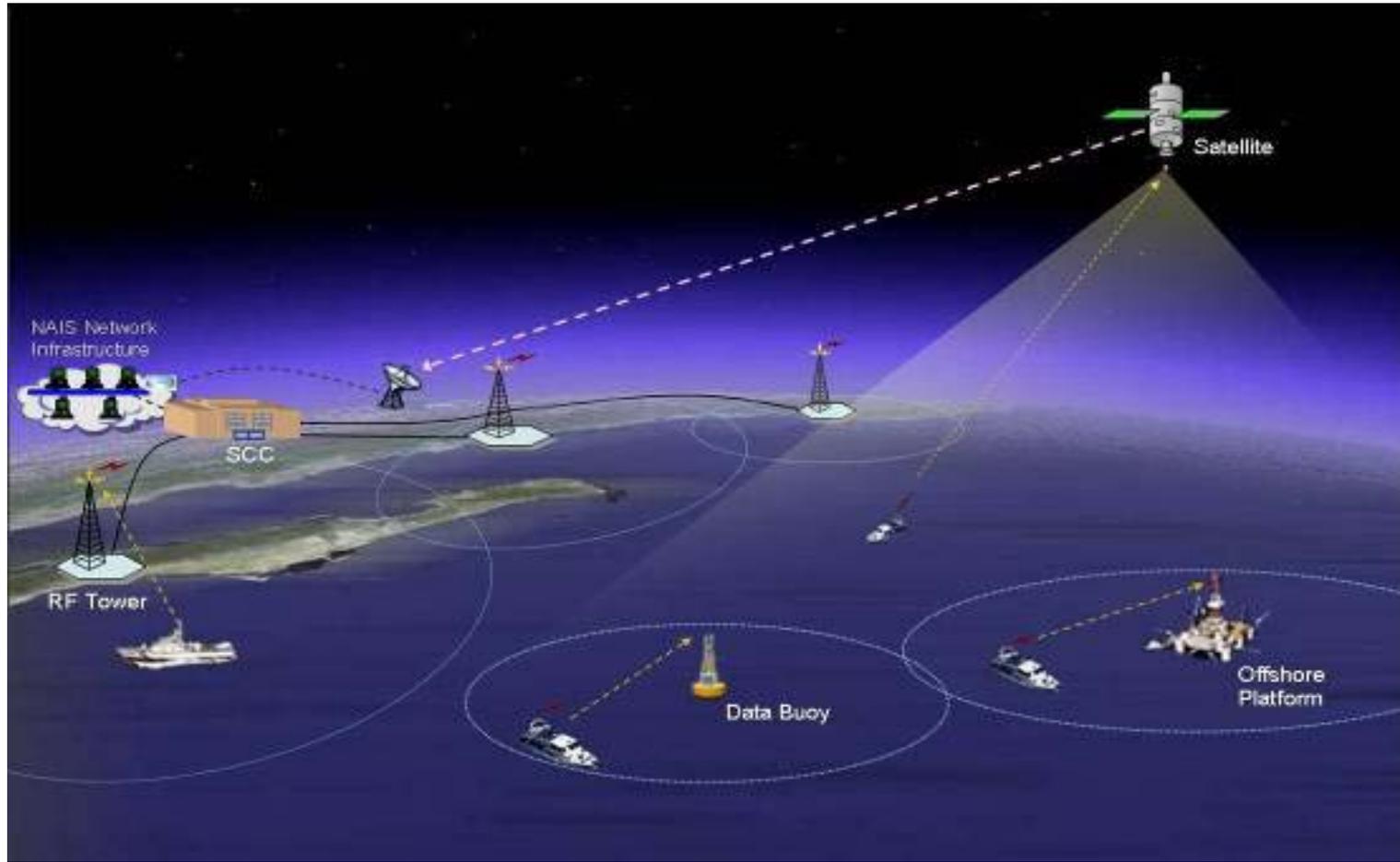
- Oil/gas production source activity data obtained from:
 - BOEMRE (drilling rigs, pipelaying)
 - RigZone (drilling rigs)
 - Vessel operators (survey vessels)
 - Offshore Marine Service Association (support vessels)
 - FAA (helicopters)

Data Collection – Non-Platform Sources

- Non-oil/gas production source activity data obtained from:
 - NOAA (fishing)
 - Gulf Gateway Energy Bridge
 - U.S. Coast Guard (military)
 - EPA (Commercial Marine Vessels)
 - AIS (LOOP)



Data Collection – Non-Platform Sources



Emission Estimation Procedures – Non-Platform Sources

- Match vessels to characteristics reported by classification societies (Lloyds & American Bureau of Shipping)
- Calculate emissions using the latest EPA approved load and emission factors; supplement with IMO GHG factors
- Allocate emissions spatially using GIS tools

Data Collection – Biogenic/Geogenic Sources

- Update emission estimates from vents, seeps, and mud volcanoes based on new research on emission rates and locations of these sources

