

# Bureau of Ocean Energy Management Gulf Of Mexico Emissions Inventories

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# Acknowledgements

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- Holli Ensz, BOEM

- ERG Staff:

- Darcy Wilson

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- Richard Billings

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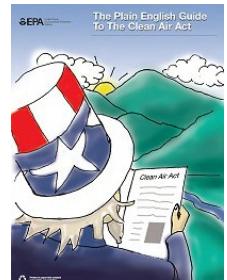
# Overview of Presentation

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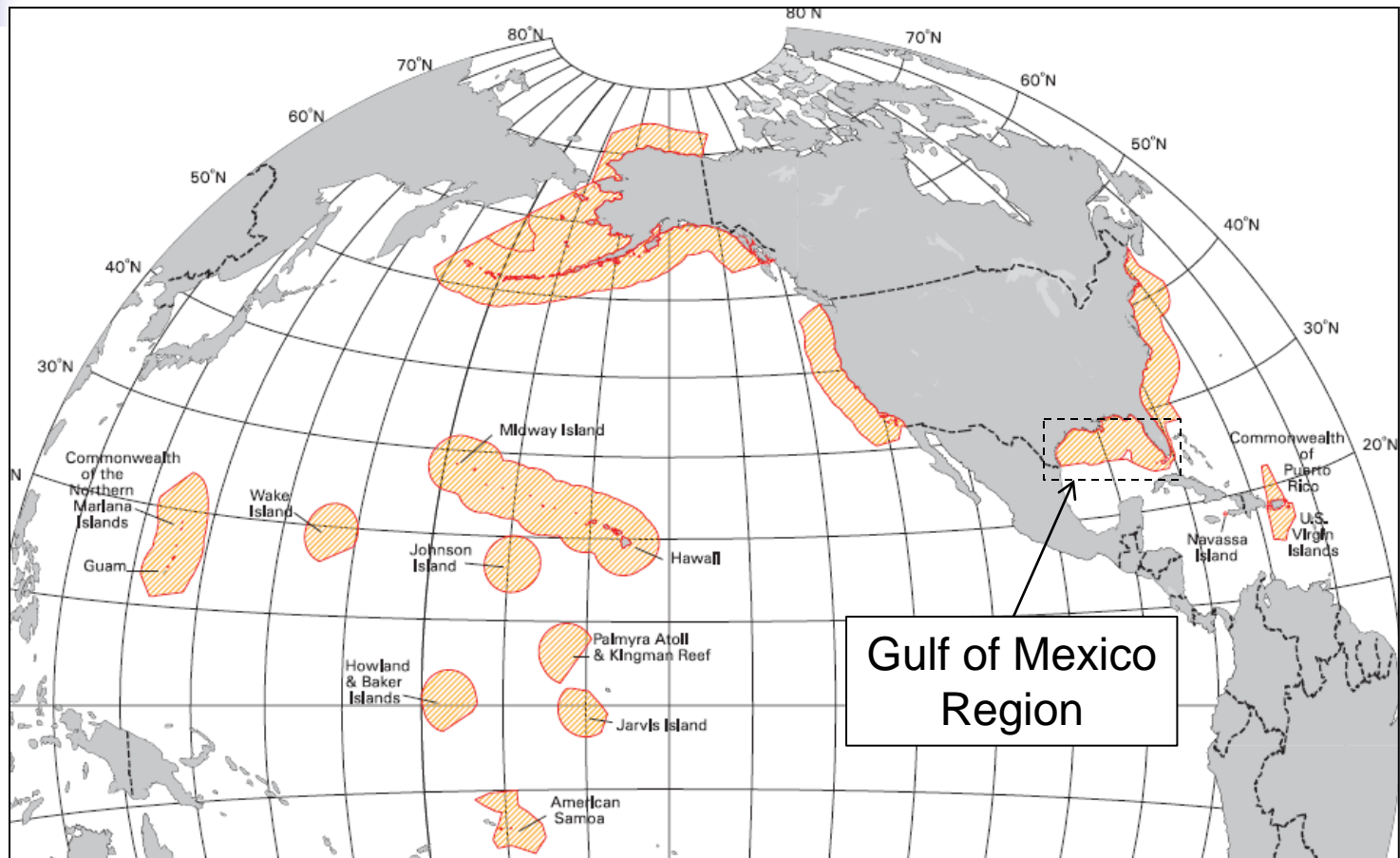
- Background on Gulfwide Emission Inventories
- 2008 Emission Inventory Results
- 2011 Emission Inventory Plans (currently underway)

# Background - Authority

- OCS Lands Act (43 U.S.C. 1334(a)(8))
  - BOEM has the authority and responsibility to comply with onshore National Ambient Air Quality Standards (NAAQS), as established in the Clean Air Act.
- Clean Air Act Amendments of 1990
  - Established NAAQS
  - Requires BOEM-EPA coordination
  - Designated OCS area of responsibility



# U.S. Continental Shelf Boundary

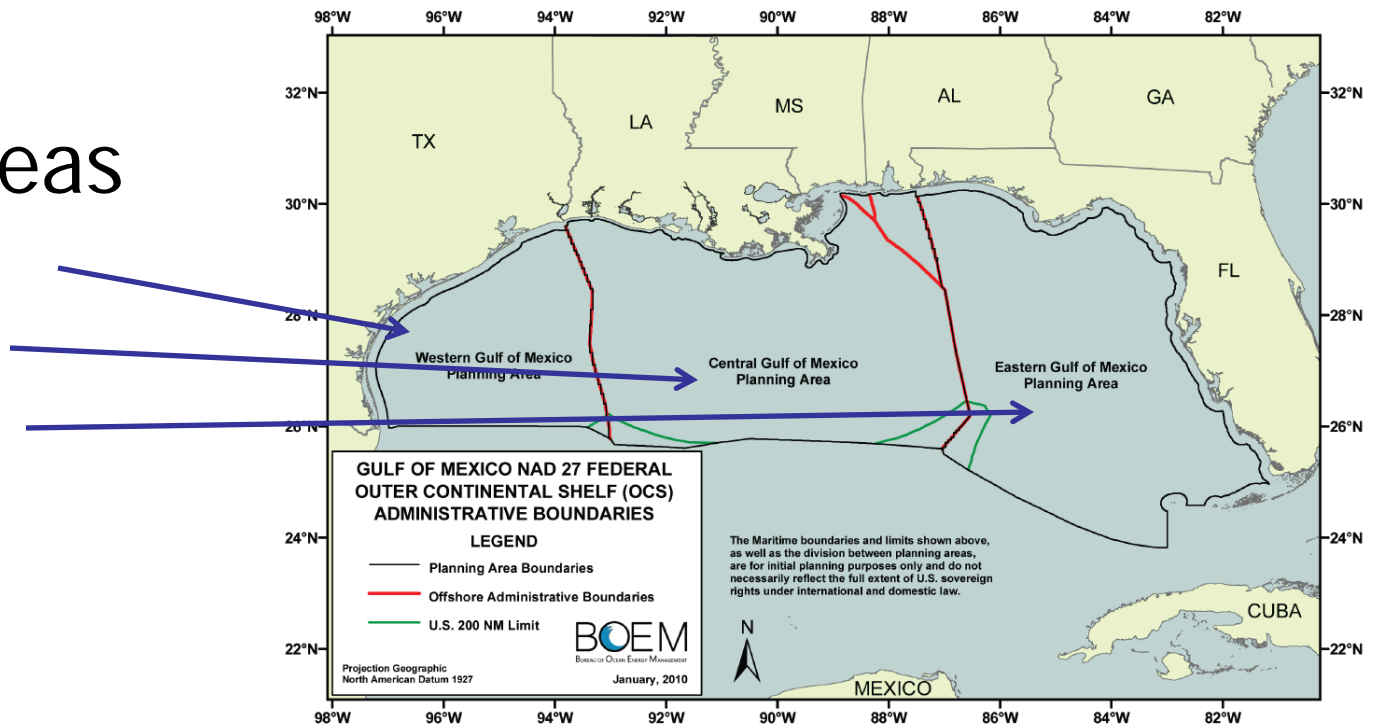


Source: [http://www.boem.gov/Oil-and-Gas-Energy-Program/Mapping-and-Data/csb\\_bathy112106-pdf.aspx](http://www.boem.gov/Oil-and-Gas-Energy-Program/Mapping-and-Data/csb_bathy112106-pdf.aspx)

# Gulf of Mexico Region

- Three Areas

- Western
- Central
- Eastern



- 2008 Emission Inventory is the 4<sup>th</sup> for BOEM

- Previously completed 1995, 2000, and 2005



# 2008 Emission Inventory

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- Geographic Coverage
  - Western and Central Planning Areas
- Pollutant Coverage
  - Criteria Pollutants (CO, SO<sub>2</sub>, NO<sub>x</sub>, PM<sub>10</sub>, PM<sub>2.5</sub>, VOC)
  - GHG Pollutants (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O)
- Source Category Coverage
  - Platform activities
  - Non-platform activities



# Platform Sources

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- Equipment Types

Amine Units

Boilers/Heaters/Burners

Diesel/Gas Engines

Drilling Equipment

Combustion Flares

Fugitives

Glycol Dehydrators

Losses from Flashing

Mud Degassing

Natural Gas Engines

Natural Gas Turbines

Pneumatic Pumps

Pressure Controllers

Storage Tanks

Cold Vents





# Non-Platform Sources

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- Oil/Gas Production Sources
  - Drilling Rigs
  - Pipelaying Operations
  - Support Helicopters
  - Support Vessels
  - Survey Vessels
- Non-Oil/Gas Production Sources
  - Biogenic and Geogenic Sources
  - Commercial Fishing Vessels
  - Commercial Marine Vessels
  - LOOP
  - Military Vessels
  - Vessel Lightering

# Data Gathering - Platforms

## ■ GOADS-2008 Software

- Gulfwide Offshore Activity Data System (GOADS)
- Data are collected at the monthly-level
  - Users enter monthly activity data (e.g., fuel use)
  - Users enter descriptive information for each piece of equipment
  - Microsoft Access is the background database

BOEM Gulfwide Offshore Activity Data System (GOADS-2011) - Description Edit Mode

File Edit Help

Operator: ERG

Operator

General Information

New Structure

GOADS-2011 Registered User  
Only the owner/lessees can be listed as the Registered User

Contact Name: Darcy Wilson  
Phone: (919) 488-7860 ext  
Fax:  
Email: darcy.wilson@erg.com

Company Name: Eastern Research Group, Inc.  
Address 1: 1600 Perimeter Park Drive Suite 200  
Address 2:  
City: Morrisville  
State: NC  
Zip Code: 27560

Edit Activity Data Print Screen Edit Data

Operator: ERG

# Required Structures

- All structures in the Western Gulf of Mexico (OCS west of 87° 30' West longitude)
- Flag minor sources exempt from reporting:
  - Living quarters
  - Caissons
  - Wellhead protectors





# Purpose of GOADS

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- Assures coordination of air pollution control regulations between OCS offshore sources and State's sources onshore (as per Sec 328(b) of the 1990 CAAA).
- Ongoing assessment of the potential impacts of emissions from oil and gas exploration, development, and production from the Gulf of Mexico OCS to onshore areas.
- Used to augment the BOEM NEPA process to compute emission trends and to perform necessary air quality impacts assessments.



# Static/Dynamic Information

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- User/operator information: static
- Platform description data: static
- Equipment description data: static
- Monthly platform and equipment activity data: dynamic

# Examples of Static Platform Descriptive Data

- User ID
- Address
- Complex ID
- Structure ID
- Area
- Block
- Latitude/longitude
- Lease number
- Sales gas composition

BOEM Gulfwide Offshore Activity Data System (GOADS-2011) - Description Edit Mode

File Edit Help

Operator: ERG  
23, 123, 23

**Structure - EDIT DATA**

General Information Sales Gas QC Results

BOEM Struct. ID: 12  
BOEM Cmplx. ID: 123  
Area: 23  
Block: 123  
Structure Name: 23

Lease Number:   
Longitude (dec. degrees):   
Latitude (dec. degrees):   
Distance To Shore (mi):

Add New Equipment

Minor Source Exempt from Reporting: Yes

Caisson  
Living Quarters  
Wellhead Protector  
Other (describe in comments)

Edit Activity Data Print Screen Run QC Save Cancel End Edit & Save

Operator: ERG\23, 123, 23



# Examples of Static Equipment Descriptive Data

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- Equipment ID
- Stack parameters
- Fugitive component count
- Boilers: heat input, fuel usage rate; fuel heating value
- Diesel engines: horsepower, fuel usage rate, fuel heating value
- Mud degassing: mud type



# Examples of Static Equipment Descriptive Data (continued)

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- Natural gas turbines and engines: horsepower, fuel usage rate, fuel heating value, make and model
- Pneumatic pumps: make and model
- Pressure level controllers: make and model
- Storage tanks: dimensions



# Examples of Dynamic Equipment Data (monthly)

- Operating hours
- Total fuel used
- Processed throughput
- Volume flared
- Volume vented



# Data Collection Example

BOEM Gulfwide Offshore Activity Data System (GOADS-2011) - Activity Edit Mode

File Edit Help

Operator: ERG  
Monthly Survey 2011/01  
23, 123, 23  
Amine Unit: 12321  
NG Turbine: 1231

**Natural Gas, Diesel, or Dual-Fuel Turbine - EDIT DATA**

**General Information** | QC Results

Manufacturer:   
Model No.:   
Engine Purpose of Use:

**Natural Gas Usage** | **Diesel Usage**

Operating Horsepower (hp):	<input type="text"/>	Operating Horsepower (hp):	<input type="text"/>
Average Fuel Usage: (Btu/hp-hr)	<input type="text"/>	Average Fuel Usage: (Btu/hp-hr)	<input type="text"/>
Fuel H2S Content (ppmv):	<input type="text"/>	Fuel Sulfur Content (% by mass):	<input type="text"/>
Fuel Heating Value (Btu/scf):	<input type="text"/>	Fuel Heating Value (Btu/lb):	<input type="text"/>
Max Rated Horsepower (hp):	<input type="text"/>	Max Rated Horsepower (hp):	<input type="text"/>
Max Rated Fuel Usage: (Btu/hp-hr)	<input type="text"/>	Max Rated Fuel Usage: (Btu/hp-hr)	<input type="text"/>
Hours Operated (hrs):	<input type="text"/>	Hours Operated (hrs):	<input type="text"/>
Total Fuel Used (Mscf):	<input type="text"/>	Total Fuel Used (gal):	<input type="text"/>

Comments:

No Emissions to Report

Edit Description Data | Print Screen | Run QC | Save | Cancel | End Edit & Save

Operator: ERG\Monthly Survey 2011/01\23, 123, 23\NG Turbine: 1231

# QC Checks

- Software has built-in QC routines
  - Missing data fields
  - Range checks
- Operators can also print out QA summary form





# GOADS-2008 Results

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- 103 companies submitted for 3,026 active platforms
- 1,538 were flagged as minor sources
- All data were compiled into a Master Database
  - 300,000+ monthly activity records
  - Additional large-scale QA checks conducted



# Emission Estimation Procedures— Platform Sources

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- Monthly activity data QA'd; surrogates used as needed
- Emission factors from EPA's AP-42, *Compilation of Air Pollutant Emission Factors*
- Emission estimation methods from the Emission Inventory Improvement Program (EIIP)
- AMINECalc software and GLYCalc regressions
- CO<sub>2</sub>e
  - CO<sub>2</sub>:1
  - CH<sub>4</sub>: 21
  - N<sub>2</sub>O: 310



# Non-Platform Sources Data Collection & Estimation

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- Oil/gas production source activity data obtained from BOEM, vessel operators, the Offshore Marine Service Association, and the FAA
- Non-oil/gas production source activity data obtained from NOAA, the Maritime Administration, the LOOP, and the U.S. Coast Guard
- Estimations based on Swedish EPA EF (Marine Vessels) and EPA EF, plus EIIP methods

# 2008 Platform Emissions-Criteria Pollutants

Equipment	CO Emissions (tpy)	NO <sub>x</sub> Emissions (tpy)	PM <sub>10</sub> Emissions (tpy)	SO <sub>2</sub> Emissions (tpy)	VOC Emissions (tpy)
Amine Units	0	0	0	3	1
Boilers/heaters/Burners	542	910	22	8	35
Diesel Engines	1,808	7,427	306	711	351
Drilling Equipment	545	2,060	37	260	51
Combustion Flares	1,304	254	2	2	22
Fugitives	0	0	0	0	21,476
Glycol Dehydrators	0	0	0	0	2,573
Losses From Flashing	0	0	0	0	950
Minor Sources	0	0	0	0	213
Mud Degassing	0	0	0	0	25
Natural Gas Engines	75,103	52,538	250	15	1,310
Natural Gas Turbines	2,844	11,096	66	21	73
Pneumatic Pumps	0	0	0	0	1,893
Pressure/level Controllers	0	0	0	0	3,939
Storage Tanks	0	0	0	0	909
Cold Vents	0	0	0	0	27,003
<b>Total Emissions (tpy)<sup>a</sup></b>	<b>82,146</b>	<b>74,286</b>	<b>682</b>	<b>1,021</b>	<b>60,824</b>

# 2008 Platform Emissions-GHG Pollutants

Equipment Types	CO <sub>2</sub> Emissions (tpy)	CH <sub>4</sub> Emissions (tpy)	N <sub>2</sub> O Emissions (tpy)	CO <sub>2</sub> e Emissions (tpy)
Amine Units	0	8	0	171
Boilers/heaters/burners	850,228	14	14	854,806
Diesel Engines	335,392	10	N/A	335,608
Drilling Equipment	106,250	N/A	N/A	106,250
Combustion Flares	419,083	442	7	430,640
Fugitive Sources	0	91,468	0	1,920,838
Glycol Dehydrators	N/A	19,505	N/A	409,615
Losses From Flashing	475	20,890	0	439,169
Minor Sources	0	646	0	13,561
Mud Degassing	1	194	0	4,076
Natural Gas Engines	2,886,612	12,244	N/A	3,143,735
Natural Gas Turbines	3,814,880	298	104	3,853,392
Pneumatic Pumps	414	20,426	0	429,355
Pressure/level Controllers	580	31,448	0	660,988
Storage Tanks	0	901	0	18,919
Cold Vents	3,251	224,211	0	4,711,689
<b>Total Emissions (tpy)</b>	<b>8,417,165</b>	<b>422,707</b>	<b>125</b>	<b>17,332,814</b>



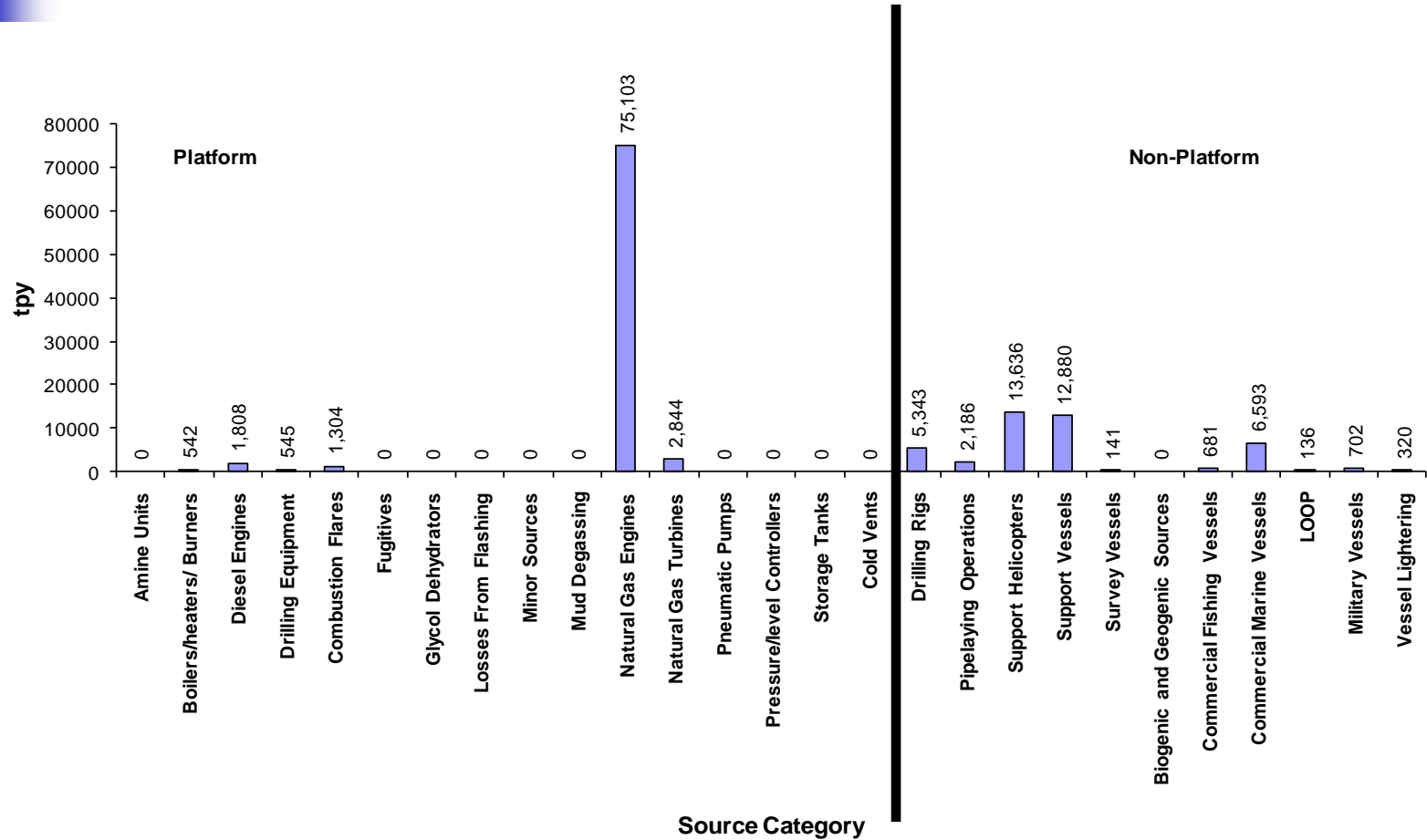
# 2008 Non-Platform Emissions- Criteria Pollutants

Source Category	CO Emissions (tpy)	NO <sub>x</sub> Emissions (tpy)	PM <sub>10</sub> Emissions (tpy)	SO <sub>2</sub> Emissions (tpy)	VOC Emissions (tpy)
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
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
<b>Total Non-Platform Emissions (tpy)<sup>a</sup></b>	<b>42,618</b>	<b>307,729</b>	<b>10,958</b>	<b>80,283</b>	<b>28,872</b>

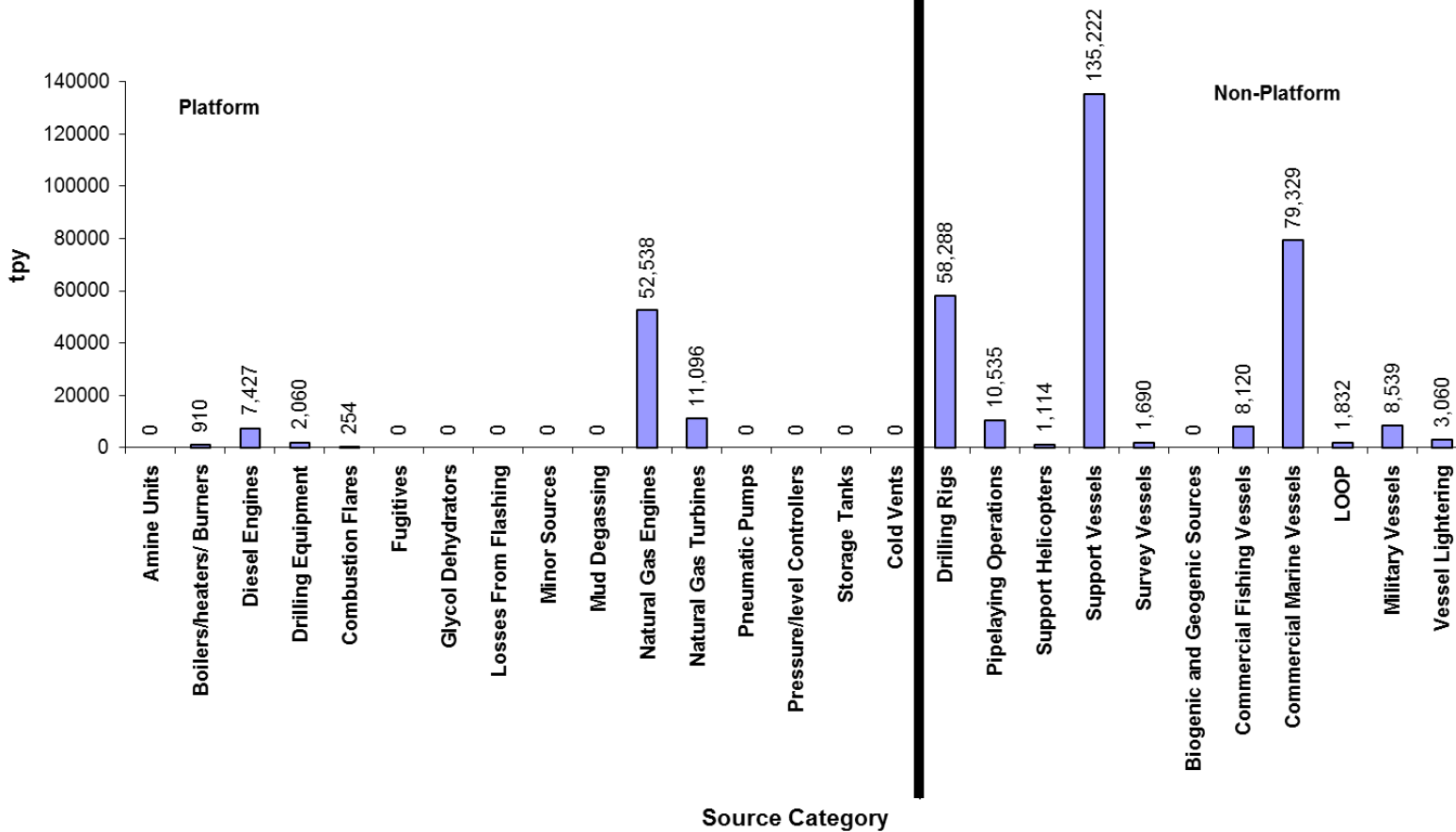
# 2008 Non-Platform Emissions- GHG Pollutants

Source Category	CO <sub>2</sub> Emissions (tpy)	CH <sub>4</sub> Emissions (tpy)	N <sub>2</sub> O Emissions (tpy)	CO <sub>2</sub> e Emissions (tpy)
<b>Biogenic and Geogenic Sources</b>	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
<b>Total Emissions (tpy)</b>	<b>16,840,418</b>	<b>1,957</b>	<b>2,536</b>	<b>17,667,683</b>

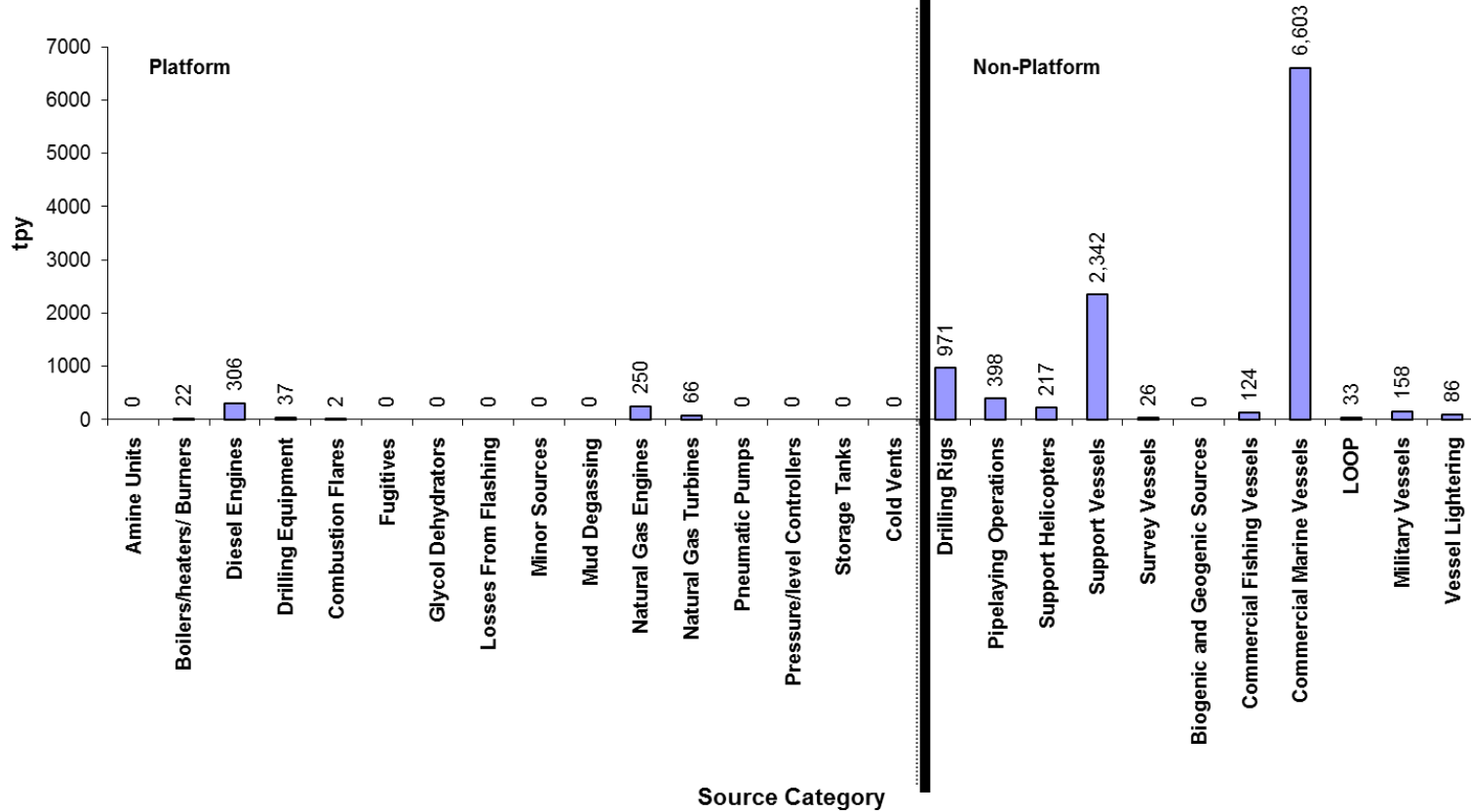
# 2008 Gulfwide CO Emissions



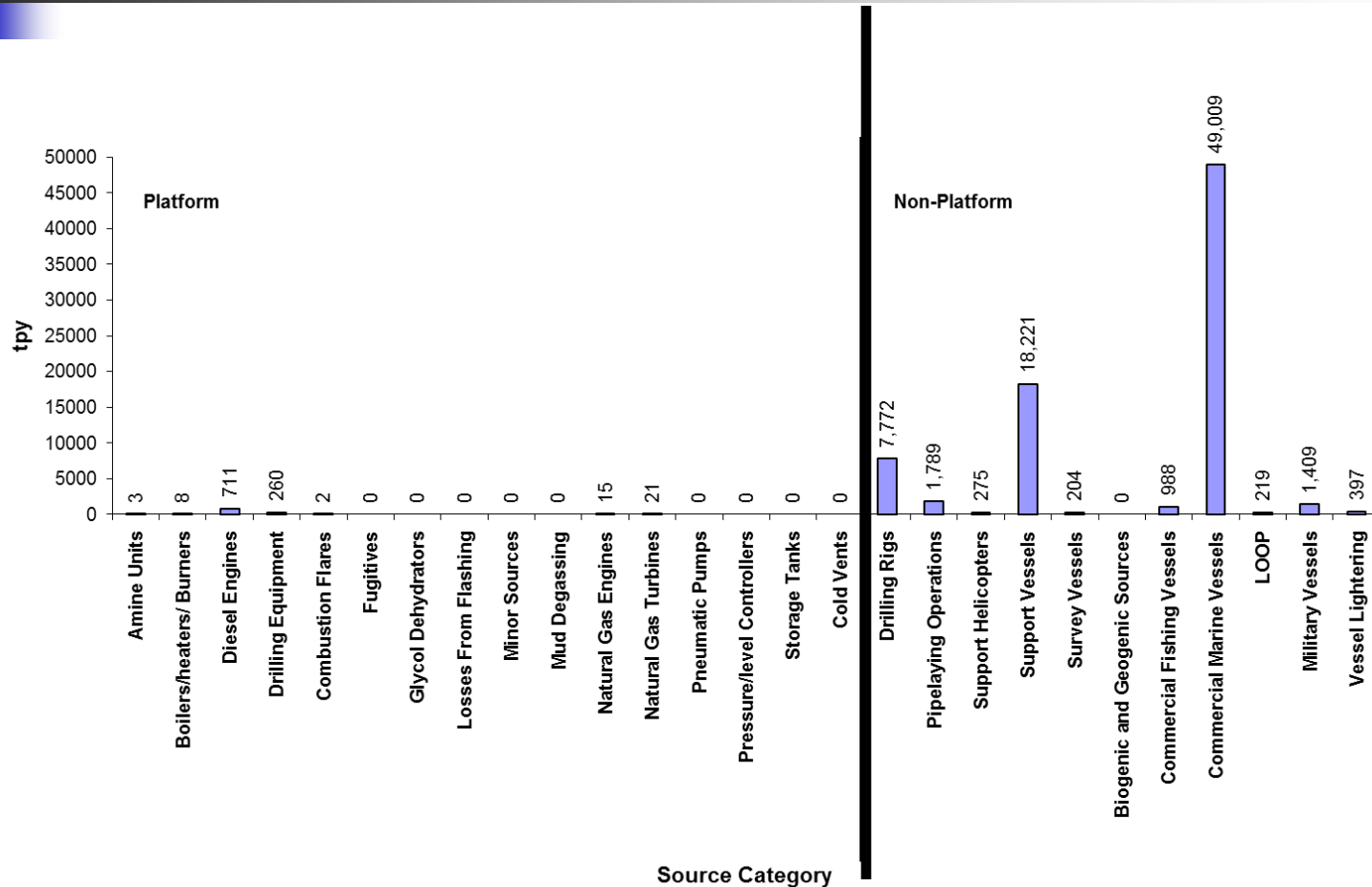
# 2008 Gulfwide NO<sub>x</sub> Emissions



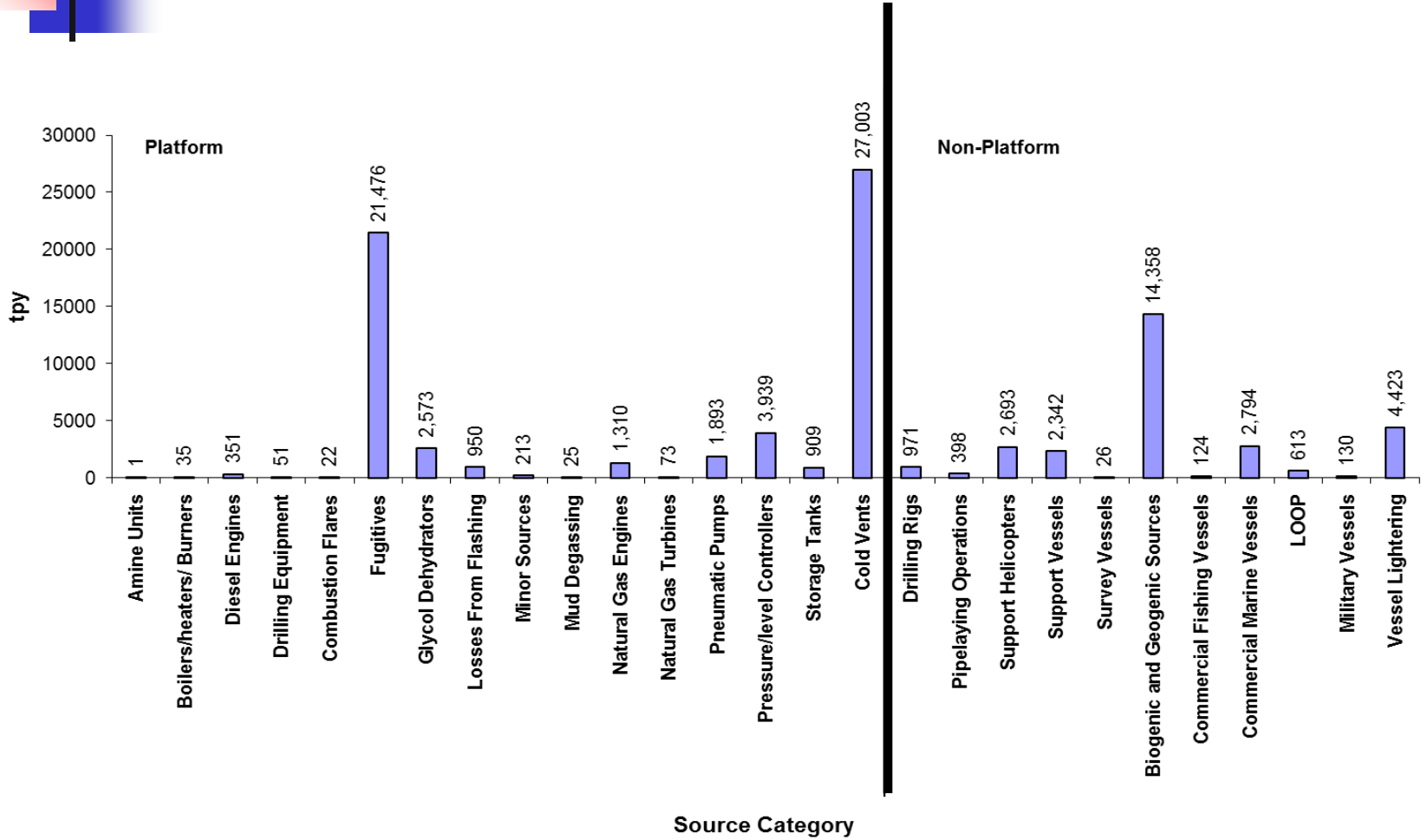
# 2008 Gulfwide PM<sub>10</sub> Emissions



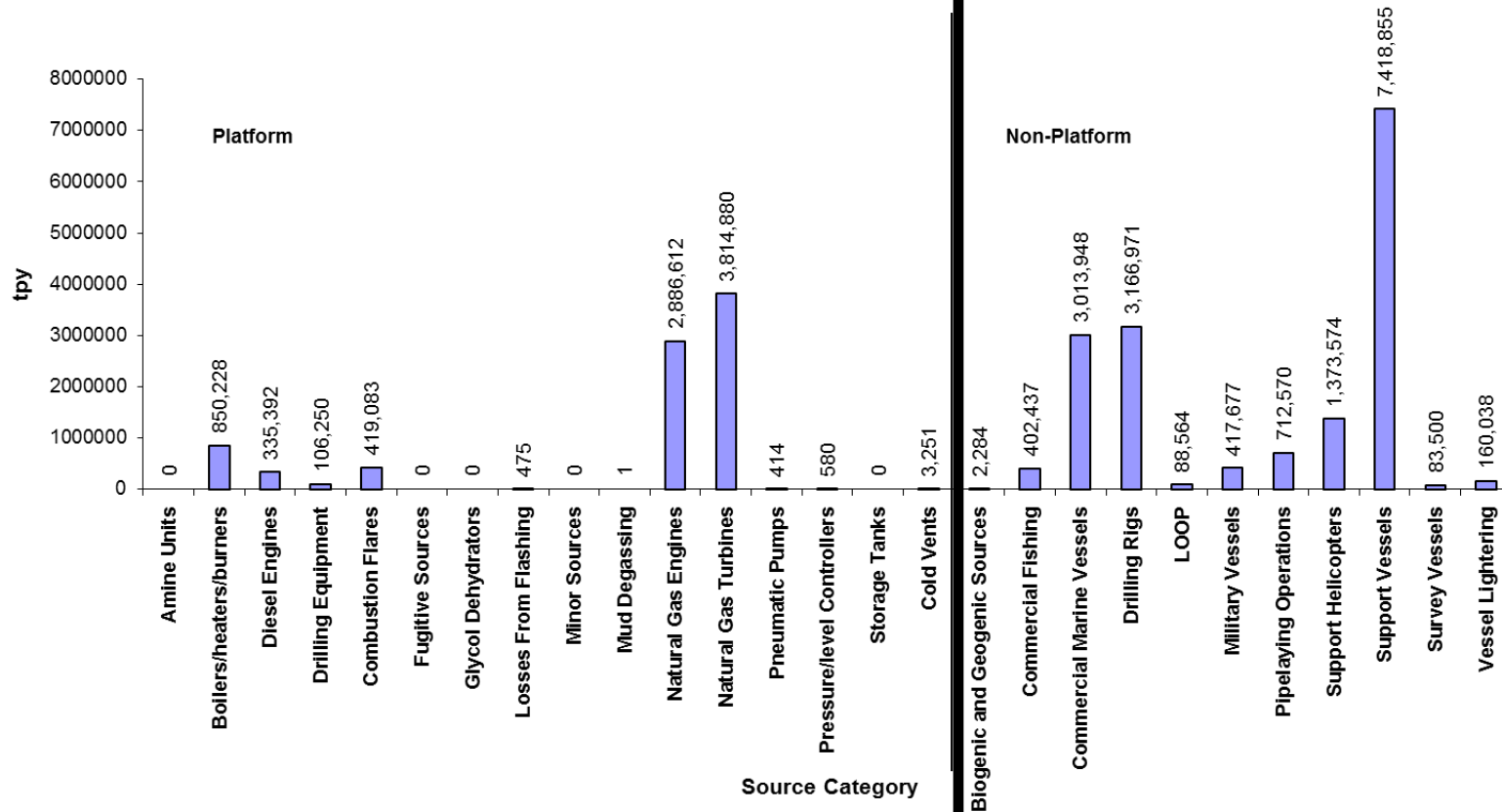
# 2008 Gulfwide SO<sub>2</sub> Emissions



# 2008 Gulfwide VOC Emissions

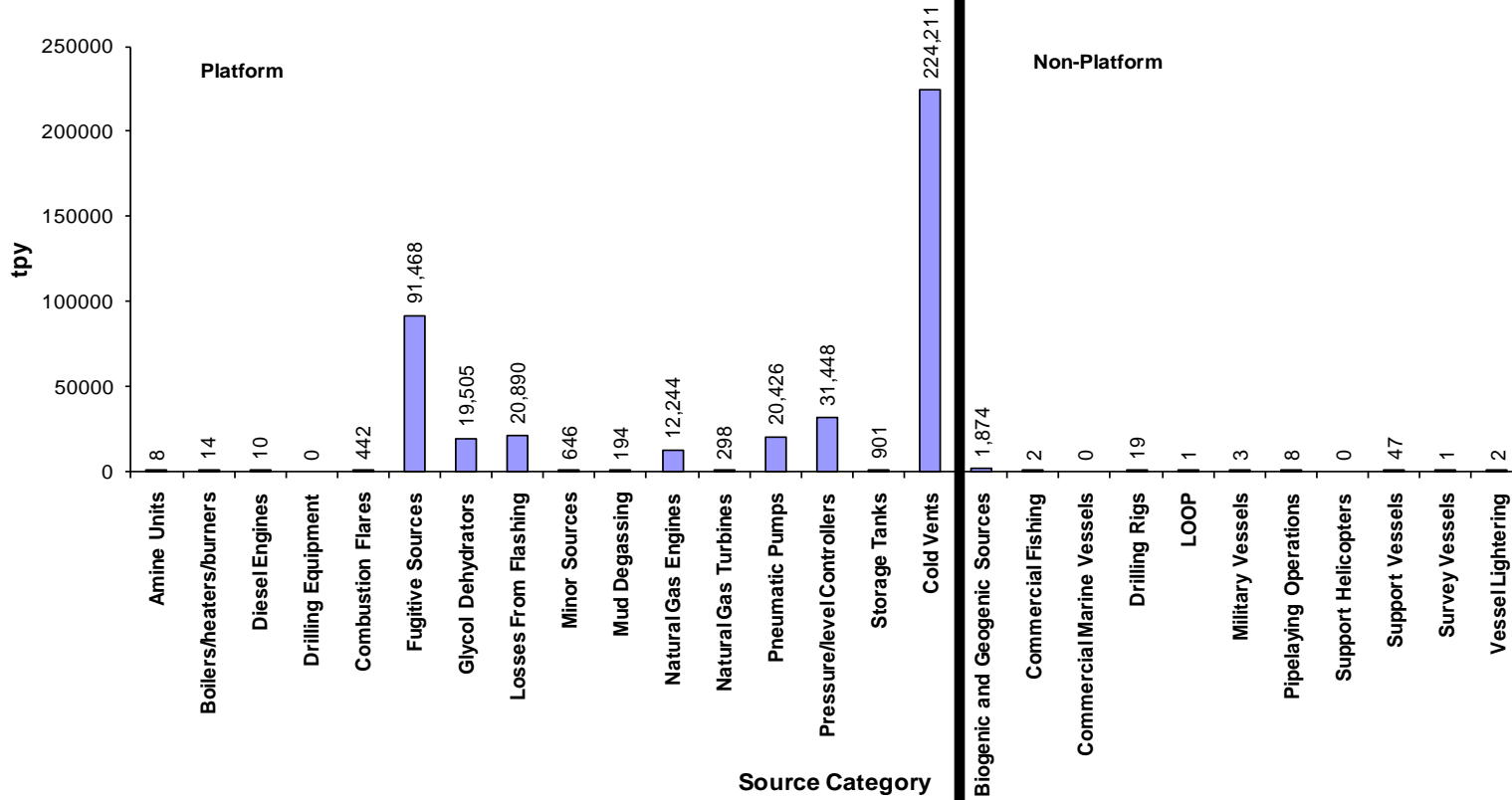


# 2008 Gulfwide CO<sub>2</sub> Emissions

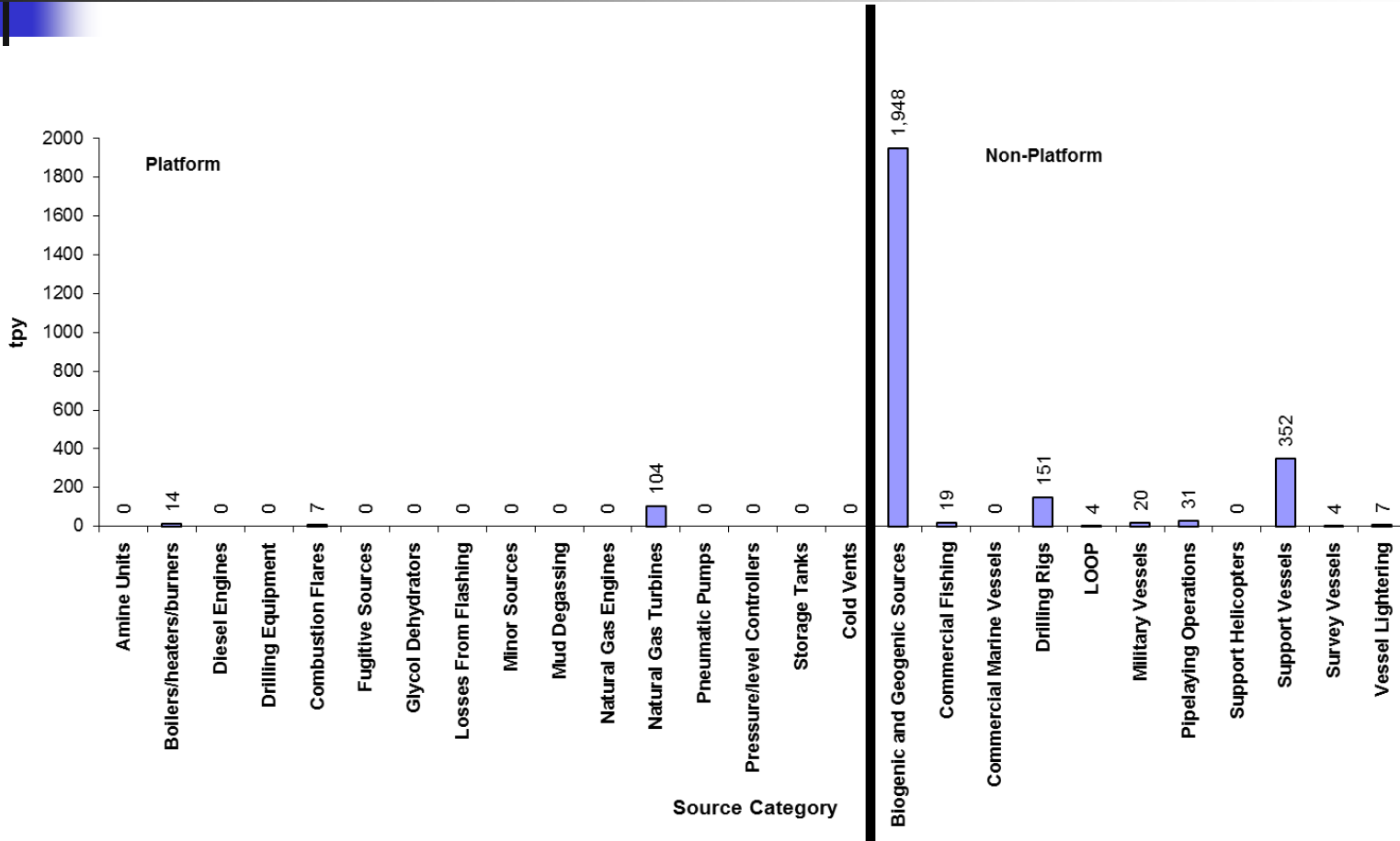




# 2008 Gulfwide CH<sub>4</sub> Emissions



# 2008 Gulfwide N<sub>2</sub>O Emissions





# 2011 Gulfwide Emissions - Update

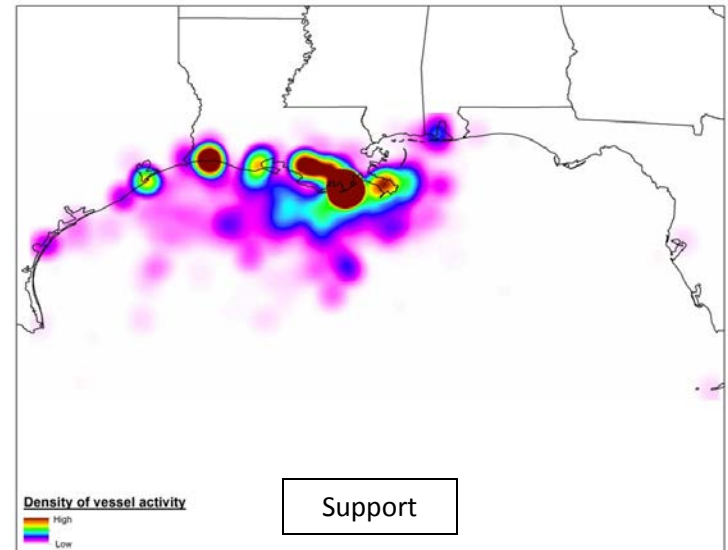
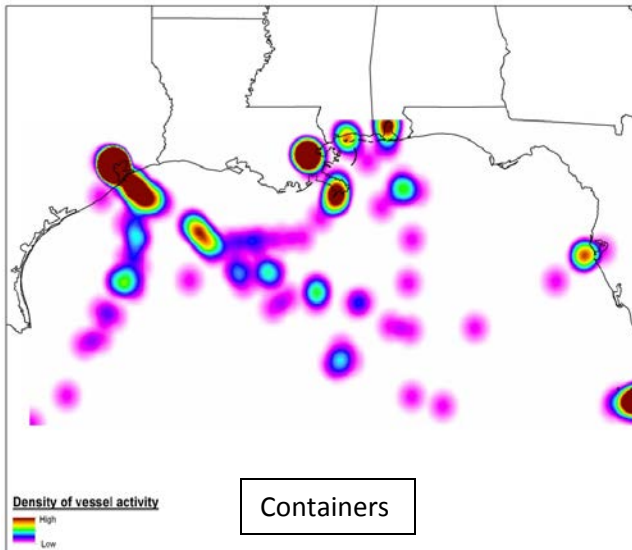
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- Operators submitted 2011 activity surveys in Spring 2012
  - Currently, QA'ing data submittals
  - Draft/Final emission estimates – tentatively Fall 2012
- New for 2011
  - BOEM will compare and reconcile venting and flaring submitted volumes to OGOR reports
  - EPA Greenhouse Gas Reporting Rule, Subpart W (venting, flaring, fugitives) – draft rule suggests that operators must use latest GOADS to report to EPA

# 2011 Gulfwide Emissions - Update

## New for 2011 (cont.)

- Using Automatic Identification System (AIS) data to estimate and spatially allocate vessel emissions to study area



# Questions?

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Final Reports are posted at:

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