

# The Year 2005 Gulfwide Emission Inventory Study

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# Introduction

- Holli Ensz is the MMS COTR for this study.
- The 2005 Gulfwide Emission Inventory Study builds upon several previous MMS air quality emission inventory efforts, especially the base year 2000 *Gulfwide Emission Inventory Study for the Regional Haze and Ozone Modeling Effort*.
- The 2005 Gulfwide Inventory covers all OCS oil and gas production-related sources in the Gulf, including non-platform sources.
- Pollutants covered are criteria pollutants and greenhouse gases.



# Offshore Platform Sources

- The 2005 Gulfwide Offshore Activities Data System (GOADS-2005) program was used to collect monthly activity data from lessees and operators.

[www.gomr.mms.gov/homepg/regulate/envIRON/airquality/goad.html](http://www.gomr.mms.gov/homepg/regulate/envIRON/airquality/goad.html)

- NTL issued 10 September 2004
- Workshop held 13 October 2004
- Original deadline: 22 April 2006

Amine units	Glycol dehydrators	Natural gas turbines
Boilers	Loading operations	Pneumatic pumps
Diesel engines	Losses from flashing	Pressure/level controllers
Drilling rigs	Mud degassing	Storage tanks
Flares	Natural gas engines	Vents

# Preliminary Results

- 114 companies provided data for 1,579 active platforms
  - 1,460 by 1 May 2006
  - 135 by 1 August 2006
  - 17 by 22 December 2006
- For the 2000 inventory, 90 companies submitted data for 2,873 active platforms.
- Compared to the MMS TIMS database, we have data for 85% of the “major” platforms.
- Still no response for some missing platforms.

# Preliminary Results

Equipment Type	# Units in 2005	# Units in 2000
Boilers	700	637
Diesel engines	2,860	2,982
Flares	111	90
Glycol dehydrators	368	416
Natural gas engines	2,265	2,314
Natural gas Turbines	443	379
Vents	1,004	783

# Quality Assurance/Quality Control

- We have completed one round of QA/QC on the first batch of submittals (99% of the data received to date).
  - Evaluated structure and equipment records to clarify status (active vs. inactive)
  - Reviewed and corrected company, complex, and structure IDs
  - Reviewed and corrected area, block, coordinates
  - For each active platform confirmed sales gas and fugitive records populated
- Completed range checks for equipment descriptive data to ID outliers, missing values, and apply surrogate values (e.g., stack parameters).
- Checked monthly activity data for:
  - Operating horsepower
  - Heat input
  - Fuel usage

# Next Steps

- Emissions have been calculated for the majority of equipment types.
- We are comparing the values from month to month, and with 2000 data set.
- We are identifying equipment types and individual records for more in-depth analysis:
  - Erroneous outliers in activity data or missing data for calculations:
    - Vents and flares
    - Diesel engines
    - Drilling and mud degassing

# Non-platform Sources – 2000 Update

- For the 2000 inventory, emissions were initially estimated based on a load factor of 100%. This was corrected to more accurately reflect vessel operating modes.

	PM	NO <sub>x</sub>	SO <sub>2</sub>	VOC	CO <sub>2</sub>
<b>Original 2000 estimates</b>	<b>3,636</b>	<b>137,917</b>	<b>24,135</b>	<b>27,763</b>	<b>9,367,783</b>
<b>Revised 2000 estimates</b>	<b>3,228</b>	<b>125,298</b>	<b>23,287</b>	<b>25,474</b>	<b>8,389,064</b>
<b>Percent difference</b>	<b>11.2%</b>	<b>9.1%</b>	<b>3.5%</b>	<b>8.2%</b>	<b>10.4%</b>

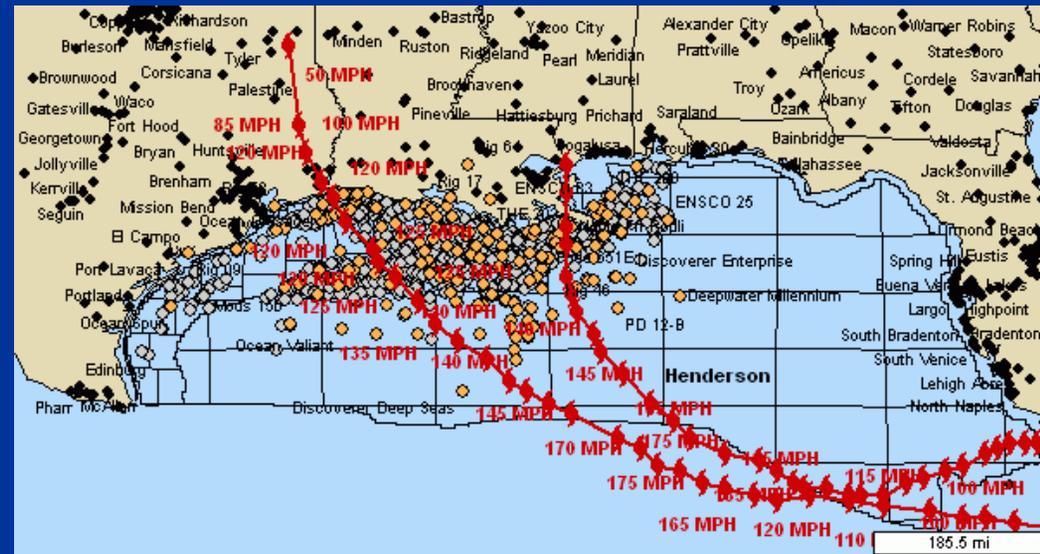
# Non-platform Sources – 2005

- 2005 was not a typical year due to the hurricanes
  - Increased activity - vessels and helicopters involved in repairing platforms
  - Decreased activity - drilling rigs and new pipeline activities

## ■ Emission factors

- The Swedish Environmental Agency (2004)
- U.S. EPA (1992)
- FAA Emission and Dispersion Modeling System

- Activity and emissions will be partially allocated to Federal waters using a variety of surrogates



# Survey Vessels

- For the 2000 inventory, hours of operation were estimated only for non-leased blocks. The total hours of operation for survey vessels in 2000 for non-leased blocks was 13,888 hours.
- Assume all survey vessels are operating in federal waters, visit port one week every two months. This leads to 94,416 annual hours of operation (Seven times higher than estimates in 2000 inventory)

## Fugro Geoservices Inc.

R/V Universal Surveyor

R/V Geodetic Surveyor

R/V Seis Surveyor

R/V L'Arpenteur

## C&C Technologies

C-Surveyor I AUV

## Gulf Ocean Services, Inc

M/V David McCall II

## Western Geco - USA

Arctic Star

Western Frontier

Western Aleutian

Western Polaris

Western Endeavor

Western Shore

## Edison Chouest Offshore Inc

Trailblazer

## Sea Mar Inc

Cape Scott

# Drilling Rigs

Rig Type	Total Days	Total Hours	Total Trips
<b>2005</b>			
Barge	241	5,784	3
Drillship	1,344	32,256	19
Jack-up	10,037	240,888	231
Semi-submersible	4,906	117,744	119
Submersible	705	16,920	16
<b>Total</b>	<b>17,233</b>	<b>413,592</b>	<b>388</b>
<b>2000</b>			
Barge	49	1,176	1
Drillship	1,431	34,344	20
Jack-up	15,035	360,840	359
Semi-submersible	5,852	140,448	107
Submersible	274	6,576	6
<b>Total</b>	<b>22,641</b>	<b>543,384</b>	<b>493</b>

- Drilling rig activity data were obtained from MMS. Drilling rig activity declined in 2005 by 24%.
- Horsepower data for individual rigs was obtained from RigZone.
  - Matched 181 of 321 drilling rigs
  - Drill ships and offshore barges could not be matched to the RigZone data
- Load factor for all rigs is assumed to be 75%.

# Support Vessels

Offshore Vessel Type	Minimum Horsepower	Maximum Horsepower	Vessel Count
Anchor Handling Vessels	10,000	14,000	25
Crew/Supply/ Support/Utility Boats	900	6,000	660
Lift Boats	1,000	1,500	113
Tugs/Towing	1,000	5,000	200
Total			998

- Obtained new data from the Offshore Marine Service Association.
- Evaluated data from *A-Z of Offshore Support Vessels of the World*
- The vessel population and activity level quantified for 2005 is roughly twice that reported in the 1995 Gulfwide inventory.

# Helicopters

- Helicopter Safety Advisory Committee data are provided voluntarily by the helicopter service providers and as such underestimate actual helicopter activity levels.
- The FAA provided data that 2.3 million helicopter flights are made per year. Based on the FAA data, activity will be increased by 64% to represent 2005.
- Data provided by the Helicopters Association International, indicate that helicopters clock a total of 380,000 annual flight hours, yielding a LTO cycle period of 11 minutes.

## Major Helicopter Support Companies

**ERA Helicopters LLC**

**Air Logistics**

**Houston Helicopters Inc.**

**Industrial Helicopters**

**Petroleum Helicopters Inc.**

# Pipelaying

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- MMS pipelaying data for 2005 indicate that 105 pipeline segments were installed, compared to 222 segments in 2000.
- Pipelaying vessel activities have shifted from new construction to inspection and repair of damaged pipelines.
- MMS hurricane impact monitoring data will be reviewed to determine the best approach to quantify inspection and repair operations and estimate emissions from these activities.



# LOOP

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- Previously downloaded the schedule of vessel calls to the Louisiana Offshore Oil Platform (LOOP) from their website.
- They no longer post this information for security reasons.
- ERG has requested vessel traffic data for 2005 from the LOOP.

# Lightering

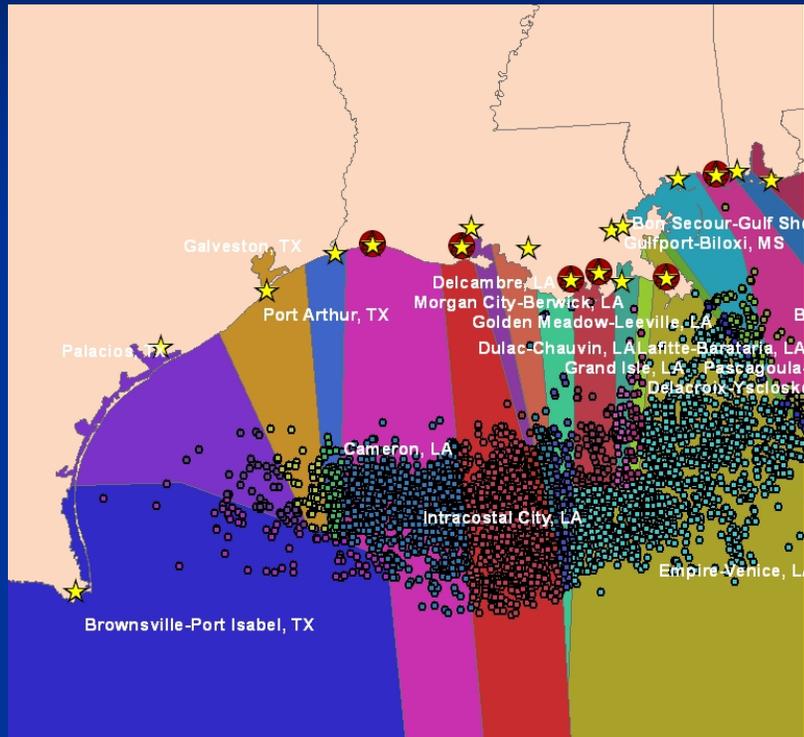
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- The Coast Guard monitors the lightering zones and previously provided lightering data.
- 2004 data have been obtained, but 2005 data are currently not available.
- The 2004 data can be adjusted to approximate activity levels in 2005 based on the Houston Vessel Traffic Service data.



# Commercial Fishing

- The National Marine Fisheries Service (NMFS) provided data about fishing activities in the Gulf of Mexico.
- NMFS has not been able to provide similar data for 2005.
- Data were obtained from NMFS that quantify the amount of catches within state and federal waters.
- Data provided by the Army Corps of Engineers quantify the amount of fish individual ports handle.
- The combination of these port and fish catch data will be sufficient to estimate and spatially allocate 2005 fishing vessel activities.



# Military Vessels

- No data from the U.S. Navy.
- The Coast Guard has provided details about their Gulf fleet, including estimates of the period of time individual vessels spend at sea.
- The 2005 Coast Guard vessel list is similar to that used for the 2000 inventory.

Vessel Type	Name	Home Port
Buoy Tenders	CGC Cypress	Mobile, AL
Major Cutters	CGC Dauntless	Galveston, TX
	CGC Decisive	Pascagoula, MS
Patrol Boats	CGC Amberjack	South Padre Island, TX
	CGC Brant	Corpus Christi, TX
	CGC Cobia	Mobile, AL
	CGC Heron	Sabine, TX
	CGC Manatee	Ingleside, TX
	CGC Manowar	Galveston, TX
	CGC Manta	Freeport, TX
	CGC Pompano	New Orleans, LA
	CGC Razorbill	Gulfport, MS
	CGC Skipjack	Galveston, TX
	CGC Steelhead	Port Aransas, TX
	CGC Stingray	Mobile, AL
	CGC Sturgeon	Grand Isle, LA
USCG Pelican	Morgan City, LA	

# Commercial Marine Vessels

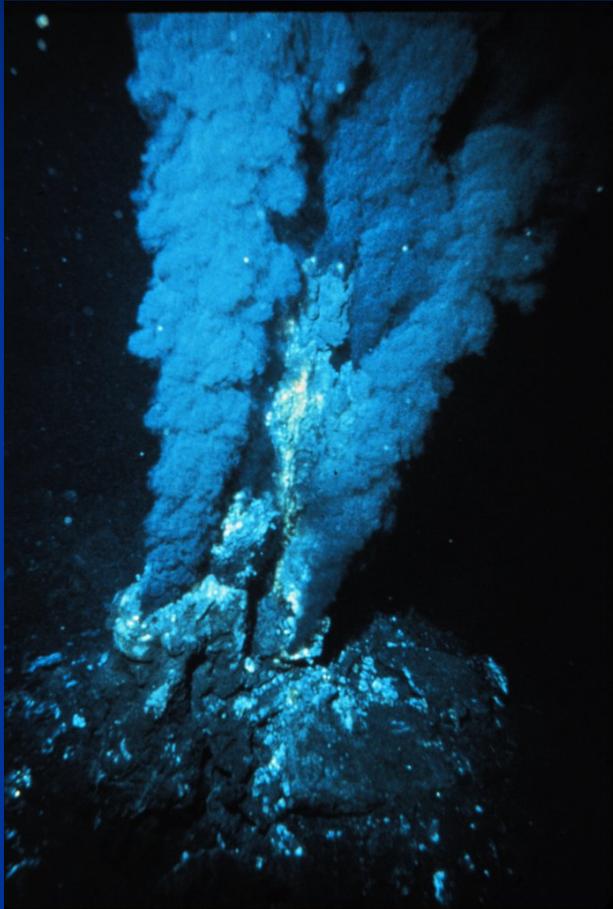
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- Vessel Movement data were obtained from U.S. Maritime Administration (MARAD) for 2005.
- Soliciting data from the Army Corps of Engineers to account for vessels that only carry cargo between domestic ports.



# Biogenic / Geogenic Sources

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- 11 new studies were identified that could help quantify emissions from biogenic and geogenic sources.
- These references are currently being reviewed
- At this time, we have not found any new information that would change the 2000 emission estimates.

# Platform Construction and Removal

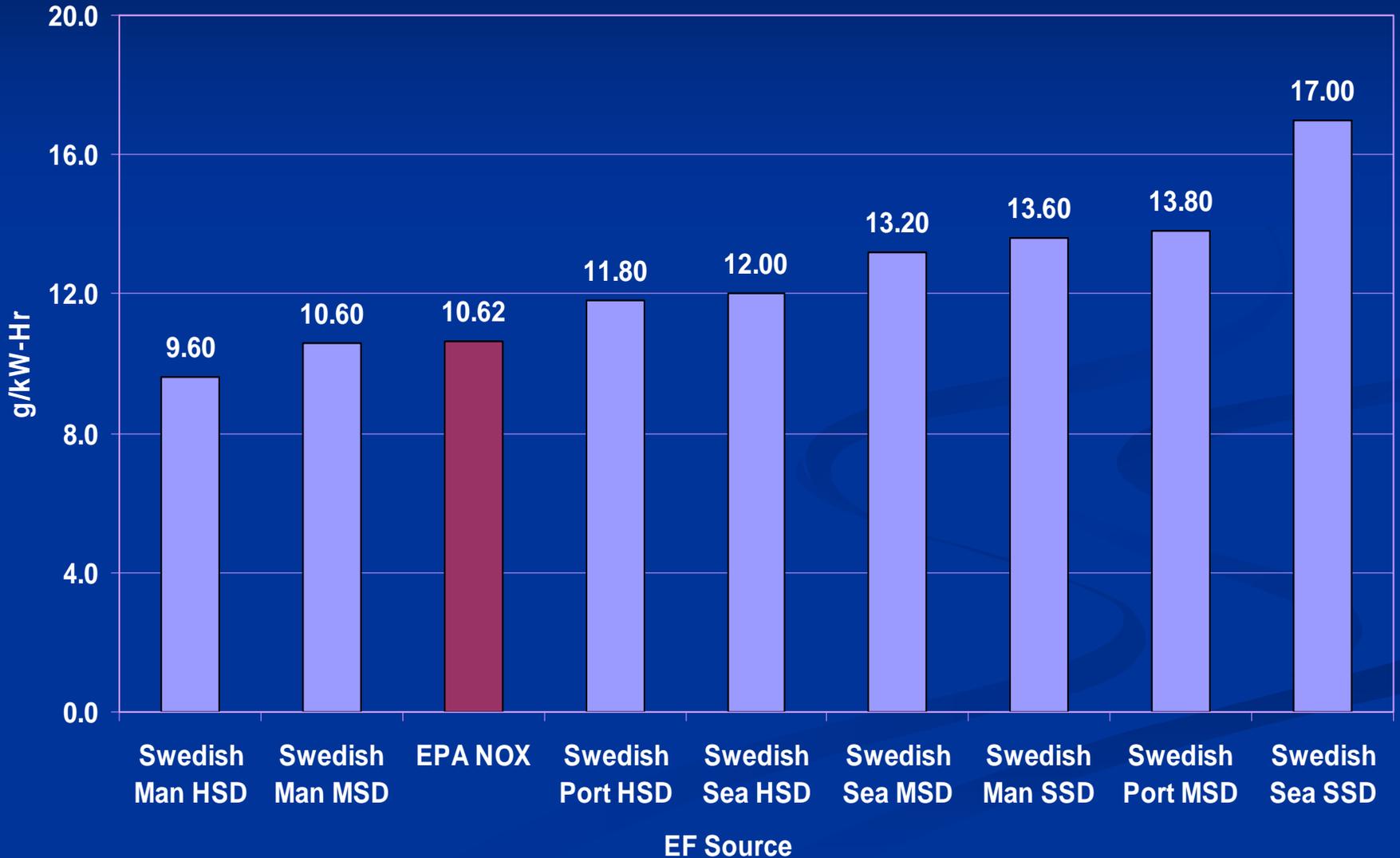
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- We are currently evaluating whether these vessels are included in the offshore support vessel category.



# Emission Factor Comparison

NOx



# Emission Factor Comparison

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