

**STUDY TITLE:** Year 2008 Gulfwide Emissions Inventory Study

**REPORT TITLE:** Year 2008 Gulfwide Emissions Inventory Study

**CONTRACT NUMBER:** M07PC13189

**SPONSORING OCS REGION:** Gulf of Mexico

**APPLICABLE PLANNING AREAS:** Central and Western

**FISCAL YEARS OF PROJECT FUNDING:** 2007, 2008, 2009, 2010

**COMPLETION DATE OF REPORT:** December 2010

**COSTS:** FY 2007: \$46,410; FY 2008: \$24,857; FY 2009: \$165,001; FY 2010: \$79,166

**CUMULATIVE PROJECT COST:** \$315,434

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**KEY WORDS:** Air pollutant emissions inventory, offshore, Gulf of Mexico, OCS, GOADS, criteria air pollutants, greenhouse gases.

**BACKGROUND:** The Bureau of Energy Management, Regulation and Enforcement (BOEMRE) is responsible for determining if air pollutant emissions from Outer Continental Shelf (OCS) oil and natural gas platforms and other sources in the Gulf of Mexico on the OCS influence the ozone attainment and nonattainment status of onshore areas. Consequently, BOEMRE initiated a research study to develop a base year 2008 inventory of criteria air pollutant emissions and greenhouse gas emissions from offshore oil and gas exploration, development, and production in the Gulf of Mexico on the OCS. The inventory also included non-OCS oil and gas production sources such as the Louisiana Offshore Oil Port (LOOP), military vessels, and commercial marine vessels.

**OBJECTIVES:** 1- Describe and quantify emission sources in the OCS that release criteria air pollutants (i.e., carbon monoxide (CO), sulfur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), particulate matter (PM), and volatile organic compounds (VOC)) and greenhouse gases (i.e., carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O)) over the course of one calendar year; 2- prepare a report that summarizes the emissions data,

describes the methodology used to generate the emissions inventory; and 3- prepare data files for platform and non-platform emissions sources that can be used in air quality modeling studies.

**DESCRIPTION:** The Year 2008 Gulfwide Emission Inventory Study includes all oil and gas production platforms and non-platform sources in the Central and Western Gulf of Mexico on the OCS. Pollutants covered in the inventory are the criteria pollutants as well as greenhouse gases. BOEMRE attempted to collect activity data from every major active offshore oil production platform in the Gulf of Mexico on the OCS; operators were also required to identify minor sources such as caissons and wellhead protectors. Operators were provided with the Gulfwide Offshore Activities Data System (GOADS) Visual Basic activity data collection software for compiling monthly data for calendar year 2008. Data were submitted for a total of 3,026 active oil and gas production platforms; 1,538 of these were flagged as minor sources. Rigorous quality assurance/quality control (QA/QC) activities were performed on the activity data collected from platform operators. The monthly activity data collected from the platform operators were used to calculate the platform production equipment emission estimates. Non-platform sources were also included in the inventory, such as pipelaying vessels, drilling vessels, and support helicopters and vessels. Base year 2008 activity data for non-platform sources were collected and combined with emission factors to develop emission estimates for non-platform sources in the Gulf of Mexico on the OCS. Inventory data files were compiled with the oil and gas production platform data suitable for use in air quality modeling applications. In addition to monthly emission estimates by pollutant and individual piece of equipment, the files include the company, structure, and complex ID, lease number, block and area number, and latitude/longitude. For each piece of equipment, stack parameter information such as outlet height, exit velocity, and exit temperature is also presented. Non-platform emission estimates were allocated using Geographic Information System (GIS) software to lease blocks and areas, and inventory data files were compiled with the non-platform data, suitable for use in air quality modeling applications.

**SIGNIFICANT CONCLUSIONS:** BOEMRE has undertaken the Year 2008 Gulf of Mexico Gulfwide Emission Inventory Study to continue past assessments of the potential impacts of emissions from oil and gas exploration, development, and production in the OCS region of the Gulf of Mexico. The overall goal of the studies is to assess the effects that OCS development has on the attainment (or nonattainment) status of onshore areas of Texas, Louisiana, Mississippi, Alabama, and Florida. This responsibility was mandated by the 1990 Clean Air Act (CAA) Amendments. In addition, the CAA requires BOEMRE to coordinate air pollution control activities with State regulatory agencies. Thus, there is a continuing need for emission inventories and air quality modeling. Improvements continue to be made in the inventory development methods, such as improving the data collection tool for monthly platform activity data. Significant improvements also continue to be made for non-platform sources, particularly for emission estimates for commercial marine vessels for which the EPA has updated their emission calculation methodology to better incorporate the latest emission factor and detailed fuel usage data.

**STUDY RESULTS:** The results of the *Year 2008 Gulfwide Emission Inventory Study* are similar to the results of the *Year 2005 Gulfwide Emission Inventory Study* for some pollutants. However, significant increases are seen for PM and SO<sub>2</sub> from commercial marine vessels (a result of revised emission calculation methods) and CH<sub>4</sub> from several platform equipment types (likely due to increased activity levels in 2008). The inventory results indicate that OCS oil and gas production platform and non-platform sources emit the majority of criteria pollutants and greenhouse gases in the Gulf of Mexico on the OCS, with the exception of PM and SO<sub>2</sub> (primarily emitted from commercial marine vessels), and N<sub>2</sub>O (from biological sources). OCS platform and non-platform sources account for 93% of total CO emissions, 74% of NO<sub>x</sub> emissions, 41% of PM emissions, 36% of SO<sub>2</sub> emissions, and 75% of VOC emissions. Oil and gas production platforms account for the majority of the CO and VOC emissions. Non-platform OCS oil and gas production sources such as support vessels and drilling vessels emit the majority of the estimated NO<sub>x</sub> emissions. For greenhouse gases, platform sources account for almost all of the CH<sub>4</sub> emissions. Commercial marine vessels are the top-emitting non-OCS oil and gas production sources in the inventory for CO, NO<sub>x</sub>, PM, SO<sub>2</sub>, and CO<sub>2</sub> emissions. Biological sources are the top-emitting non-OCS oil and gas production sources in the inventory for VOC, CH<sub>4</sub>, and N<sub>2</sub>O emissions.

Recommendations for future inventory efforts for platform sources in the Gulf of Mexico on the OCS focus on obtaining more accurate emission estimates. Currently the BOEMRE requires operators to report activity data, and emission factors are applied to the activity data in order to calculate emissions. A requirement that platform operators submit source test data or calculated emission estimates based on industry-developed software for key emission sources would reduce the uncertainty in the emissions estimates. For example, fugitive emissions are calculated using out-of-date methods and surrogate component counts. Direct source test data for fugitive emission sources would provide more accurate emission values. Alternatively, the BOEMRE should continue to review emission factor publications and available emissions data to make sure the most up-to-date emission factors, including greenhouse gas emission factors, are used in future emission inventories. For non-platform sources, future inventory development efforts will build upon the foundation developed in previous BOEMRE inventories. With each inventory, significant improvements have been made to the estimation methods and activity data gathering methods for non-platform source categories. For example, in order to further improve the emission estimates for survey vessels, a formal survey could be implemented. A formal request for information from BOEMRE and the Offshore Operators Committee (OOC) should provide more complete and higher quality data regarding monthly activity levels. A final recommendation is to assess the uncertainty of the emissions estimates (and the diurnal profiles) for each source type in the inventory. This type of assessment would help air quality modelers and other users of the inventory understand which categories have major uncertainties associated with their estimates. This would also allow the BOEMRE to pinpoint areas in the inventory development process that need improvement.

**STUDY PRODUCTS:** Wilson, D., R. Billings, R. Oommen, B. Lange, J. Marik, S. McClutchey, and H. Perez. 2010. *Year 2008 Gulfwide Emission Inventory Study*. U.S.

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