Written Comments of the Manufacturers of Emission Controls Association Regarding Compliance by Existing CI RICE on Drilling Vessels Operating on the Outer Continental Shelf with the U.S. EPA's RICE NESHAP

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The Manufacturers of Emission Controls Association (MECA) is pleased to provide written comments in response to the U.S. Environmental Protection Agency's request for comment regarding compliance by existing compression ignition (CI) reciprocating internal combustion engines (RICE) on drilling vessels operating on the Outer Continental Shelf (OCS) with the agency's National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines rulemaking (RICE NESHAP). We commend the agency for its continuing efforts to develop and implement effective emission control standards for stationary RICE.

MECA is a non-profit association made up of the world's leading manufacturers of emission control technology for automobiles, trucks, buses, and off-road equipment, as well as stationary internal combustion engines. MECA member companies have over 40 years of experience and a proven track record in developing and commercializing exhaust emission control technologies for these types of engines.

MECA supported the original rulemaking for the control of hazardous air pollutants (HAPs) from existing stationary CI RICE that was adopted by EPA on February 17, 2010. The regulation presented a balanced and cost-effective approach for controlling HAPs from this category of stationary RICE. The required control technologies include oxidation catalysts for some diesel and other lean-burn engines. Oxidation catalysts represent the most cost-effective means for controlling HAPs from this category of engines. Typically using a very light loading of platinum catalyst on a monolithic support, diesel oxidation catalysts (DOCs) are able to oxidize carbon monoxide (CO), hydrocarbons (HCs), and the soluble organic fraction (SOF) of particulate matter (PM) in a diesel engine's exhaust stream. DOCs installed on engines running 500 ppm or less sulfur fuel have achieved total PM reductions of 20 to 50%, HC reductions of 60 to 90% (including those HC species considered toxic, e.g., polyaromatic hydrocarbons), and significant reductions of CO (over 90%), smoke, and odor.

In re-opening the comment period, EPA requested comment on information provided in the initial comment period by commenters regarding compliance by existing CI RICE on drilling vessels operating on the OCS with the current RICE NESHAP emission limits (in particular, information related to technological feasibility). Specifically, EPA says the main (propulsion) engines on dynamically positioned drilling vessels operating in the eastern Gulf of Mexico on the OCS may be subject to the RICE NESHAP. The operators of the drilling vessels approached the agency expressing concerns that the main engines will not be able to comply with the RICE NESHAP limits (23 ppm CO or 70% CO reduction). The engines are in the 28-32 liters/cylinder size

range (about the size of Category 3 marine diesel engines). The vessel operators have indicated that the main engines are designed to operate around 85% load, but they only operate their engines at 25-50% load. Exhaust temperatures typically range from 270°C to 300°C at 25% load (as noted by Transocean in one of their comments). They say that the engines don't operate above 50% load, so that, if there was a malfunction and one of the engines needed to shut down, the remaining engine can accept the total load (the U.S. Coast Guard requires them to operate this way). They claim that the turbocharger doesn't work as well at low loads, which means the combustion wouldn't be as complete, and, therefore, there would be catalyst fouling from unburned HCs. As a result, the commenters have requested that any existing CI RICE on marine vessels that become subject to the requirements of the RICE NESHAP be subject to maintenance-based management practices similar to those proposed for remote spark ignition (SI) engines, rather than the CO numerical emission limits otherwise applicable.

MECA surveyed its member companies regarding their experience with retrofitting Category 3 marine diesel engines with DOCs and none of the companies had any direct experience installing DOCs on these engines. The emission control experience related to these engines has been primarily the use of SCR systems for the reduction of NOx emissions. However, several MECA member companies do have experience with the installation of DOCs on Category 2 marine diesel engines (engines from 5 to 30 liters per cylinder), like those used on ferries and tug boats, as well as on similar-sized engines used on locomotives. SCR systems have also been used extensively on these Category 2 marine diesel engines. (MECA has issued a report entitled "Case Studies of the Use of Exhaust Emission Controls on Locomotives and Large Marine Diesel Engines (September 2009)," which includes select case studies on the installation of DOCs and/or SCR systems on large marine diesel engines. The report is available on MECA's website at: www.meca.org/galleries/default-file/Loco%20Marine%20Case%20Studies%20update%200909.pdf.)

Regarding the technological feasibility of installing DOCs on Category 3-type CI RICE on offshore drilling vessels, emission control manufacturers are very familiar with the issue of catalyst fouling and engineering solutions are available to address the issue. The level of sulfur in the diesel fuel plays a big part in the possibility of catalyst plugging. In the comments made by the vessel operators, it is not explicitly stated what the sulfur level is in the diesel fuel used by the CI RICE on the drilling vessels. In general, in high sulfur fuels, most of the particulate is sulfates and soluble organic fraction (SOF), which together contribute to plugging. Using low sulfur fuel greatly diminishes the possibility of ash and catalyst plugging at low-load operation (e.g., using ultra-low sulfur diesel, problems are not likely to occur above 200°C). The amount of lube oil consumed also needs to be closely monitored (consumption of too much lube oil can lead to plugging of the DOC). An increase in the substrate cell size is another option for reducing the potential for plugging, which is a specification catalyst suppliers can easily change in their designs (one MECA member recommended a cell density of around 100 cpsi). Both ceramic substrates and metallic substrates can be used.

The issue of a "yellow plume" in the stack due to the oxidation of NO to NO_2 was raised by Wartsila in one of the comments. It is true that a DOC will promote $NO + O_2 \rightarrow NO_2$, which can, in some cases, cause the exhaust to look yellow or brown. The issue is exactly the same for land-based diesel engines being retrofitted with DOCs. One MECA member found that a DOC designed for 70% CO reduction is small enough that it does not significantly increase opacity. In any case, where NO_2 is a major concern, the catalyst can be reformulated to virtually eliminate NO_2 formation. A MECA member has just completed testing with Colorado State University on this subject (MECA staff will provide EPA with a copy of this case study once it becomes available). An SCR system can also be installed to reduce emissions of nitrogen oxides.

Regarding the request by certain commenters that existing CI RICE on offshore drilling vessels be classified as remote engines due to their location in sparsely populated areas and, therefore, be subject only to maintenance-based management practices similar to those being proposed for remote SI engines (see comments by Anadarko and BHP Billiton), it should be pointed out that these drilling operations still employ many on-site workers and personnel who would be exposed to harmful diesel emissions if the requirements were relaxed. In addition, although these engines may be located in remote areas, pollutants such as NOx, PM, and VOCs can be transported over great distances, which can result in higher pollution levels in areas far from where the pollutants originated.

MECA thanks EPA for the opportunity to comment on this important issue. As noted above, we believe that it is technologically feasible to install DOCs on Category 3-type CI RICE on offshore drilling vessels based on emission control manufacturers' existing knowledge base and their experience with similar installations. We believe the data provided by the commenters is insufficient to support exemption of these engines from the CO numerical emission limits under the current RICE NESHAP. Furthermore, lessening the requirements for these engines would expose workers on these vessels to harmful diesel emissions. MECA recommends keeping the rulemaking as written under the original NESHAP for existing stationary CI RICE. MECA and its member companies look forward to working with EPA and other stakeholders in implementing the requirements of the rulemaking.

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