



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**  
Washington, DC 20460

OFFICE OF  
AIR AND RADIATION

JUN 26 2013

Gregory D. Hoenert  
Caterpillar Inc.  
P.O. Box 600  
Mossville, IL 61552-0600

Dear Mr. Hoenert:

The U.S. Environmental Protection Agency (EPA) has reviewed your request for verification of the Caterpillar Inc. (Caterpillar) 3500 Series Marine Engine Emissions Upgrade Group (EUG) Kit #5. The Caterpillar 3500 Marine Engine EUG Kit #5 is an upgrade for certain unregulated Caterpillar marine engines originally equipped with electronic unit injection (EUI); with this upgrade typically performed at the time of engine rebuild, engines achieve Tier 2 emission levels. Caterpillar's 3500 Series Marine Engine EUG Kit #5 includes a new turbocharger, fuel pump, injectors, electronic controls, cylinder packs, jacket water after-cooler and other components. Based on our evaluation of the verification application, the test data, and additional information provided, EPA hereby verifies that this technology reduces emissions to the Tier 2 level.

The technology is approved for use on the following engines and/or equipment provided all of the operating criteria are met as described below:

Technology	Engine Model/Application	Fuel, Max Sulfur (ppm)	Reductions (%)			
			PM	NO <sub>x</sub>	HC	CO
Marine Engine Emissions Upgrade Group Kit #5 (EUI to Tier 2)	Caterpillar 3508, 3512, and 3516 (large cam bore) diesel engines for non-road, marine applications, model year 1994 – 2006, originally equipped with electronic unit injection (EUI) and rated at 1600 rpm	15	Tier 2 Level (marine)			

This technology is approved for Caterpillar 3500 Series EUI marine variable speed propulsion engines with rated power greater than 600 horsepower originally manufactured between 1994 and 2006 model years rated at 1600 rpm for Kits listed below.

Kit Type	Sales Model	Type of Upgrade	Original Engine Arrangement	Rated Speed	EUG Kit	
Kit #5	3508	EUI to Tier 2	100-8316	1600	357-1808	20R-1070
	3512		100-8317		357-1809	20R-1071
	3516		100-8318		357-1810	20R-1072

Please note that this verification is based on the ISO 8178 E3 general marine duty cycle only. The following criteria must be met in order for appropriately retrofitted engines to achieve the aforementioned emission reductions:

1. The servicing dealer must follow specific installation instructions approved by Caterpillar and validate that the upgraded engine has the necessary components installed and has been tested to ensure the proper fuel delivery, power, torque and speed. The dealer must submit a validation form to Caterpillar in order to receive a label for the upgraded engine.
2. The original Caterpillar 3500 Series Marine Engine must be equipped with electronic unit injection (EUI), and the electronic control module (ECM) must be replaced or updated as part of the upgrade. The primary critical new components are turbocharger, fuel pump/governor, nozzles, cylinder packs, jacket water after-cooler, and other installation parts as necessary.
3. The engine must be operated on ultra-low sulfur diesel fuel (ULSD) of 15 ppm or less.
4. This verification is for engines used in vessels with variable speed propulsion systems and is not applicable for engines used in recreational or constant speed propulsion applications.

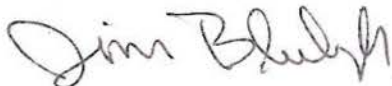
Caterpillar has indicated there is approximately up to 2 percent fuel economy penalty with the use of this technology. If Caterpillar's 3500 Series Marine Engine EUG Kit #5 is modified such that good engineering judgment would indicate that the performance could be affected, you must notify us immediately.

Vessel owners who use this kit must be made aware of EPA's 2008 Locomotive and Marine Engine Regulations which cover existing marine diesel engines that are upgraded, remanufactured, or rebuilt. This mandated measure, referred to as EPA's Marine Remanufacture Program, requires a vessel owner to use an EPA certified remanufacture system at the time of engine upgrade, of a specific marine engine, if available. Caterpillar is obligated to inform vessel owners if any certified remanufacture system is available for their engine. If not, and the above criteria listed is met, then the verified 3500 Marine Engine EUG Kit #5 can be applied. If a certified remanufacture system exists, then this verified technology does not qualify for EPA grant funding, and the owner must use a certified system in accordance with applicable regulations. More information about EPA's Marine Remanufacture Program can be found on: <http://www.epa.gov/otaq/marine.htm>.

Information on the Caterpillar 3500 Marine EUG Kit #5 will be posted on the EPA's Verified Technology List website at: <http://www.epa.gov/cleandiesel/verification/verif-list.htm>. Caterpillar will be responsible for completing the required in-use testing program and for submitting all in-use testing data to EPA as outlined in EPA's in-use test methods.

Thank you for participating in EPA's Technology Assessment Center Verification Program. If you have any questions or comments, please contact Britney J. McCoy, of my staff, at (202) 343-9218.

Sincerely,

A handwritten signature in black ink that reads "Jim Blubaugh". The signature is written in a cursive, slightly slanted style.

Jim Blubaugh, Deputy Director  
Transportation and Climate Division  
Office of Transportation and Air Quality