

GE Marine 6L250 EPA Tier 3 Development

Task #5 Report

for:

New Technology Research and Development Program

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Submitted by:

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Abstract/Executive Summary

This project involves the prototype build and engine performance testing of a marine compression-ignition engine that meets US Environmental Protection Agency (EPA) Tier 3 emissions standards. In particular, it is a goal of this project to manufacture and certify an engine that meets Tier 3 emissions standards ahead of the January 1, 2014, compliance deadline.

This task in particular consisted of the necessary certification testing and official submittal preparation for the 6L250 engine configuration. In particular, this task was focused on the American Bureau of Shipping (ABS) and EPA compliance submittals. The EPA submittal consisted of emissions certification testing and verification. The ABS submittal included design reviews and analysis of the modified engine components.

Introduction/Background

The GE family of inline engines is EPA Tier 2 certified. This project seeks to modify the current inline engine design such that it is capable of meeting the more stringent EPA Tier 3 emissions standards. Given that the EPA guidelines on Tier 3 marine engines only apply to engines with a rated load of less than 2000 kilowatts, the inline engines in GE's portfolio will be subject to the Tier 3 standards starting in January 2014.

Project Objectives/Technical Approach

From the Grant Activities (Scope of Work):

“1.1. The objectives for this work are:

1.1.1. Certify a marine 4-stroke six and eight cylinder engine rebuild kit to American Bureau of Shipping (ABS) class standards and EPA Tier 3 marine emission standards ahead of the 2014 EPA regulatory deadline.”

This report in particular is in regards to the submittals to EPA and ABS for the purposes of receiving an EPA Certificate of Conformity and ABS Product Design Assessment.

Tasks

Task 3: 6L250 Certification Testing

From the Grant Activities (Scope of Work):

“2.5. Task Statement: The PERFORMING PARTY will obtain all final product certification and compliance approvals from the EPA and ABS for release to manufacturing of a Tier 2 certified 6L250 engine family operating at US EPA Tier 3 emissions levels.”

EPA Certification

From the Grant Activities (Scope of Work):

“2.5.1. The PERFORMING PARTY will complete EPA certification testing of the prototype engine. The PERFORMING PARTY will submit all necessary documentation to the EPA and respond to all EPA questions as necessary to receive Tier 3 certification for the prototype engine.”

“2.5.1.1. All EPA certification testing will be completed using the 6L250 test engine and be completed in the engine test cells in Erie, Pennsylvania”

The EPA certification testing was completed in the engine test cell in Erie, Pennsylvania on November 21, 2012. The application for certification was submitted to US EPA on December 12, 2012. This application included all required test data and supplemental documentation with the exception of a final warranty instruction. The warranty instruction shall be submitted to US EPA no later than January 18, 2012. At this time, the rating for the 6L250, 900RPM, and 2035 horsepower engine model has been submitted for EPA compliance approval: .

To complete the engine certifications for the remaining 6L250 engine ratings, the certification testing will be completed at the production engine test facility in Grove City, Pennsylvania. This split in testing has been added to improve the lead time for the 8L250 performance development in the Erie, Pennsylvania test facility.

To date there have been no questions from the EPA regarding this application; however if any are received then they will be handled promptly. Shown below in Figure 1 is an electronic confirmation that the submittal was received by the EPA.

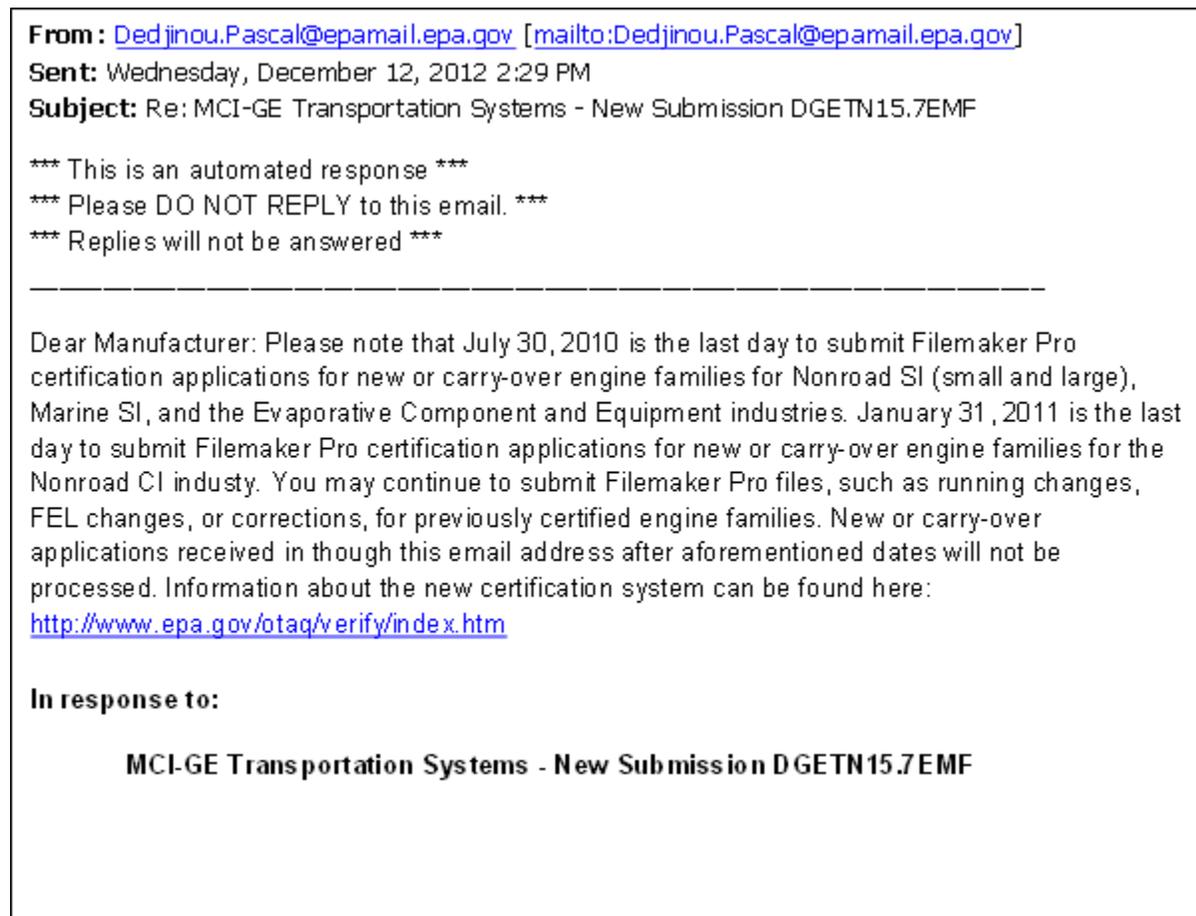


Figure 1: Electronic EPA submission confirmation

It must be noted that with respect to the EPA submittal, compliance submittal has been submitted for the entire engine system, rather than as a rebuild kit that could be applied to any existing engine. The design

of the system components has left this upgrade as an option; however the chosen path will provide complete engine certification for a new engine build.

ABS Certification

From the Grant Activities (Scope of Work):

“2.5.2. The PERFORMING PARTY will submit all necessary documentation to the ABS and respond to all ABS questions as necessary to receive ABS certification for the prototype engine.”

“2.5.2.1. All ABS certification testing will be completed using the 6L250 test engine and be completed in the engine test cells in Erie, PA”

All necessary steps to submit for engine level ABS type approval have been completed. Since the L250 Tier 3 engine has been deemed similar to the L250 Tier 2 engine, a request has been submitted to ABS to ask for a simple addition to the existing type approval certificate. As such, no separate engine level testing was required. The official engine compliance submittal occurred on December 10, 2012.

To date there have been no questions from ABS regarding this application; however if any are received then they will be handled promptly. Shown below in Figure 2 is an electronic confirmation that the submittal was received by the EPA.

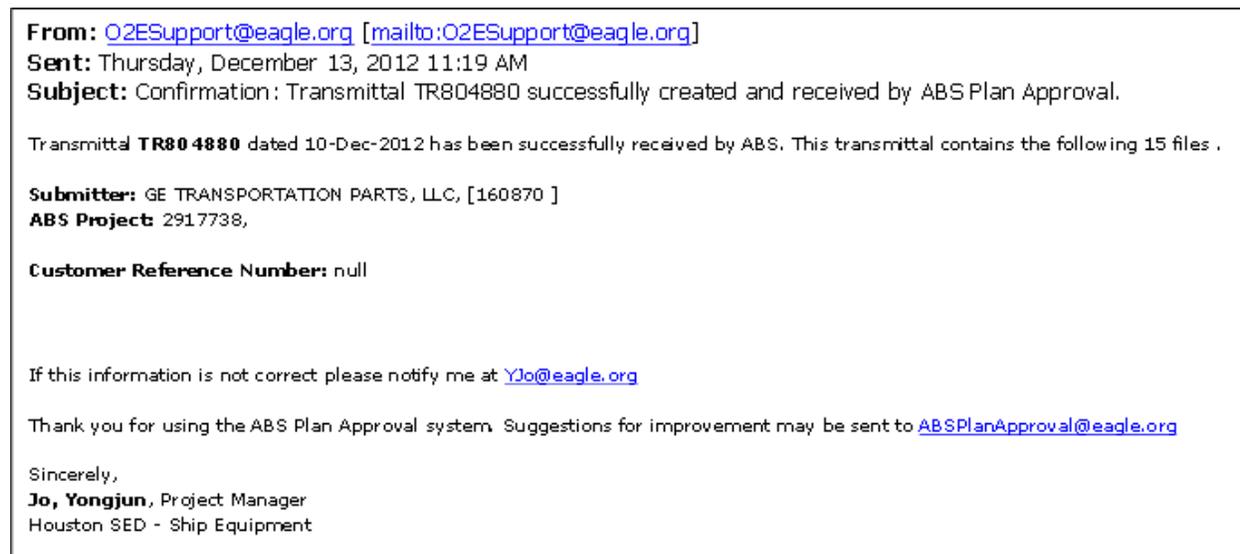


Figure 2: Electronic ABS submission confirmation

System Design Reviews

From the Grant Activities (Scope of Work):

“2.5.3. The PERFORMING PARTY will complete all necessary design review closure and design tasks to finalize the Tier 3 system component designs per internal practices.”

All necessary design reviews to approve of the compliance submittal have been completed. Per Task 3 of this grant, all engine level performance reviews have been completed. All engine component level

analysis and design reviews have been completed up to a point where all internal requirements have been met for compliance submittal.

Schedule

From the Grant Activities (Scope of Work):

“2.5.4. Schedule: The PERFORMING PARTY shall complete this task within 17 months of the signed Notice to Proceed Date as issued by TCEQ.”

The Notice to Proceed Date was July 11, 2011. All compliance submittals occurred during the month December 2012.

Deliverables

From the Grant Activities (Scope of Work):

“2.5.5. Deliverables: The PERFORMING PARTY shall submit a report to the TCEQ upon completion of this task. This report will include but is not limited to copies of the EPA Tier 3 and ABS certifications approvals.”

Due to the regulatory lead time to obtain complete approval on an engine submission the EPA and ABS certifications have not been received. However, all regulatory data has been submitted and formal reviews are in process per the above noted figures.

Discussion/Observations

Objectives vs. Results

All desired objectives have been met for this portion of the grant objectives. As noted above, the compliance approval certificates have not been received, however the official compliance submittal has occurred. All questions or concerns from the EPA and ABS will be reviewed and answered promptly.

Critical issues

The only critical issue encountered thus far has been with regard to schedule, due to test lab resource availability. Constraints on resources resulted in the certification testing not taking place as early as originally planned.

Technical and commercial viability of the proposed approach

All aspects of this project to date are deemed achievable and technically viable. Some activity is still to be undertaken to finalize the serial production design of the engine, however this activity is within the allowances of the noted agencies.

Scope for future work

Future planned work includes the follow through from any questions from the noted agencies. Additionally, the documentation created for the 6L250 compliance submittal will be leveraged for the eventual 8L250 submission.

Intellectual Properties/Publications/Presentations

All information provided in this Task Deliverable Report is the property of GE Transportation. It has been supplied in accordance with the agreed upon terms of the NTRD contract as proof of task completeness.

The commercialization process of the GE EPA Tier 3 L250 engine has begun in the fourth quarter of 2012.

Summary/Conclusions

The elements of this part of the grant activity focused on ABS and EPA compliance certifications. All tasks specified in this deliverable report have been completed with the noted exception of the warranty instruction that remains to be submitted. Electronic confirmation of compliance submittal has been provided above as proof that the necessary applications have been submitted. The remaining scope of this grant activity includes the follow up with the noted agencies, along with the performance development, testing, and certification of the 8L250 prototype engine.

Contact Information

For further information about this project please contact:

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