GE Marine and Stationary 8L250 EPA Tier 3 Development

Task #6 Report

for:

New Technology Research and Development Program

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Submitted by:

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Transportation Systems

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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 involved the procurement of components and subsequent upgrade of a GE 8L250 test engine to meet EPA Tier 3 emissions standards as defined in 40 Code of Federal Regulations (CFR) 1042. The scope of this task included procuring new camshafts, pistons, piston rings and a new turbocharger. Given that this project includes the upgrade of both the GE 6L and 8L250 to meet the EPA Tier 3 emissions standards; this task covered the physical upgrade of the 8L250 test engine for use in performance and emissions testing.

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 parts procurement and rebuild of the prototype 8L250 engine to be used for compliance certification.

Tasks

Task 6: Rebuild One 8L250 Prototype Engine

From the Grant Activities (Scope of Work):

> *"2.6. Task Statement: The PERFORMING PARTY will rebuild one 8L250 prototype engine."*

Procure components

From the Grant Activities (Scope of Work):

> *"2.6.1. The PERFORMING PARTY will procure all required Tier 3 package components to include but not limited to: turbocharger, cam shafts, and power assembly components (pistons, piston rings, etc)."*

The power assembly components (piston rings, rotating component bearings) in this case were procured through the GE replacement parts team, however the turbocharger is a new component for GE engines, and as such was procured as an engineering prototype component. Similarly, the required engine camshafts were a new design on GE engines, however they are based on the current GE design. Since the final camshafts were a new component, they were also procured as prototype engineering components.

All components for this task were received by August 31, 2012, in time to allow for associated engine build steps and requirements.

Rebuild 8L250 Engine

From the Grant Activities (Scope of Work):

> *"2.6.2. The PERFORMING PARTY will rebuild one existing 8L250 prototype engine with the chosen Tier 3 engine configuration."*

This work has been completed on the 8L250 engine. Figures 1, 2, 3, and 4 below display the engine as configured with the components noted above, and ready to begin performance testing.

Figure 1: Top view of prototype 8L250 engine configured for performance testing

Figure 2: Front view of prototype 8L250 engine configured for performance testing

Figure 3: Rear view of prototype 8L250 engine configured for performance testing

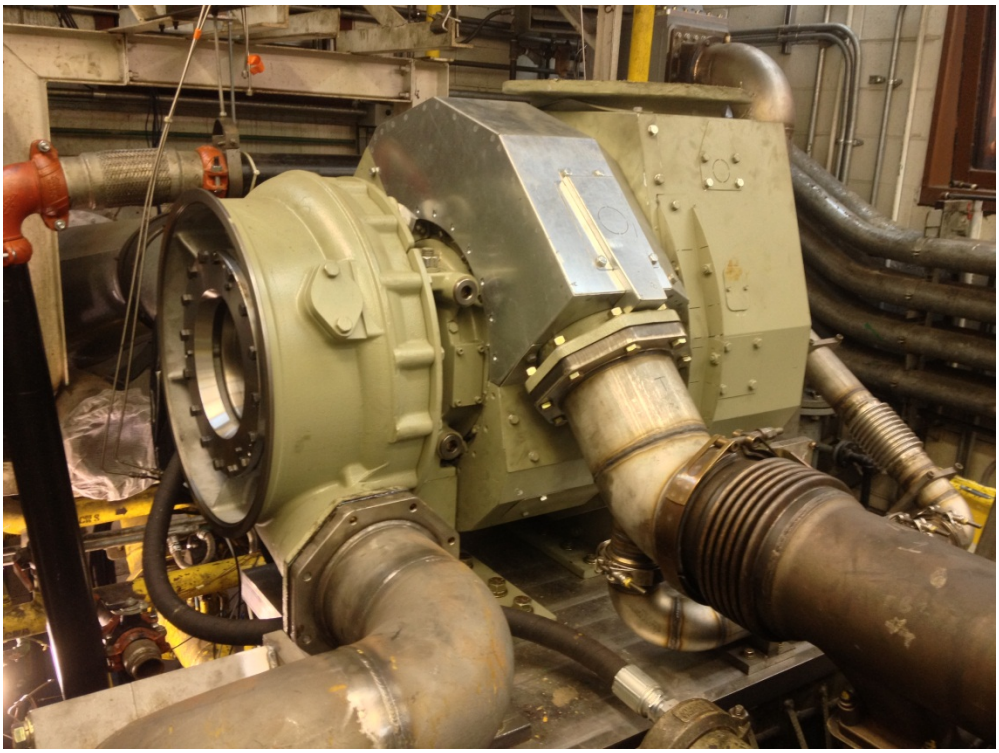

Figure 4: View of new turbocharger installed on the prototype 8L250 engine

Schedule

From the Grant Activities (Scope of Work):

> *"2.6.3. Schedule: The PERFORMING PARTY shall complete this task within 16 months of the signed Notice to Proceed Date as issued by TCEQ."*

The Notice to Proceed Date was July 11, 2011. The engine rebuild was completed during the month of December 2012.

Deliverables

From the Grant Activities (Scope of Work):

> *"2.6.4. 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 a summary of the work completed and pictures of the finished engine configuration."*

This document and the pictures shown above fulfill the requirements for the deliverables portion of this task.

Discussion/Observations

Objectives vs. Results

All desired objectives have been met for this portion of the grant objectives. All prototype components have been procured and mounted on the engine. Any necessary prototype mounting components have also been fabricated and are in place on the engine as shown in the above figures.

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 8L250 performance testing occurring later than originally expected

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 develop a serial production ready version of the hardware, however this task can be viewed as a modification of the prototype component designs.

Scope for future work

Future work is to involve the performance testing and compliance certification of the engine with the applicable governing bodies. For this portion of the work, the already completed 6L250 performance development will be leveraged to reduce the amount of test time necessary for the 8L250 development.

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

This task as part of the grant activity allowed for the preparation of a 8L250 engine to be used for engine performance testing. Following activities as noted in the grant scope of work will finalize the compliance review and release of this engine to the governing bodies.

Contact Information

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