Final Report

Contract No. MS10017
19 Heavy Duty Natural Gas Trucks
Ryder Truck Rental Inc.
07/24/2014

Prepared for the Mobile Source Air Pollution Review Committee (MSRC) under the AB 2766 Discretionary Fund Work Program
Contract Period – December 2011 through December 2017

Acknowledgements:

We would first like to acknowledge the SCAQMD and MSRC organizations for their foresight and vision in bringing this and so many other funding projects to the marketplace in order to lessen this country's dependence from foreign oil and improve the air quality of our planet.

Ryder in cooperation with Navistar developed a replacement product for the originally intended Phoenix ESI engine in order to satisfy the original intent of this grant program; replacing 19 diesel straight trucks with clean burning natural gas vehicles. Scott Perry, VP Supply Management from Ryder led the efforts together with Kevin Keene, Director National Accounts from Navistar in these vehicle development efforts. Alex Madrinkian, VP Sales West Region and his team of Ryder sales professionals found willing customers to sign up for extended lease contracts with these vehicles and was supported by the efforts of Chris Nordh, Director Advanced Fuels & Strategic Infrastructure.

Disclaimer:

The statement and conclusions in this report are those of the contractor and not necessarily those of the Mobile Source Air Pollution Reduction Review Committee (MSRC) or the South Coast Air Quality Management District (SCAQMD). The mention of commercial products, their sources or their uses in connection with material reported is not to be construed as either an actual or implied endorsement of such products.

Project Description and Work Performed:

Ryder, together with Navistar worked to create an engineering solution to integrate the Phoenix ESI 6.7 Liter engine, into a Navistar chassis. During the beginning stages of implementation at Navistar, ESI went bankrupt and Navistar decided not to move forward with the ESI platform. At this time, the only available engine for a vehicle of this classification (26,000 – 33,000 gvw) was the 8.9L Cummins Westport

ISL-G. The engineering of this larger engine required a larger chassis to be utilized, which led to a significant increase in overall weight of the finished vehicle and therefore decreased the available payload. It was determined that the only feasible solution was to rate all these vehicles at 33,000gvw in order to maximize available payload for the eventual customer. The difficulty that followed was that any vehicle rated at more than 26,000lbs requires a Commercial Driver License (CDL), which did impede certain customers from adopting these vehicles. Once the final specification had been decided upon, Ryder issued binding Purchase Orders to Navistar, which prompted the production schedule to begin. During this entire process, Navistar was integrating with Agility fuel Systems in order to install Agility CNG tank systems at their modification center, just outside of their vehicle production facility. Navistar also purchased a temporary CNG fueling station, which could be moved to a fueling station and be refilled upon request. This was to facilitate the movement and road testing of the CNG vehicles after final tank installation.

Prior to the 19 vehicles being delivered to the Ryder facilities, Cummins Westport provided training to Ryder trainers, which we refer to as "train the trainer" events. The Ryder trainers are all seasoned technicians who have moved to these regional or national support roles and provide training to the technicians at each Ryder branch that is going to receive NGVs in the near future. Additional training and expertize has been developed since that time and has been rolled out in various forms, such as conference calls, online tools and events and in-person training sessions.

In regards to the vehicles being replaced with these new NGVs, 8 of the 19 vehicles were replacements of existing diesel lease vehicles and they have been sold into the secondary market through Ryder's used vehicle sales network. 10 of the 19 vehicles are considered "add" vehicles, which implies that the customer did not replace an existing Ryder lease vehicle and we do not have detailed information about what the customer was doing previously. The last vehicle is actively being rented to various customers on a regular basis and can therefore not be classified as replacing an existing vehicle.

Problems Encountered:

The implementation of the physical operation of these vehicles into our fleet has gone smoothly with few exceptions. The Agility fuel systems have performed very well on these vehicles, which we attribute in great part to the excellent quality control that Navistar implemented at their mod center, who are responsible for the installation of the Agility tank systems.

One vehicle has recently developed issues with rough idle and variable revs at idle and is in the process of being diagnosed with support from Cummins Westport and Allison Transmission but is expected to be resolved within days or weeks of this writing.

The reporting of GPS coordinates for tracking purposes has had mixed results, some because of internal controls, as our system automatically shuts off reporting on units that do not have customer contracts for the GPS system and its software features or if those customers stop paying their bills. This ensures that we do not continue paying for the polling charges if a customer decides to stop paying us or if a vehicle goes out of service for any other reason. Even though we had put these vehicles into a special account, the system overrode this feature when other adjustments were made to the vehicles. Therefore, several vehicles stopped reporting GPS coordinates for the months of May and June 2014. This has now been resolved, as per our IT department handling these systems. Additional issues came as a result of one customer (Ernest Packaging) that chose to use their own GPS tracking system, which even though they agreed to provide the "GPS breadcrumbs" on a monthly basis, their operations responsible people were never informed and getting in touch with them was difficult and once we did, the information they were able to provide was less than perfect. Today, vehicles are only able to accommodate one GPS system, which is why this presents a problem.

Emissions Benefits:

These vehicles have replaced a diesel vehicle operation in a 1 to 1 manner, which implies that the environmental benefits accomplished as of June 30th can be calculated directly from utilizing the number of miles operated through June 30th, the expected MPG degradation of 15%, the then calculated number of Diesel Gallon Equivalents of CNG burned and comparing the greenhouse gas emissions (CO_2e) of the diesel gallons to the CNG in DGEs.

Total Miles of 19 vehicles as of 6/30/2014:	532,517 miles
Estimated Diesel MPG for equivalent vehicle:	9.00 MPG
Estimated Diesel displaced with CNG vehicle:	59,168.56 gallons
Estimated CNG MPG given 15% degradation:	7.65 MPG (DGE)
Estimated CNG consumed:	69,610.07 DGEs
Greenhouse gas emissions from Diesel vehicle:	676 Metric Tons of CO_2e
Greenhouse gas emissions from CNG vehicle:	538 Metric Tons of CO_2e
Greenhouse gas emission reduction:	138 Metric Tons of CO_2e (20.4%)

See appendix/excel sheet "AQMD CNG GHG Emission Metrics" for full calculations of emissions reduction

Photographs & Outreach:

One innovative solution that I would like to call out is the location of the low pressure fuel filter and drain, which as per OEM instructions should be relieved each day, after the fueling takes place. This filter keeps water, oil and contaminants from reaching the engine during operation and can enter the system from the CNG station itself, given inadequate filtration. Previous vehicles have all had these filters in the engine compartment, which may be inconvenient for the driver to pop open and close each time they fuel the vehicle.

Ryder has had numerous customer and public outreach events, which have included the showing of these vehicles to fleets, customers and the public. These events include the grand openings of our Orange, CA and Fontana, CA shops, which included the maintenance shop upgrades, the L-CNG stations as well as a sample of our various CNG and LNG vehicles.

We also featured a vehicle from this group at the recent Fortune Brainstorm Green event, at the Ritz Carlton in Laguna Nigel, CA, which was the first time we featured our new marketing campaign on one of our vehicles, as per below image.

Below you will find two images of a vehicle with the MSRC logo/decal.

Summary and Conclusions:

Ryder is committed to a clean transportation future and it is programs such as this that provide the groundwork for allowing public and private enterprise to develop and improve the products that eventually become mainstream options with scale and availability to create the financial benefits required to end subsidy programs. This project partially funded the purchase of 19 Navistar straight trucks, with the Cummins Westport ISL-G 8.9L engine and 57DGEs of CNG storage and has thus far eliminated 138 Metric Tons of CO_2e, a 20.4% reduction in comparison to what the diesel counterparts would have emitted. It is expected that these vehicles will displace as much as 10 times that amount of CO_2e throughout their life. These vehicles have operated exceptionally well and have been identified as a perfect solution for applications operating at between 33,000 to 54,000 lbs GVW, as the engine and chassis is configured for such load conditions. Anything below 33,000 GVW would not provide adequate payload for the majority of operations.

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