OptiFuel Combats Climate Crisis with Testing of Preproduction Renewable Natural Gas Hybrid Line-Haul Locomotive Reducing Emissions by 99.5% and Reducing Their Fuel Expenses by 50%

40% of the U.S. Population in Urban and Environmental Justice Communities Will Directly Benefit from Zero Criteria Pollutants and CO_2 Emissions, While Railroads Significantly Reduce their Carbon Footprint

BEAUFORT, SC – July 22, 2020 – OptiFuel Systems ("OptiFuel"), a system integrator of Cummins and BAE Systems hybrid power products for decarbonizing the rail, marine, and microgrid power market, is in the process of finalizing a $2.6 million U.S. Department of Energy (DOE) grant to demonstrate a pre-production Renewable Natural Gas (RNG) hybrid 4,300 hp line-haul locomotive. The program will demonstrate that a suite of commercially available, EPA rail-certified engines present a near-term, low risk solution to create an affordable RNG hybrid line-haul locomotive with near zero emissions while simultaneously improving fuel cost by 50%. This new program, partially funded with the DOE grant, will allow pre-production testing at AAR's Transportation Technology Center, Inc. (TTCI) and will operate in-service with a regional railroad to validate that OptiFuel's low-risk, affordable technology can also be applied in the higher horsepower freight and passenger locomotive market.

This program is integral to OptiFuel's 5-year plan to disrupt and decarbonize the rail market with a full line of zero and near-zero NOx, PM and CO_2 emissions freight and passenger locomotives. In several weeks, OptiFuel will be announcing that it will start taking orders, in 49 of the U.S. states, for a new line of affordable 800 hp to 3,200 hp, 100% natural gas freight and transit locomotives. All will have **zero NOx/PM emissions** with carbon-neutral emissions by consuming an RNG/CNG mixture. OptiFuel has already developed and tested a high volume CNG/RNG refueling system at the Indiana Harbor Belt CNG locomotive program, utilizing low-cost CNG. In the next 2 years, OptiFuel will be announcing additional refueling products, including an affordable 12,000 DGE (Diesel Gallon Equivalent) CNG/RNG tender; and a 9,000 CNG/RNG DGE, 1,600 hp zero emission, powered tender.

The Rail Sector is the only transportation modality without significant emissions related development that is feasible in the near-term to eliminate ozone, smog and GHG emissions. In comparison, the composite US freight line-haul fleet, which consumes 90% of the fuel in the rail industry, emits 8 g/bhp-hr of NOx while new CNG Class 8 trucks emit 0.02 g/bhp-hr of NOx, **a reduction of 400 times**. Even if locomotives can carry 4 times amount of tonnage per horsepower as a new CNG Class 8 trucks, it still has emissions 100 higher. Beside the U.S. locomotive fleet average NOx emissions of 8 g/bhp-hr, the U.S. rail fleet's average fine

Particulate Matter (PM) emissions is 0.22 g/bhp-hr. In comparison, OptiFuel's 4,300 RNG hybrid line-haul locomotive is expected to emit 0.04 g/bhp-hr of NOx, **a reduction of 200 times**, and emit 0.00 g/bhp-hr of PM. Using RNG as the fuel, OptiFuel's locomotive will dramatically lower greenhouse gas (GHG) emissions resulting in a neutral or negative carbon footprint, in addition to far exceeding California's Tier 5 locomotive petition standards to U.S. EPA.

As of September 2016, there were more than 1,000 railyards in the U.S. located in densely populated, urban areas classified as particulate matter and ozone EPA defined "nonattainment" areas. More than 122 million people (nearly 40% of the U.S. population) living in these nonattainment areas are having more acute and chronic adverse health outcomes, including exacerbation of respiratory and cardiovascular disease. In these U.S. railyards, there are more than 28,000 technologically obsolete, diesel powered locomotives operating which produce Pre-Tier 0 (non-regulated, pre-1973), Tier 0 or Tier 1 emissions. These pollutants create very high levels of ozone, air toxins, greenhouse gases, fine particulate matter, and other diesel exhaust compounds classified as carcinogenic to humans.

In 2018, Class I, II, and III railroads purchased 4.7 billion gallons of diesel fuel for the 39,000 locomotives used for freight operations in the US. Freight railroads emitted more than 1.6 million tons of NOx, 43,000 tons of PM, and 38 million metric tons of CO_2, much of which occurs in Environmental Justice communities. OptiFuel's EPA rail certified technology with a CNG/RNG fuel mixture would limit railroad emission throughout the U.S. to 8,600 tons of NOx, zero tons of PM, and zero metric tons of CO_2.

This demonstration will include a comprehensive natural gas hybrid propulsion package featuring four 100% natural gas engines– the OptiFuel KOFSG11.9400 ("OFS12") and a single Cummins Tier 4, EPA rail certified, diesel-powered QSK60 in a hybrid configuration. Our design also includes a 100% battery-electric mode for limited yard operations. OptiFuel's OFS12 engine is EPA rail certified with emissions of 0.00 g/bhp-hr for both NOx and PM, and is capable of operating on either CNG, RNG, LNG, or a CNG-RNG blend. The OFS12 engine, which is identical to the Cummins ISX12N for on-road applications, is the cleanest rail engine currently certified by EPA.

The pre-production locomotive will consume 83% natural gas along with 20% improved efficiency versus Tier 4 diesel line-haul freight locomotives. OptiFuel will utilize one of its proprietary, Federal Railway Administration approved onboard CNG/RNG storage system holding 1,500 DGE to complete the locomotive design.

The production locomotive will be market competitive in pricing and will have an industry-leading 5-year warranty on all engines along with comprehensive maintenance coverage. The propulsion system design is compact enough to fit on virtually any legacy EMD or GE line-haul locomotive with no structural modifications to the operator cab or frame. OptiFuel design will allow the railroads to repower existing Tier 3 and Tier 4 line-haul locomotives at half the cost of fully replacing older Pre-Tier 0 to Tier 2 locomotives. In production, OptiFuel will provide its proven locomotive CNG fueling station solution and expect the CNG to cost between 0.70 to $1.35 per DGE, depending on capitalization and implementation strategies of the locomotive

operator. This is well below the 10-year average cost of $2.45 that the Class 1 railroads have paid for diesel.

“We developed and certified these technologies for rail, because we believe there is a need for line-haul locomotives that deliver value and cleaner, more economical solutions simultaneously to railroads, railroad customers, and urban and Environmental Justice communities,” said Scott Myers, President of OptiFuel. “With the transportation and non-transportation mobile sector emitting 37% of all GHG emissions in the United States, it is critical to repower or replace all mobile assets to operate on carbon-neutral or carbon-negative renewable fuels such as RNG, Green Methane, Green Hydrogen or other biofuels, eliminating carbon-intensive gasoline or diesel fuels in the U.S. in 15 years.”

About OptiFuel Systems:
OptiFuel is providing zero emissions products (NOx, PM, CO2) for decarbonizing rail, marine, and microgrid power applications with innovative, cost-efficient, and sustainable solutions utilizing advance gaseous fuels with Cummins and BAE Systems hybrid power products. OptiFuel is the only US company that has final FRA approvals and EPA certifications for gaseous locomotives in service in the U.S. OptiFuel was the system integrator for the Indiana Harbor Belt CNG/RNG locomotives in service in Chicago. OptiFuel will be introducing additional zero emissions solutions in the marine and microgrid generator power markets to replace diesel, powered with carbon-neutral renewable natural gas.

More information can be learned at https://optifuelsystems.com/

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