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Two New CRISI Awards Worth $26,155,673 Will Fast-Track Production of OptiFuel Zero Emission Diesel-RNG Dual Fuel Hybrid Switcher Locomotives and "No Tender" Line Haul Locomotives

BEAUFORT, SC – November 20, 2024 – Two new CRISI awards to Colorado State University Pueblo and the University of Delaware will fast-track FRA Concurrence for OptiFuel **Total-Zero™** Diesel-RNG Dual Fuel Hybrid Switchers and Line Haul Locomotives to 2026 and 2027, respectively. This FRA concurrence will position OptiFuel to deliver Diesel-RNG hybrid switcher locomotives in 2026, serving short lines and transit railroads awarded 2024 CRISI grants, as well as those seeking to submit grant applications in 2025. OptiFuel **Total-Zero™** Diesel-RNG Switchers dramatically reduce CARB Spending Account funds by a factor of 16 compared to Tier 4 diesel locomotives.

By 2028, OptiFuel plans to commence production of its **Total-Zero™ 5000 hp Diesel-RNG Dual Fuel Hybrid Line Haul Locomotives**, following the completion of FRA concurrence and one million miles of reliability testing at the FRA's Technology Transportation Center (TTC).

Key Value Drivers: OptiFuel Total-Zero™ Diesel-RNG Dual Fuel Line Haul Locomotives

- Achieve near-zero nitrous oxide (NOx) and particulate matter (PM) emissions, and **NET-ZERO** greenhouse gas (GHG) emissions
- **Reduce total fuel costs by up to 50%** compared to Tier 4 diesel locomotives through combined value of 20% fuel economy gains from advanced power modules, hybridization, regenerative braking, energy management systems, and fixed-rate RNG pricing
- Travel 2,000 miles—e.g., from the Ports of Los Angeles or Long Beach to Chicago—without refueling or **requiring a tender**

- Redundant power ensures extreme high availability and reliability to guarantee tractive power (5500 hp IC Diesel and 1000 hp Battery Power for a total peak power of 6500 hp)
- AC Traction with Regenerative Braking: Maintains full tractive effort even with the loss of one traction motor
- Over 95% availability with high reliability and lower lifetime maintenance costs
- Can be retrofitted to any existing switcher or line haul platform
- 1-hour engine module replacement, minimizing disruptions and out-of-order assets
- 90% component modularity allows for easy module swapping between locomotive sizes
- 30-year locomotive lifespan with flexibility to simply swap out modules for upgrades and transitions to future technologies or alternative fuels
- Requires minimal infrastructure expansion

“We believe that the debate on the next generation power source for freight locomotives is over,” said Scott Myers, OptiFuel’s President. “Replacing existing locomotives with battery-electric, hydrogen or catenary power would cost Class 1 railroads several trillion dollars, while OptiFuel locomotives achieve the same goal at around 5% of that cost. To meet Class 1 SBTi targets of 100% **NET-ZERO** by 2050, a zero emission line haul locomotive must achieve FRA concurrence and be in production by 2030 to feasibly replace the 25,000 high-emission line haul locomotives reaching end-of-life within this timeframe. OptiFuel’s innovative Diesel-RNG dual fuel hybrid locomotive is the only product on track to achieve FRA concurrence in time to meet this critical need. OptiFuel’s technical approach to innovation offers railroads not only emissions elimination, but a low-risk, cost-effective solution that can achieve widespread adoption within the next 5 years, reduce annual fuel expenses by up 50%, and exceed the performance levels of existing Tier 4 diesel line haul locomotives.”

CRISI Award Details

Colorado State University of Pueblo - $11,671,781 (35% match; $18,417,681 total)
This award supports a comprehensive $18,417,681 initiative with OptiFuel and ENSCO Engineering to validate the reliability, crashworthiness, and FRA concurrence of OptiFuel’s RNG/Hydrogen Onboard Storage Modules for switchers and line haul alternative fueled locomotives. The first portion of the program will support testing of OptiFuel’s 5000 hp Diesel-RNG Dual Fuel Hybrid Line Haul Locomotive at FRA’s TTC facilities in 2026 and 2027. Some of the key tasks in this portion of the initiative include:

- OptiFuel RNG/hydrogen onboard storage system modules will undergo accelerated impact and vibration testing to simulate 1 million miles of revenue service
- The survivability of these fuel storage modules will be validated by simulating a collision with a Class 7 truck at a rail crossing

- Testing will confirm that OptiFuel locomotives meet Tier I passenger equipment crashworthiness requirements, as specified in 49 CFR Part 238, for speeds up to 125 mph
- The program will also demonstrate a rapid gas-release system on the module to manage major accidents involving fire and prevent operational issues in tunnels

The second portion of this program includes the design and installation of fixed and mobile RNG and hydrogen refueling systems at TTC, integrated with diesel refueling. As part of this initiative, the partners will develop new refueling standards, safety and hazard protocols, and refueling procedures for the industry—all based on OptiFuel's successful programs with integrated Diesel-RNG and hydrogen refueling systems at IHB Railroad and Sierra Northern Railway.

The final portion of this comprehensive public-private initiative encompasses the development of processes and documentation for training railroad industry professionals, first responders, emergency managers, planning and permitting officials, and safety engineers on gaseous fuel motive power operations, maintenance, safety, and incident mitigation - supporting safe implementation of these environmentally friendly alternative fuel locomotives throughout the United States.

University of Delaware – $14,483,892 (20% match; $18,104,865 TOTAL)
This award, supporting a comprehensive $18,104,865 program, incorporates long-term reliability testing for multiple line haul locomotives, expanding OptiFuel's industry impact to the development of programs for the next generation railroad workforce. OptiFuel plans to build four additional line haul locomotives in 2026, specifically for million-mile reliability testing at the TTC that supports this effort.

To see more information, see the following presentations

- *Achieving Low Risk, Affordable Decarbonization of the U.S. Locomotive Fleet to Zero Emissions Using a Diesel-RNG Dual Fuel 'No Tender' Solution*
- *Achieving Low Risk, Affordable Decarbonization of the U.S. Locomotive Fleet to Zero Emissions Using a Diesel-RNG Dual Fuel 'No Tender' Solution*

About OptiFuel Systems LLC:

OptiFuel Systems is a solution provider designing and manufacturing **Total-Zero™** emission products and services in the hard-to-abate transportation and industrial markets, specifically in rail, marine and power generation. OptiFuel works as a systems integrator with strategic partners to engineer innovative technology that is low-risk and modular with flexible fuel options including diesel, renewable natural gas (RNG) and hydrogen fuels.