IV.J.7 Diesel-Fueled SOFC System for Class 7/Class 8 On-Highway Truck Auxiliary Power (New Project)

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Subcontractors:
International Truck & Engine Corp.
SOFCo-EFS Holdings LLC

Objective

- Design, develop and perform in-vehicle demonstration of a diesel-fueled solid oxide fuel cell power system configured to provide electrical power for sleeper cab air conditioning, heating, engine block heating and convenience loads for Class 7 and 8 on-highway trucks.

Technical Barriers

This project addresses the following technical barrier from the Fuel Cells section of the Hydrogen, Fuel Cells and Infrastructure Technologies Program Multi-Year Research, Development and Demonstration Plan:

- D. Fuel Cell Power System Benchmarking

Approach

An auxiliary power unit (APU) for on-highway trucks must operate on diesel fuel; must be optimized for installed cost, size, weight and fuel efficiency; and needs to provide a base load of about 2.5 kW. The proposed system comprises a diesel fuel reformer matched to a nominal 4-kW solid oxide fuel cell (SOFC) – with balance of plant, housing, and other subsystems as required – supplying electrical energy to a 12V DC vehicle battery bus; DC power conditioning to control fuel cell output and balance the electrical load between the SOFC and vehicle batteries; and an inverter to supply AC power to the sleeper cab air conditioning, heating system, and convenience loads. The SOFC is directly derived from a larger unit currently being developed with support from the DOE's Solid-State Energy Conversion Alliance (SECA) initiative. The humidified ca1alytic partial oxidation (CPOX) diesel fuel reformer is an extension of SOFCo's diesel fuel reformer work. The controls and power electronics are also derivatives of the SECA project and ongoing new product development work, primarily for the recreational vehicle industry. International will provide the application technical guidance, vehicle integration specifications, vehicle configuration, and vehicle testing. SOFCs offer the potential for an incremental, but significant, improvement in fuel efficiency over diesel engine APUs plus virtually zero emissions of NO_x, HC, and PM; very low maintenance; and negligible noise and vibration.