

Hydrogen Fuel Cell-Powered Emergency Relief Truck Prototype



Science and
Technology

DEVELOPING NEXT GENERATION DISASTER RELIEF CAPABILITIES

Disaster and crisis situations frequently put responders in locations with limited fuel resources or deployed to areas far from resupply. Through an interagency collaboration between the Department of Homeland Security (DHS) Science and Technology Directorate (S&T), the U.S. Army Corps of Engineers, the U.S. Department of Energy (DOE), the Department of Defense, and Cummins, Inc., an advanced hydrogen (H₂) fuel cell truck prototype — known as H2Rescue— is being developed and tested. The H2Rescue truck is a hydrogen fuel cell/battery hybrid vehicle that can be driven to disaster recovery sites to provide on-site power for up to 72 hours without refueling.

THE BENEFITS OF HYDROGEN FUEL CELLS

Hydrogen fuel cells offer viable fuel alternatives to the emergency response community while also operating in near silence without volatile exhaust. Hydrogen fuel cells have the potential to be a stable and easily transportable energy storage medium for use in disaster response operations. With 80% of the energy created being utilized, the fuel cells are both energy efficient and environmentally friendly, as water and heat are the only byproducts created.

H2-POWERED EMERGENCY RELIEF TRUCK

The integration of an electric drivetrain, a hydrogen fuel cell, and a hydrogen storage system coupled with high-energy-density Lithium-ion battery packs allow the H2Rescue to operate on zero-emission power generation, using a state-of-the-art power delivery system. With this, the H2Rescue prototype can operate as a self-propelled electric generator, providing up to 25 kilowatts export power; enough to power 20 average U.S. homes, lights at a shelter, a communications trailer, etc. In addition, the system operates at full capacity with little to no noise.

The H2Rescue truck is the first vehicle of its kind and will assist in further defining the capabilities of new technologies in the future. In addition to power generation, future applications could capture and utilize the water and heat byproducts of the hydrogen fuel cell.

Vehicle Specifications & Vehicle Concept

Vehicle Specifications	
Make/Model	Kenworth T370 MY2020
Classification	Class 7 Medium Duty Conventional
Application	Rescue Vehicle with Mobile Command Center
Truck Dimensions	
Length	42'1"
Height	12'1" (from bottom of frame rail)
Width	102"
GWR	33,000 lbs.
Wheelbase	272"
Powertrain	Cummins PowerDrive PD750PFC
Traction Motor	
Rated Power	245 kW (330 kW peak)
Rated Torque	3400 Nm (2517 lb-ft)
Transmission	Direct Drive
Hydrogen Fuel Cell	Cummins H250 PEM Fuel Cell (500kW)
High Voltage Battery	155kWh (2 pack); 600-700Vdc
Hydrogen Storage	170 kg @ 700bar, 18 tank system
Target Range	150 miles +12 hours of Export Power up to 25kW
Emissions	Zero-emissions Fuel Cell Electric Hybrid



This presentation does not contain any proprietary, confidential, or otherwise restricted information.

PROJECT IMPACT

- The provision of on-site export power is dominated by diesel generators and does not address efforts to utilize alternate fuel options.
- H2Rescue prototype demonstrates the ability to provide emergency export power with green energy and minimal noise to the Homeland Security and Emergency Management communities, with a vision into what future technologies can provide.

ACCOMPLISHMENTS

- Field Test, Sacramento, CA
- H2Rescue Demonstration/Showcase in Washington, DC
- Field Test, Fort Carson, CO

UPCOMING MILESTONES

- Final Report (Q4 FY23)

PROJECT PERFORMERS/PARTNERS

- U.S. Army Corps of Engineers, Engineer Research and Development Center, Construction Engineering Research Laboratory, Champaign, IL
- U.S. Department of Energy — Hydrogen and Fuel Cell Technologies Office and Vehicle Technologies Office, Washington, DC
- Cummins Electrified Power Inc., Milpitas, CA
- U.S. Army Ground Vehicle Power and Mobility, Warren, MC
- U.S. Naval Research Laboratory, Washington, DC
- Federal Emergency Management Agency, Washington, DC