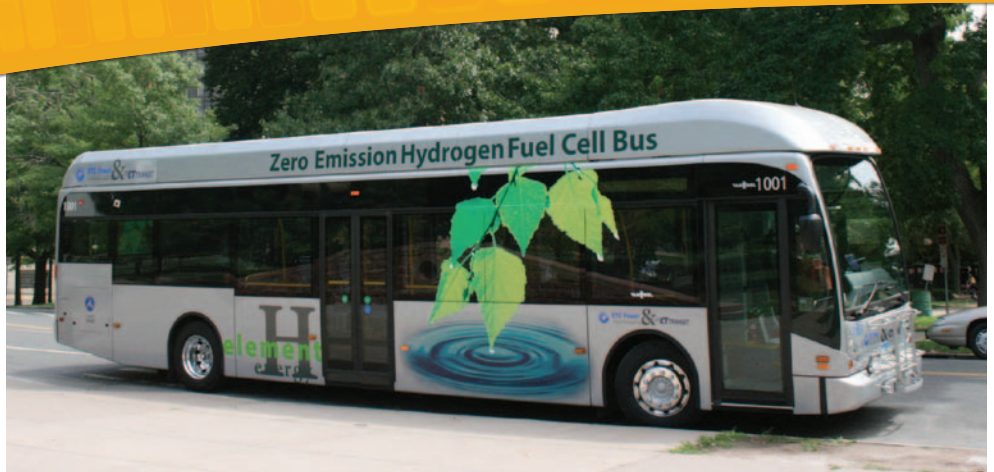
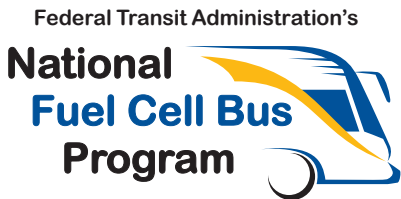


Connecticut Nutmeg Fuel Cell Bus Project



Demonstrating Advanced-Design Hybrid Fuel Cell Buses in Connecticut

The Federal Transit Administration's (FTA) National Fuel Cell Bus Program (NFCBP) focuses on developing commercially viable fuel cell bus technologies. The Northeast Advanced Vehicle Consortium (NAVC) is one of three non-profit consortia chosen to manage projects competitively selected under the NFCBP. UTC Power is leading one project to develop a next-generation fuel cell bus based on an earlier-generation design that was demonstrated in several locations, including Connecticut Transit (CTTRANSIT). Four of these next-generation buses are now in service at CTTRANSIT in Hartford, Connecticut, as part of the Nutmeg Project.

CTTRANSIT is the Connecticut Department of Transportation owned bus service operating a fleet of over 500 heavy duty transit buses in Greater Hartford, New Haven, Stamford, New Britain, Bristol, Meriden, Wallingford and Waterbury, Connecticut. CTTRANSIT currently operates five hydrogen fuel cell transit buses which is the second largest hydrogen fuel cell bus fleet in the United States. This fleet will increase to six buses in 2012. CTTRANSIT's commitment to improving the environment has led the agency to investigate new

technologies and fuels for its fleet that are more efficient and produce fewer emissions.

Early Fuel Cell Bus Experience

CTTRANSIT's experience with its first fuel cell bus made it an excellent location choice for demonstrating the new bus design. The agency began demonstrating its first fuel cell bus in April 2007 in a downtown shuttle service. Through May 2011 the bus accumulated more than 54,000 miles, providing CTTRANSIT and the manufacturer partners with valuable data on the bus operation and performance. The manufacturers used the early results from this demonstration (and the demonstrations of four similarly-designed fuel cell buses in Oakland and Thousand Palms, California) to improve the system and components, thus increasing efficiency, reliability, and durability.

Nutmeg Project Fuel Cell Bus Facts

Bus chassis	Van Hool, A300L
Length/width/height	40 ft/102 in./136 in.
Curb weight	31,400 lb
Passenger capacity	26 seated plus two wheelchair positions, or 30 seats without wheelchairs.
Hybrid system	Siemens series hybrid-electric ELFA drive system integrated by Van Hool
Fuel cell	UTC Power, PureMotion 120 kW
Energy storage	EnerDel, lithium ion batteries Rated energy: 17.4 kWh Rated capacity: 29 Ah
Fuel/storage	Gaseous hydrogen, 40 kg at 5,000 psi, 8 Dynetek type 3 tanks

Nutmeg Project Details

The Nutmeg Project, named for Connecticut's state nickname, is fielding a fleet of four next-generation fuel cell buses under the NFCBP. UTC Power, a unit of United Technologies Corporation that produces fuel cells for on-site building power and transportation applications, is providing the fuel cell system. Since developing its first fuel cell power system for buses in



the late 1990s, UTC Power's fuel cell systems have powered buses in the United States, Italy, Spain, Holland, and Belgium. Building on this experience, the company is leading the Nutmeg project through NAVC. UTC Power owns the four buses and works in partnership with CTTRANSIT to operate the buses in service. While CTTRANSIT currently operates all four buses, UTC Power is exploring opportunities to showcase a bus in other fleets.

The Nutmeg buses new design features significant improvements over the two previous generations of fuel cell buses. Improvements include a redesigned Van Hool chassis that is 6,000 lb lighter in weight and 3 inches shorter in height than the earlier generation buses. The buses have the newest UTC Power fuel cell power system and an advanced lithium ion energy storage system by EnerDel. Van Hool fully integrated the hybrid design using a Siemens hybrid electric system. The system is also capable of a higher top speed than the previous model could achieve, which allows it to be operated on most of the agency's routes.

CTTRANSIT has built a new garage to store up to six hydrogen fueled buses. Construction of a hydrogen fueling station at the CTTRANSIT Hartford facility property is underway. This station will fuel one or two buses a day on site while the remaining fleet will continue to be fueled at the UTC Power headquarters station located about seven miles away.

In-Service Evaluation

To evaluate the technology, FTA has enlisted the help of the National Renewable Energy Laboratory (NREL). NREL will collect and analyze data from all of the NFCBP bus demonstrations to ensure consistency; additionally, NREL will collect and analyze performance and operations data from a selection of diesel buses in similar service. Consistent data collection and analysis will ensure fair and accurate information and comparisons, document the status and progress of fuel cell buses toward commercial-

ization, and provide information to the transit industry to aid in purchasing decisions. The results will also be fed back into the research and development process to appropriately focus future resources.

More Information

CTTRANSIT: www.cttransit.com

UTC Power: www.utcpower.com

Van Hool: www.vanhool.com

NAVC: www.navc.org

NREL fuel cell bus publications: www.nrel.gov/hydrogen/proj_fc_bus_eval.html

Northeast Advanced Vehicle Consortium (NAVC) Advanced transportation for the Northeast

NAVC is a public-private partnership with the goal of promoting advanced vehicle technologies in the northeastern United States. Since it was established in 1993, NAVC's projects have included alternative fuel, battery electric, hybrid electric, and fuel cell technologies in a variety of vehicle platforms.



**U.S. Department of Transportation
Federal Transit Administration**

FTA's National Fuel Cell Bus Program (NFCBP) is a cooperative research, development, and demonstration program, established in 2006, to advance the commercialization of fuel cell electric buses. The program is part of a broader FTA research effort designed to improve transit efficiency and deliver environmentally sustainable transportation solutions. Conducted in close partnership with the industry, the program has secured over \$62 million in local and private commitments, matching the Federal contribution. The teams and projects are competitively selected and managed by three non profit consortia. The project portfolio includes development and demonstration projects, component projects, and analysis and coordination efforts.