

## Summary of Demonstration Projects

Name of Demonstration	Location	Number of Buses	Engine Type	Fuel Cell Manufacturer	Bus Manufacturer	Duration	More Information
<b>International Fuel Cell Bus Demonstration Programs</b>							
Clean Urban Transport for Europe (CUTE)	Amsterdam, Netherlands Barcelona, Spain Hamburg, Germany London, England Luxembourg, Luxembourg Madrid, Spain Stockholm, Sweden Stuttgart, Germany Porta, Portugal	27 (3/city)	Fuel cell/battery hybrid	Ballard	DiamlerChrysler EvoBus	2004-2006	A total of 33 full-size (12 meter) Citaro buses built by EvoBus, a wholly-owned subsidiary of DaimlerChrysler, will be operated for approximately 2 years each in 11 different cities to test and demonstrate FCBs in revenue service. Each bus is powered by a 250 kW gross (200 kW net shaft power) Ballard fuel cell engine and operates using hydrogen stored at 350 bar pressure in roof-top cylinders.
Ecological City Transport System (ECTOS)	Reykjavik, Iceland	3	Fuel cell/battery hybrid	Ballard	DiamlerChrysler EvoBus	2004-2006	The ECTOS was a 4 year project sponsored by the European commission 5th framework programme, attached to the DG research. The project period was 2001 - 2005, starting with a two year preparation phase. A hydrogen production - compression, storage and dispensing station was ingaugurated in 2003. Three fuel cell buses of the type CITARO were test driven within the public transport system of Reykjavik. In 2006 it was decided to prolong the project partially with a new agenda; Icelandic New Energy participates thereby in Hy-FLEET.CUTE
Sustainable Transport Energy for Perth (STEP)	Perth, Australia	3	Fuel cell/battery hybrid	Ballard	DiamlerChrysler EvoBus	2 years (September 2004)	Since September 2004, Perth has been participating in one of the first major trials of hydrogen fuel cell buses in the world. Three Daimler Chrysler hydrogen fuel cell buses will be trialled on normal Perth service routes for two years.
Natural Resources Canada Fuel Cell Program	Winnipeg, Canada	1	Distributed array of 25kW modules w/ ultra-capacitors	Hydrogenics	New Flyer	3 Years (Fall 2006)	Canadian fuel cell company Hydrogenics has committed to partner with New Flyer to develop a 40-foot fuel cell bus for demonstration and testing in Winnipeg, Canada in 2004 and 2005. Natural Resources Canada is spearheading this three-year project, whose partners also include Dynetek Industries, ISE Research and Maxwell Technologies.
	Whistler, BC, Canada	20	N/a	n/a	n/a	Fleet in service by 2009	In addition, the Canadian Government is targeting a larger in-service fleet demonstration in Whistler, British Columbia. With a planned fleet of 20 FCBs in service by 2009, these 40 foot FCBs will require a hydrogen production supply capacity of 1000 kg/day minimum with fast fueling (8 to 10 minutes per bus).
London Olympics	London, England	70	n/a	n/a	n/a	Expected for 2012 Olympics	Mayor of London has called for 70 fuel cell buses to be enroute by 2012 Olympics
BC Olympics	Vancouver, Canada	15-20	n/a	n/a	n/a	Expected for 2010 Olympics	Over five days the bus clocked 405 kilometers (253.6 miles), consuming a total of 10.1 kg of hydrogen. Approximately 800 people rode the bus to travel between the event's 13 buildings.
CityCell Program	Torino, Italy	1	Fuel cell/battery hybrid	UTC Fuel Cells	Irisbus	Demonstrated Beginning in 2002	A zero emission hybrid electric bus with a UTC Power fuel cell system shuffled passengers on a route through the Torino, Italy, city center during the Winter Olympic games in February. The bus will continue to operate in Torino into the early summer. UTC Power is a leading worldwide producer of fuel cells and a company of United Technologies Corp
Japan Fuel Cell Bus Program	Tokyo, Japan	1	Fuel cell/battery hybrid	Toyota	Hino	August 2003 to December 2004	Toyota, in collaboration with the bus manufacturer, Hino, and with support from the Japanese government has been quietly, but actively developing FCBs. Their activities have been given greater prominence in public forums during the past year. Their efforts date to 1999, when a Hino bus with a 90 kW Toyota stack was operated on a test track. Subsequently, the development of a Hino bus with twin 90 kW Toyota stacks was initiated, and in September 2002 four buses (model name FCHV-BUS2) were certified by the Japanese government for public road tests (non-revenue service) to take place through 2004. The FCHV-BUS2 model is 10.5 meter long and supplements the two 90-kW PEMFC stacks with nickel-metal hydride batteries. Hydrogen is stored at 350 bar on the roof.
	Aichi	8	Fuel cell/battery hybrid	Toyota	Hino	March to September 2005	

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United Nations Development Program Global Environment Facility (UNDP-GEF)	Beijing, China	3	Fuel cell/battery hybrid	Ballard	DiamlerChrysler EvoBus	Began June 2006	Three buses will run from 9am to 3pm during weekdays, following an 18.2 km route through the northwest suburbs, from the North Gate of the Summer Palace to Wudaokou.
	Shanghai, China	6	Fuel cell/battery hybrid	Ballard	DiamlerChrysler EvoBus	Projected to Begin by end of 2006	Different from Beijing's Benz bus, the hydrogen fuel cell bus to be presented in Shanghai is under the joint development and manufacturing of the prestigious Shanghai Jiaotong University, local Shanghai fuel cell Company Shenli High Tech Co. and China's indigenous automaker Suzhou King Long.
	Sao Paulo, Brazil	8	Fuel cell/battery hybrid	Ballard	DiamlerChrysler EvoBus	Prototype (June 2007) Test Period ('07-'08) Proposal/decision making (March 2008) Production (Nov. 2008)	During 2003, the national executing agency STA initiated and oversaw scoping activities indicated that a call for expression of interest at this time would most likely result in delivery dates beyond what is currently contemplated in the project market.
	Mexico City, Mexico	10	Fuel cell/battery hybrid	Ballard	DiamlerChrysler EvoBus	Projects Cancelled in 2005: delays in approval of the project, outstanding technological issues, problems with costing, changes in interest of key stakeholders, ect.	
	New Dehli, India	8	Fuel cell/battery hybrid	Ballard	DiamlerChrysler EvoBus		
	Cairo, Egypt	8	Fuel cell/battery hybrid	Ballard	DiamlerChrysler EvoBus		
863 Program	Beijing, China (For 2008 Olympics)	100	Fuel cell/battery hybrid	Shanghai Shen-Li High Tech & Dalian Sunrise Power		Development began in 2005 with an end goal of service during the 2008 Olympics	The "863 Program" (named for the date it was created) of the Ministry of Science and Technology is funding US\$106 million of hybrid-electric drive and fuel cell vehicle development work during 2001-2005. Private companies are expected to invest an additional \$200-300m during the next 5 years. The emphasis of the 863 program is on demonstration, commercialization, and support of the Chinese vehicle industry (as distinct from fundamental R&D, which is supported under the separate "973 Program"). Most of the \$106 million of 863 funds are being spent on buses (rather than cars), as well as on H2 production and storage technology. The immediate goal is to develop two full-size 150 kW FCBs by 2005 and three prototype 50 kW FC cars, leading to 100 FCBs at the 2008 Olympics.
Miscellaneous Demonstrations	Berlin, Germany	2	N/a	Proton Motor Fuel Cell	NovaBus	in progress	BVG - Berlin's public transportation body - to buy 2 prototypes
	Munich, Germany	1	Fuel cell/ hybrid	Ballard	MAN	May 2004 (2 year test period)	As part of the "Five Years of Hydrogen Project at Munich" jubilee, the MAN Nutzfahrzeuge Group is presenting a recently developed low-floor scheduled-service bus with hybrid fuel-cell drive. The electric engine is supplied with 68 kW from a PEM fuel-cell system and over 100 kW from an energy storage system. The electric storage unit makes it possible to reduce fuel consumption by using the brake energy. The bus is initially being used for test operations on the airport apron. There are also plans for it also to be deployed on local public transport routes close to the airport.
	Germany	1	Fuel cell/battery hybrid	Hyundai	Hyundai/ Enova Systems	2006 World Cup	Hyundai Motor Co., an official sponsor of FIFA World Cup, held a trial operation of fuel cell buses that have been developed by the company and were used during the World Cup.
	North-Rhine-Westphalia	1	Fuel cell/battery hybrid	Hydrogenics	Technobus	(May) 2006	Hydrogenics Corporation, a leading developer and manufacturer of hydrogen and fuel products, today announced the successful deployment of its fuel cell hybrid midibus, alongside the regular fleet of diesel powered buses, at the world's largest annual industrial fair in Hannover, Germany. Over five days, from April 24 to 28, the bus clocked 405 kilometers, consuming a total of 10.1 kg of hydrogen. Approximately 800 people rode the bus to travel between the event's 13 buildings. Hydrogenics' Germany-based team designed, built and integrated the bus's HyPM <sup>®</sup> fuel cell hybrid power-train utilizing a Technobus Gulliver all-electric midibus platform. In November 2005, the bus achieved TUV road certification.

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<b>US Fuel Cell Bus Demonstration Programs</b>							
FTA- Automotive Based Fuel Cell Hybrid Bus	Honolulu, HI	1	Fuel cell/battery hybrid	Hydrogenics	El Dorado	2004 (February)	A fuel cell hybrid electric bus was unveiled at Honolulu's Hickam Air Force Base in February 2004, becoming the first fuel cell vehicle in Hawaii and the first in the US Air Force. The 30-foot flight crew shuttle bus underwent 1 year of in-service data collection and evaluation, then continued in routine service at the base.
	Birmingham, AL	1	Fuel cell/battery hybrid	Ballard	DiamlerChrysler	proposed	few details available
	Newark, DE	n/a	Fuel cell/battery hybrid	n/a	na/	In State Budget as of 2005	University of Delaware's Automotive Based Fuel Cell Hybrid Bus Program in Newark. Over \$10 million appropriated to project at University of Delaware
	New Haven, CT	1	Fuel cell/battery hybrid	UTC Fuel Cells	n/a	proposed	few details available
FTA -- Georgetown Fuel Cell Bus Program	Washington, D.C.	1	Fuel Cell	Ballard	NovaBus	2001	In December, 2001, Georgetown University introduced a fuel cell bus, using a 100 kW PEM fuel cell supplied by Ballard in a 40-foot bus provided by NovaBUS. The hydrogen was provided by onboard methanol reformation. Traction batteries provided surge power and store energy recovered by regenerative braking.
	Washington, D.C.	1	Fuel Cell	UTC Fuel Cells	NovaBus	2003 (1 year demonstration)	The fuel cell is the primary energy source, and traction batteries provide surge power and a means to recover braking energy by regeneration. The bus is operated as a student shuttle service on the Georgetown campus, and is now being run by the Washington, D.C. Metropolitan Transit Authority (WMATA) in a one-year demonstration project.
	Davis, CA	1	Fuel Cell	Fuji (PAFC)	BMI	Spring 2003	UC Davis is now home to a unique and valuable research tool, a 30-foot fuel cell transit bus. Built in 1994, this is the first of three proof-of concept fuel cell buses built at Georgetown University. Professor Paul Erickson is examining systems degradation and durability issues and using the bus as a teaching tool. Powered by a high-temperature phosphoric acid fuel cell, the bus uses an onboard reformer to make hydrogen from a methanol-water premix feedstock. The bus resides in the main engineering complex outside Bainer Hall.
	Jacksonville, FL	1	Fuel Cell	Fuji (PAFC)	BMI	Spring 2004	It is hoped that the bus will be used to promote community awareness about clean energy as well as to inspire similar research projects in universities. The bus will also be used in future mechanical and civil engineering classes at UNF.
Ford Motor, Co.	Florida	1	Fuel Cell	Ford (?)	Ford (?)	End of 2006	Ford's hydrogen-powered buses use the same type of hydrogen as fuel-cell vehicles. The company hopes the commercial availability of hydrogen-powered vehicles will spur the construction of hydrogen fueling stations that will also be able to service tomorrow's fuel-cell vehicles.
CaFCP Demonstrations	Santa Clara, CA	3	Fuel cell/battery hybrid	Ballard	Gillig	Early 2005	World class suppliers and local transit agencies have been working together to build buses and hydrogen infrastructure facilities for fuel cell bus demonstration projects in California. Bus builders such as Gillig and Val Hool have formed joint ventures with fuel cell manufacturers such as Ballard and UTC to design and build state of the art fuel cell buses for Southern California and the San Francisco Bay Area.
	Oakland, CA	3	Fuel cell/battery hybrid	UTC Fuel Cells	Van Hool	(March) 2006	
	Palm Springs, CA	1	Fuel cell/battery hybrid	UTC Fuel Cells	Van Hool	(December) 2005	
Greater Columbia Fuel Cell Challenge	Columbia, SC	??	n/a	n/a	n/a	n/a	The purpose of the challenge is to create and execute a plan for how Columbia can set standard for large scale use and implementation of fuel cell applications by partnering with industry from te entire supply chain around this technology