















Fuel Cell Specialty Vehicles

Mfr.	Vehicle	Partners	Year Shown	Fuel Cell Size/Type	Range	Max. Speed	Fuel/Storage Type	Commercialization Plans	Picture
Aerovironment	Helios – unmanned aerial vehicle	NASA Dryden Flight Research Center	2003	10-25kW PEM	250 miles	17-27 m	2 compressed hydrogen tanks	Destroyed in crash in 2003, fuel cell not responsible	
Anuvu, Inc.	Fuel cell boat	Millennium Cell, Duffy Electric Boats, Seaworthy Systems	2003	4 1.5 kW PEM	N/a	N/a	Hydrogen from sodium borohydride	18 passenger boat was tested in San Francisco Bay, could lead to bigger ferry by 2005.	
Asia Pacific Fuel Cell Technologies (APFCT)	ZES IV		September 2003	APFCT 2 kW/PEM	60 km	35 km/h	Metal hydride on-board hydrogen storage	APFCT, DuPont Fuel Cells and DuPont Taiwan have plans for commercialization in 2005.	
	ZES III		July 2002	5 kW PEM	120 km	58 km/h	Metal hydride on-board hydrogen storage	Plans to introduce in the European market, ZES II introduced in 2000.	
Astris Energi	Freedom golf cart		2001	1 kW Alkaline	8-10 hours	19 mph/31 km/h	Compressed hydrogen gas		
Besel S.A.	Wheelchair	MEYRA, ONCE	2003	PEM	N/a	N/a	Metal hydride on-board hydrogen storage		
	Scooter	Derbi	Project went from January 2003 – October 2004	PEM	N/a	N/a	Metal hydride on-board hydrogen storage		
Bombardier Recreational Products	Urban transport vehicle - Embrio		Concept vehicle	N/a	N/a	N/a	N/a	2025	
Cellex Power Products	Forklift	BOC, Wal-Mart	2004	Cellex PEM	N/a	N/a	Compressed hydrogen	Wal-Mart is set to participate in field trials	
Deere & Company	Commercial Work Vehicle (CWV)	Hydrogenics	2005	Hydrogenics HyPM 20 kW Power Module	6 hours	40+ km/h	Direct hydrogen		
	Pro-Gator™	Hydrogenics, Dynatek	2003	Hydrogenics 20 kW	4 hours	50 km/h	Compressed hydrogen	Entered into 5-year agreement with Hydrogenics. No immediate plans to commercialize.	
ECN	FRESCO scooter	Piaggio & C SpA, Selin Sistemi SpA and Commissariat a l'Energie Atomique	2004	12 kW PEM	100 km goal	75 km/h goal	Hydrogen	Project ended November 2004	

EIVD/MW-Line	Hydroxy 3000	Paul Scherrer Institute (PSI)	2003	3 kW/PEM	160 km	10- 15 mph	Compressed hydrogen @200bar	Switzerland's first family leisure fuel cell boat	
	Hydroxy 300	PSI	1999	300 W PSI/IGS	120 km-160 km	10-12 mph	Compressed hydrogen @200bar	2 passenger	
FAAM	Camaleo Hydrogen bicycle	Beijing Fuyuan	2003	400 W PEM	90 km	N/a	Metal hydride on-board hydrogen storage		
FASTec/ATP	Fuel cell-powered electric plane	UQM Technologies, NASA, American Ghiles Aircraft, Giner Electrochemical Systems, Satcon Technology Corp., Diamond Aircraft, Analytic Energy Systems, Lockwood Aviation, Lynntech	July 2001	Phase 2 – 25kW Phase 3 – 75 kW	Phase 2 – 250 mi Phase 3 – 500 mi	230mph at sea level	On-board hydrogen	First fuel cell flight scheduled for 2005	
H2 Logic ApS	H2 Truck	A. Flensburg - Herning A/S	2005	PEM hybrid fuel cell system	N/a	15 km/hr (9.3 mph)	Low pressure hydride storage	Includes an H2 Filling Station where the replaceable H2 Canisters inside the H2 Truck can be refilled with hydrogen. Operating time of 4 hours continuously.	
HaveBlue LLC	X/V-1 Sailboat	Texaco Ovonic Hydrogen Systems, Hydrogenics, Catalina Yachts	Will be shown in 2004	Hydrogenics 10 kW PEM	N/a	N/a	Metal hydride on-board hydrogen storage	Public demonstrations are planned for 2004 with limited retail availability in 2005.	
Honda	Fuel cell scooter		2004	Honda fuel cell stack	N/a	N/a	Hydrogen	Based on a 125cc scooter	
Howaldtswerke-Deutsche Werft AG (HDW)	U 33 Class 212 A submarine	Germany Navy – now other Navies are placing orders	2002	Siemens 300kW fuel cell	N/a	N/a	N/a	January 2006	
Hydrogenics	GEM hybrid mini-car	GEM	TBD	Hydrogenics 5 kW HyPM	N/a	N/a	Hydrogen	Demonstrator vehicle	
	Airport tow tractor	U.S. DoD, FCTec	TBD	65kW	N/a	N/a	N/a	Will be used in fuel cell demonstrations at select Air Force Bases and civil airports in the USA	
	Forklift	Deere & Company, FedEx Canada, General Motors of Canada, HERA Hydrogen Storage Systems, NACCO Materials Handling Group and City of Toronto	2004	10 KW	N/a	N/a	Direct Hydrogen, On-board hydrogen storage	Demonstrations at GM and FedEx operations in Greater Toronto area during fall and winter 2004/2005.	
Intelligent Energy	ENV - fuel cell motorbike	Seymourpowell	2005	1 kW Intelligent Energy CORE PEM	100 miles	50 mph	High pressure composite cylinder		
Kurimoto	Fuel cell wheelchair	APFCT	2003	APFCT 250W/PEM	38mi 60km	3.7mph 6km/h	Pure Hydrogen @150psi	Can keep driving for 10 hours – 100 are expected to be sold in 2005	
Los Alamos National Laboratory (LANL)	Personal mobility vehicle	Ergenics	2003	140W/PEM	50 miles	5 mph	Metal hydride on-board hydrogen storage		

Manhattan Scientifics	Fuel cell Segway	U.S. Army ERDC/CERL, FC Tec, Concurrent Technologies Corporation	November 2003	700 W/PEM	Range should double	12- 17 mph	Compressed hydrogen (2-liter)		
	Mojito FC scooter	Aprilia s.P.a.	2002	NovArs 3 kW PEM	100 km	55 km/h	Hydrogen		
	Enjoy FC Bicycle	Aprilia s.P.a.	2001	600 W/PEM	43 miles	20 mph	Compressed hydrogen (2-liter tanks)		
	Hydrocycle™	Aprilia s.P.a.	December 2000	NovArs 670 W PEM	100 km	30 km/h	Compressed hydrogen (2-liter tanks)		
Masterflex AG	Fuel cell bike	Veloform	2004	Masterflex 250W/PEM	120 km		Metal hydride stored hydrogen (45 grams)	2005 Masterflex also signed agreement with Swizzbee AG for fuel cell bikes.	
MES-DEA	Aprilia Atlantic Zero Emission fuel cell scooter	Aprilia	2004	Two 3kW fuel cells	140 km (87 miles)	85km/h (53 mph)	Hydrogen	Expected to begin production in 2005.	
MTU Friedrichshafen	"No. 1" Yacht	Ballard Power Systems	2003	CoolCell™ 4.8 kW/PEM	225 km	6 km/h	Hydrogen	Demonstrated on Lake Constance	
Palcan Fuel Cells Ltd.	Scooter	MOU with Celco Profil S.R.L.	June 2003	2 kW PEM	N/a	45km/h	Metal hydride on-board hydrogen storage	Commissioned by University of Victoria to prepare and supply two scooters for comparative research purposes – one will be a fuel cell scooter.	
	E-bike	Yamaha	May 2002	500 W PEM	N/a	20mph	Metal hydride on-board hydrogen storage		
PEM Technologies, Inc.	PemPower-04 3-wheel motorcycle		June 2003	1 kW PEM	50 km	30 km/h	N/a		
	PemPower-03 2-wheel motorcycle		January 2003	1 KW PEM	50 km	30 km/h	N/a		
Peugeot	Quark concept vehicle	MES-DEA	2004	1.5 kW MES-DEA PEM	100km (60mi)	110 km/h	Compress. hydrogen		
Powerzinc Electric	Motorcycle		2003	Zinc-Air fuel cell (ZAFC)	250 km	70 km/h	Zinc oxide		

	Scooter		2003	ZAFC	150 km	30 km/h	Zinc oxide		
	Fuel cell/electric bicycle	Shanghai Green Light Electric Bicycle	2002	ZAFC	200 km	20 km/h	Zinc oxide		
Proton Motor Fuel Cell	Fuel cell lift truck	Linde and STILL	2004	PEM	8 hours	N/a	Hydrogen	Undergoing field trials at Munich Airport	
Quantum Fuel Systems Technologies	Quantum AMV "Aggressor"	U.S. Army TARDEC	2004	10 kW PEM		80 mph	Compressed hydrogen/ impact resistant carbon fiber storage tanks	Will be tested at different military bases for a period of six months.	
Research Centre Jülich	JuMOVE fuel cell electric vehicle	Ministry for Science and Research of the Federal State of North Rhine-Westphalia	2004	DMFC 1.3 kW	120 km	N/a	Methanol	Successfully completed road trials. Still being tested.	
Siemens/KWU	Forklift		1999	10 kW/PEM	8 hours	N/a	Hydrogen		
Toyota Industries Corp.	Forklift	Toyota Motor Corp.	Oct. 2005	30 kW/PEM	N/a	18 km/h	Hydrogen	Toyota developed fuel cell stack	
University of Tasmania	Fuel cell scooter	Technical University of Nuremburg, Germany	2004	PEM fuel cell	N/a	N/a	Metal hydride on-board hydrogen storage		
Vectrix		Parker Hannifin, Protonex and NGen	November 2004	500 W DMFC	240 km	100 km/hr	Methanol	The scooter will be offered in Europe and US in 2006 or 2007.	
	Fuel cell/electric hybrid scooter	Parker Hannifin, Giner Electrochemical Systems, GP Batteries, Methanex, Robrady Design	November 2003	800 W DMFC	250 km @ 40 km/h	100 km/h	Methanol	Initial commercial models are expected to be available in 2006.	
Vehicle Projects, LLC	Army locomotive	DoT Volpe Center, DoD, TTCl, Nuvera, NAC, AeroVironment, WSRC, HERA Hydrogen Systems	5-year project began in 2003	1.2 MW	N/a	N/a	TBD	4 phase project	
	Mine locomotive	Nuvera	2002	Two Nuvera 17kW PEM	8.5 hours	N/a	Metal hydride		
	Mine loader	Nuvera, Modine Manufacturing Company, HERA Hydrogen Storage Systems, Caterpillar, U.S. DOE, UQM Technologies, Natural Resources Canada	2004	Nuvera 160kW/ battery	N/a	N/a	Metal hydride	Expected to be placed in demonstration at a mine in Nevada in early 2005	
Yamaha Motor Company	Fuel cell motorcycle	Yuasa Corporation	September 2003	500W DMFC	200 km	40 km/h	Methanol stored in 4-liter tank	Road-testing, aims to have in market by 2005.	