






















Fuel Cell Specialty Vehicles


Company	Vehicle	Partners	Year	Fuel Cell Mfr.	Fuel Cell Size/Type	Range	Max. Speed	Fuel/Storage Type	Comments	Picture
Aerospace										
NASA	SCARAB mobile rover	N/a	2012	NASA	PEM	N/a	N/a	N/a	The FC will extend the range of surface operations. The non-flow-through fuel cell uses capillary action to wick away water	
	Space Shuttle, Apollo spacecraft	N/a	1960s-2011	NASA	Alkaline fuel cells	N/a	N/a	N/a	Delivered electrical power to the spacecraft.	
	Gemini spacecraft	N/a	1960s	GE	PEM	N/a	N/a	N/a	Delivered electrical power to the spacecraft.	
All-Terrain Vehicles (ATVs)										
Quantum Fuel Systems Technologies	Quantum Aggressor hybrid fuel cell alternative mobility vehicle (AMV)	U.S. Army TARDEC	2004	N/a	10 kW PEM	N/a	80 mph	Compressed hydrogen/ impact resistant carbon fiber storage tanks	High performance off-road stealth fuel cell vehicle.	
Peugeot	Fuel cell hybrid Quark	MES-DEA	2004	N/a	1.5 kW MES-DEA PEM	60 mi	68 mph	Compressed hydrogen @ 700 bar	2-seater, 4-wheel drive quad concept car.	
Aviation – Airplanes										
Boeing	Fuel cell-battery hybrid airplane	UQM Technologies, Gore, Diamond Aircraft, SAFT France, Air Liquide, Regional Govt. of Madrid	2008	Intelligent Energy	PEM	N/a	62 mph	N/a	Manned aircraft. Flown in Spain in 2008. Used batteries & fuel cells to gain altitude then cruised using solely fuel cell power.	








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DLR (German Space Agency)	A320 ATRA (Advanced Technology Research Aircraft) with fuel cell-powered nose wheel	DLR, Lufthansa Technik, Airbus	2011	N/a	N/a	N/a	N/a	N/a	In July 2011, DLR, Airbus and Lufthansa Technik taxied the A320 ATRA aircraft, equipped with a fuel cell-powered electric nose wheel, around Hamburg Finkenwerder Airport using solely fuel cell power.	
	Antares DLR-H2 fuel cell airplane	Lange Aviation, Serenergy, Lange Aviation	2009	BASF Fuel Cells	N/a	450 mi	102 mph	N/a	Manned aircraft. Take-off, cruising and landing using only fuel cell power. Flown in Hamburg, Germany. Will be the flying test platform of DLR fuel cell test activities.	
European Community "ENFICA-FC" project	Rapid 200-FC fuel cell-hybrid airplane	Turin Polytechnic University, SkyLeader, APL, Mavel Elettronica, University of Pisa	Project started in 2006	Intelligent Energy	20 kW	N/a	N/a	Compressed hydrogen at 350 bar	2-seat airplane. Two taxiing tests conducted in 2009. Manned test flight is planned. ENFICA-FC" project (Environmentally Friendly Inter City Aircraft powered by Fuel Cells).	
FASTec/ATP	Fuel cell E-plane	UQM Technologies, NASA, American Ghiles Aircraft, Giner Electro-chemical Systems, Satcon Technology Corp., Diamond Aircraft, Analytic Energy Systems, Lockwood Aviation, Lynntech	2001	N/a	Phase 2 – 25kW Phase 3 – 75 kW	Phase 2 – 250 mi Phase 3 – 500 mi	230 mph at sea level	On-board hydrogen	FC-battery hybrid powered plane. First fuel cell flight in 2005.	
Polytechnic University of Turin	Enfica-FC	Intelligent Energy, Skyleader, APL, Mavel Elettronica, Pisa University	2010	Intelligent Energy	20 kW PEM	N/a	N/a	N/a	2-seater, single-engine, ultra-light aircraft powered by a fuel cell, has a 20kW Li-Ion battery for backup and extra power for take-off and climbing if needed; flown for 2 ½ hrs. in May 2010.	
Aviation – Unmanned Aerial Vehicles (UAVs)										
Aerovironment	Helios UAV	NASA Dryden Flight Research Center, Quantum Technologies	2003	N/a	10-25kW PEM	250 mi	17-27 mi	2 compressed hydrogen tanks	Flew for 15 hours during 1 st flight. Destroyed in crash in 2003, fuel cell not responsible	
	Hornet fuel cell MAV (micro aerial vehicle)	N/a	2003	N/a	N/a	N/a	N/a	N/a	Test flight in 2003, powered entirely by a fuel cell. The Hornet was developed under a DARPA sponsored research contract.	

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	Global Observer UAS (unmanned aircraft system)	N/a	2005	N/a	2 hp fuel cell	N/a	N/a	Liquid hydrogen	Mission applications include communications relay and remote sensing payloads for military or commercial customers.	
	Fuel cell-battery hybrid Puma UAV	Protonex, U.S. Air Force Research Laboratory, Naval Research Laboratory, Millennium Cell	2007	Protonex	1 kW	9+ hrs	N/a	Metal hydride on-board hydrogen storage	First shown in 2007, in 2008 beat its own record twice – first flying 7 hours and then 9 hrs.	
	HALE Global Observer	1 st aircraft developed under the Global Observer™ Joint Capability Technology Demonstration (JCTD) program	2010	N/a	N/a	5-7 days at 55,000-65,000 ft	N/a	N/a	Tested at Edwards Air Force Base in CA, climbed to 4,000 ft where it performed a series of maneuvers before landing successfully 1 hr later.	
Baranov Central Institute of Aviation Motors (CIAM)	CIAM-80 mini UAV	CIAM, Horizon Energy Systems	2010	Horizon Energy Systems	PEM	N/a	N/a	Compressed hydrogen	The flight, near Moscow, lasted several minutes.	
BlueBird Aero Systems	Boomerang mini-UAV	N/a	2009	Horizon Fuel Cell Technologies	N/a	31 mi/9+ hrs	30-60 knots	N/a	5-hr endurance flight in 2009.	
Boeing	Stalker XE UAS	Boeing, Lockheed Martin, Adaptive Materials Incorporated (a division of Ultra Electronics Holdings, plc)	2011	Ultra Electronics Holdings	SOFC	>8 hrs	N/a	Propane	Developed under DARPA's Tactical Advanced Power (TAP) program. Combines a SOFC with a lithium polymer battery. Met or exceeded all technical and performance milestones during test flight.	
	Phantom Eye UAV	Boeing, NASA	2011	N/a	N/a	N/a	N/a	N/a	Completed 1 st test flight in June 2012 at Edwards AFB (CA) – flown at 4,000 ft. for 28 min. The UAV is designed to stay aloft at 65,000 feet for up to 4 days.	
Cal State MFDC Lab	Pterosoar UAV	Oklahoma State University	Project started in 2007	Horizon Fuel Cell Technologies	N/a	N/a	N/a	Compressed hydrogen	Range test - flown 74 miles in 3 hours. Flown in endurance test for over 12 hrs.	
	Fuel cell UAV	N/a	2006	Horizon Fuel Cell Technologies	650 W PEM	N/a	N/a	N/a	First flown in 2006. Four test flights were conducted by MFDC Lab.	

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DLR (German Aerospace Agency)	HyFish fuel cell jet wing UAV	Team SmartFish, DruKon, Luxfer, BaltiCo, Horizon Fuel Cell Technologies, Technikzentrum Ainet, LTB-Borowski	2007	Horizon Fuel Cell Technologies	1 kW	N/a	124 mph	Compressed hydrogen	A successful first flight was carried out in 2007 in Switzerland.	
Elbit Systems	Skylark UAV	Elbit Systems	2010	Horizon Energy Systems	PEM	900 Wh per quart of fuel	N/a	Compressed hydrogen	Flown in Israel in turbulent weather, with an operational payload integrated onboard in simulated battlefield conditions.	
EnergyOr	FAUCON H2	N/a	2011	EnergyOr	PEM	N/a	N/a	N/a	Demonstrated >10 hrs. The FAUCON H2 uses EnergyOr's EO-310-XLE fuel cell designed specifically for UAV applications	
	EO-360 fuel cell-battery hybrid UAV	N/a	2009	N/a	PEM	N/a	N/a	N/a	8-hour flight is planned. EnergyOr has also test flown its UAVs in Canada and Israel in 2007.	
Georgia Institute of Technology	UAV	Georgia Institute of Technology, NASA, FC/BT	2006	N/a	500 W PEM	N/a	N/a	Hydrogen	Flew for 22 minutes.	
Insitu	ScanEagle UAV	Insitu (Boeing subsidiary, Naval Research Laboratory, UTC	2012	UTC Power	1.5 kW	N/a	N/a	Hydrogen	Flew for a 2½-hour test flight in April 2012.	
Korea Advanced Institute of Science and Technology	UAV	N/a	2007	N/a	N/a	5 hrs	N/a	Liquid hydrogen	N/a	
University of Michigan	Endurance UAV	N/a	2008	Adaptive Materials, Inc.	N/a	N/a	N/a	N/a	Flown for 10+ hrs in 2008.	
U.S. Naval Research Laboratory	Ion Tiger UAV	University of Hawaii, and HyperComp Engineering	2009	Protonex	550 W	N/a	N/a	Liquid hydrogen	Flown 23+ hours in 2009, 48+ hours in 2012.	
	Mako UAS	Pennsylvania State University's Applied Research Laboratory, Kuchera Engineering, L3 Communications/BAI	2009	Jadoo Power	63 W	N/a	N/a	Compressed hydrogen	N/a	






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	Spider-Lion UAV	Protonex Technology Corporation	2005	Protonex	100 W fuel cell	N/a	N/a	Compressed Hydrogen	Long-term goal is development of an efficient fuel cell propulsion system for long endurance (8-24 h) mini-UAV applications.	
Marine - Boats, Submarines, Yachts										
Anuvu, Inc.	Fuel cell boat	Millennium Cell, Duffy Electric Boats, Seaworthy Systems	2003	Anuvu	4 1.5 kW PEM	N/a	N/a	Hydrogen from sodium borohydride	18-passenger boat was tested in San Francisco Bay.	
Bristol Hydrogen Boats	Hydrogenesis fuel cell ferry	Bristol Hydrogen Boats, Air Products, Bristol City Council	2012	N/a	12 kW fuel cell	N/a	6 to 10 knots	N/a	Will begin operating in Bristol harbor in April 2012. Can carry up to 12 passengers per trip.	
British Columbia govt. and Canadian Foundation for Innovation	Tsekoa II research vessel	B.C. government, Canadian Foundation for Innovation, University of Victoria	2011	N/a	N/a	Na	N/a	N/a	The vessel will be re-fit with an all-electric propulsion system powered by batteries, fuel cells and low-emission diesel generators – the generators will be used when power demands are high, and acoustically-sensitive studies conducted using quiet electric power.	
EIVD/MW-Line	Hydroxy 3000	Paul Scherrer Institute (PSI)	2003	N/a	3 kW PEM	256 mi	10-15 mph	Compressed hydrogen @ 200 bar	Switzerland's first family leisure fuel cell boat, had several earlier versions.	
FellowSHIP project	Fuel cell merchant ship	Eidesvik Offshore ASA, Eidesvik Offshore ASA, Wärtsilä	2009	N/a	330 kW fuel cell	N/a	N/a	N/a	First merchant ship with a fuel cell.	
HaveBlue LLC	X/V-1 Sailboat	Texaco Ovonic Hydrogen Systems, Hydrogenics, Catalina Yachts	2004	Hydrogenics	10 kW PEM	N/a	N/a	Metal hydride on-board hydrogen storage	Public demonstrations in 2004.	
Howaldts-werke-Deutsche Werft AG (HDW)	U36 class submarine	N/a	2013	Siemens	PEM	N/a	N/a	N/a	Developed for the German Navy. Uses a HDW fuel cell system [SIEMENS PEM fuel cell]	
	U212 and U214 class submarines	N/a	2002	Siemens	300 kW fuel cell	N/a	N/a	N/a	German Navy ordered 4 U212 FC subs, Greek navy ordered 4 U214 FC subs, South Korea ordered 3 U214 FC subs, Italian Navy ordered 2 FC subs.	








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MTU Friedrichshafen	"No. 1" Yacht	Ballard Power Systems	2003	Ballard Power Systems	CoolCell™ 4.8 kW PEM	360 mi	3.75 mph	Hydrogen	Demonstrated on Lake Constance.	
Proton Motor Fuel Cell	Alsterwasser	ZemShip (Zero Emission Ship) project partners: Linde, Proton Motor, Germanischer Lloyd AG	2008	Proton Motor Fuel Cell	Two 50 kW PEM fuel cells	N/a	8.75 mph	50 kg gaseous hydrogen	Operates in Hamburg, Germany, holds 100 passengers.	
Fuel Cell Boat BV	"Nemo H2" Canal Trip Boat	N/a	2009	Hybride	60-70 kW PEM	N/a	10 mph	Hydrogen	Holds 87 passengers. Power to electrolyze hydrogen provided by North Sea wind farm.	
Frauscher	Recreational Motorboat	Fronius International, Bitter GmbH	2009	Fronius	4 kW	80 km	N/a	Hydrogen	Hydrogen comes from a photovoltaic-powered electrolyzer. Fuel cartridge can be changed in 5 minutes.	
Istanbul Technical University	"Martı" (Seagull) fuel cell boat	Istanbul Metropolitan Municipality, United Nations Industrial Development Organization (UNIDO)	2011	N/a	N/a	N/a	N/a	N/a	10 hrs. of cruising using 5 kg of hydrogen.	
SFC Energy	N/a	N/a	2012	SFC Energy	105 W DMFC	N/a	N/a	Methanol	SFC's EFOY Comfort 210 DMFC powered equipment onboard the Open 50 sailboat, Vento di Sardegna, in the two-handed TwoStar 2012 race.	
	Taika	N/a	2011	SFC Energy	90 W DMFC	N/a	N/a	Methanol	The boat won the 2011 Azores and Back (AZAB) 2,500-mile race hosted by the Royal Cornwall Yacht Club. The SFC Energy EFOY 2200 fuel cell generated 90 W of electricity to power the boat's navigation and communication equipment.	
	Ridas Yachts, all models	Ridas yachts, SFC Energy	2010	SFC Energy	N/a	N/a	N/a	Methanol	SFC Energy EFOY fuel cells are now standard equipment on all Ridas Yachts' models. The fuel cell provides onboard electrical power.	
	Nightlife yacht	N/a	2009	SFC Energy	65 W DMFC	N/a	N/a	Methanol	Nightlife, which won the RORC IRC Racing Division of ARC 2009, used an EFOY 1600 DMFC to power the navigation, computer and communications equipment.	










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Statue Cruises	Hornblower hybrid fuel cell ferry	Statue Cruises	Statue of Liberty/Ellis Island ferry – 2011	N/a	PEM	N/a	N/a	N/a	The New York Harbor ferry operates using a combination of energy generated by Tier 2 diesel engines, fuel cells, solar panels and wind turbines.	
Tropical Green Technologies	GreenBoat	N/a	N/a	N/a	1 kW	N/a	N/a	Metal hydride	Hydrogen outboard motor that operates with 1 kW fuel cell. Approximately 2Nm ³ metal hydride hydrogen storage tank.	
University of Birmingham	N/a	University of Birmingham	2007-2011	N/a	1 kW	N/a	N/a	Hydrogen	The University modified a barge, adding a battery pack, a fuel cell, hydrogen storage, and an electric motor.	
Unknown	Tsekoa II	British Columbia, University of Victoria	N/a	N/a	Fuel cell/plug-in battery hybrid	N/a	N/a	N/a	The former Coast Guard vessel will be retrofitted with a fuel cell and used by the University for ocean research.	
Materials Handling Equipment - Forklifts, Lift Trucks, Tugs (for a chart of recent forklift deployments, click HERE)										
Cellex Power Products (later purchased by Plug Power)	CX-P150 fuel cell pallet truck	Cellex Power Products, Crown Equipment Corp., Plug Power	2004	Plug Power/Ballard	4.8 kW PEM	N/a	N/a	Compressed hydrogen	Walmart participated in field trials at two distribution centers and placed purchase order for Cellex fuel cell pallet trucks in 2007.	
Crown Equipment Corp.	Fuel Cell Forklifts	N/a	2009	Works closely with a variety of fuel cell manufacturers and customers to qualify trucks as new fuel cell pack models are introduced	N/a	N/a	N/a	Compressed hydrogen	Crown has qualified 20 of its electric forklift models to operate with various fuel cells, offers 29 qualified combinations of fuel cell packs and trucks.	
Siemens	Fuel cell forklift	SWB partnership (Siemens, Linde, BMW, Bayernwerk)	1998	N/a	10 kW PEM	8 hrs	N/a	Compressed hydrogen with metal hydride onboard storage	Demonstrated at site in Neunburg vorm Wald, Germany.	










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Hydrogenics	HyPX Power Packs	N/a	2007	Hydrogenics	PEM	N/a	N/a	Compressed hydrogen	Hydrogenics offers HyPX™ Power Packs that fit popular makes of new and used counterbalanced and lift trucks with no modifications.	
	Fuel Cell Forklift	Deere & Company, FedEx Canada, General Motors of Canada, HERA Hydrogen Storage Systems, NACCO Materials Handling Group and City of Toronto	2004	Hydrogenics	10 KW PEM	N/a	N/a	Compressed hydrogen	Numerous demonstrations at GM, FedEx and other locations.	
Hyster Co.	Fuel Cell Forklifts	Hydrogenics	2005	Hydrogenics	PEM	N/a	N/a	Compressed hydrogen	Hyster Company has partnered with Hydrogenics to offer fuel cell power modules (HyPX™ Fuel Cell Power Packs).	
LiftOne	Fuel Cell Forklifts	N/a	Ongoing since 2007	Several fuel cell manufacturers	PEM	N/a	N/a	Compressed hydrogen	Several week demonstrations of two fuel cell-powered lift trucks at large electric fleet user sites in the Columbia, South Carolina area.	
Nuvera	PowerEdge	N/a	2009	Nuvera	10 kW PEM	N/a	N/a	Compressed hydrogen	PowerEdge products are interchangeable with standard lead acid batteries in Class 1, 2 & 3 forklifts.	
Oorja Protonics	OorjaPac™ Model III	N/a	2008	Oorja Protonics	DMFC	N/a	N/a	Liquid methanol	OorjaPac™ Model III operates as an on-board battery charger for a wide variety of Class 3 vehicles.	
Plug Power	GenDrive	Ballard Power Systems	2007	Plug Power/Ballard Power Systems	PEM	N/a	N/a	Compressed hydrogen	Plug Power fuel cells fit into the existing battery compartment of all major OEM material handling equipment.	
Proton Motor Fuel Cell	Fuel cell lift truck	Linde and STILL	2004	Proton Motor Fuel Cell	PEM	8 hrs	N/a	Hydrogen	Undergoing field trials at Munich Airport in Germany.	
Raymond Corp.	Forklifts	N/a	2010	Plug Power	N/a	N/a	N/a	N/a	GenDrive fuel cell power units have been tested and approved for use in Raymond® Model 8400 pallet trucks, Model 4100 and 4200 stand-up counterbalanced trucks, and various Model 7400 Reach-Fork® trucks.	









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Still GmbH	Still FM-X 20 reach truck	Hoppecke, Linde Gas, federal state of North Rhine-Westphalia, as part of "progres.nrw" funding program	2010	Hoppecke	N/a	N/a	N/a	N/a	Being tested at BASF Coatings AG in Münster, Germany.	
Toyota Industries Corp	Forklift	Toyoda Gosei Co., Ltd., Toyota Motor Co.	2013	Toyota	8kW, 32kW max	N/a	N/a	Hydrogen	2 units in testing now; will be commercially available by 2015	
Toyota Industries Corp.	Forklift	Toyota Motor Corp.	2005	Toyota	30 kW PEM	N/a	11 mph	Hydrogen	Toyota developed the fuel cell stack.	
Tropical Green Technologies	GreenForklift	N/a	N/a	Tropical Green Technologies	10 kW	N/a	N/a	Metal hydride hydrogen storage	N/a	
Yale Materials Handling Corp.	Fuel Cell Forklifts	Plug Power	2008	Plug Power	PEM	N/a	N/a	Compressed hydrogen	Yale sells lift trucks that use cleaner burning alternative fuels, including fuel cells (Plug Power GenDrive).	
Personal Mobility - Wheelchairs, Carts										
Besel S.A.	Fuel cell Wheelchair	MEYRA, ONCE	2003	Axane	0.35 kW PEM	N/a	N/a	Metal hydride on-board hydrogen storage	34 wheelchairs being developed under the European HyChain project.	
From Concept to Car	H-ergo Piemonte Personal Mobility Vehicle	From Concept to Car is a consortium of Italian auto part makers, government agencies & universities	2009	Politecnico di Torino and HySyLab	N/a	2 hours	12.5 mph (20 km/h)	Hydrogen	N/a	
H2 Logic	H2 Service Truck	A. Flensburg - Herning A/S	2005	N/a	PEM hybrid fuel cell system	4 hrs	9.4 mph	Low pressure hydride storage	Includes an H2 Filling Station where replaceable canisters inside the truck can be refilled with hydrogen. For internal transportation in industrial sector, warehouses, hospitals, airports and other applications. 6 sold during 2005.	











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Kurimoto, Ltd	Fuel cell cart II	N/a	2007	N/a	250 W PEM & Li-Ion battery	N/a	3.7 mph	H2 storage 190 g, 4 canisters	Can run continuously for 5 hrs/30 km.	
	Fuel cell wheelchair	APFCT	Four versions released between 2003-2006	N/a	250 W PEM & Li-Ion battery	N/a	3.7 mph	Pure Hydrogen @150 psi H2 storage 180 g, 4 canisters	Can run continuously for 10 hrs/60 km.	
Los Alamos National Laboratory (LANL)	Personal mobility vehicle	Ergenics	2003	N/a	140W PEM	50 mi	5 mph	Metal hydride on-board hydrogen storage	N/a	
Manhattan Scientifics	Fuel cell Segway	U.S. Army ERDC/CERL, FC Tec, Concurrent Technologies Corporation	2003	N/a	700 W PEM	Range should double	12-17 mph	Compressed hydrogen (2-liter)	N/a	
Research Centre Jülich	JuMOVE fuel cell electric vehicle	Ministry for Science and Research of the Federal State of North Rhine-Westphalia	2004	N/a	DMFC 1.3 kW	75 mi	N/a	Methanol	Successfully completed road trials. Still being tested.	
Suzuki	MIO Wheelchair	N/a	2006	N/a	DMFC	25 mi	N/a	Methanol solution	N/a	
Rail – Locomotives, Trams										
FEVE	Tram	N/a	2011	N/a	Two 12 kW FCs	N/a	12.5 mph	Hydrogen	The fuel cell tram carries 20-30 passengers. Will enter service in 2012 in Asturias, Spain	
Vehicle Projects, LLC	Mino locomotive	Anglo American Platinum	2012	Ballard	FC Velocity PEM	N/a	N/a	N/a	FC hybrid locomotive will be used in Applets' Dishaba platinum mine, Limpopo province, one of 5 FC locomotives that will be tested underground	
	Mine locomotive	Nuvera	2002	Nuvera	Two 17 kW PEM	8.5 hrs	N/a	Metal hydride	Also working on Army locomotive.	

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	Prototype Switch Locomotive	BNSF Railway Co., Dept. of the Army	2009	Ballard Power Systems	Two 125 kW	8-24 hrs	N/a	Hydrogen	Can also serve as mobile backup power source for disaster relief efforts.	
Recreational Vehicles										
International Center for Hydrogen Energy Technologies	Recreational vehicle	N/a	2011	N/a	N/a	N/a	N/a	N/a	ICHET (Turkey) has developed the EkoKaravan that requires no refueling. It produces energy using a battery storage system, a 1.2 kW hydrogen fuel cell; a 1.71 kW solar array; and a 1 kW retractable wind turbine.	
SFC Energy	Recreational vehicles	20 recreational vehicle manufacturers, SFC Energy	2011	SFC Energy	EFOY PEM fuel cell	N/a	N/a	N/a	The manufacturers will offer a version of their vehicles already equipped with an EFOY fuel cell, as well as an 'EFOY Ready' variant (motor homes in which owners only have to connect and switch on an EFOY fuel cell). The fuel cell provides electrical power on board the RVs, such as for electronics and cooking.	
Small Transport - Golf Carts, Shuttles, Neighborhood Vehicles										
Astris Energi	Freedom fuel cell golf cart	N/a	2001	Astris Energi	1 kW AFC	8-10 hours	19 mph	Compressed hydrogen	N/a	
Fuyuan Fuel Cell Company	Golf cart concept vehicle	N/a	2002	N/a	2.5 kW PEM	500 km	50 mph	Ammonia	N/a	
Global Electric Motorcars	GEM hybrid neighborhood car	GEM	TBD	Anuvu, Ballard, ECN, Hydrogenics	Anuvu: 3 kW PEM Ballard: 1.2 kW ECN: 5 kW PEM Hydrogenics: 5 kW PEM	N/a	N/a	Hydrogen	Several fuel cell companies have installed fuel cells into the GEM hybrid neighborhood vehicles as demonstrators. Anuvu's FC GEM car is deployed at Mohegan Sun Hotel & Casino. Photo (right) is ECN's HydroGEM.	
Shanghai Automotive Industry Corp.	Shenshi 11-seat fuel cell vehicle	N/a	2010	N/a	N/a	50 mi	25 mph	N/a	N/a	







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Shen Li High Tech	Fuel cell tourist cart	N/a	N/a	N/a	10 kW PEM	N/a	N/a	Low pressure hydrogen	Seats 11 passengers.	
	Fuel cell tourist cart	N/a	2004	N/a	PEM	N/a	N/a	N/a	N/a	
Tropical Green Technologies	GreenCityCar (2 seats)	N/a	N/a	N/a	1 kW PEM (5 kW optional)	N/a	N/a	2 nm ³ metal hydride hydrogen storage (5 nm ³ optional)	N/a	
	GreenCityCar (4 seats)	N/a	N/a	N/a	5 kW PEM (1 kW optional)	N/a	N/a	5 nm ³ metal hydride hydrogen storage (2 nm ³ optional)	N/a	
	GreenTourBus	N/a	N/a	N/a	N/a	N/a	N/a	Metal hydride hydrogen storage	Seats 15. Hydrogen storage is mounted on the roof.	
Quantum Technologies	Fuel cell hybrid utility vehicle	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	
Two-Wheeled Transport - Motorcycles, Scooters, Mopeds and Bicycles										
Asia Pacific Fuel Cell Technologies (APFCT)	ZES V.b motorcycle	N/a	2008	APFCT	PEM - Li-Ion hybrid	50 mi	37.5 mph	Metal hydride on-board hydrogen storage	Takes less than 1 minute to refuel.	
	ZES IV motorcycle	N/a	2003	APFCT	2 kW PEM	37.5 mi	22 mph	Metal hydride on-board hydrogen storage	APFCT, DuPont Fuel Cells and DuPont Taiwan.	
	ZES III motorcycle	N/a	2002	N/a	5 kW PEM	75 mi	36 mph	Metal hydride on-board hydrogen storage	Plans to introduce in the European market, ZES II introduced in 2000.	


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Besel S.A.	Scooter	Derbi	Project January 2003 – October 2004	N/a	PEM	N/a	N/a	Metal hydride on-board hydrogen storage	N/a	
ECN	FRESCO scooter	Piaggio & C SpA, Selin Sistemi SpA and Commissariat a l'Energie Atomique	2004	N/a	12 kW PEM	62 mi goal	47 mph goal	Hydrogen	Project ended November 2004.	
FAAM	Camaleo Hydrogen bicycle	Beijing Fuyuan	2003	N/a	400 W PEM	56 mi	N/a	Metal hydride on-board hydrogen storage	N/a	
Honda	Fuel cell scooter	N/a	2004	Honda	PEM	N/a	N/a	Hydrogen	Based on a 125cc scooter.	
Horizon Fuel Cell Technologies	HMX – Hydrogen Mobility X-tender bike	N/a	2008	Horizon Fuel Cell Technologies	PEM	190 mi	16 mph	Metal hydride on-board hydrogen storage	300 km pedal assisted range.	
Intelligent Energy	ENV - fuel cell motorbike	Seymourpowell	2005	Intelligent Energy	1 kW PEM	100 mi	50 mph	High pressure composite cylinder	N/a	
Iwatani Corp.	Fuel Cell Electric-Assisted Bicycle	N/a	2008	N/a	300 W	N/a	N/a	N/a	N/a	
Manhattan Scientifics	Mojito FC scooter	Aprilia s.P.a.	2002	NovArs	3 kW PEM	62 mi	34 mph	Hydrogen	N/a	
	Enjoy FC Bicycle	Aprilia s.P.a.	2001	N/a	600 W PEM	43 mi	20 mph	Compressed hydrogen (2-liter tanks)	N/a	

Company	Vehicle	Partners	Year	Fuel Cell Mfr.	Fuel Cell Size/Type	Range	Max. Speed	Fuel/Storage Type	Comments	Picture
	Hydrocycle™	Aprilia s.P.a.	2000	NovArs	670 W PEM	62 mi	19 mph	Compressed hydrogen (2-liter tanks)	N/a	
Masterflex AG	Cargobike	N/a	2007	Masterflex	250 W PEM	156 mi	3.75 mph	90 grams of hydrogen storage	Already being sold to industrial customers and at least 40 Cargobikes will be deployed in four regions in Europe as part of the HyChain-MINITRANS project over the next two years.	
	Fuel cell bike	Veloform	2004	Masterflex	250 W PEM	75 mi	N/a	Metal hydride hydrogen storage (45 grams)	N/a	
MES-DEA	Aprilia Atlantic Zero Emission fuel cell scooter	Aprilia	2004	N/a	Two 3 kW fuel cells	87 mi	53 mph	Hydrogen	N/a	
Palcan Fuel Cells Ltd.	Scooter	MOU with Celco Profil S.R.L.	2003	Palcan Fuel Cells	2 kW PEM	N/a	28 mph	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	2002	Palcan Fuel Cells	500 W PEM	N/a	20 mph	Metal hydride on-board hydrogen storage	N/a	
PEM Technologies, Inc.	PemPower-04 3-wheel motorcycle	N/a	2003	PEM Technologies, Inc.	1 kW PEM	31 mi	19 mph	N/a	N/a	
	PemPower-03 2-wheel motorcycle	N/a	2003	PEM Technologies, Inc.	1 KW PEM	31 mi	19 mph	N/a	N/a	
Powerzinc Electric	Motorcycle	N/a	2003	Powerzinc Electric	Zinc-Air fuel cell (ZAFC)	156 mi	44 mph	Zinc oxide	N/a	

Company	Vehicle	Partners	Year	Fuel Cell Mfr.	Fuel Cell Size/Type	Range	Max. Speed	Fuel/Storage Type	Comments	Picture
	Scooter	N/a	2003	Powerzinc Electric	Z AFC	94 mi	30 km/h	Zinc oxide	N/a	
	Fuel cell/electric bicycle	Shanghai Green Light Electric Bicycle	2002	Powerzinc Electric	Z AFC	125 mi	12.5 mph	Zinc oxide	N/a	
Shanghai Pearl Hydrogen Power Source Technology Ltd.	Fuel cell moped	N/a	2008	N/a	PEM	44-50 mi	15 mph	Metal hydride on-board hydrogen storage	N/a	
Suzuki	Crosscage Motorbike concept	Intelligent Energy	2007	N/a	PEM	N/a	N/a	Hydrogen	Introduced at the Tokyo Motor Show.	
	Burgman Fuel Cell	N/a	2009	N/a	PEM - Li-Ion battery hybrid	219 mi	N/a	Hydrogen	Granted Whole Vehicle Type Approval in the E.U.	
Taigene	Scooter	APFCT, Japan Steel Works	2007	N/a	PEM	62.5 mi	37.5 mph	Hydrogen	A full demonstration project of 20 scooters will begin in April 2007 in a science park.	
Tropical S.A.	GreenScooter (2 wheels)	N/a	2008	N/a	500 W PEM	94 mi	19 mph	Metal hydride on-board hydrogen storage	Delivered to Center for Renewable Energy Sources in Athens, Greece.	
	GreenScooter (3 wheels)	N/a	N/a	N/a	500 W PEM	81 mi	22 mph	Metal hydride on-board hydrogen storage	N/a	
University of Tasmania	Fuel cell scooter	Technical University of Nuremburg, Germany	2004	N/a	PEM fuel cell	N/a	N/a	Metal hydride on-board hydrogen storage	N/a	
Vectrix	N/a	Parker Hannifin, Protonex and NGen	2004	Protonex	500 W DMFC	150 mi	62.5 mph	Methanol	N/a	

Company	Vehicle	Partners	Year	Fuel Cell Mfr.	Fuel Cell Size/Type	Range	Max. Speed	Fuel/Storage Type	Comments	Picture
	Fuel cell/electric hybrid scooter	Parker Hannifin, Methanex, Giner Electrochemical Systems, GP Batteries, Robrady Design	2003	N/a	800 W DMFC	156 mi @ 25 mph	62.5 mph	Methanol	N/a	
Veloform	3-wheel electric bicycle	SFC Smart Fuel Cell AG	2006	SFC Smart Fuel Cell	EFOY DMFC	N/a	N/a	Methanol	N/a	
Yamaha Motor Company	FC-Dii	N/a	2007	N/a	1 kW DMFC	N/a	N/a	Methanol	N/a	
	FC-AQEL	N/a	2006	N/a	PEM	N/a	N/a	Compressed hydrogen	N/a	
Yamaha Motor Company	Fuel cell motorcycle	Yuasa Corporation	2003	N/a	500 W DMFC	125 mi	25 mph	Methanol stored in 4-liter tank	Road-testing	
Unmanned Ground Vehicles (UGVs)										
Adaptive Materials	Fuel cell-battery hybrid UGV	N/a	2009	Adaptive Materials	150 W SOFC	N/a	N/a	Propane	Completed 40-mile, 12-hour test drive.	
Foster-Miller, Inc.	TALON robotic fuel cell-battery hybrid UGV	N/a	2009	Protonex	N/a	N/a	N/a	N/a	FC platform allowed TALON robot to increase mission range from 15 to 45 km. Demonstration conducted under Next Generation Manufacturing Technologies Initiative led by SC Research Authority	
Utility Vehicles – Trucks, Work Vehicles, Tractors										
Coval H2 Partners	Utility truck	Shell hydrogen, UK government, City of Westminster	1999	Zevco	AFC	125 mi	62.5 mph	Compressed hydrogen	City of Westminster park maintenance van. 28 Nm ³ of compressed hydrogen is stored in a tank on top of the van's cab.	
Deere & Company	Commercial Work Vehicle	Hydrogenic, Dynatek	2005	Hydrogenics	20 kW PEM	4 hrs	31 mph	Compressed hydrogen	Uses a modified Deere ProGator work utility hauler.	

Company	Vehicle	Partners	Year	Fuel Cell Mfr.	Fuel Cell Size/Type	Range	Max. Speed	Fuel/Storage Type	Comments	Picture
EcoMotion	Work Vehicle	GMR Maskiner A/S, Serenergy A/S, Energiselskabet OK a.m.b.a	2010	Serenergy	RMFC (reformed methanol fuel cell)	3 hrs. to 3 days (depending on configur- ation)	N/a	Methanol	EcoMotion's work trucks are being tested in real operating conditions at the following sites in Denmark: Billund Airport, Aalborg Zoo, Holstebro Cemeteries, Esbjerg Municipality, and Skanderborg Festival 2010. The truck has a power point on each side with 230 volt alternating current for tools such as a hedge trimmer and leaf blower.	
EMPA	FC street sweeper	N/a	2009	N/a	N/a	N/a	N/a	Hydrogen	- Has been operating on the streets of Basel, Switzerland since 2009 - Uses 0.3 to 0.6 kg of fuel per hour - Will move to St Gallen for further practice trials	
Entwhistle	MB-4 Aircraft Tow Vehicle	N/a	2006	Hydrogenics	65 kW	N/a	N/a	Hydrogen	Tows F-15 fighters for Hawaii Air National Guard Unit at Hickam AFB.	
	Step Van	N/a	2006	Hydrogenics	65 kW	150 mi	N/a	Hydrogen	Used by maintenance squadron at Hickam AFB, Hawaii.	
	Still R 60-25 fuel cell truck	HHLA Logistics	2008	N/a	N/a	N/a	N/a	N/a	Test operation at the port of Hamburg, Germany since 2008.	
Heliocentris	FC garbage truck	German Federal Ministry of Transport, Heliocentris Energiesysteme GmbH and FAUN	2011	Hydrogenics	32 kW PEM	N/a	N/a	N/a	Currently undergoing tests with BSR and will be in everyday operation for two years in Adlershof, Friedrichshain and Lichtenberg, Germany.	
Hydrogenics	Newton Truck	Smith Electric Vehicles	2012	Hydrogenics	N/a	N/a	N/a	N/a	Hydrogenics integrated its FC power and range extender system ("REX") into a Smith Electric Vehicle's commercial Newton Truck. After road testing, Smith will commercially launch the REX system in the 'Newton', and will sell the first 20 vehicles to customers in the German market in 2012/2013.	
	Airport tow tractor	U.S. DoD, FCTec	TBD	Hydrogenics	65 kW	N/a	N/a	N/a	Will be used in fuel cell demonstrations at select Air Force Bases and civil airports in the U.S.	
New Holland	NH2 fuel cell tractor	Iveco	2009	N/a	N/a	N/a	N/a	Hydrogen @ 350 bar	Carries enough fuel to operate 1.5-2 hrs. Shown at Turin, Italy in Jan. 2009. Production planned in 2013.	

Company	Vehicle	Partners	Year	Fuel Cell Mfr.	Fuel Cell Size/Type	Range	Max. Speed	Fuel/Storage Type	Comments	Picture
	Mine loader	Nuvera, Modine Manufacturing Company, HERA Hydrogen Storage Systems, Caterpillar, U.S. DOE, UQM Technologies, Natural Resources Canada	2004	Nuvera	160 kW	N/a	N/a	Metal hydride	N/a	
Nilfisk-Advance Group	Advance CS7000™ Combination Sweeper-Scrubber Fuel Cell	N/a	2013	Plug Power	PEM	N/a	N/a	Hydrogen	Shown at the ProMat 2013 Expo in Chicago in Jan. 2013. Uses Plug Power's GenDrive® fuel cell.	
Still GmbH	Still R 07-25 fuel cell tractors	Hydrogenics	2006	Hydrogenics	N/a	N/a	N/a	N/a	Two tractors have been transporting baggage at Hamburg airport.	
Vision Motor Corporation	Tyrano Class 8 truck	Ports of Long Beach and Los Angeles	2010	Hydrogenics	33 kW PEM fuel cell/battery hybrid	8-hr shift: standard drayage range 200 mi, extended range 400 mi	N/a	Hydrogen	Demonstrations at the ports of Los Angeles and Long Beach, CA, with 15 trucks retrofitted. Aug. 2011-TTSI purchased 100 fuel cell-powered Class 8 trucks from Vision Motors.	