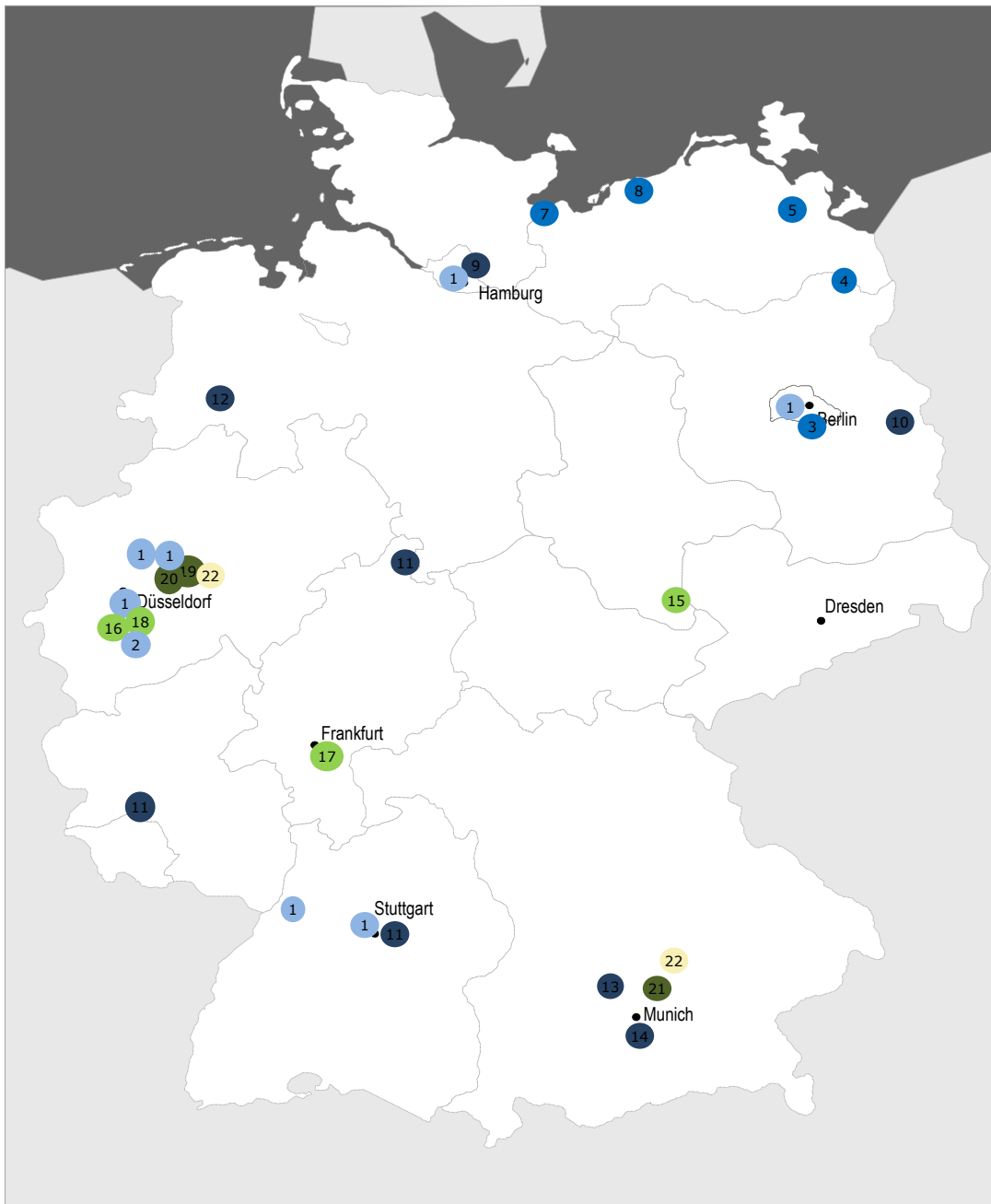


# Green Hydrogen & Power to Gas

Demonstrational Projects in Germany

February 2012



- Hydrogen/Mobile application
- Energy Storage/Wind-Hydrogen
- Power to Gas
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- Sewage Gas or Biomass to Hydrogen
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GERMANY  
TRADE & INVEST

# Green Hydrogen & PowertoGas

## Demonstrational Projects in Germany

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No.	Name	Type	Thumbnail sketch	Location	Further Information
1	<b>Clean Energy Partnership (CEP):</b> Hydrogen for road transport	Hydrogen/ Mobile application	Project aims at preparing the market for commercial hydrogen-powered vehicles by 2016 and at developing a H2-infrastructure in Germany. Already over 20 filling stations built and new ones under construction using renewable energies to produce hydrogen. This project is supported by the NOW.	Berlin, Hamburg, Düsseldorf, Herten, Bottrop, Karlsruhe, Stuttgart	<a href="http://www.cleanenergypartnership.de">www.cleanenergypartnership.de</a>
2	<b>CHIC:</b> Hydrogen for Busfleet	Hydrogen/ Mobile application	The project is based on a staged introduction and build-up of FCH bus fleets, hydrogen refuelling stations and infrastructure in order to facilitate the integration of the FCH buses in Europe's public transport system. The CHIC project is supported by the EU Joint Undertaking for Fuel Cells and Hydrogen (FCH JU).	Köln	a.)
3	<b>BBI:</b> Electricity and green Hydrogen for mobility	EnergyStorage/ Wind-Hydrogen	Total builds a CO <sub>2</sub> -free Station next to the new Berlin-Brandenburg-Airport. The stations' power demand is covered by wind power, which generates electricity for the charging stations and the production of hydrogen. A biomass plant produces biogas for the CNG fuel station. The project is supported by the <b>Federal Ministry of Transport, Building and Urban Development</b> .	Berlin	<a href="http://www.berliner-flughaefen.de/EN">www.berliner-flughaefen.de/EN</a>
4	<b>ENERTRAG:</b> Hybrid power plant	EnergyStorage/ Wind-Hydrogen	In October 2011 ENERTRAG opened the world wide first hybrid power plant which utilizes a mix of wind power and biomass energy to supply an independent, integrated and self-stabilized sustainable power network.	Gut Dauerthal	<a href="http://www.enertrag.com">www.enertrag.com</a>
5	<b>Hydrogen for wind power storage:</b> RH2-WKA	EnergyStorage/ Wind-Hydrogen	In this project an innovative Wind-Hydrogen-System is to be developed to help balance fluctuating wind energy. The storage system will supply energy for both, the energy requirements of the wind energy power plant and also local energy requirements for the three municipalities. The hydrogen will be produced by means of electrolysis. The project will run from 2009 to 2013 and is supported by the NOW.	Werder/Kessin/Altentreptow	b.)
6	<b>Evonik:</b> Wind-electrolysis-system for decentralized energy supply	EnergyStorage/ Wind-Hydrogen	The wind-electrolysis-system enables increased shares of renewables and decentralized energy supply. In this project, combining technologies provides new options for designing, operating and optimizing storage systems. Decentralizing hydrogen based storage systems make it easier to benefit from certain potentials (e.g. CHP, use of H <sub>2</sub> as fuel or raw material, use of Oxygen). Hence, the project's main task is to evaluate storage combinations.	Herten/NRW	c.)
7	<b>Dewitec:</b> UPS powered by Wind-Hydrogen	EnergyStorage/ Wind-Hydrogen	The project aims at developing grid independent and uninterruptible power generation based on renewable energies like wind or solar. For short-term storage a Li-battery will be installed, for long term storage hydrogen systems will be used. The system will be mounted in a 20' container. This project is supported by the <b>Federal Ministry of Economics and Technology</b> .	Lübeck	<a href="http://www.zim-bmwi.de">www.zim-bmwi.de</a>
8	<b>NEMO:</b> Energy supply systems based on wind energy	EnergyStorage/ Wind-Hydrogen	The NEMO-Netzwerk aims at promoting the development of energy supply on the base of wind energy and hydrogen technology. In five demo-projects the initiative strives to develop of marketable system solutions. The network is supported by the <b>Federal Ministry of Economics and Technology</b> .	Rostock	<a href="http://www.windwasserstoff.de">www.windwasserstoff.de</a>
9	<b>PowertoGas 1:</b> Greenpeace Energy	EnergyStorage/ Wind-Hydrogen- Biomethane	Greenpeace Energy converts excessive energy into hydrogen and feeds it into the gas grid. For the process only power from wind shall be used. In October 2011 the project started and during 2012 an increasing wind gas share gradually will be added to the conventional gas supply. Greenpeace Energy already has more than 6000 "wind gas" customers.	Hamburg	<a href="http://www.greenpeace-energy.de/windgas.html">www.greenpeace-energy.de/windgas.html</a>
10	<b>PowertoGas 2:</b> Eon	EnergyStorage/ Wind-Hydrogen- Biomethane	E.ON is developing a pilot plant in Falkenhagen to convert power from wind energy into hydrogen which can then be stored in the country's gas grid. The plant will produce about 360 m <sup>3</sup> of hydrogen per hour (2MW) from 2013 onwards through electrolysis.	Falkenhagen/Brandenburg	<a href="http://www.eon.com/de/media/news-detail.jsp?id=10737">http://www.eon.com/de/media/news-detail.jsp?id=10737</a>
11	<b>PowertoGas 3:</b> ZSW/Fraunhofer IWES/Solarfuel**/Juwi***	EnergyStorage/ Wind-Hydrogen- Biomethane	Fluctuating electricity from renewable energy sources is used for electrolytic generation of hydrogen, which is converted to methane with CO/CO <sub>2</sub> in a synthesis reactor. Since 2009 a demonstration plant with 25 kW is operating and another testing plant is under construction with an output of 250 kW. The project** is supported by the <b>Federal Ministry for the Environment*</b> .	Stuttgart**, Morbach***	<a href="http://www.solar-fuel.net">www.solar-fuel.net</a>
12	<b>PowertoGas 4:</b> Audi/ZSW/Fraunhofer IWES/Solarfuel/ EWE Energie AG : CO <sub>2</sub> -neutral mobility	EnergyStorage/ Wind-Hydrogen- Biomethane	Based on the concept of the "PowertoGas3" hydrogen will be produced for fuel-cell vehicles or, in an additional step, converted in "Bio-methane for gas-engine-powered cars. The construction of the production unit with a capacity of 6.3 MW started in July 2011 and in 2013, Audi will begin series production of models whose engines will be powered by e-gas.	Werlte	d.)

13	<b>PowertoGas 5:</b> Erdgas Schwaben	EnergyStorage/ Wind-Hydrogen- Biomethane	Erdgas Schwaben is conducting a feasibility study for a 1 MW PowertoGas production plant in cooperation with Solar Fuel, GASAG and Thüga. The production site is located next to the Bio-Gas plants of Erdgas Schwaben which provides the required CO2 for the PowertoGas conversion process. Concrete planning will start early 2012.	Augsburg	e.)
14	<b>PowertoGas 6:</b> Thüga AG	EnergyStorage/ Wind-Hydrogen- Biomethane	Thüga has launched a "PowertoGas" project which involves three phases: - Preparation of a feasibility study for a PowertoGas conversion process and its feed-in into the gas grid. - Basic and detail engineering for the construction of a pilot plant for hydrogen feed-in into the gas distribution grid. - Construction and operation of the demo plant (2013)	Munich	<a href="http://www.thuega.de">www.thuega.de</a>
15	<b>Glycerin Reforming Project:</b> The Linde Group	Green Hydrogen from Chemical Site	In 2010 Linde started operations at a pilot plant in Leuna where hydrogen is generated from crude glycerin as by-product of biodiesel production by pyroreforming. The resulting hydrogen-rich gas is fed into the local Linde hydrogen plants for purification and liquefaction. The project will run from 2009 to 2013. This project is supported by the NOW.	Leuna	f.)
16	<b>Chemenergy:</b> Byproduct Hydrogen for mobility application	Green Hydrogen from Chemical Site	The project has the purpose to open up the infrastructure of the chemical industry so that by-product hydrogen can be used as energy carrier. The general programme aims at developing vehicle fleets and hydrogen infrastructure starting in key regions. The project will run from 2009 to 2011 and is supported by the NOW and the <b>Federal Ministry of Transport, Building and Urban Development.</b>	Köln	g.)
17	<b>Zero Regio:</b> Hydrogen-powered mobility	Green Hydrogen from Chemical Site	Projekt aiming at developing and testing hydrogen refueling systems and fuel-cell cars in European cities under real conditions. In Frankfurt/Höchst the Hydrogen derives from a chemical plant. This project is supported by the EU Joint Undertaking for Fuel Cells and Hydrogen (FCH JU).	Frankfurt/Main	<a href="http://www.zeroregio.com">www.zeroregio.com</a>
18	<b>CO2RRECT:</b> Bayer (Lead)/ Siemens/RWE	Green Hydrogen from Chemical Site	Bayer Technology Services (BTS) and MaterialScience, RWE and Siemens together with ten RnD institutes and universities, will conjointly investigate new ways of material usage of CO2 in combination with hydrogen produced via electrolysis using the excess supply from renewable energies. The project is supported by the <b>Federal Ministry of Education and Research.</b>	Leverkusen	h.)
19	<b>EuWak:</b> Hydrogen from sewage gas	Sewage Gas/ Hydrogen	EuWak is a demonstration project which combines the production of bio-methane and hydrogen from wastewater treatment plants. The perspective on the long-term is to serve filling stations for bio methane and hydrogen costumers in the surrounding area. The production of renewable hydrogen from wind energy is also planned.	Bottrop	<a href="http://www.eglv.de">www.eglv.de</a>
20	<b>Blue Tower:</b> Hydrogen from biomass	Biomass/ Hydrogen	High temperature gasification of up to 48 kt/a biomass/organic residues from forestry and agriculture to produce clean, hydrogen-rich gas used to generate 37,500 MWh/a electrical power.	Herten/NRW	<a href="http://www.blue-tower.de">www.blue-tower.de</a>
21	<b>Sewage sludge Hydrogen:</b> hs energieanlagen GmbH	Sewage Gas/ Hydrogen	Construction and testing of a demonstration plant to produce hydrogen-rich gas generated from biological residue and waste materials. It will be used in stationary and mobile applications. The plant will be constructed from February 2012 to June 2012, followed by the operation test. The project is supported by the NOW.	Moosburg / Isar	<a href="http://www.hsenergie.eu">www.hsenergie.eu</a>
22	<b>Future PowertoGas Projects</b>		e.g. GSB Sonderabfall-Entsorgung Bayern, DEW Dortmund	<b>Projects in the pipeline. This list will be up-dated regularly.</b>	

Links:

- a.) <http://www.hycologne.de/chic-clean-hydrogen-in-european-cities.phtml>  
b.) <http://www.wind-projekt.de/eng/hydrogen/index?WINDPROJEKT=afa964f92ce847eb8560d1deedca463f>  
c.) <http://www.h2-netzwerk-ruhr.de/Home.15.0.html?&L=1>  
d.) [http://www.audi.de/de/brand/de/unternehmen/aktuelles.detail.2011~05~audi\\_balanced\\_mobility.html](http://www.audi.de/de/brand/de/unternehmen/aktuelles.detail.2011~05~audi_balanced_mobility.html)  
e.) <http://www.erdgas-schwaben.de/zukunft-beginnt-in-augsburg>  
f.) [http://www.the-linde-group.com/en/corporate\\_responsibility/engineering\\_division/biomass/green\\_hydrogen/index.html](http://www.the-linde-group.com/en/corporate_responsibility/engineering_division/biomass/green_hydrogen/index.html)  
g.) <http://www.hycologne.de/chemergy-chemie-und-energie-1.phtml>  
h.) <http://www.exzellenz.nrw.de/maschinenbauproduktionstechnik-neu/ressourceneffizienz/clusterinfo/news/view/data/20080/backpid/11/>

\*Complete Name: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

\*\*Project in Partnership between Juwi and Solarfuel started in 2011

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This list is not intended to be exhaustive.

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