Power-to-Gas Projekte

IPHE

„Hyrid Power Plant“

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Dipl. Kfm. Werner Diwald | Vorstand ENERTRAG AG
ENERTRAG is a European IPP specialized in sustainable energy and acting in all renewable areas for power generation.

**Key figures:**

- 1.000 million € investment
- over 850 MW installed capacity
- over 500 erected turbines
- over 1300 turbines under service and maintenance
- over 250 million € annual turnover
- over 1.2 billion kilowatt hours per year
- 450 employees (170 of them in O&M)
Fluctuation of wind offer

Electricity demand

Storage

Hydrogen for Mobility

Biomasse

H2-Electricity

Electricity work

Last

0 6.00 12.00 18.00 0.00

Hour

Wind

ENERTRAG Generation Management

Kraftwerk N

Electricity

work

work
World’s first industrial-scale Hybrid-Energy-Plant

500 kilowatts outlined “green” capacity

Partnership with University of Applied Sciences in Stralsund, Technical University in Braunschweig, Brandenburg-Technische-Universität

Over 4 million EUR direct investment for the hydrogen part and over 3 million EUR research investment / incl. windturbine 21 million EUR

Supply of Electricity, Heat and Fuel at all times, even if the wind isn’t blowing

Industrial Partners: TOTAL, Vattenfall, Deutsche Bahn
Functional principle HYBRID-POWER-PLAN

- **Electricity**
  - 3 Turbines
  - Electrolysis

- **Heat - Cooking - Power**
  - Mixing valve
  - Biogas
  - Gasgrid
    - Exp. QII 2013
  - Fuel
    - Storage
    - Hydrogen
    - Storage

- **CHP**
  - Variable mixing

- **Storage**
Demonstrating Wind-Hydrogen for Mobility

hydrogen as part of an integrated energy system → renewable hydrogen as fuel system

Enertrag: Hybrid Power Plant

Total: Refueling Station at Heidestr., Berlin
First delivery of wind-hydrogen on April 18th, 2012
HYBRID-ENERGY-PLANT: Project details

**Hydrogen Generation:**
- Alkaline Electrolyser (500kW): 120Nm³/h @nominal load
- Compression to 30 bar
- Compression to 200 bar
- Pipeline over 4 km

**Biomass plant:**
- 10,000 to/a

**Storage:**
- Hydrogen: 1,350kg @30bar
- Biogas: 300 m³ @nominal load

**CHP:**
- 2 x 350kW (el.)
- 2 x 155kW (thermal)
- Fuel: max. 70% Hydrogen, 30% Biogas
Challenges of Implementation

Energy law
- Energy tax costs (EEG-Cost allocation; electricity tax; etc.)
- Feed in payment for Biomass will be lost in combination with hydrogen / change of energy law (EEG) required
- Not currently economically / no compensation of losses and additional investments (missing of storage reimbursement regulations) / only in the mobility (f-cell) sector competitive

Building law
- No experience by the licensing authorities
- No regulations for construction of hybrid power plants outside zoning plans

Technical challenges
- Balance of component-sizing
- Adjustable electrolyzers over a range of 100%
- Determining the required control speed
- Full automatic energy control system / own development of control system
- Reducing investment costs
Next project - BER Airport
performing energy

Brandenburgische Technische Universität (BTU),
DBI Gas- und Umwelttechnik GmbH (DBI GUT),
Deutsche Umwelthilfe e.V. (DUH),
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR),
ENERTRAG AG,
Fraunhofer-Institut für Solare Energiesysteme (ISE),
GASAG Berliner Gaswerke AG,
hySOLUTIONS GmbH
IVG Immobilien AG
Linde AG,
Siemens AG,
Total Deutschland GmbH,
Vattenfall Europe Innovation GmbH,
Vattenfall Europe Windkraft GmbH.
Hydrogen and Fuel Cells as Strong Partners of Renewable Energy Systems