26th World Gas Conference

1 – 5 June 2015 – Paris, France

WOC 5 – 4

First commercial POWER TO GAS-Project in Germany

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E.ON Innovation Center

WGCPARIS2015
WORLD GAS CONFERENCE

Motivation for energy storage

increasing
variable generation

fluctuating demand
(as it always was)

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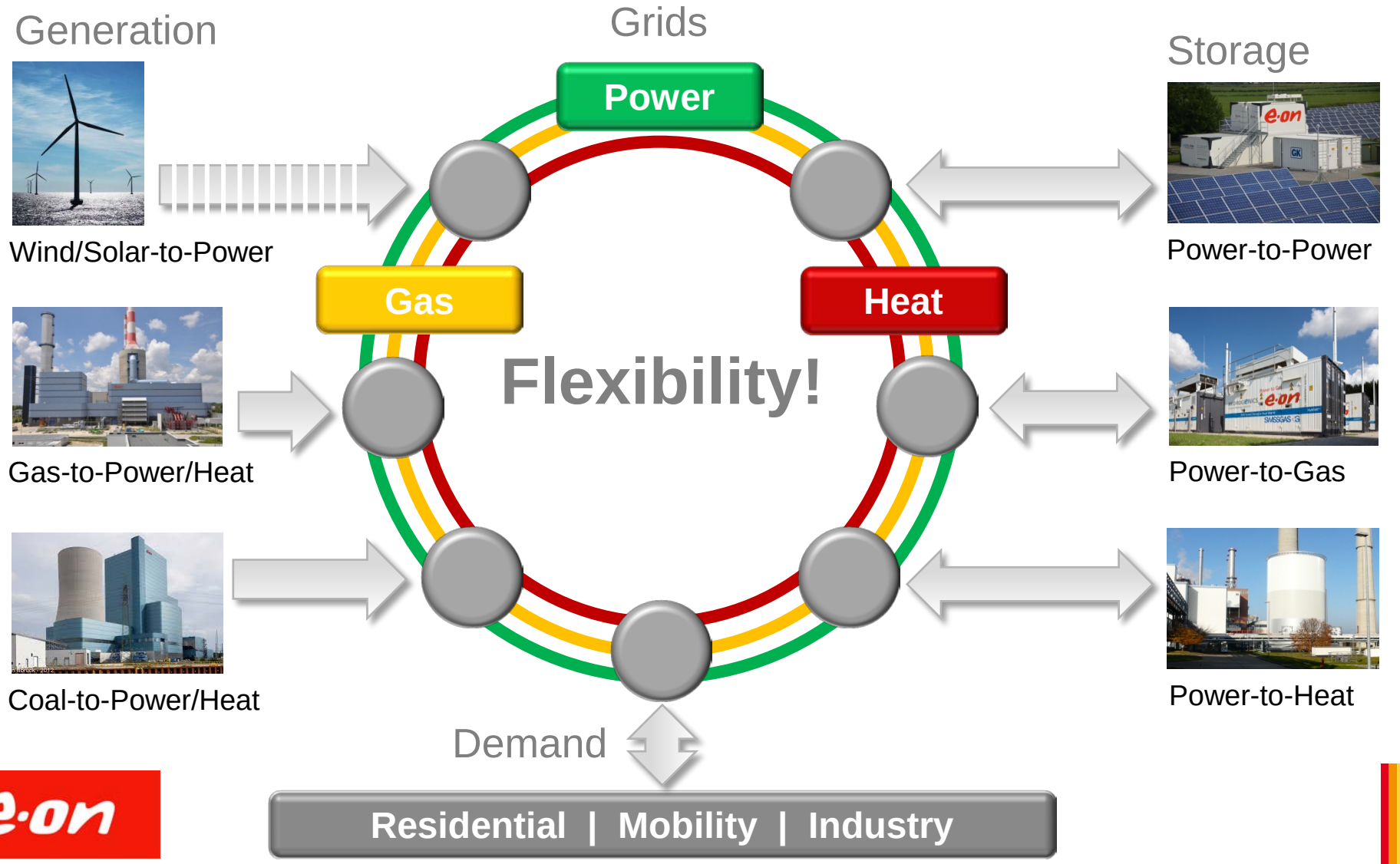
What does the transition to wind and solar mean?



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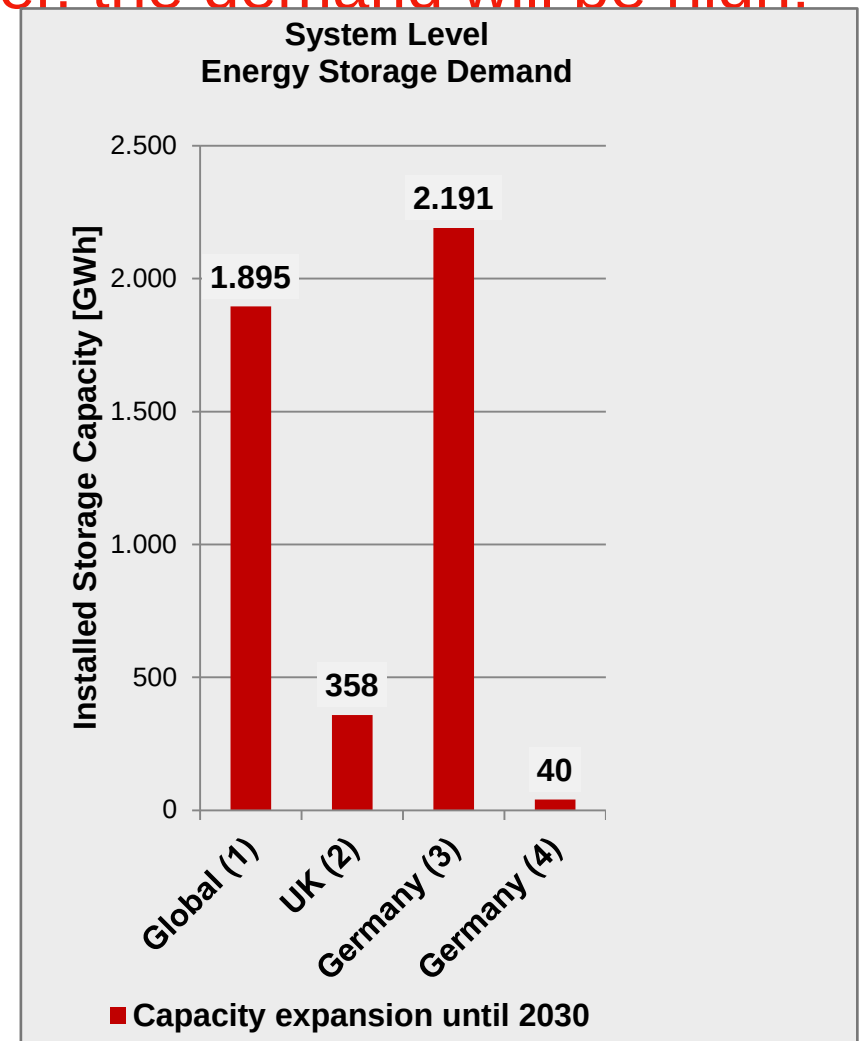
Its useless to estimate the energy storage demand? However, the demand will be high!



(1) BCG, (2) Imperial College (3) VDE-ETG (4) TUM-FfE

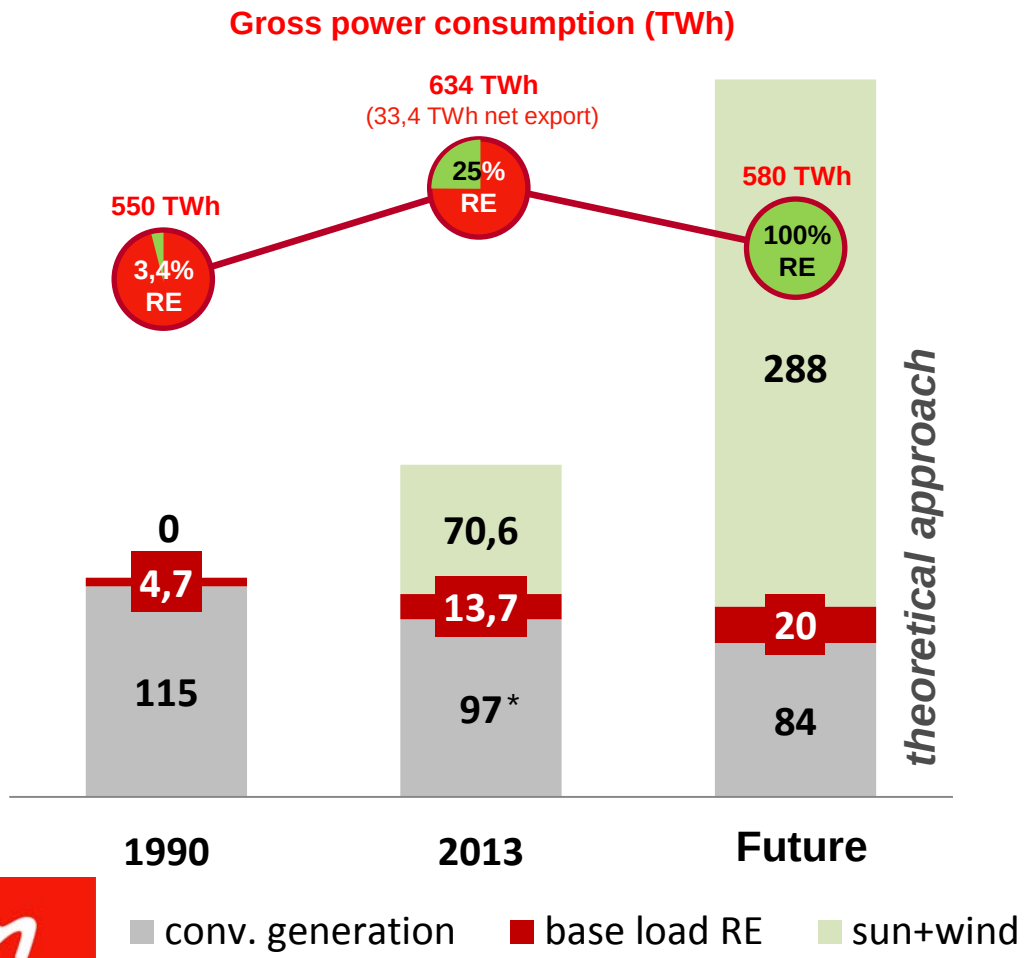
When and how much

- increase of renewables?
- decommissioning of conventional generation?
- grid expansion?
- decentralization?
- demand respond management
- E-Mobility with batteries?
- E-Mobility with fuel cells?
- Synergies with Industry?
- …

… and what about the influence of commodity

Example: Energy transition Germany

Installed generation capacity approaching 400 GW?



*) data 2012

- **Wind and solar generation quadruples installed capacity**
- **1% curtailment requires additional 3 - 4 GW RE**

Source: BMWi, Arbeitsgruppe Erneuerbare Energien-Statistik

Assumptions scenario future:

- Power consumption is stagnant and corresponds the RE generated.
- **Full load hours of wind + sun = 1,600 h**
- Base load RE have a limited potential.

RE: Renewable Energy

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Energy storage technologies

Proven Technology - Potential for improvement - New Technology

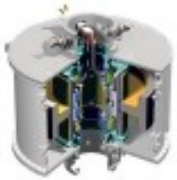
Power-to-Power

Pumped Storage

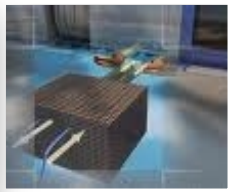
Battery

(A) CAES

Fly Wheel



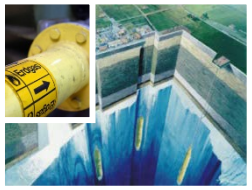
Capacitor



Power-to-Gas

Power-to-Gas

Gas storage



Power-to-Heat

Heat storage

Power-to-Heat

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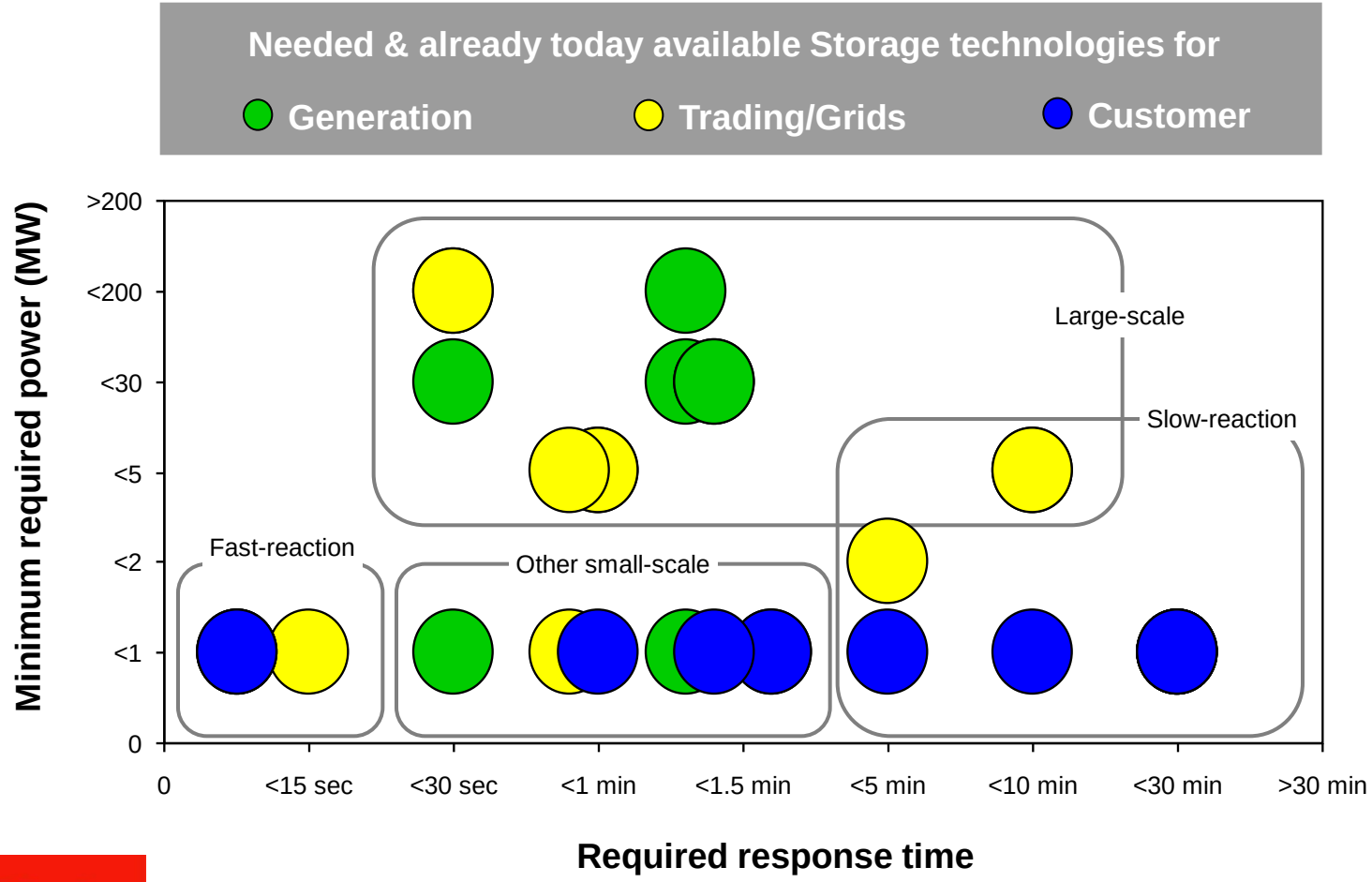
Flexibility demand needs different storage technologies



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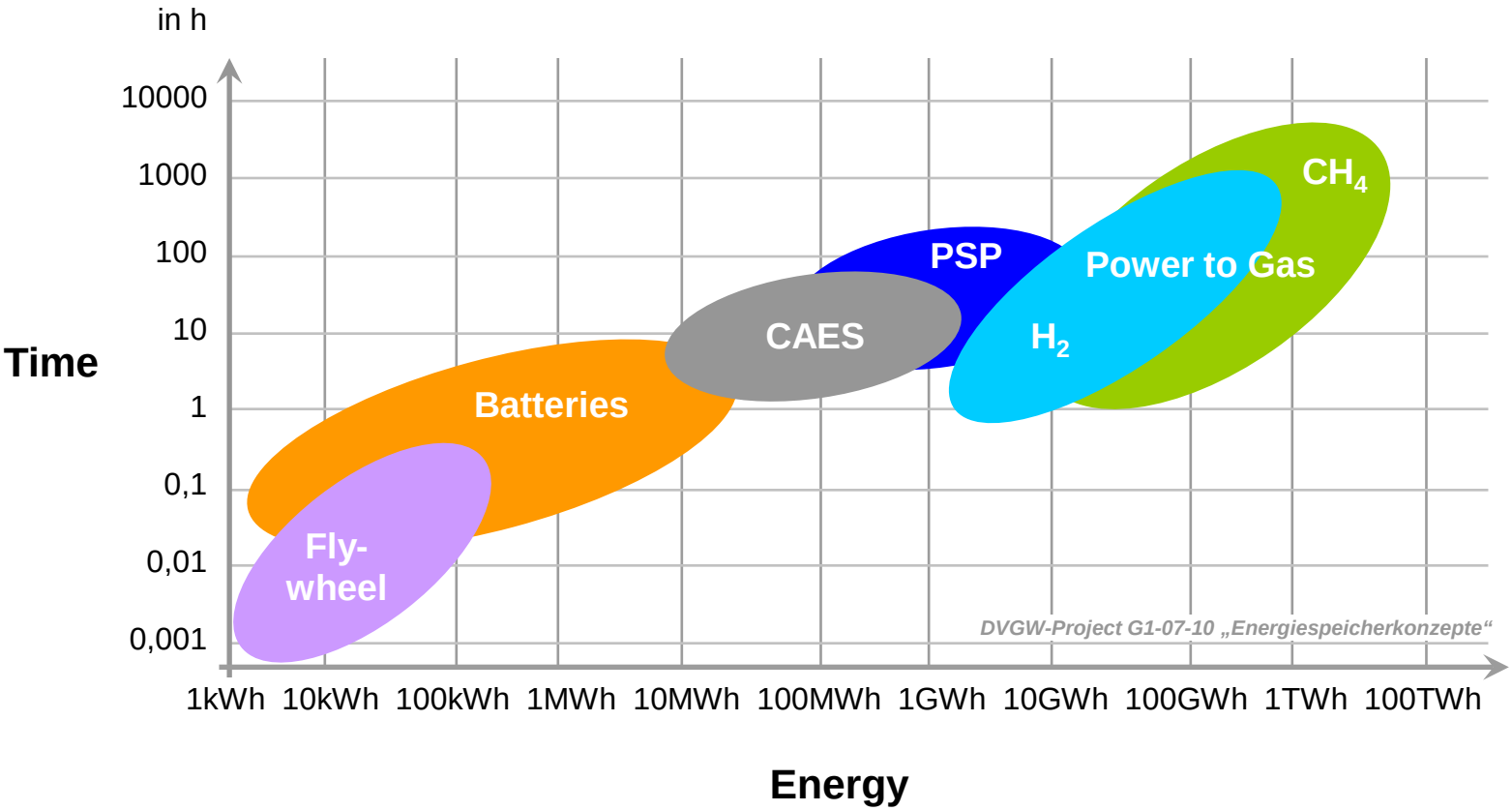
Different capabilities & applications



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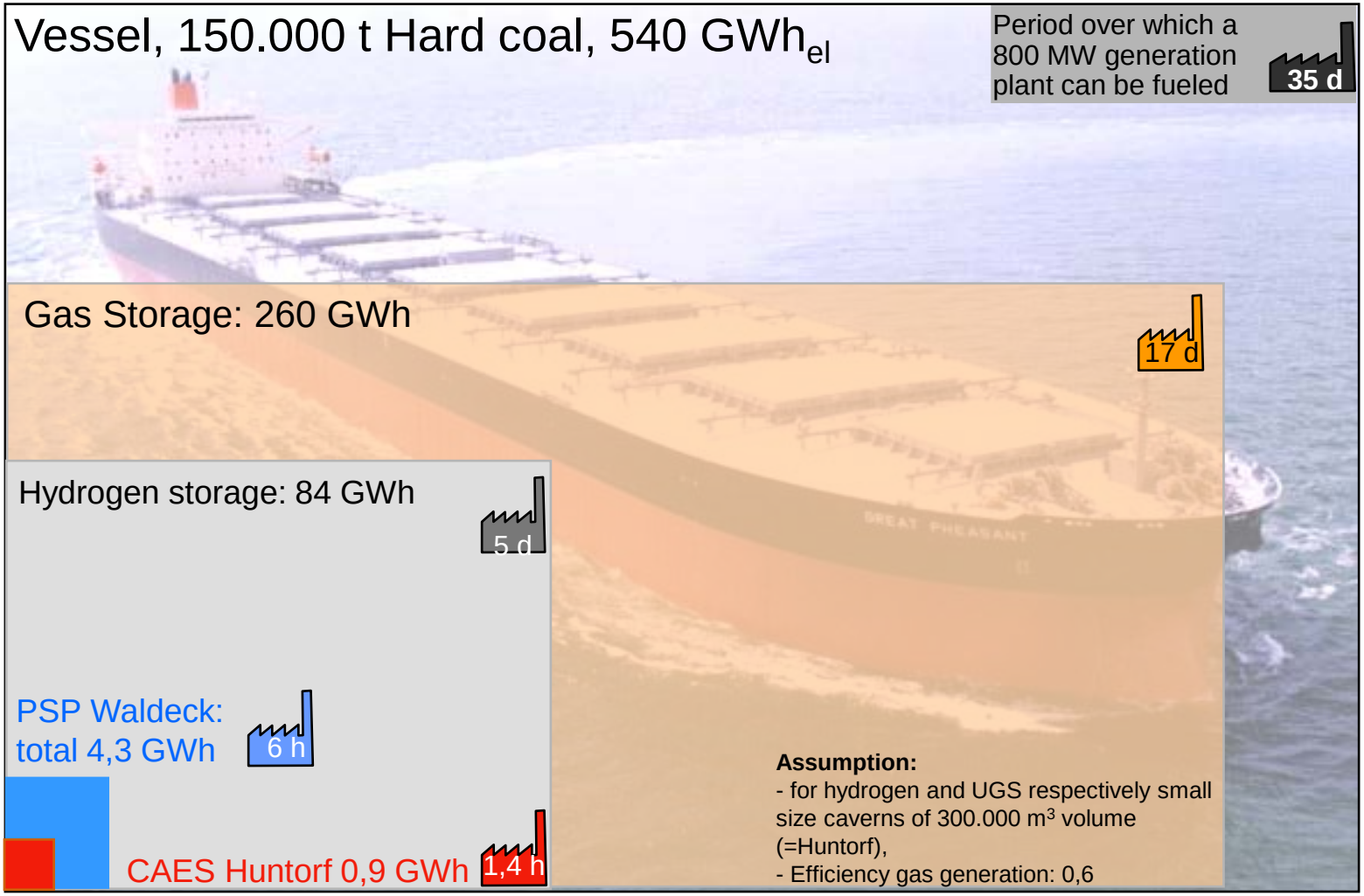
Comparing the energy content



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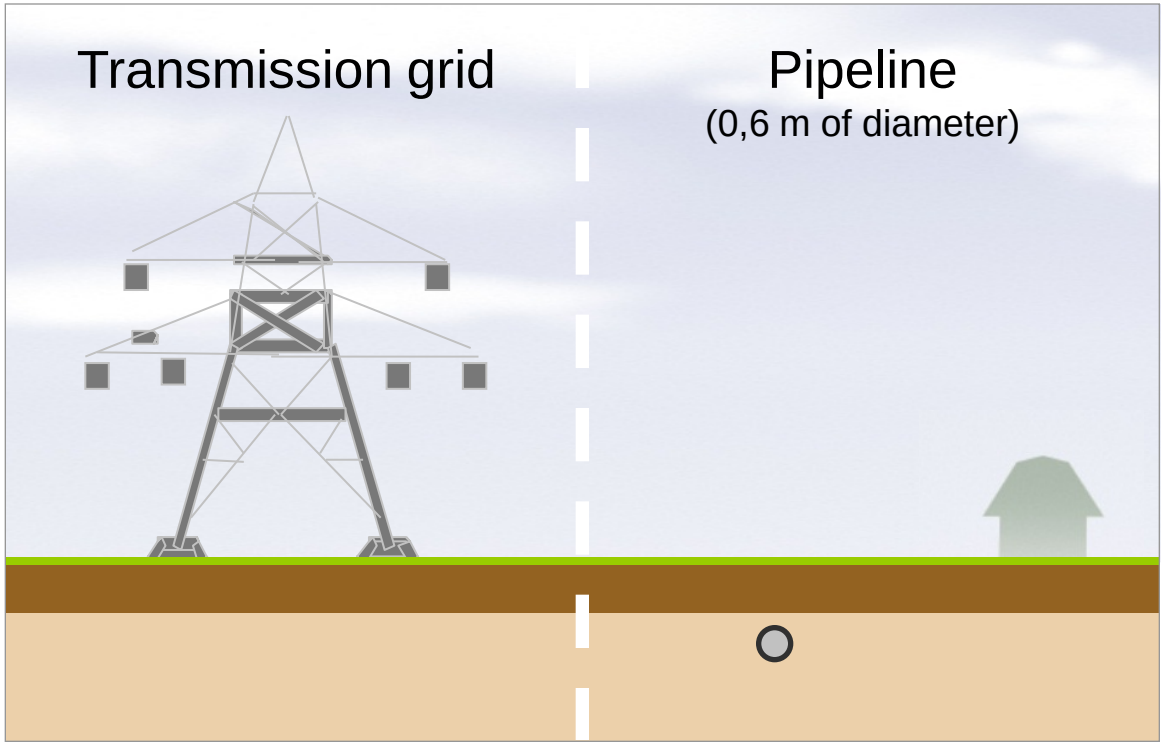
Comparison of 1GW (1000 MW) transport capacity

corresponding to the power of an large scale power plant or peak power of 200 wind turbine



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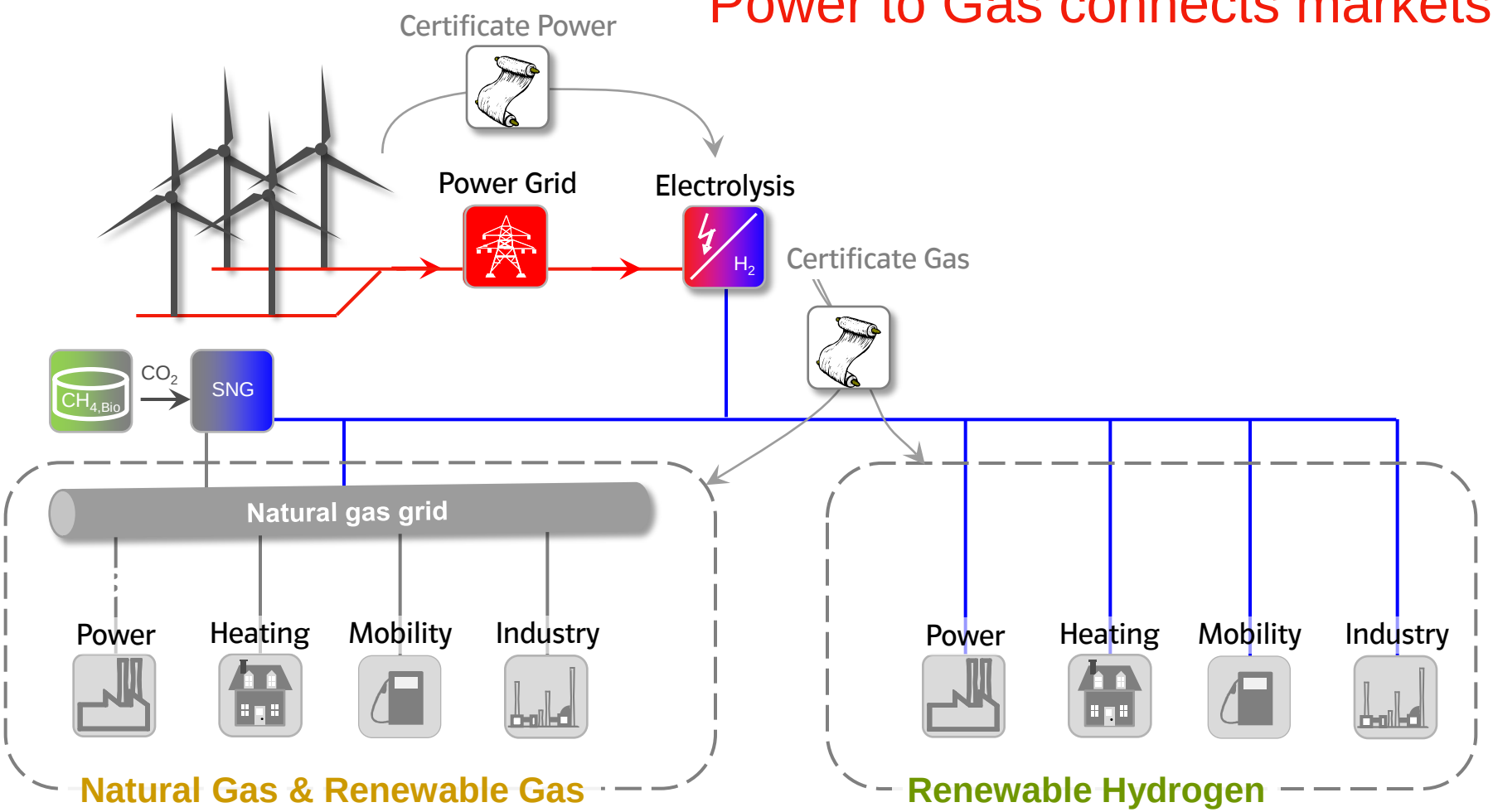
Power to Gas connects markets



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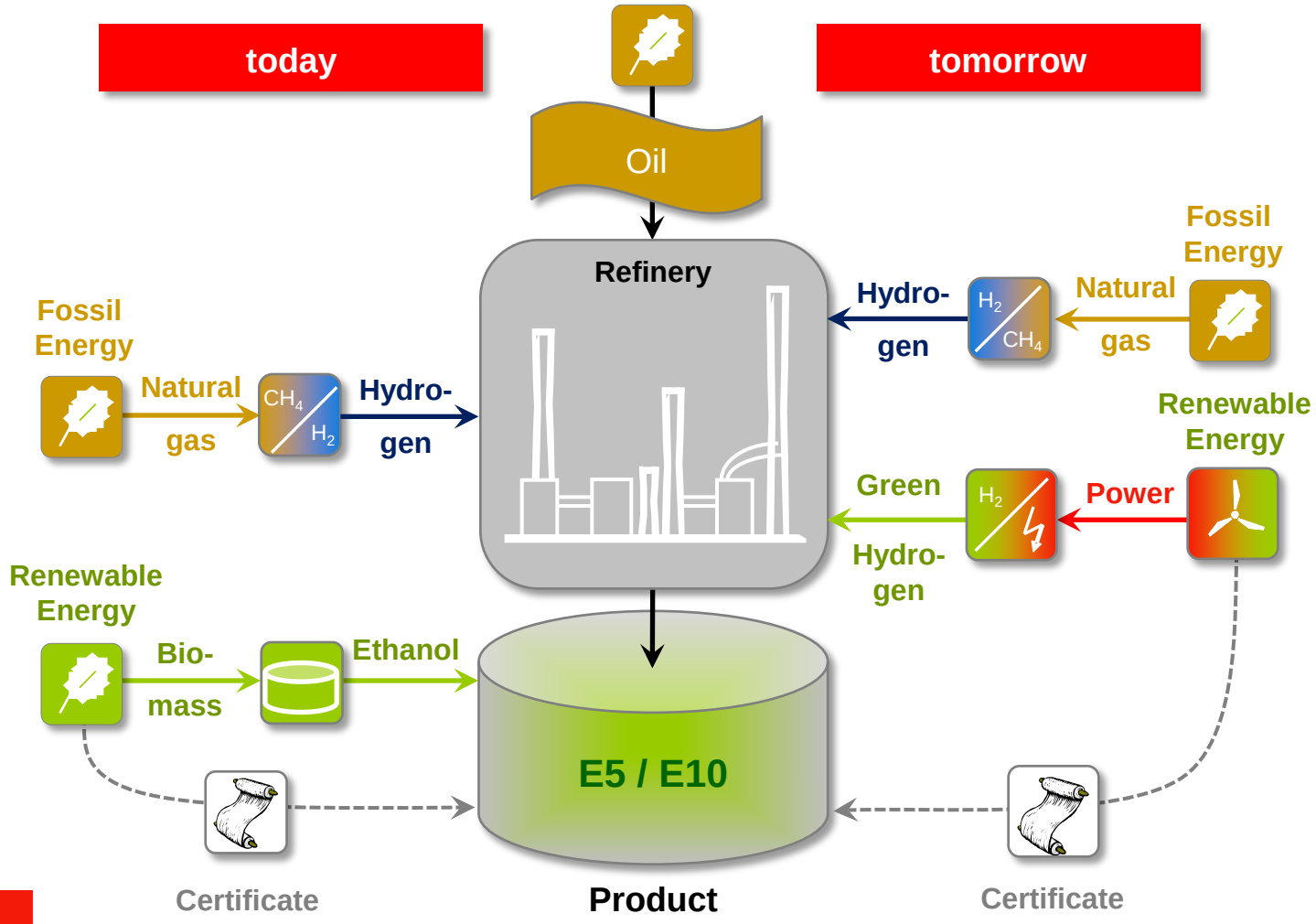
Example: Power to Gas for Refineries



Storage effect = Integration of Renewables

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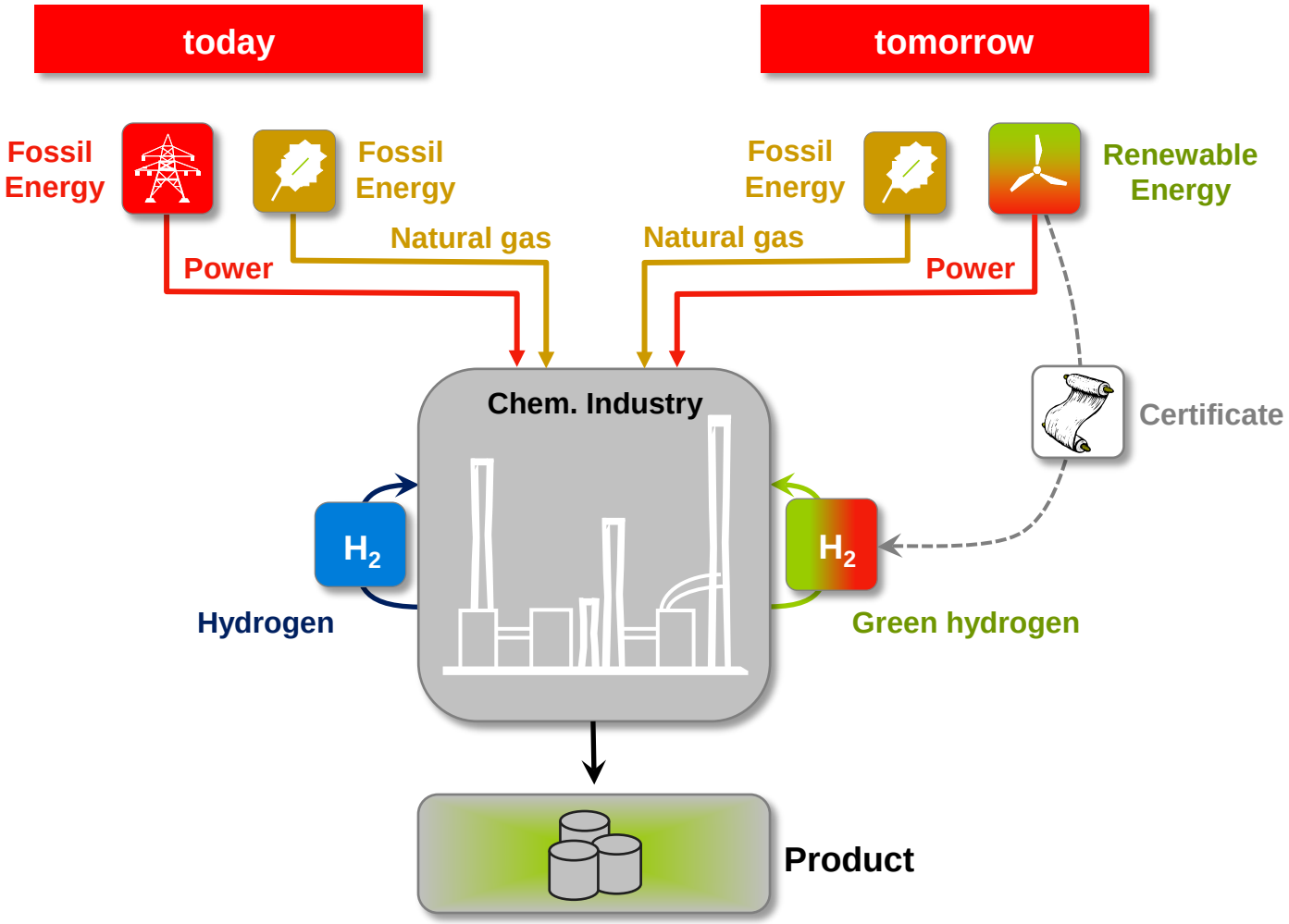
Example: Power-to-Gas for Industry



Storage effect = Integration of Renewables

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Example: Power to Gas pilot "WindGas Falkenhagen"

Key Parameters

- **Power: 2 MW_{el}**
- **Hydrogen production: 360 m^3/h**
- **Fed into the local gas grid** (ONTRAS Gastransport)
- Start of construction: 08/20/2012; Start of operation 08/28/2013
- Owner is E.ON Gas Storage

Goals

- **Demonstration of the process chain**
- Optimize operational concept (fluctuating power from wind vs. changing gas feed)
- Gain experience in technology, costs, consenting

In cooperation with

SWISSGAS

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Example: Power to Gas pilot "WindGas Falkenhagen"

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First WindGas products on the market

Product Description

- Customer segment: End-customer
- Regional focus: Germany
- Composition:
  10% WindGas, 90% natural gas
- Application: sustainable gas for heating & cooking
- Link: www.eon.de/windgas

Product Description

- Customer segment: Wholesaler
- Regional focus: Switzerland
- Composition: 100% WindGas
- Application: sustainable gas for heating, cooking & industry
- Partnership in Falkenhagen project
- Link: www.swissgas.ch

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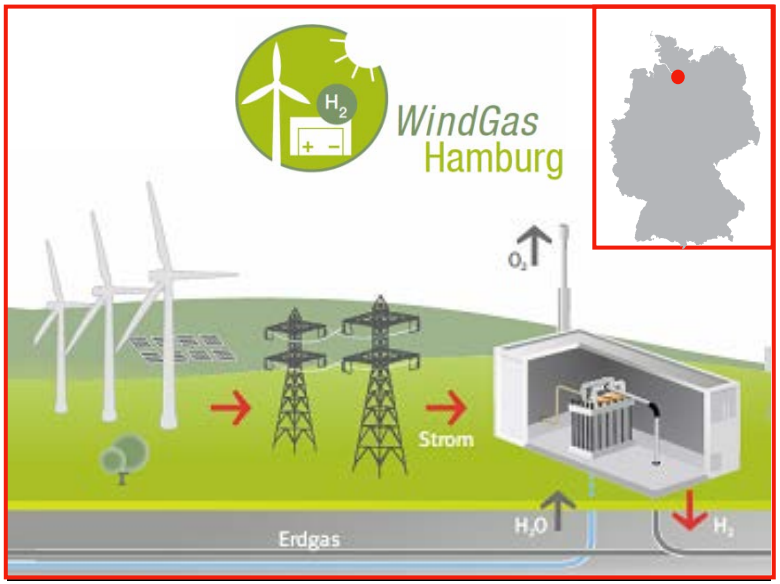
Example: „WindGas Hamburg“

Key Parameters

- Public funding from BMVDI
- **Power: 1 MW_{el} (stack)**
- Hydrogen production: 265 m³/h
- Fed into the local gas grid
- Planned start of operation: 2015



Goals

- **Utilization of high efficient “Proton Exchange Membrane“ electrolysis (PEM)**
- Demonstration within E.ON infrastructure
- Business development

Funding & Partners

Gefördert durch:

Bundesministerium für Verkehr und digitale Infrastruktur

Koordiniert durch:

NOW Nationale Organisation Wasserstoff- und Brennstoffzellentechnologie

nip Nationales Innovationsprogramm Wasserstoff- und Brennstoffzellentechnologie

PtJ Projektträger Jülich Forschungszentrum Jülich

e·on

HYDROG(E)NICS SHIFT POWER | ENERGIZE YOUR WORLD

SolviCore Fuel Cell Technologies

Fraunhofer ISE

DLR Deutsches Zentrum für Luft- und Raumfahrt

e·on

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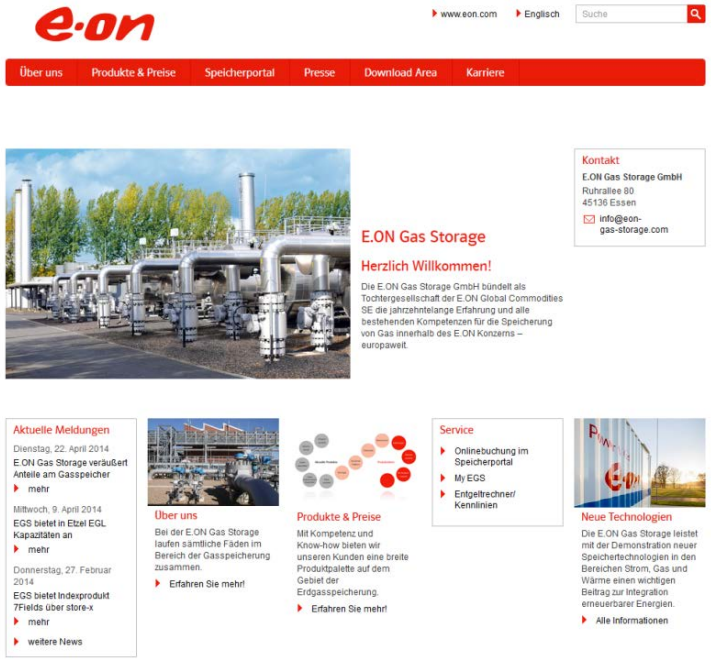
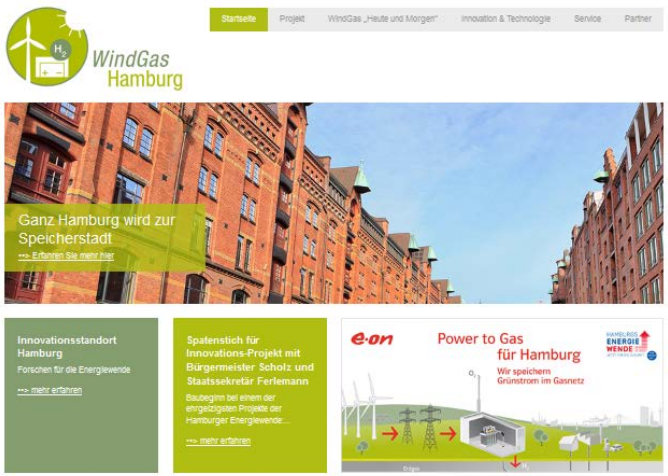
Further information

www.eon-gas-storage.com

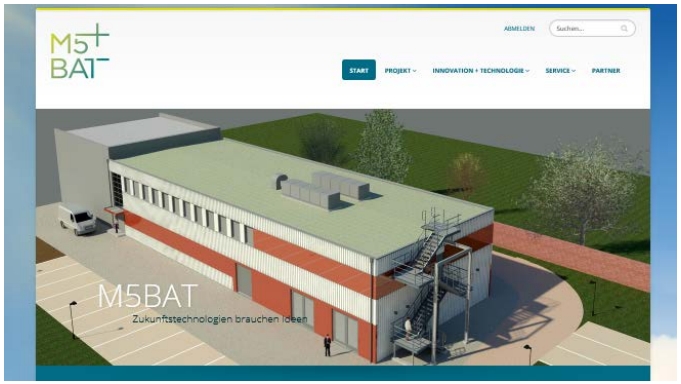


www.windgas-hamburg.de



http://www.smartregion-pellworm.de/

www.m5bat.de



POWER TO GAS

Gas storage
- Power-to-Gas projects in Germany

European platforms:
- Mediterranean Power-to-Gas – Platform
- North Sea Power-to-Gas Platform

European projects:
- Norway, Utsira
- Danmark, Foulum
- Fance, Dunkerque
- Spain, Sotavento (Galicia)

Development main area Germany

Sources: Green Facts, DVGW, DNVKEMA,Electrochaea, McPhy

Status as of: 2013

Prerequisites for Energy Storage

- **Storages represent a fourth element in the energy system**
  = they are neither generation, nor network, nor consumers.

- **The regulatory framework for storages should be technology open.**
  = Power-to-Power, Power-to-Gas, Power-to-Heat
  = part of the competitive market

- **Reduction of investment costs**
  = cost reduction

- **Storages should be relieved from grid tariffs, charges and/or taxes**
  = no burdens for innovation prior economic efficiency

- **Direct marketing**
  = customer interest

European discussion

- Green Hydrogen as an Advanced Biofuel in the mobility sector (FQD, RED)
- Energy Storage Definitition
- Ownership-Question for Energy Storages
- Quotas for hydrogen in the gas grid

Takeaways

(1) Power to Gas is part of the transition to renewable energy. For many customers it is the only applicable connection to renewable energy.

(2) Power to Gas connects to very different markets such as heating or mobility and offers flexibility to the electricity grid.

(3) Power to Gas opens up a sustainable long-term perspective for the gas infrastructure.

(4) The technology is ready for the market. Are you?

(5) If you think Power to Gas is too expensive, you may come to a different conclusion looking at the alternatives for abating carbon emissions.

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Innovation Energy Storage

E.ON Innovation Center Energy Storage