

Unlocking the Hydrogen Potential for Transport und Industry

German-French Office for renewable Energies

Berlin

Juni 24th, 2014

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Shaping the future

Vision or Reality?



**Water is the coal of the future.
The energy of tomorrow is water, broken down
into hydrogen and oxygen using electricity.
These elements will secure the earth's power
supply for an indefinite period.**

Jules Verne, The Mysterious Island, 1870

Why do we need energy storage?

2020 Climate Goals

- 20% Energy saving through higher efficiency
- 20% Renewable energies in Energy-Mix
- 20% Reduction of GHG



2050 Climate Goals

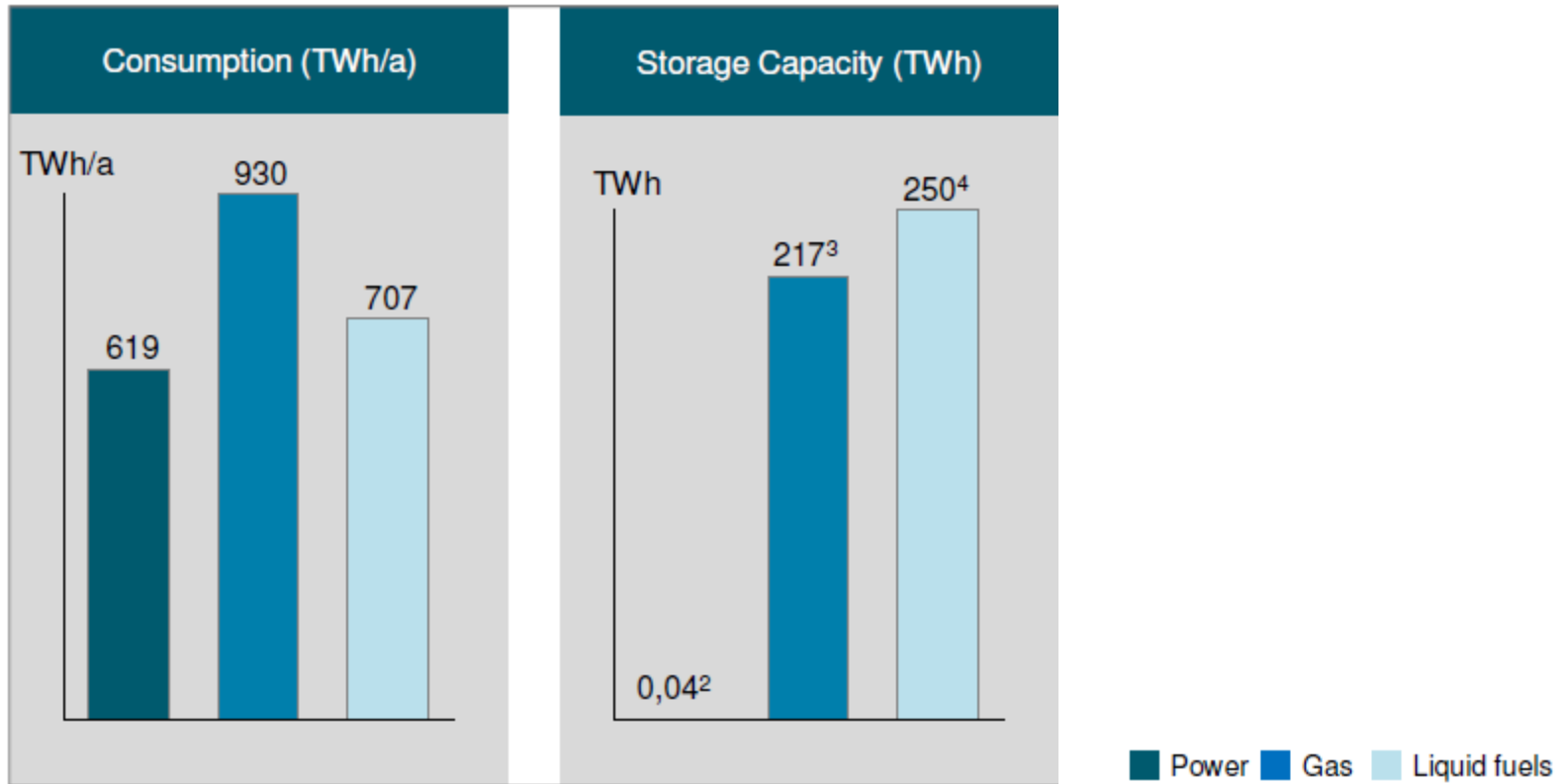
- 80% Reduction of CO₂ emission
- 80% Renewable energies in Energy-Mix
- 50% Reduction of primary energy consumption



Consequences:

- Increase of power generation by wind and photovoltaic
- ↓
- Imbalance between power generation and the demand by distribution network
- ↓
- Demand for energy storage

What is the Ratio between Energy Consumption and Storage Capacity?



Source: ETOGAS

What kind of Energy Storage is Available?

Type	Capacity
Pressure reservoir (Air)	2 GWh
Pumped storage (Hydro)	40 GWh
Underground reservoir (H ₂)	100 GWh
Natural gas pipelines & Natural gas underground reservoir (CH ₄) in Germany 400.000 km & 51 underground reservoirs Existing Infrastructure !	200.000 GWh makes 1/3 of the German demand for electric power

How do you convert Wind and Sun Energy into Methane?

**Two technologies are commercially available to convert wind and sun energy into methane
(Synthetic Natural Gas = SNG)**

Step 1: Hydrogen production by Electrolysis

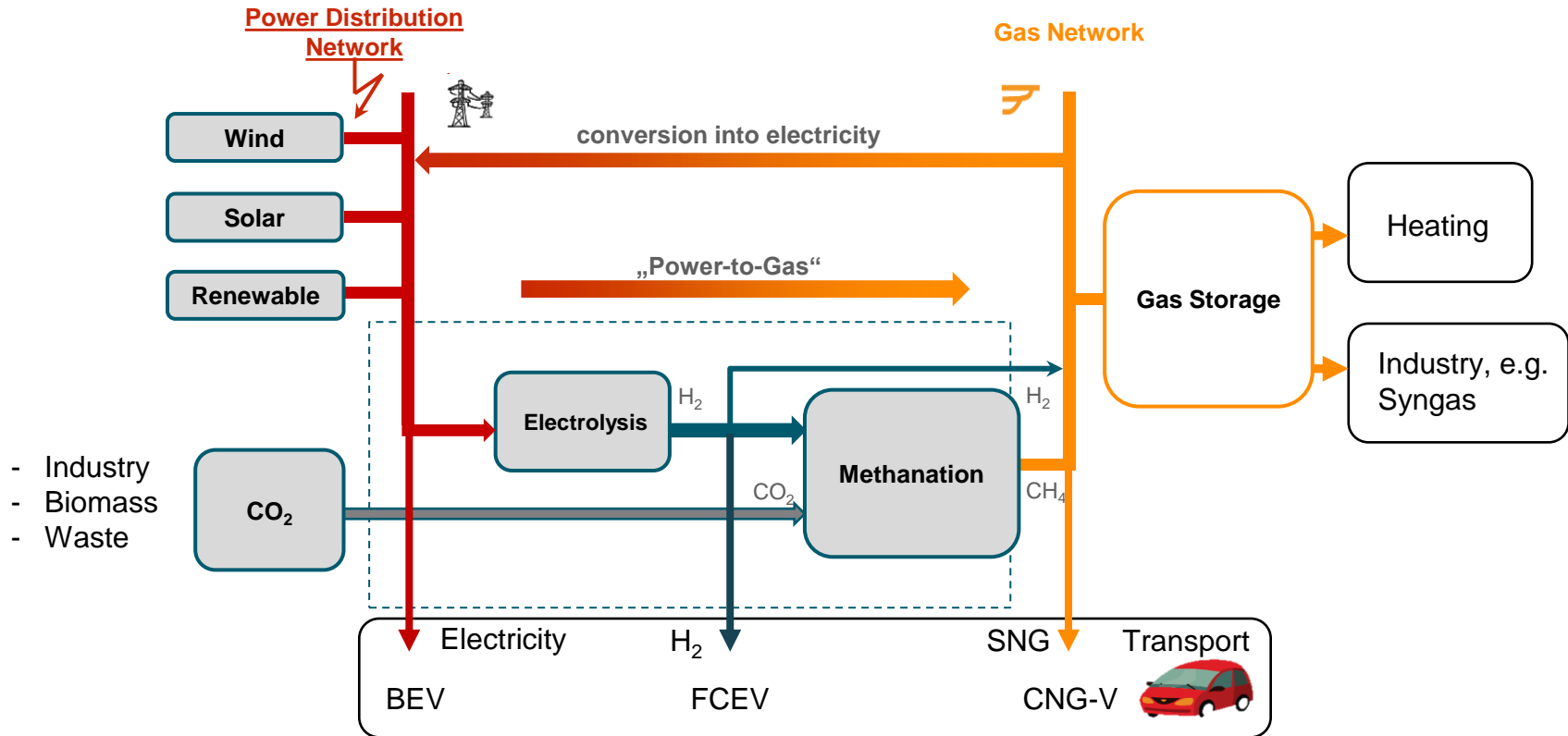


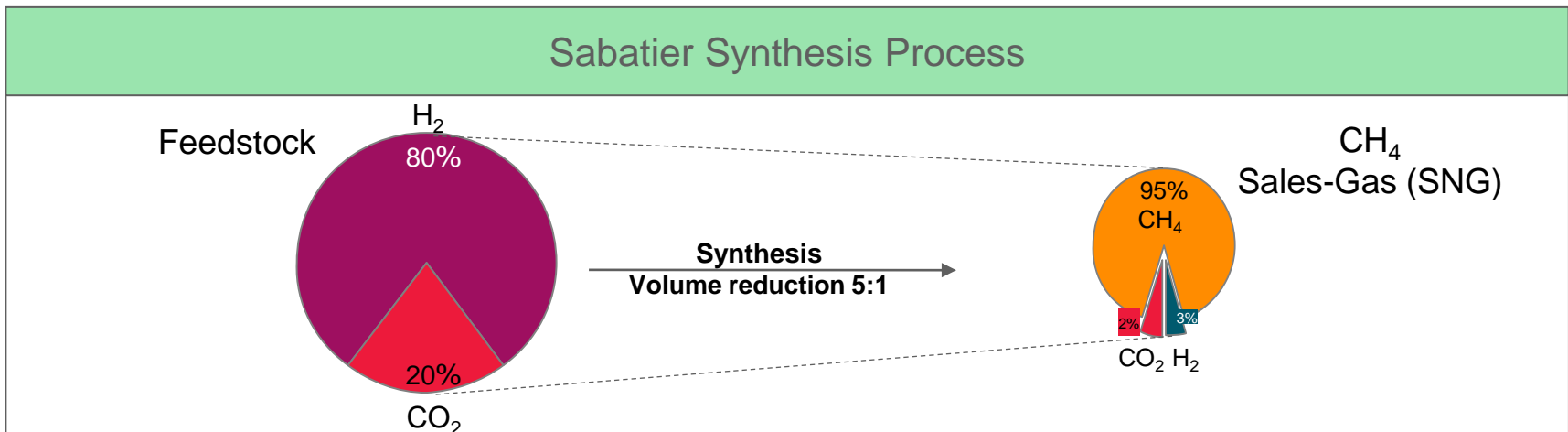
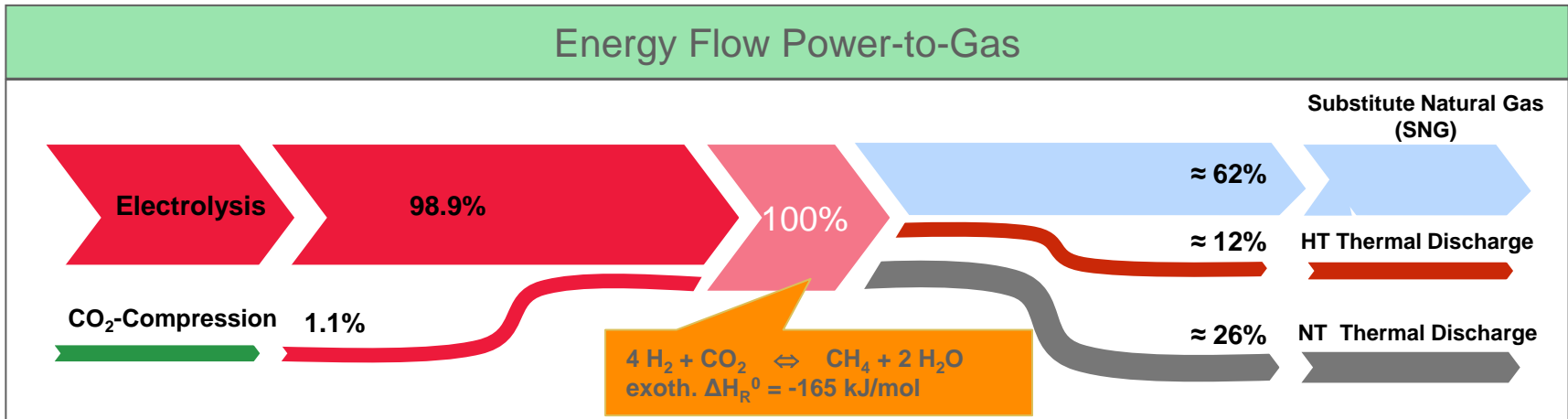
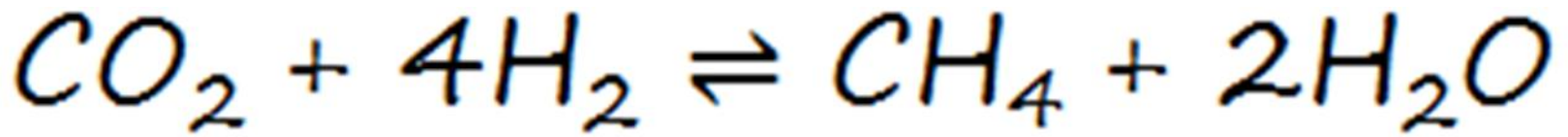
Step 2: Methane production by Sabatier-Process



ETOGAS Concept

SNG by "Power-to-Gas"



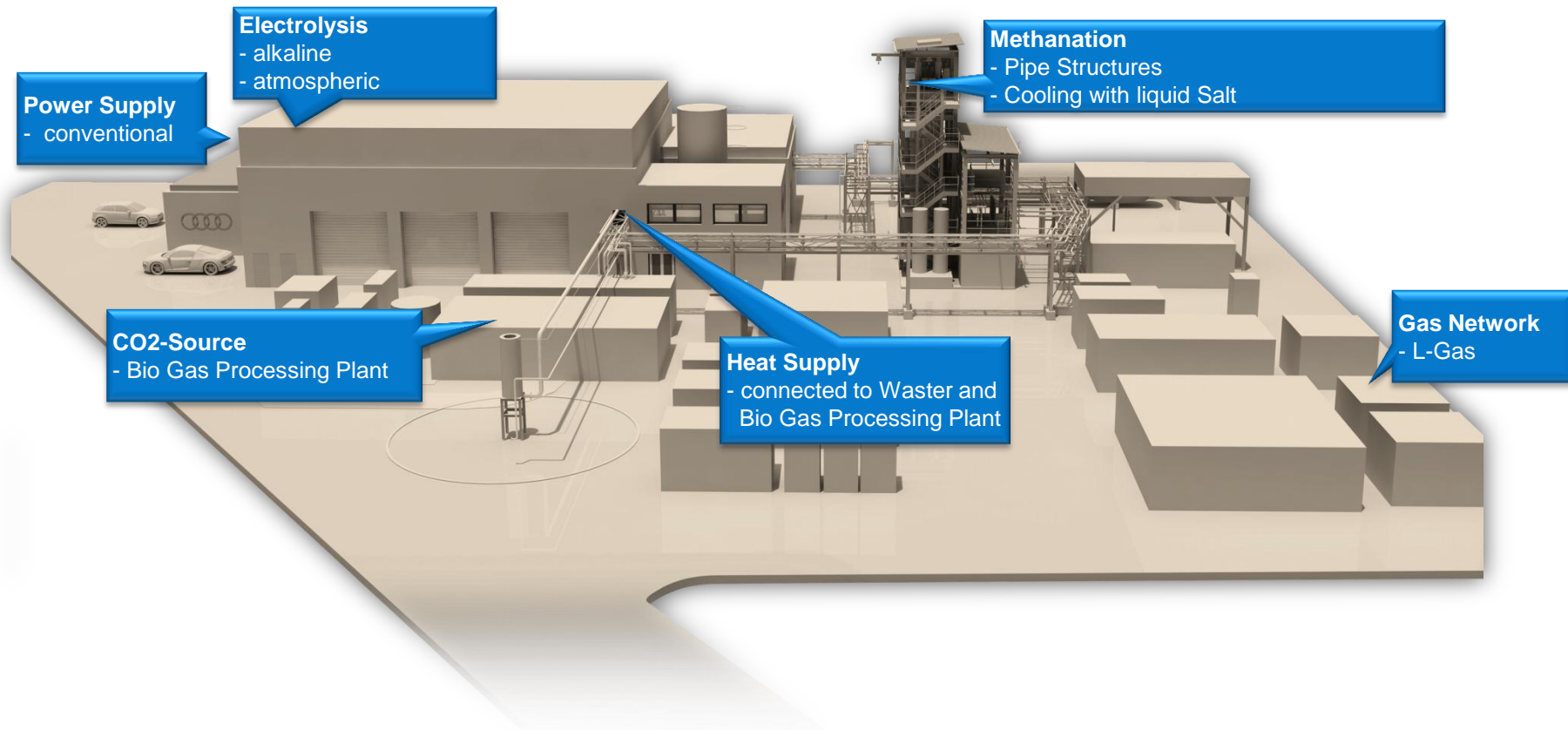


Source: ETOGAS / ZSW

ETOGAS Concept

6,3 MW Demo-Unit in Werlte, Opening 25. Juni 2013

ETOGAS
smart energy conversion



Source: AUDI, ETOGAS

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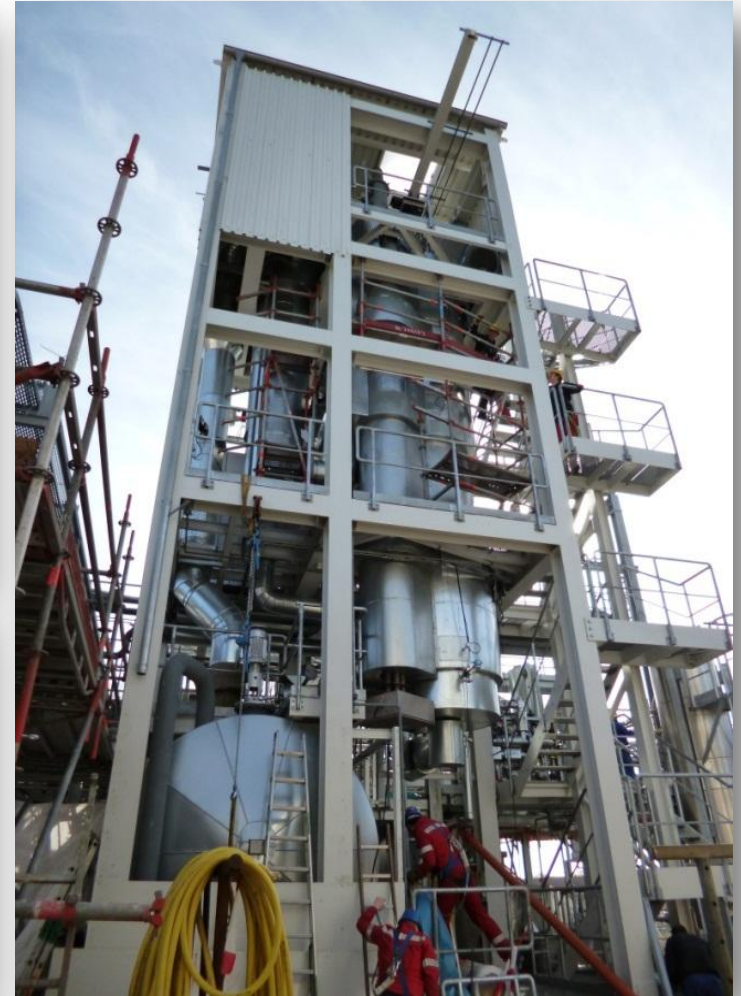
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ETOGAS Concept

6,3 MW Demo-Unit in Werlte, Opening 25. Juni 2013

ETOGAS
smart energy conversion



Electrolyser Hall

One of three 2 MW Electrolysers

Methanation Reactor

Source: ETOGAS, AUDI

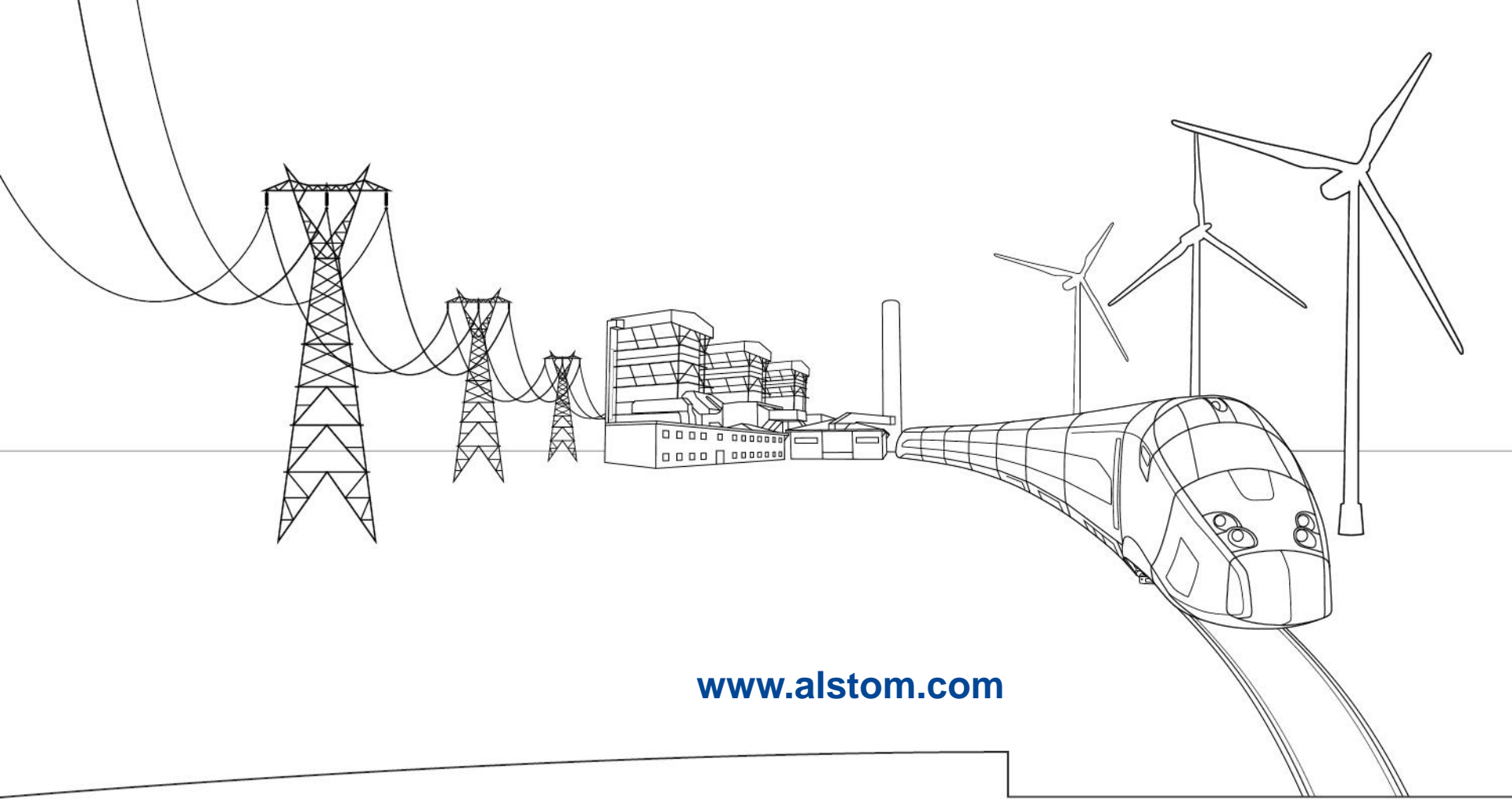
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Conclusion

- „Die Energiewende“ (*clean energy switch*) and the corresponding increase of solar and wind power plants lead to an increasingly volatile power supply.
- To avoid overcapacity in the periods of low consumption long term energy storage solutions are required.
- Wind and solar power can be converted into methane (Synthetic Natural Gas = SNG) by commercially available processes.
- SNG is suitable as a chemical energy storage and can be used:
 - for power and heat generation
 - as fuel for transportation
 - as a chemical basis for syngas generation.
- The existing infrastructure of the natural gas pipeline network and the underground reservoirs can be used for storage of SNG
 - in the capacity as high as required
 - without any additional operational risks
 - without any technical modification.



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