The Energy Hub

www.eteurope.eu  @EnergyTechEU
Currently the electricity system relies for approximately 50% on conventional thermal energy.

Conventional thermal generation needs to reach carbon neutrality, fast.

EU-28 electricity production by source, 2016 (in %)

- Conventional thermal: 48.5%
- Nuclear: 25.7%
- Hydro: 11.9%
- Wind: 9.9%
- Others: 4.0%

Source: Eurostat
The power plant of today

Currently power plants produce electricity, heat and cold on demand providing affordable and dispatchable energy when needed, thereby stabilising the grid.

EU 28 electricity production by source of thermal energy source in 2017 (excluding nuclear)

Data: Sandbag, 30-04-2018
The EU, Cities, Utilities and Industries will decarbonisation committing to carbon neutrality well before 2050
Next to the electricity industry also heating and cooling need to be decarbonised.
And we need to help gas become renewable to decarbonise other industries

*:PRIMES model results show 70% of renewable gas
Future energy systems will therefore face both periods with a lot of electricity generated (and negative prices) and periods with scarce electricity (and higher prices).
For a reliable renewable energy supply an overcapacity of around 3 to 4 times is required.
Future energy systems will therefore face both periods with a lot of electricity generated (and negative prices) and periods with scarce electricity (and higher prices).

Data for Germany,
Note: Local and regional bottleneck may increase the number of hours with oversupply.
Three key challenges

Need to decarbonise power, heating, cooling, industry and transport

The EU, Cities, Utilities and Industries will decarbonisation committing to carbon neutrality well before 2050

Next to the electricity industry also our heating and cooling needs to be decarbonised

Need for large amounts of renewable fuels and raw materials

And we need to help gas become renewable to decarbonize other industries

Installation of massive RES with increasing amounts of variable electricity supply

For a reliable renewable energy supply an overcapacity of around 3 to 6 times is required

Future energy systems will therefore face both periods with a lot of electricity generated (and negative prices) and periods with scarce electricity (and higher prices).
The Energy Hub

Abundant electricity

Input

Excess electricity

Output

Scarce electricity

Advanced synthetic fuels

Industry
Transport
Storage

Heating and cooling

Consumer
Industry
Storage

Energy transition and efficiency
The Energy Hub

Abundant electricity

INPUT

Excess electricity

Scarce electricity

OUTPUT

Advanced synthetic fuels

Energy conversion into fuels, heat and cold

Electricity, heating and cooling

Valuable minerals

Energy generation and resource recovery

CO₂ recycling or storage
The Energy Hub: Carbon Neutral well before 2050

**Energy Hub**: the place where the production, conversion, storage and consumption of different energy carriers takes place.

**Energy Hubs** can be big and centralised or small and decentralised, depending on the demand and capability of the energy grids.

Primarily during times of abundant electricity, the **Energy Hub** will mostly convert excess renewable electricity to heat and cold and use the Power-to-X to create advanced.

Primarily during times of scarce electricity, the **Energy Hub** will, in an energy efficient manner, generate electricity and provide district heating and cooling while stabilising the grid.

Depending on the input, the two different scenarios of the **Energy Hub** (electricity conversion and energy generation) may be active at the same time.

Input and output mix allows the **Energy Hub** to be a key flexibility mechanism with Carbon recycling and the creation of carbon feedstock will be enabled by CCU for fuels generation.

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**ENGINEERING THE ENERGY TRANSITION**
### The economics of the Energy Hub

<table>
<thead>
<tr>
<th>Infrastructure</th>
<th>CCS/CCU</th>
<th>Alternative Fuels</th>
<th>RES</th>
<th>Energy Efficiency</th>
</tr>
</thead>
</table>
| Using and upgrading existing infrastructure and assets, preventing high investment cost  
  - E.g. networks: electricity, gas and fuel distribution, heat and cold grids  
  - E.g. power generation: combined cycle gas plant, CHP plants | An increasing carbon price makes CCU/S more competitive and creating both a carbon feedstock that can be used in industry but also keeping with the goals of the circular economy | Fuel flexibility allows for switching based on the cost and availability of the specific resource. This includes carbon recycled fuels, synthetic fuels, biofuels and fuels of a non-biological origin | More variable renewables will increase the periods of low or negative electricity prices, making heat, cold and molecule production more affordable (Power to X) | Cross-sectorial integration improves Energy Efficiency with lower input costs and waste. |
Energy Hub: Key benefits

• Offsetting fossil fuels
• Energy efficiency improvements
• Grid balancing
• More RES electricity use
• Input flexibility
• Energy storage
• Synergies of existing assets and infrastructure
• Production and usage of synthetic fuels and other products
• Increase of energy independence and import substitution
• Sectoral integration
• Job creation
Our mission

Provide innovative energy technologies for sustainable, reliable, and affordable energy systems.

Our vision

Leading the transition to a carbon neutral Europe with cutting edge technologies.

Energy Technologies Europe commits itself to provide and further develop technologies, allowing for European energy conversion to be carbon neutral well before 2050. We will accelerate the achievement of the EU’s decarbonisation goals by enabling other sectors such as industry, transport, heating and cooling to reach zero emissions.
Developing technologies

Define and develop:
- technologies to support the energy system;
- effective combinations of technologies,
- integration
- sector coupling opportunities

Framework

Develop a framework of technologies adapted to differing local needs and circumstances (larger centralised, smaller decentralised, local resource availability)

Defining standards for interoperability and software protocols for a streamlined function

Civil society

Involving users and civil society in the concept development and implementation

Roll out

Demonstrating the integrated Energy Hub in Northern Europe, Southern Europe and Eastern Europe across power plants and industry

Rolling out the Energy Hub Europe wide in 2030
Thank you for your attention!