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KEMA Webinar: The real challenges in transition to eco-friendly power networks

WAY TO ENERGY SYSTEM 2050: A SYSTEM VIEW AND A TECHNICAL VIEW

OLAF SENER, DIRECTOR OF ASSET MANAGEMENT

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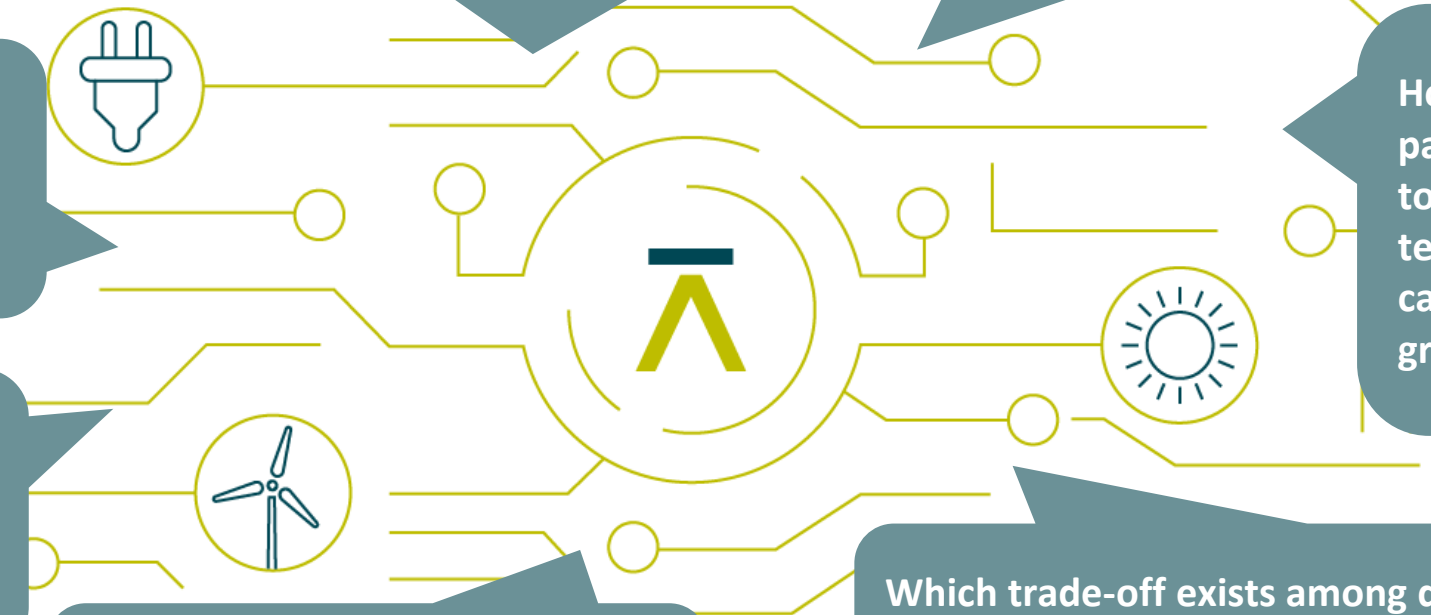
01 A system view: Way to energy system 2050

ENERGY SYSTEM 2050

Towards a decarbonised Europe

A system view: Way to energy system 2050

HOW WILL THE FUTURE ENERGY SYSTEM LOOK LIKE?



What role has sector coupling to play in the future energy system?

What are the necessary investments related to this transition?

How much infrastructure does the energy transition need? And when do we have to start planning?

How does the economical path of the EU energy system towards 2050 look like in terms of the generation capacities, technologies and grid development?

What challenges does the energy transition create for the operability of the power system?

How can the current grid development framework be modified to take into account long-term challenges?

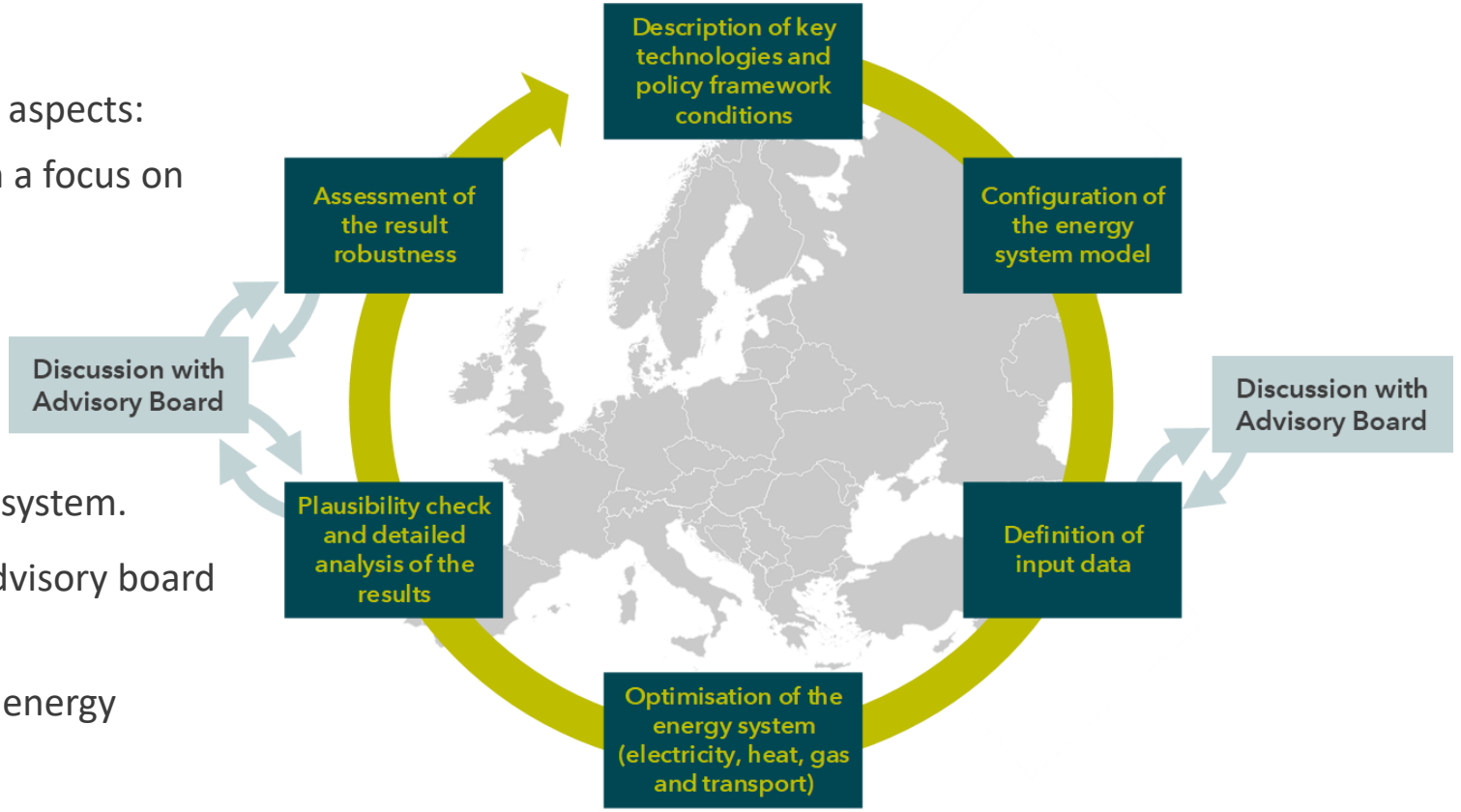
Which trade-off exists among different flexibility measures (storages, e-mobility, demand side management, electrolyzers, grid expansion)?

A system view: Way to energy system 2050

NEW ENERGY SYSTEM 2050 STUDY: ACTIVELY DRIVING FORWARD THE ENERGY TRANSITION

Main goals of the new study

- Thinking further with a focus on the following aspects:
  - Optimising the energy system in 2050 with a focus on Europe.
  - Evaluation of innovations in the electricity grid and development of an overall concept for the target grid.
  - Operability of the future electricity supply system.
- Sharpening our vision with an international advisory board of experts from industry, science and politics.
- Creating a basis for a public discussion on the energy transition in Europe.

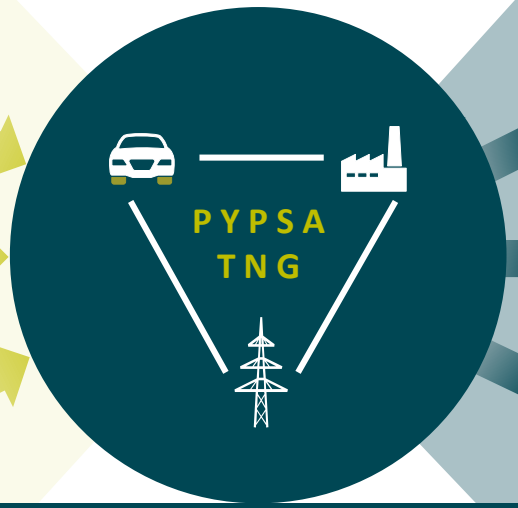


A system view: Way to energy system 2050

IN- AND OUTPUTS OF THE ENERGY SYSTEM MODEL

INPUTS:

- Final energy demand per hour for each sector in the modelled regions in Europe
- Cost Assumptions and technical Parameters for assumed technologies (power plants, Power-to-X technologies, etc.)
- Availability, yield profiles and costs of energy sources
- Grid restrictions between Countries/Regions and costs for grid development
- Installed capacities and political/social framework conditions



Objective function:
Minimization of energy supply cost for the considered year and region

OUTPUTS:

- Optimised inst. Capacities for all technologies (power plants, Power-to-X technologies, etc.)
- Additionally needed grid (electricity/ H2) expansion between regions
- Energy flows between sectors and modelled regions
- Hourly and regional dispatch of generation and demand (incl. storages)
- CO_2 emissions
- System costs (investment and operational costs)
- H2 Import-needs from outside Europe

A system view: Way to energy system 2050

FIRST INSIGHTS: SOME KEY FINDINGS OF THE STUDY

/ The final **energy demand decreases** over time due to efficiency measures and fuel / technology switches.

/ Due to its outstanding decarbonization properties, the **power sector is the main driver of sector integration** (keyword: "new consumers"). Wind and photovoltaic will be the main sources for the power generation.

/ As CO_2 reduction targets become more stringent, demand for electricity therefore increases.

/ The power dispatch in European countries is influenced by the ratio between PV and wind power. High PV capacity correlates with large battery storages. Countries with high wind production have a very good potential for electrolysers.

/ Due to limited availability of land and meteorological characteristics: in 2050 **Germany, Belgium and Italy are net importers of electricity.**

/ The integration of European energy systems goes hand in hand with increasingly enhanced infrastructural links, which enable imports of low-cost power.

/ This also affects the systematically **highly relevant hydrogen sector**: for several countries like Germany, the lack of domestic electricity surpluses also leads to import dependency of hydrogen.

/ A high degree of interconnection requires a lot of infrastructure, which in turn serves the security of supply.

/ **Demand flexibility plays a huge role in 2050:** other than today, in 2050 the availability of RES will define load peaks.

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02 A technical view: Eco-friendly on the way to 2050

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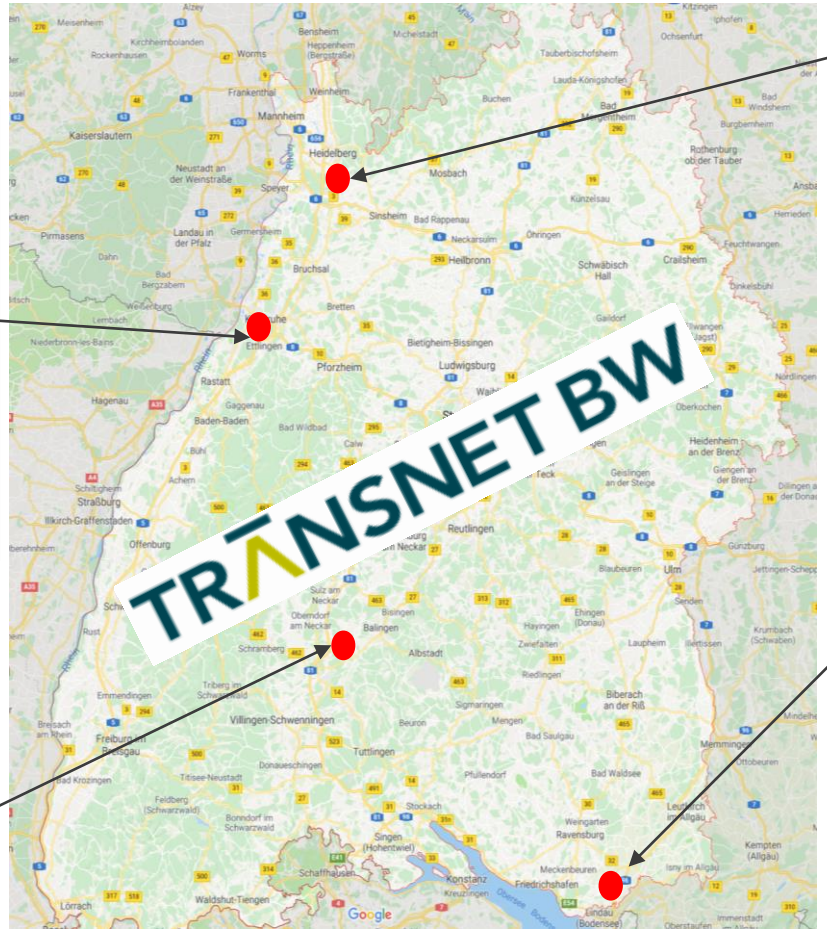
SITE EXPERIENCE WITH SF_6 ALTERNATIVE GASES

Daxlanden Substation:
Busducts of two 420 kV GIS (dry air)

Trossingen Substation
123 kV current transformers (dry air)



Neurott Substation
420 kV voltage transformers (dry air)

Obermooweiler Substation:
Passive components of a 420kV GIS (C5-blends)

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ECO-FRIENDLY POWER TRANSFORMERS

- Worldwide most powerful transformers (420 kV / 400 MVA) with ester made from 100% rapeseed oil
- reduced fire load
- no water hazard
- Weight: ~460 tons
- location: Up to now in 3 substations

Transformer for Kupferzell sustation in Siemens lab

THANK YOU VERY MUCH FOR YOUR ATTENTION!

I'm looking forward to your questions!

Company Headquarters
Pariser Platz
Osloer Strasse 15 - 17
70173 Stuttgart
Phone: +49 711 21858-0
transnetbw.de

Main Control Centre
Ohmstrasse 4
73240 Wendlingen
Phone: +49 7024 44-0

TransnetBW
Olaf Sener
Director of Asset Management
Mobile: +49 162 250 3383
Mailto: o.sener@transnetbw.de