Prof. Dr.-Ing. Thomas Leibfried, Karlsruhe Institute of Technology (KIT)

Kopernikus-Project ENSURE
ENSURE’s main goals

Mission
Holistic, systemic approach für new network structures

1. Goal
System design with centralised and dezentralised elements

2. Goal
Practical implementation and testing in form of a Demonstrator – „Energiekosmos ENSURE“
Holistic approach

- From the viewpoint of society: What does an energy supply system require?
- What kind of network topologies do arise from requirements regarding the future energy supply system?
- How are future power systems operated?
- What kind of network components are needed in the future?
The Consortium: 23 excellent partners

Spokesman:
Prof. Dr.-Ing. Holger Hanselka
President of KIT

6 Core Partners:
ABB
e.on
Schleswig-Holstein Netz
RWEAG
tennet
Siemens

23 Project Partners:

Kopernikus-Project ENSURE
Phase I: Five research clusters

- Developing new, innovative concepts and technologies.
- Transfer of basic research into longterm applicable solutions for the energy transition.
- Continued development of cellular networks, sector coupling, digitalisation and power electronics for the demonstrator region.
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Cluster 3 – System Operation

Operation of distribution networks

- Interaction of transmission networks
- Meaningful and reliable provision of flexibilities (sector coupling, batteries and load management)
- Coordination between the network operators.

Image source: ABB
Cluster 3 – System Operation

Digital System Protection Design – concept (DSPD)

- Automatic adaption of the protection scheme and setpoints depending on the grid situation.

- The first 50 protection schemes have been designed as a basis for protection design of the most probable system structures (to be defined by cluster 2).
Cluster 4 – New Technologies

Converter topologies and test facilities

- Creation of different test facilities for characterizing electrical and mechanical properties of power semiconductor modules.
- Development of different MV converter topologies for grid applications (using MMC as benchmark).
Cluster 4 – New Technologies

Redundant transmission of data
- Designing a flexible process to enhance security by redundant transmission of data.
- First implementations of the prototype concepts based on Software Defined Networking (SDN).

Superconductor cable
- Improved design of a superconductor cable due to copper stabilisation.
- Evaluation of two processes to locate defects on long MVDC cable lines.

Image source: ABB

Image source: KIT
Phase II: Pilot stage

The results of the basic research will be tested in a pilot run.
Selection of suitable technologies for the demonstrator.

- A selection of technologies and system concepts developed in phase I are examined in test environments (e.g. Energy Lab 2.0).
- Further development of the overall concept considering on-site feasibility and the covering of focused accompanying research.
- Analysing the concept's on-site transferability to other locations.

- Further goal-oriented development and pilot testing of technologies, which have been identified as necessary in the context of storylines and scenarios – especially considering phase III.
- Updating both the socio-economic framework transdisciplinarily as well as the storylines and scenarios.
- Analysing the sustainability of the overall concept.
- Transdisciplinary finalisation of the overall concept.
Phase III: The demonstrator

Energiekosmos ENSURE

- Building and launching a multimodal network demonstrator.
- Updating the sustainability assessment.
- Strategically analysing the demonstrator involving relevant stakeholders.
- Projecting results onto 2050/2070.
Kopernikus

Energy for Germany — reliable, affordable and green