

FRAUNHOFER TWIN TRANSITION SERIES – IMPULSE

»(Re-)Powering the transformation: the digitalization of the energy system«

In a nutshell:

- Digital transformation of the energy sector is key to leverage sustainability and efficiency potentials
- Adequate and comprehensive standards will shape the digital energy sector and spur the development of a European Data Space
- A Common European Data Space will serve a reliable and resilient footing of data sharing infrastructures
- Political support is needed to deploy market-ready solutions

The European energy sector is at a crossroads. Europe's path to climate neutrality and the decreased availability of fossil fuels due to the Russian war in Ukraine drive the decarbonization of the energy sector. The future European energy supply will see a more diversified mix, where renewable energy sources balance out the share of fossil fuels. Simultaneously to the energy sources, the demands to the energy grid will undergo a major shift. New challenges like the increasing decentralization of power generation, or higher fluctuation in the energy grid will put the energy system to the test, as highlighted by Prof. Reinhard Mackensen from the Fraunhofer Institute for Energy Economics and Energy System Technology IEE. He pointed out that the transition to a green, efficient and resilient energy sector can only succeed when combined with the digitalization of the energy system.

In this edition of our Twin Transition webinar series, researchers from three Fraunhofer Institutes (Fraunhofer Institute for Energy Economics and Energy System Technology IEE, the Fraunhofer Institute for Applied Information Technology FIT and the Advanced System Technology branch AST of Fraunhofer Institute of Optronics, System Technologies and Image Exploitation IOSB) presented how digital solutions enable the creation of an energy sector fit for the future. The event outlined state of the art research and technologies and emphasized the need for political support to drive the transition.

»The energy transition is only possible with a digital backbone and binding standards. «

Dr. Markus Pieper, Member of the European Parliament

As a Europe-wide approach to digitalization is missing right now, MEP Markus Pieper highlighted the EU's needs and potential in this area. Currently, a plethora of national solutions are developed, but incentives for grid operators to facilitate innovative solutions for insulation and grids are lacking as well as standards for interoperability are missing. As rapporteur for the Revision of the Renewable Energy Directive III, Markus Pieper underlined that the EU is on a good path, singling out the innovation quotas as an example. However, he also noted that further developments in research and innovation are essential to deploy solutions from the lab to the real market.

A recently published study by the Fraunhofer Cluster of Excellence Integrated Energy Systems (CINES) served as a starting point for the subsequent discussion in the webinar. The study put forward 14 recommendations for action, highlighting the potential of a more far-reaching digitalization of the energy sector. The recommendations range from the call for political support for digital business models and standardization efforts to infrastructural adaptations, such as a stronger coupling within urban quarters or the broad implementation of smart meters in the energy system of the future.

Drawing on the Fraunhofer projects [OneNet](#) and [ENERSHARE](#) our experts presented their contribution for the expected Action plan on the digitalization of the energy sector by the European Commission. The Fraunhofer institutes conduct research in the areas of energy system transformation, interoperability in data spaces, and interconnected grids.

European Energy Data Space

Prof. Antonello Monti and Oliver Warweg expressed the need for a European Energy Data Space, as outlined in the plans of the EU Commission to implement the Common Data Space by 2024. The data space will be a central building block for a data sharing infrastructure to benefit grid operators and boost transparency. With a common European data space new business models will be facilitated, efficiency gains fostered and energy saving goals promoted.

»With Data Spaces users get control over the data. Data Spaces regulate how users interact with each other, what and how they are sharing data«

Oliver Warweg, Fraunhofer IOSB-AST

Empowering citizens

Digital applications in the energy sector entail a large quantity of data. Made available for citizens, this data increases the transparency for customers and demonstrates how switching energy supplies to renewable sources decreases the carbon footprint, or how reduced energy consumption decreases energy costs. The Fraunhofer IOSB has demonstrated the feasibility of a decentralized energy management system for an urban quarter. To fully leverage such efficiency potentials, the far reaching and timely deployment of the market-ready technologies is essential.

Uptake of digital technologies

Standards and interoperability are principles relevant for data sharing in general. To conduct valuable data analysis certain standards in quantity and quality of data must be fulfilled, which can be facilitated by international or European standards. With a definition of standards, data can be better shared, and exchanged at pre-defined interfaces facilitated by data spaces. Under the leadership of Fraunhofer FIT and the Fraunhofer Center for Digital Energy, the project OneNet aims at the definition of a common market design for Europe, the definition of a common IT Architecture and IT Interfaces and large-scale demonstrators. Throughout the project scalable solutions are developed to be implemented and showcased.

»Openness is the key because nobody can do this transition alone«

Prof. Dr. Antonello Monti Ph. D., Fraunhofer FIT

Cybersecurity of the energy sector

Further, cybersecurity is key to ensure the operation of a reliable and resilient energy system, even when one of its elements fails. With the digitalization of the energy sector the number of elements in the system increases. When designing the energy system of the future, vulnerabilities should be limited to a minimum. Instead, resilience should be always incorporated in the design of digital technologies.

To tap the full potential of the cutting-edge innovations presented by the Fraunhofer researchers, there are still challenges within research and innovation to overcome. But with political support, the deployment of ready solutions should be feasible, as the transition pathway is outlined clearly.