



Fraunhofer-Gesellschaft

Fraunhofer Twin Transition Series

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

October 6, 2022

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

Fraunhofer Twin Transition Series

09:00 a.m. Moderation by Verena Fennemann

Head of Fraunhofer EU-Office Brussels

Welcome and introduction by Dr. Reinhard Mackensen

Fraunhofer Institute for Energy Economics and Energy System Technology IEE

09:10 a.m. Setting the scene by Markus Pieper

Patron of the webinar; Member of the European Parliament

09:20 a.m. Expert presentation I “Towards an open and scalable approach to distribution grid automation” by Prof. Antonello Monti

Fraunhofer Institute for Applied Information Technology FIT

Expert presentation II “The value of Data Spaces for a decentralized energy system” by Oliver Warweg

Advanced System Technology branch AST of Fraunhofer Institute of Optronics, System Technologies and Image Exploitation IOSB

09:40 a.m. Discussion

10:00 a.m. End of the event

Welcome and introduction



Dr. Reinhard Mackensen

Fraunhofer Institute for Energy Economics and Energy System Technology IEE



The Fraunhofer-Gesellschaft

At a glance

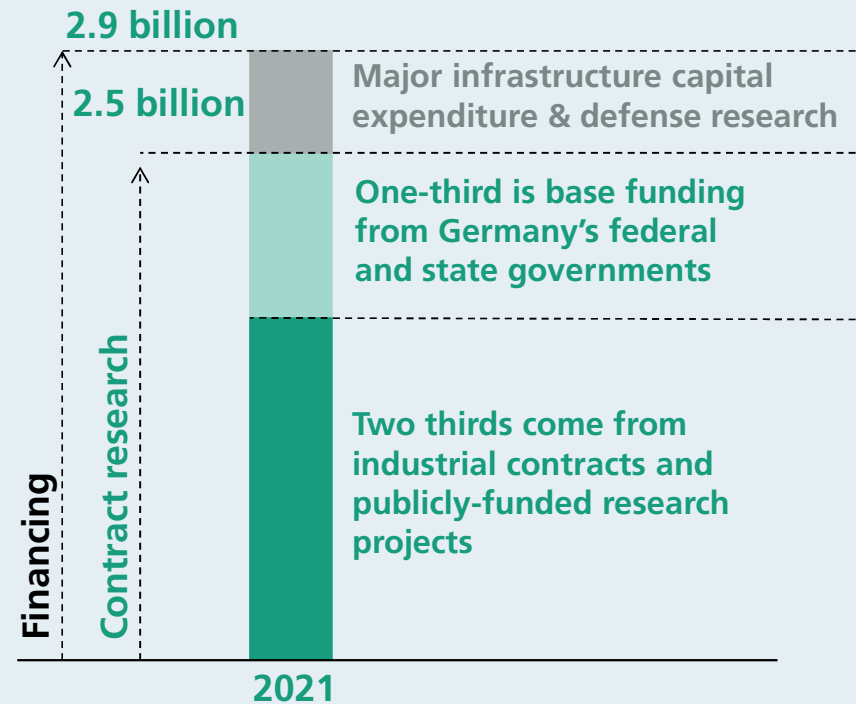
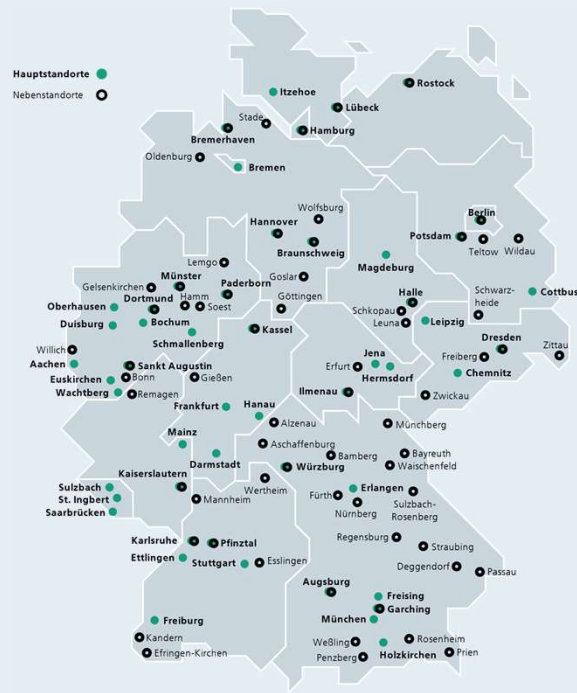
Applied research with a focus on key future-relevant technologies and the commercialization of findings in business and industry. A trailblazer and trendsetter in innovative developments.



> 30,000 employees



76 institutes and research units



CINES - Fraunhofer Cluster of Excellence »Integrated Energy Systems«

Our Mission

Profile

The Cluster of Excellence Integrated Energy Systems CINES addresses the central technological and economic challenges of the energy transition.

<https://www.cines.fraunhofer.de/en.html>



Energy system analysis, global, regional and on-site analysis as compass for energy system transformation.



Technologies for system transformation: electrolysis, power electronics and the transformation of district heating networks.



Transfer to the market via various event formats, (scientific) communication in society.



Development of Fraunhofer-Institute-wide statements and policy papers for policy makers.

Qualification and promotion of young scientists for sustainable energy research.

CINES - Fraunhofer Cluster of Excellence »Integrated Energy Systems«

Fields of action

Energy System Analysis



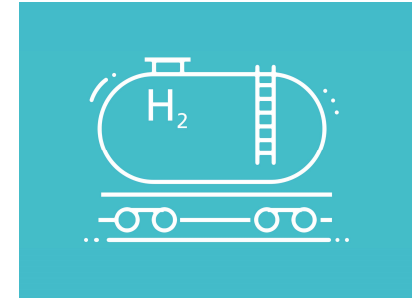
Municipal Energy Planning



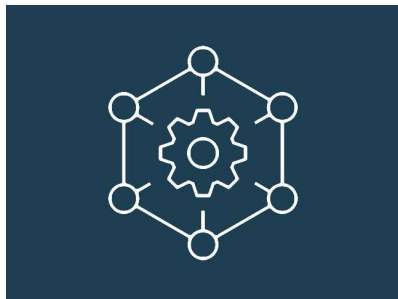
On-Site Supply



Hydrogen MENA



Digitalisation



Heat



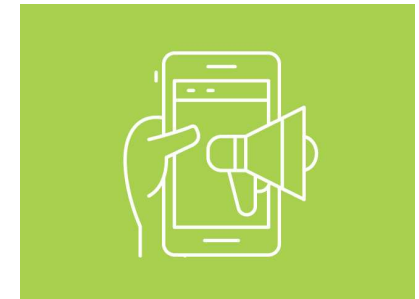
Electrolysis



Power Electronics



Science Communication



Why is digitalization that important for the energy transition?

Complexity requires digital transformation

Challenges to face...

Majority of energy production will be based on renewable, fluctuating sources

Complexity rises - More Assets in production and demand

Lack of reliable mechanisms to match energy production and demand

The cyber-physical energy system needs a strong level of resilience



... and the way forward

The system needs access to flexibilities on the demand side and storage

Aggregation on different levels, implemented over different sectors (power, heat, ...)

Fast data exchange, decisions for planning and operation, interoperability

Communication system has to be built robust in analogy to the energy system (n-1)

Setting the Scene



Markus Pieper

Member of the European Parliament

Towards an open and scalable approach to distribution grid automation

Expert Presentation I

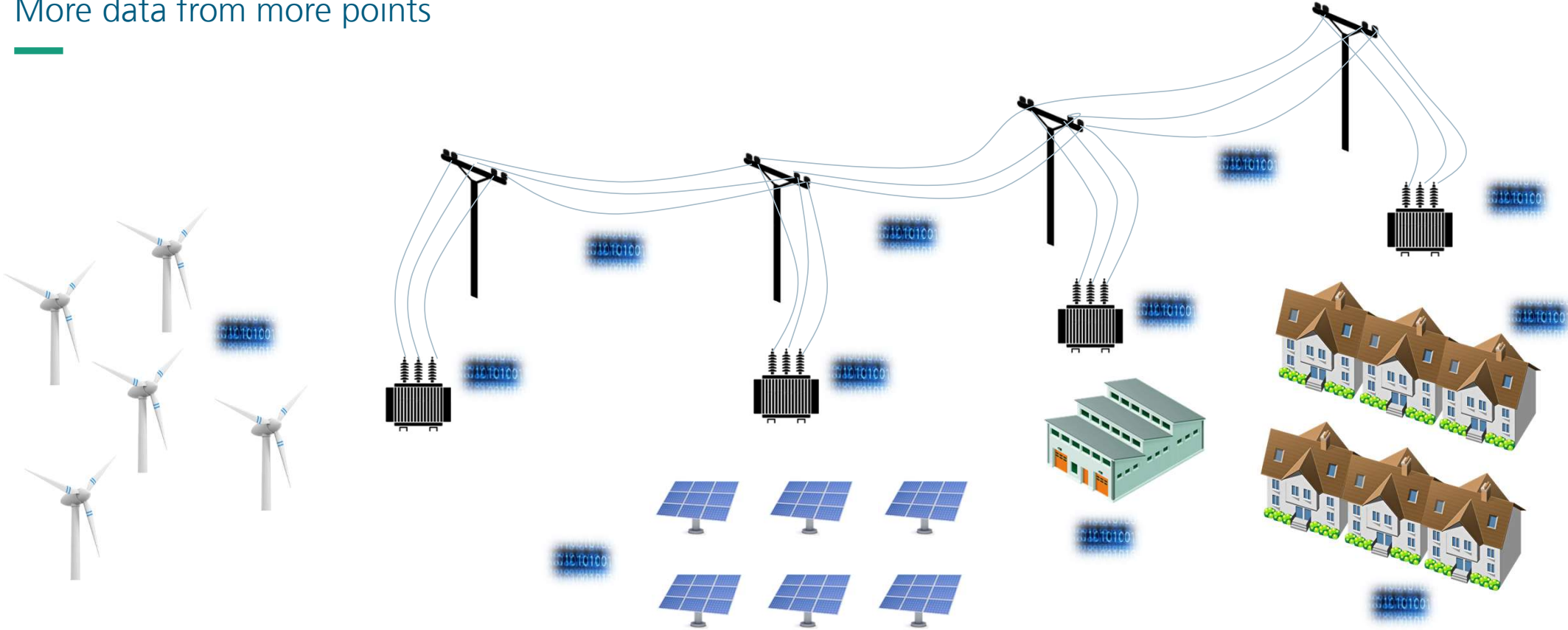


Prof. Antonello Monti

Fraunhofer Institute for Applied Information Technology FIT

The new role of edge and distribution grids

More data from more points



Digitalization of Energy Action Plan

Empowering the transformation in Europe

5 Pillars are defined with the new communication of the European Commission that will open a new era in the digitalization in Europe

- 1 Creating a European Energy Data Space
- 2 Empowering citizens
- 3 Enhancing uptake of digital technologies.
- 4 Enhancing the cybersecurity of the energy sector
- 5 Creating the conditions for green ICT

Building categories for data interfaces

Different categories, different requirements



Developing an overarching strategy

Making the Distribution System Operators (DSOs) digital

Requirements:

- 1) Data approaches must be scalable to support deployment for very large infrastructures
- 2) Solutions must be open and flexible to adapt to time of changes
- 3) Solutions should be modular to support an incremental process of digitalization
- 4) Compatibility with legacy system is mandatory

Challenges:

- 1) There is not a single solution fitting all the requirements
- 2) There is not a digital culture in many of DSOs
- 3) A process of digitalization comes with a growing risk in terms of cybersecurity

A system of systems approach for diverse requirements

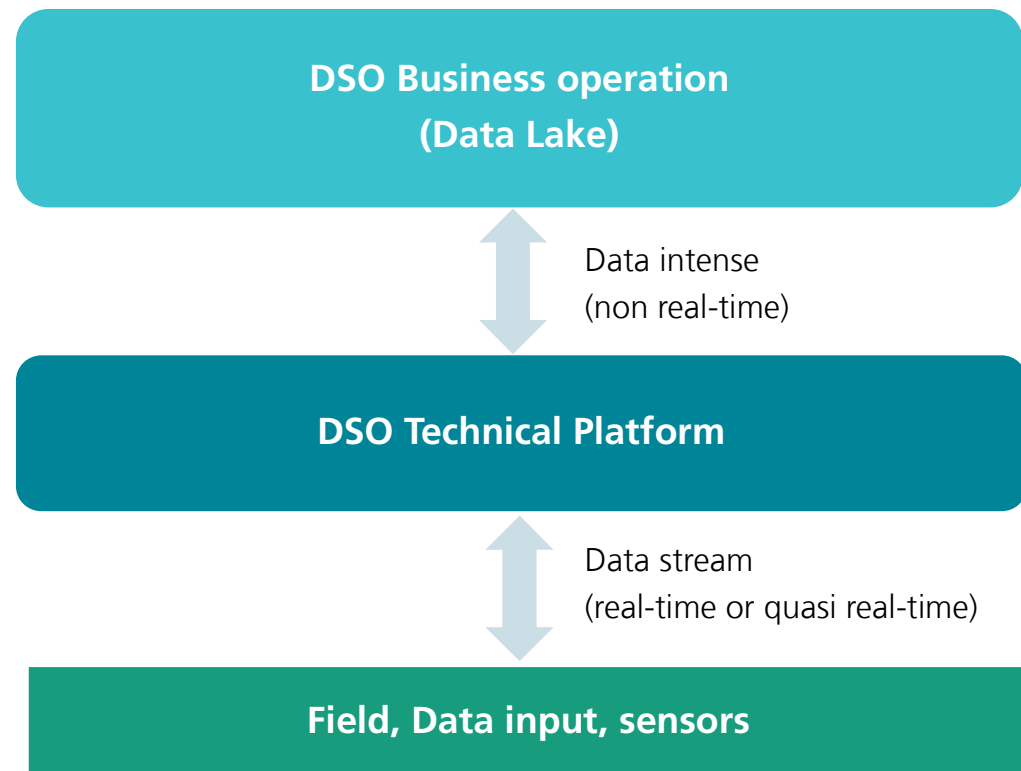
Time and size as driving elements

BUSINESS Operation Layer

- It is more general purpose
- It can be based on wider standard
- It needs to be open (FIWARE)

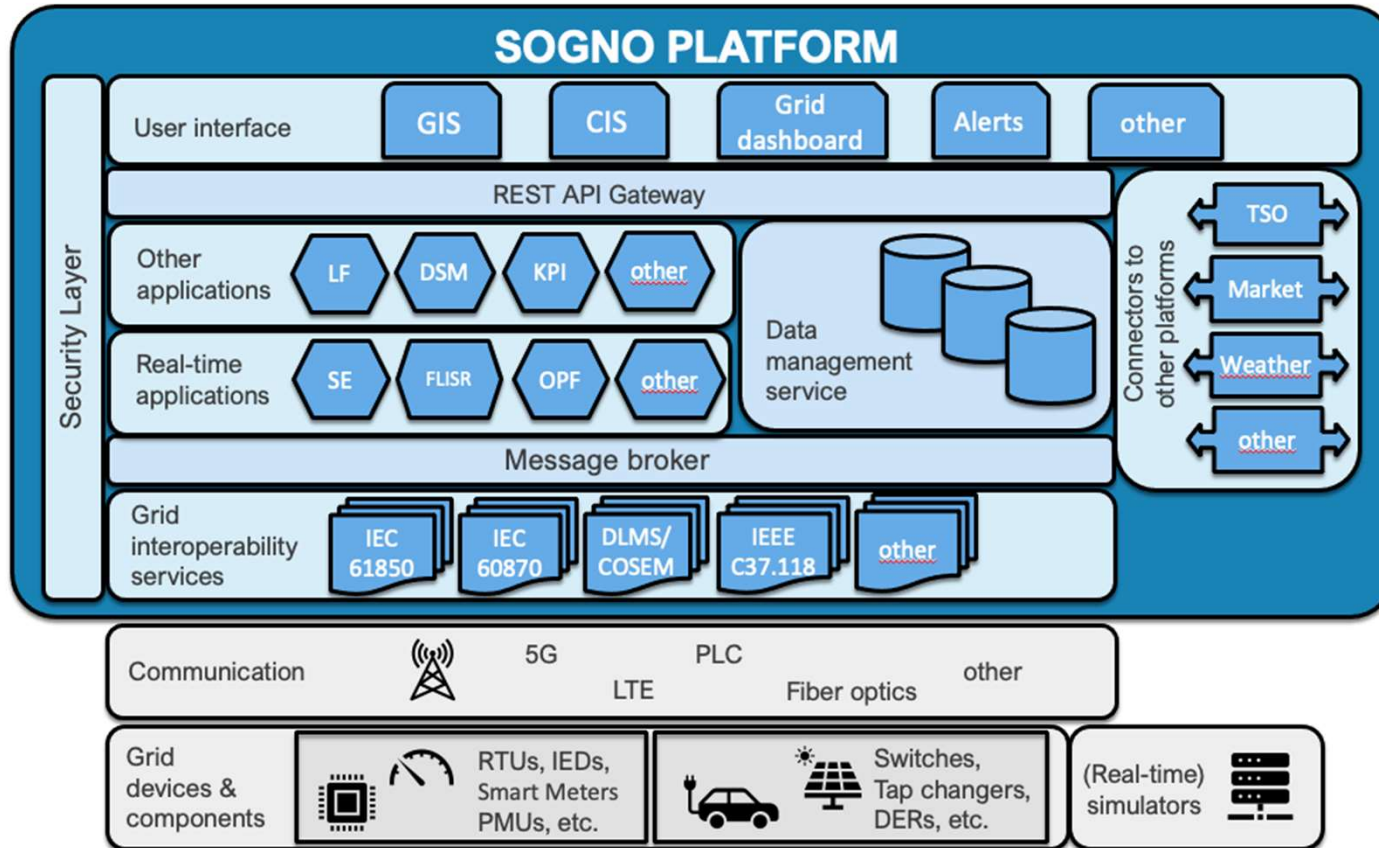
DSO Technical Platform

- It is application specific
- It should be based application specific standard
- It needs to be open (Linux Foundation Energy)
- Interface to legacy system for continue evolution



SOGNO Project in Linux Foundation Energy

A micro-service open source approach to DSO Technical Platform



ARETI and the city of Rome

A real life experience

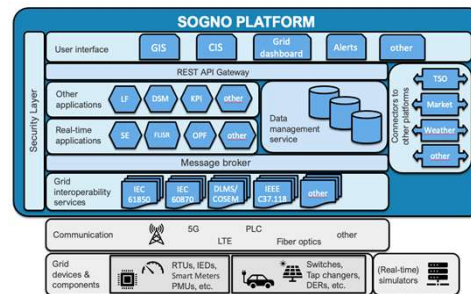


Platone



+

ENEL ENERGY



- First real open-source DMS in Europe
- Customer engagement
- Flexibility market link
- Huge savings in network expansion



Storage System



Light Node

Main conclusions



The value of Data Spaces for a decentralized energy system

Expert Presentation II



Oliver Warweg

Advanced System Technology branch AST of Fraunhofer
Institute of Optronics, System Technologies and Image
Exploitation IOSB

What is a Data Space?

From Cloud to Data Spaces

Concentrated Proprietary Opaque



Users LET Control

Distributed Open Transparent



Users GET Control

Trust & Sovereignty



Source: GAIA-X

GAIA-X Reference Model

Connecting Data & Infrastructures Ecosystems



Advanced Smart Services
(Cross-) Sector Innovations/ Market places/ Applications



Data Spaces
Interoperable & portable (Cross-) Sector data-sets and services



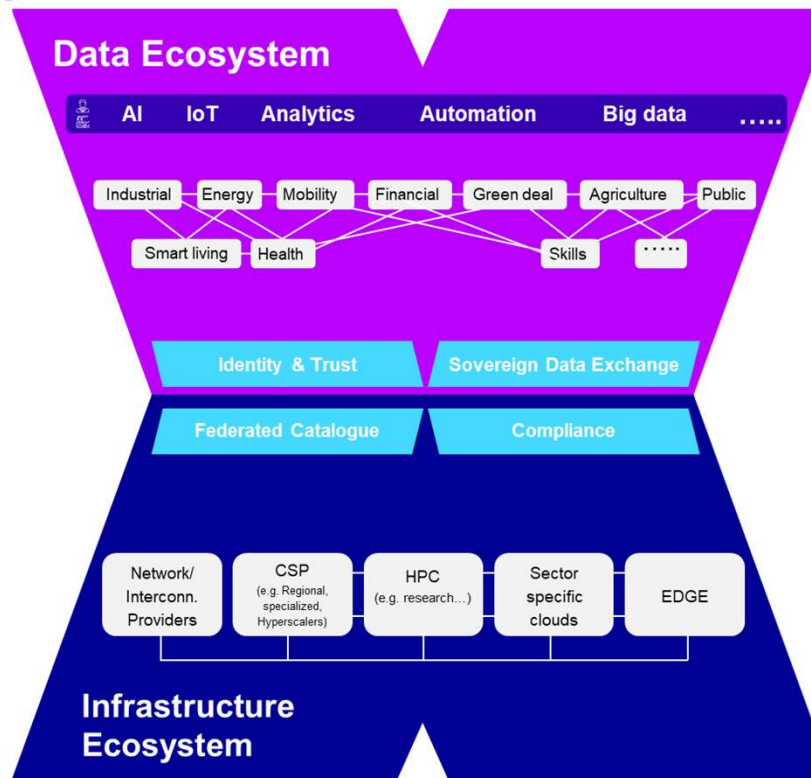
Gaia-X Federation Services
Federated & distributed for interoperability, Trust & Sovereignty services



Portability, Interoperability & interconnectivity
Technical: Architecture of Standards
Commercial: Policies



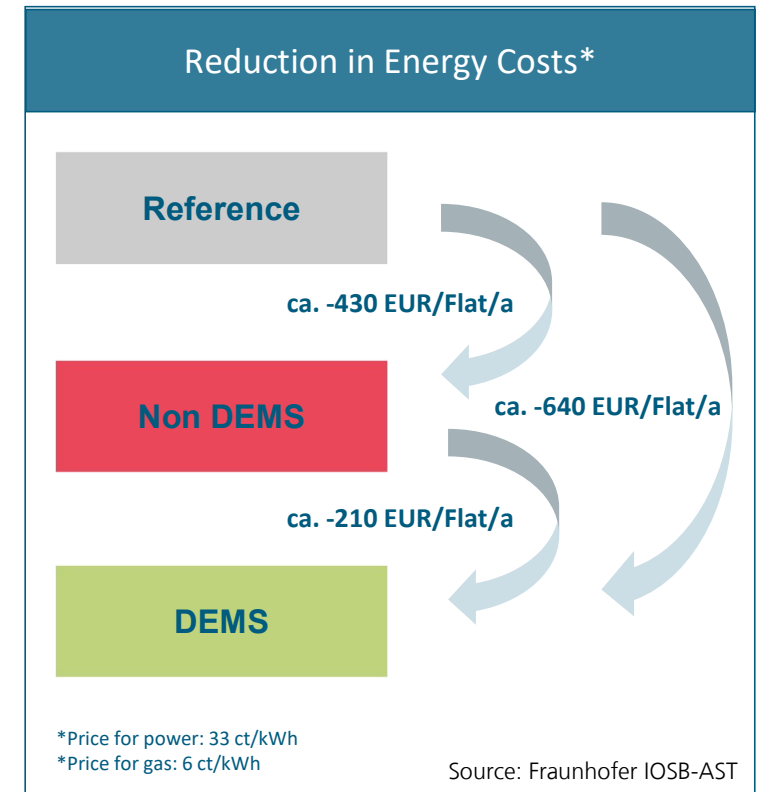
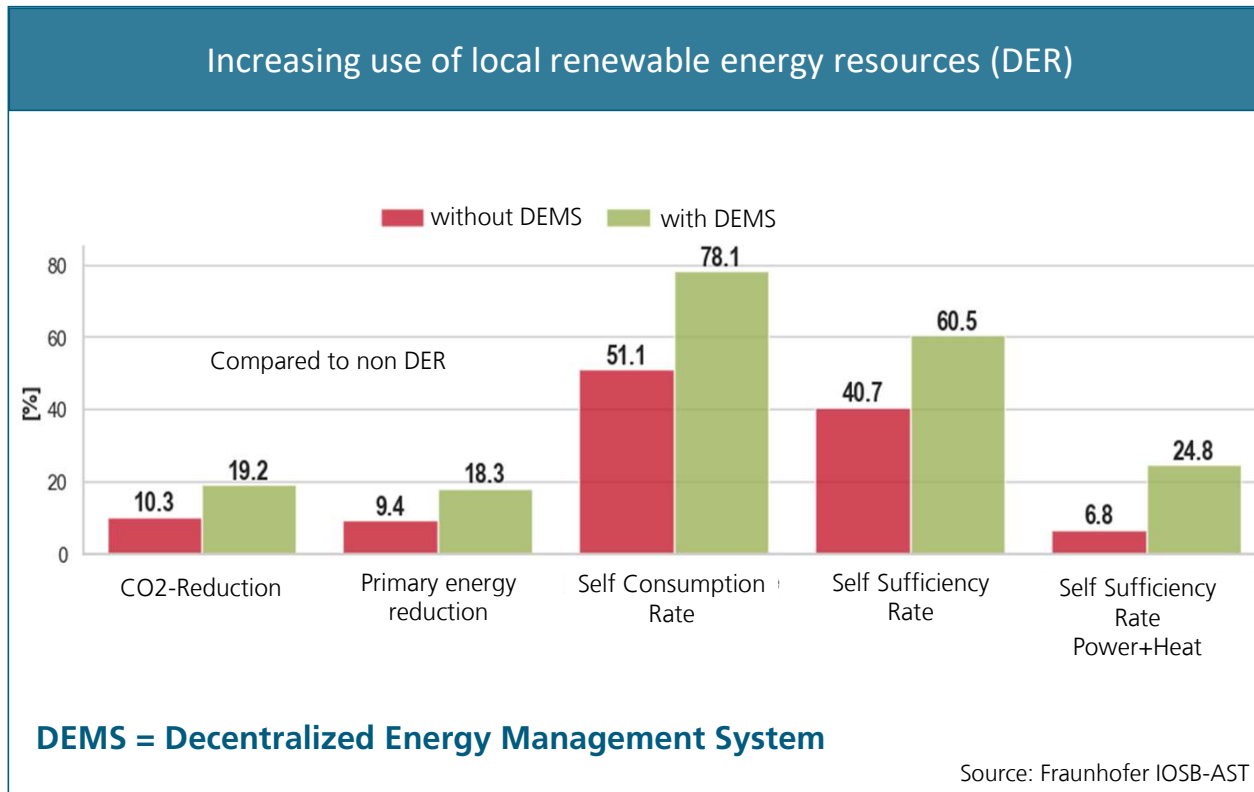
Compliance
Legal: Regulations



Source: GAIA-X

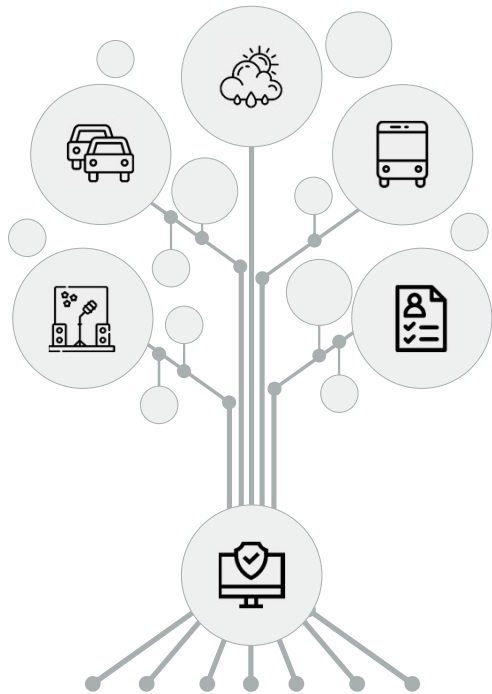
Value of decentralized energy management system

Example: Energy Management within an urban quarter

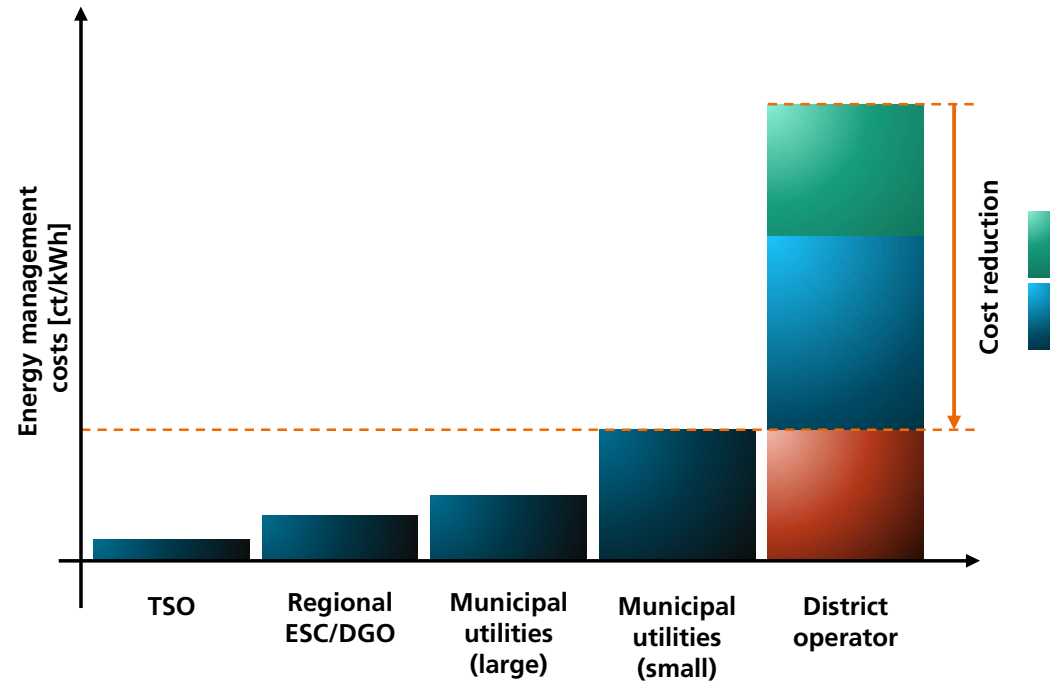


Challenges for the DEMS

The Value Proposition of Data Spaces



Provide a secure and trusted way to exchange data between different stake holders



Provide interoperability and advanced smart services to reduce costs

Source: Fraunhofer IOSB-AST

Building the Data Space

Next Steps



**European Common Energy Data
Space Framework Enabling Data
Sharing-Driven Across- and
Beyond- Energy Services**

Discussion



Verena Fennemann

Head of Fraunhofer EU Office

Pose your questions either directly to the speakers or write them in the chat – we will then ask the question for you!

Contact information



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For more information on the Fraunhofer Twin Transition Series:
<https://s.fhg.de/TwinTransition>