

Highlight of Challenges in Achieving an Efficient Implementation of the Future Low-Carbon Society



Henrik Madsen

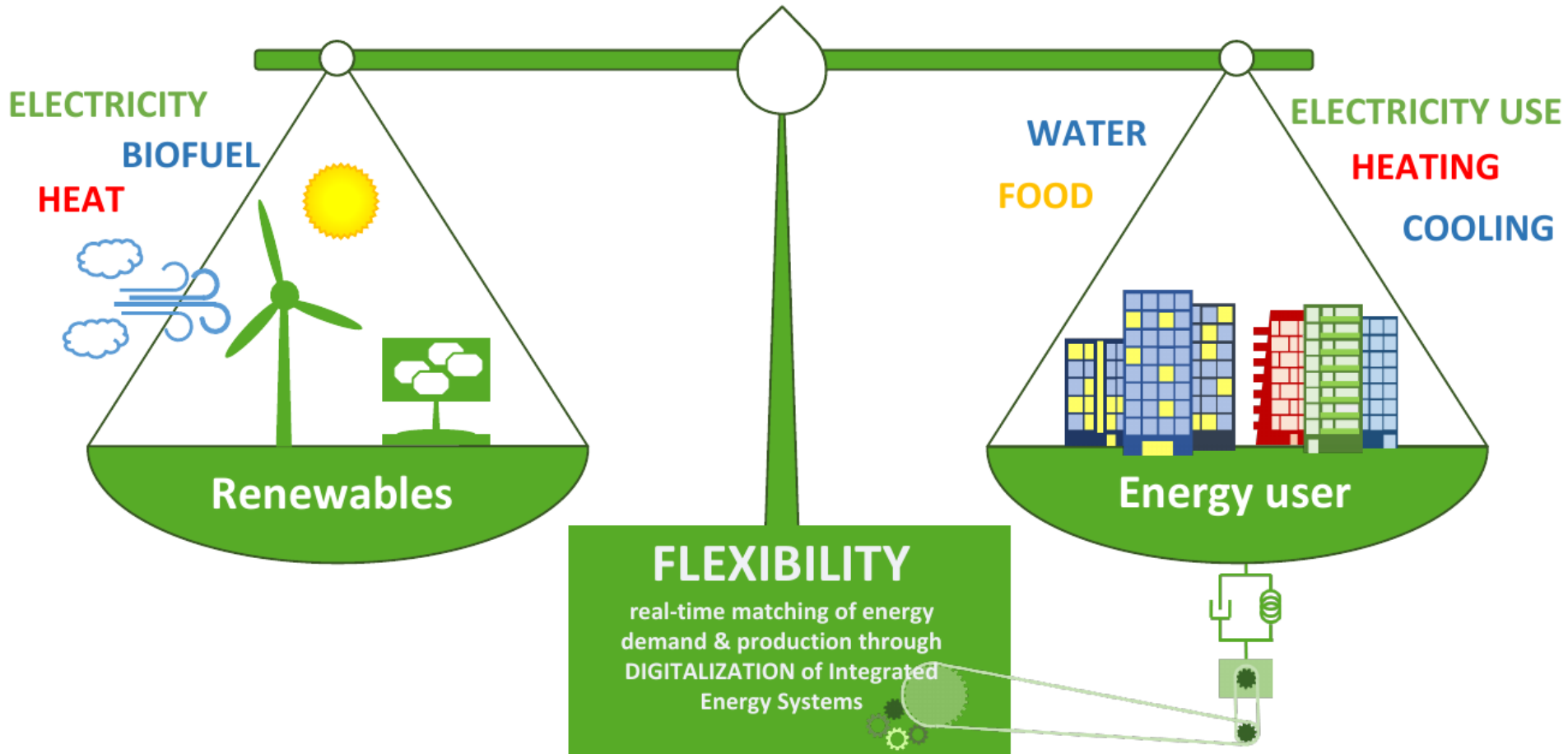
Applied Mathematics and Scientific Computing (DTU)

<https://www.flexibleenergydenmark.dk/>

<https://www.smart-cities-centre.org>

<http://www.henrikmadsen.org>

The Challenge: Denmark Fossil Free 2050

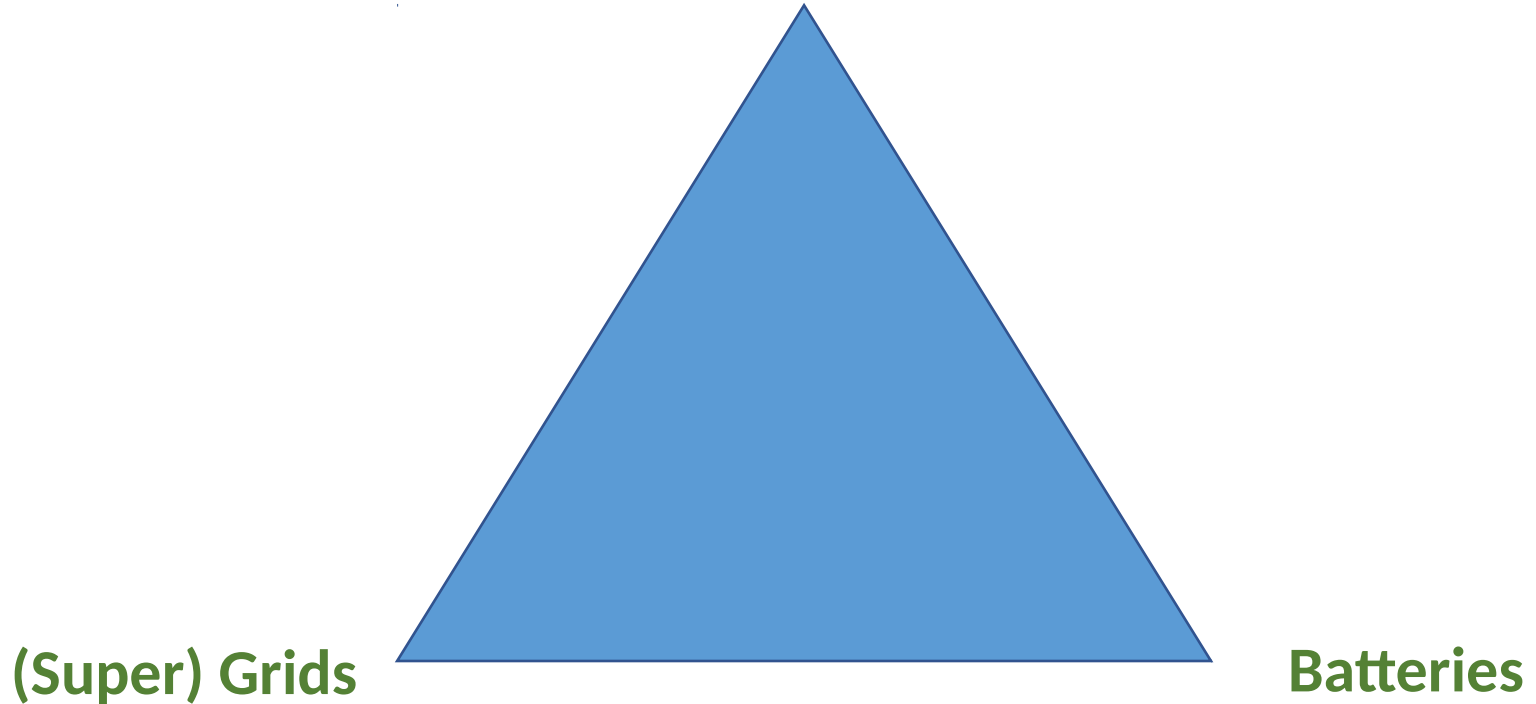


Data-Intelligent and Flexible Energy Systems



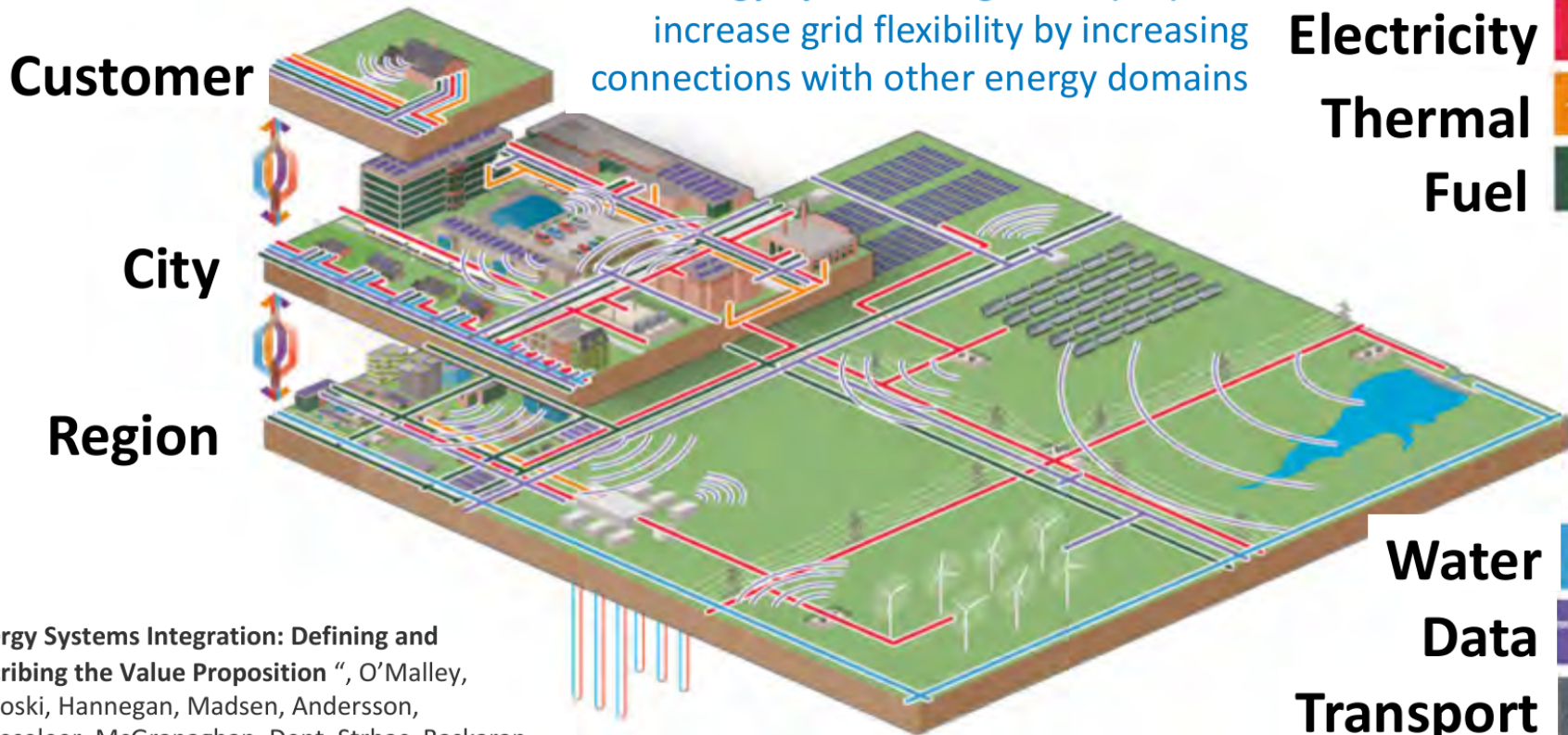
Space of Solutions




Flexibility (enabled by AI, Energy Systems Integration and IoT)



Energy Systems Integration

Energy System Integration (ESI) can increase grid flexibility by increasing connections with other energy domains

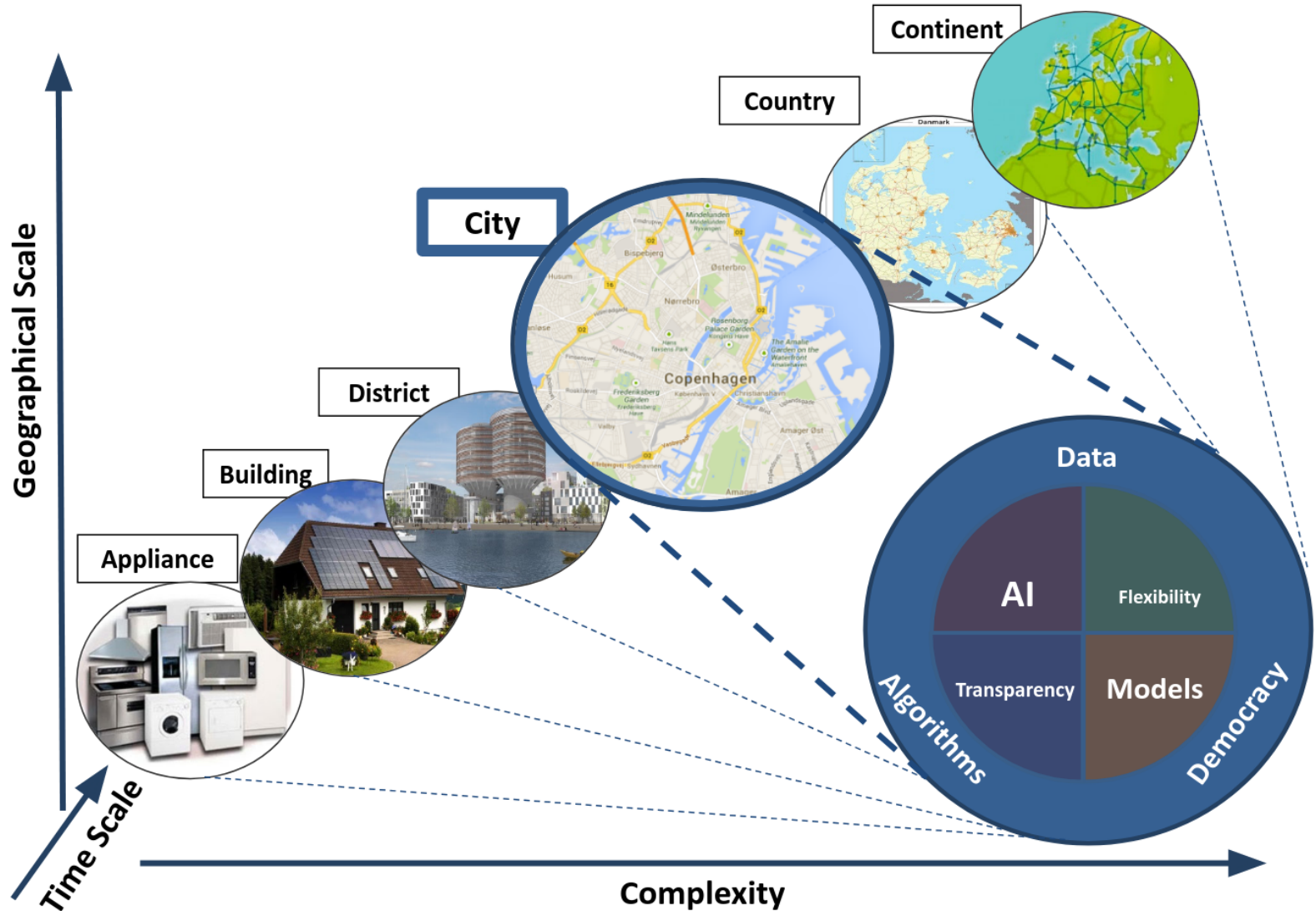


- Electricity 
- Thermal 
- Fuel 

- Water 
- Data 
- Transport 

“Energy Systems Integration: Defining and Describing the Value Proposition”, O’Malley, Kroposki, Hannegan, Madsen, Andersson, D’haeseleer, McGranaghan, Dent, Strbac, Baskaran, Rinker., NREL/TP-5D00-66616. June 2016

Temporal and Spatial Scales



Center Denmark

Digitalization Hub for Accelerating the Green Transition



CENTER
DENMARK



Connect networks and data
for a green world

Danmarks nationale Center

Fremme den grønne omstilling.
Samle og bygge bro, mellem
forskning, teknologi, natur og formidling,
på tværs af interesseorganisationer,
virksomheder, skoler og
universiteter.

Trusted Data Sharing Platform

Data Exchange Facilities Market provide neutral (infrastructure and rules) mechanisms in the background for controlled, trusted and secure data transactions.

Participants accepting the market rules benefit from the exchange mechanisms and shape together an open market for data.



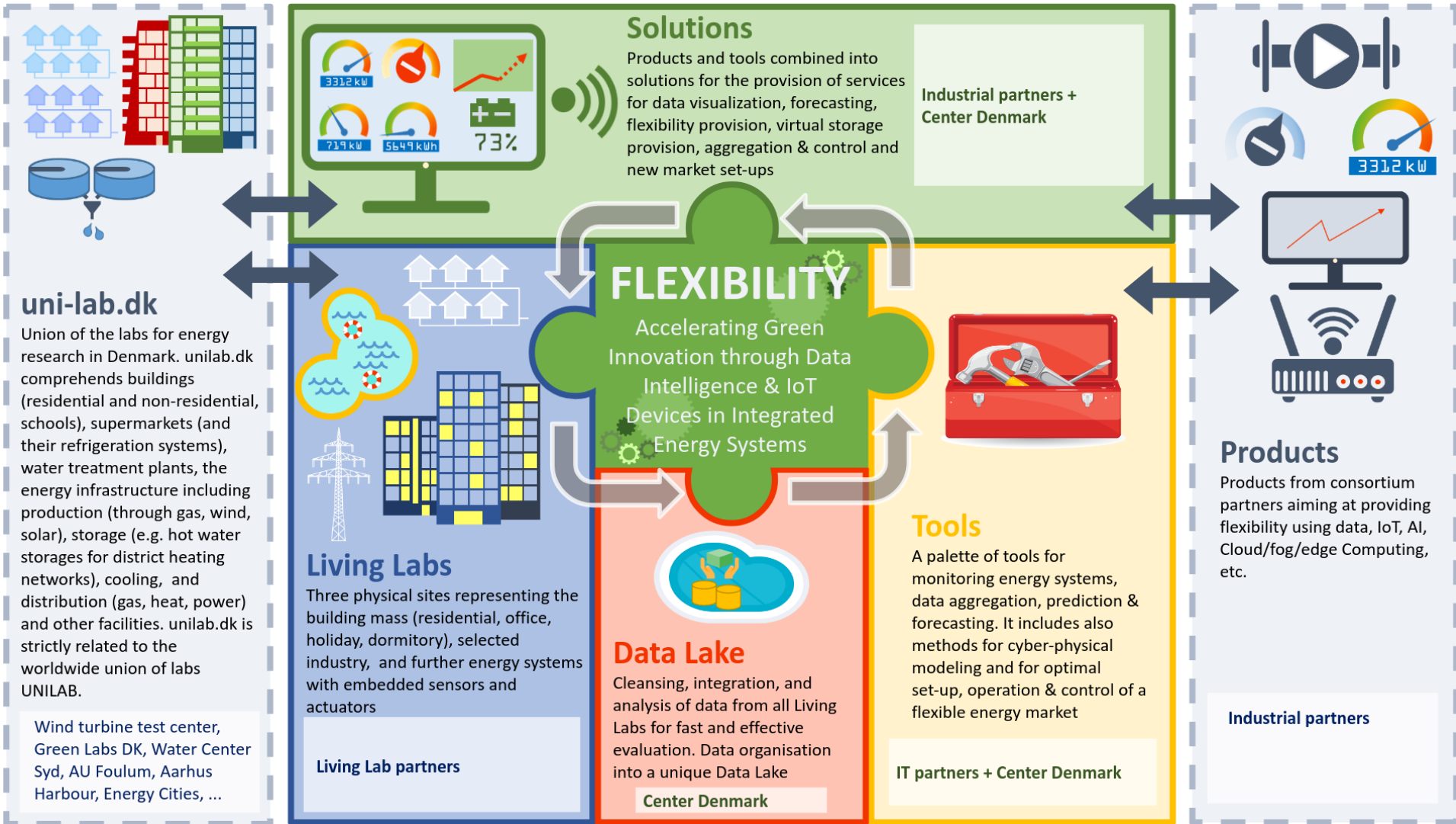
This is how we work together

Center Denmark - Control Room

Spatial-Temporal thinking



Business Ecosystem

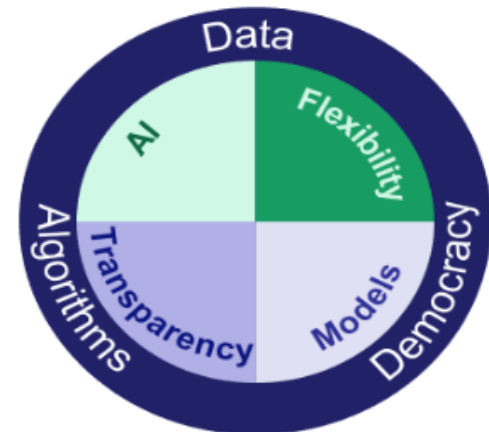


Summary

- The future weather-driven energy system calls for disruptions. We need a **deep digitalisation** (AI, IoT, Cloud/Fog/Edge Computing, etc.)
- We need **transparent, safe and democratic** solutions
- We need **data hubs** for energy related streaming data (like Center Denmark)
- We need a **Business Ecosystem** with **Living Labs**
- We appreciate the regular joint meetings we have with DG CNECT and DG ENER

(Rolf Riemenschneider, ... +

Mark van Stiphout, ...)



Wind Power Forecasting

Operated by DTU spin-out (ENFOR a/s)

