DG Connect & DECISION Workshop
Edge Computing – Energy Management & Smart Grids

Use of Smart Meter Data for Smart Grid Solutions

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(IFD projects: Flexible Energy Denmark + Cool Data + RePUP)
(EU/BRIDGE projects: ELEXIA + ARV + ebalanceplus + CitCom.ai)

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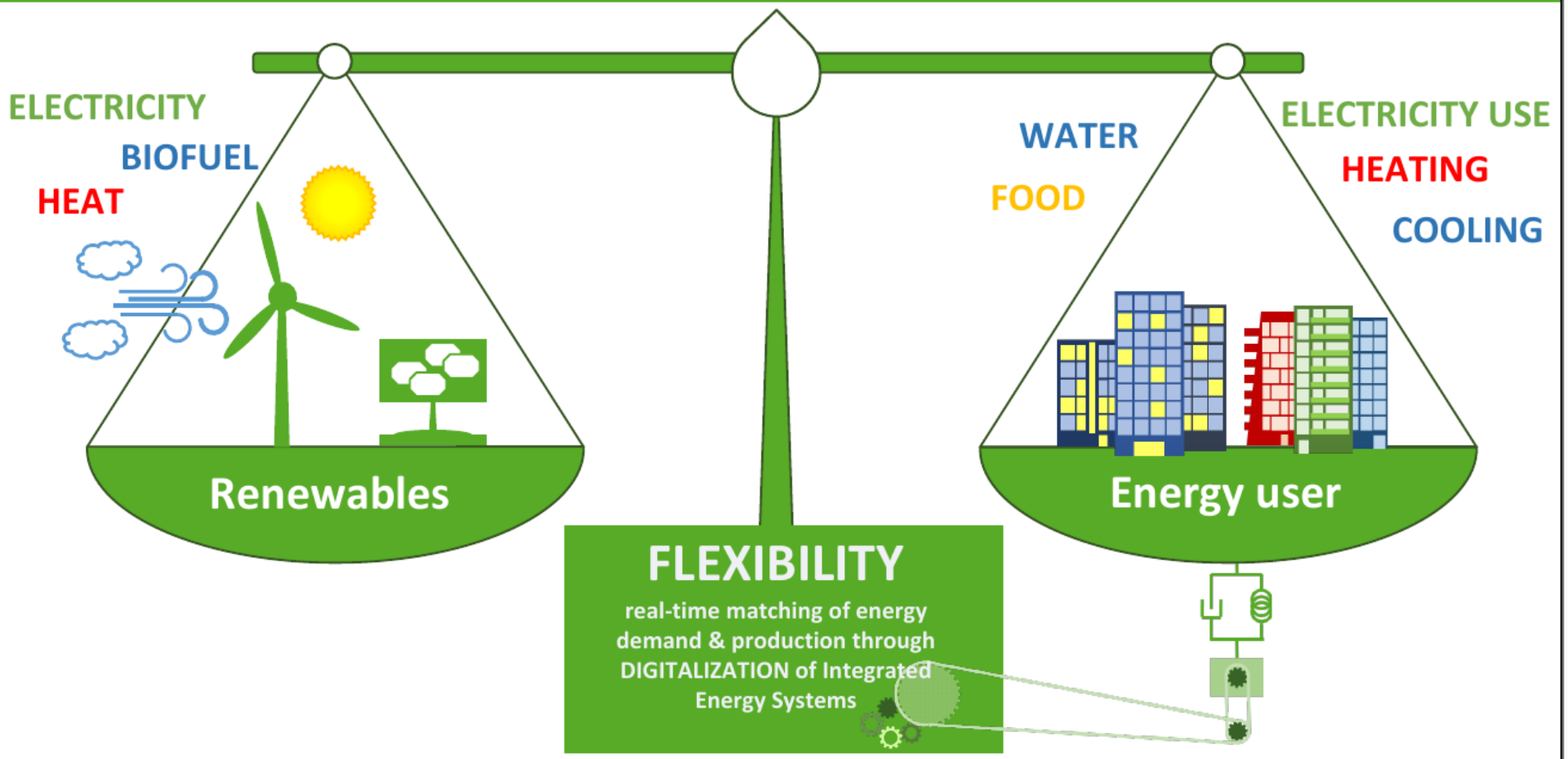
This initiative is funded by

The Challenge: Denmark Fossil Free 2050



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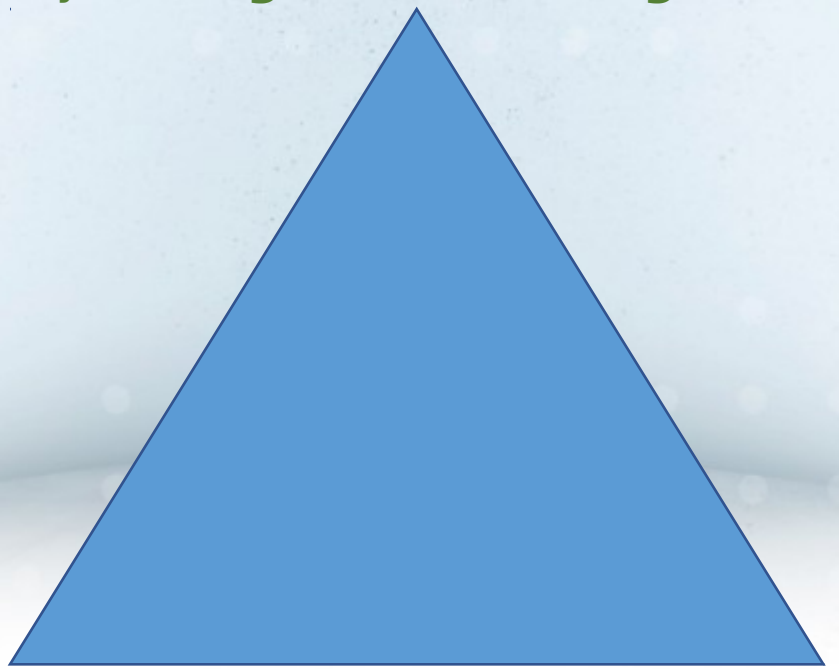
Space of Solutions

Flexibility

(enabled by **AI, Digital Twins, Edge Comp., IoT**)



Grids **Batteries**

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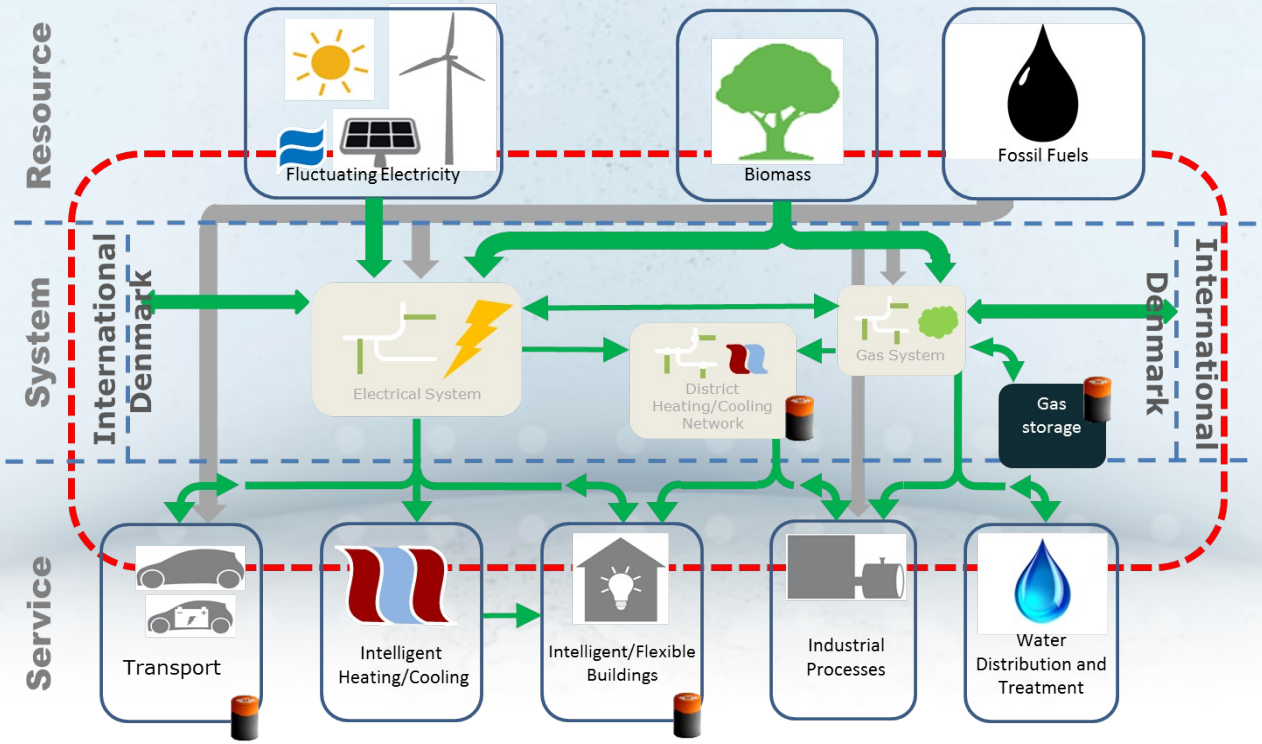
Data-driven Digital Twins for Real Time Applications

Grey-box models are simplified Digital Twin models facilitating system integration and use of sensor data in real-time



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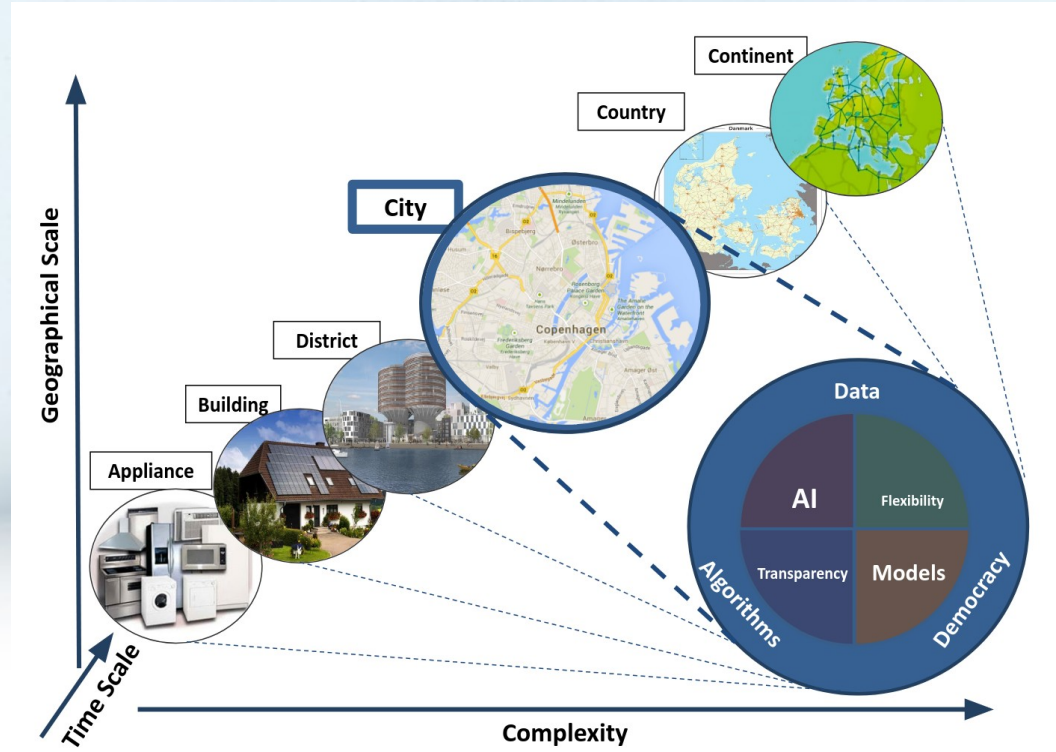
Temporal and Spatial Coherency

A so-called ***Smart-Energy Operating-System (SE-OS)*** is developed in order to develop, implement and test solutions (layers: data, models, optimization, control, communication) for ***operating flexible electrical energy systems*** at **all scales**.



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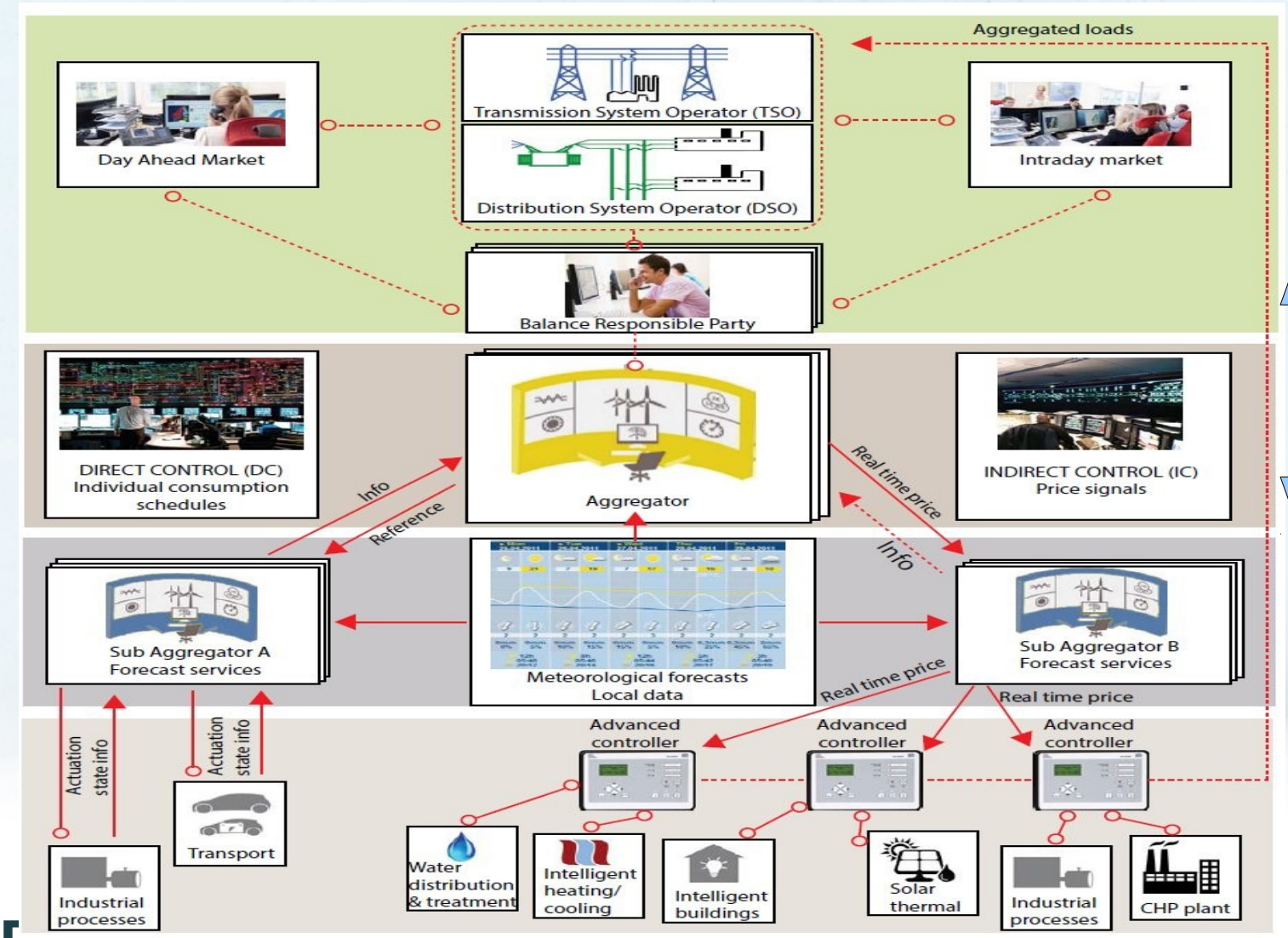
Smart-Energy OS

The Transformative Power of Digitalization and Decentralization



(**Static**)

Conventional Markets

Linking Markets to Physics using MIMs

(Flexibility Functions)

(**Dynamic**)

Local Flexibility Markets

(Hierarchy of controllers)

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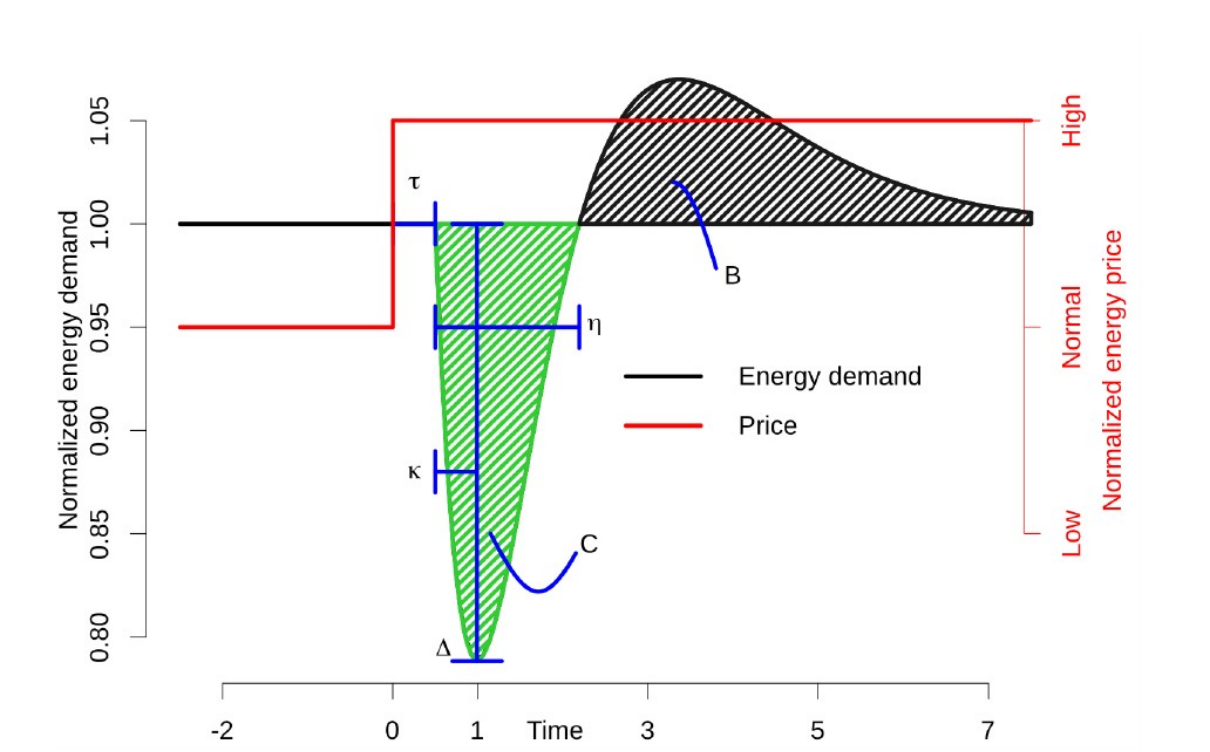
Flexibility Function

The ***Flexibility Function (FF)*** is a **MIMs for energy systems** used to characterize flexibility using **Edge AI** and providing **an interface between local and high-level markets**.



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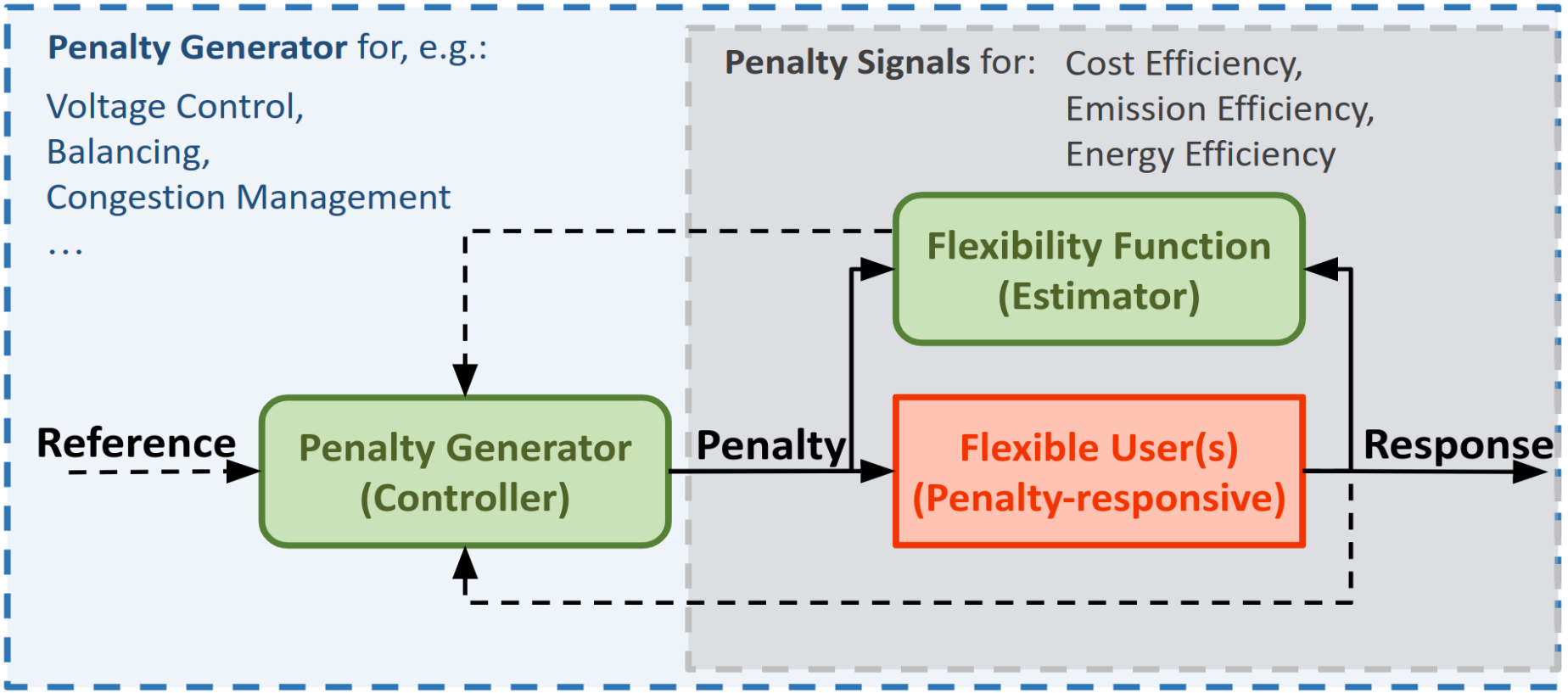
Flexible Users and Penalty Signals



Case Study

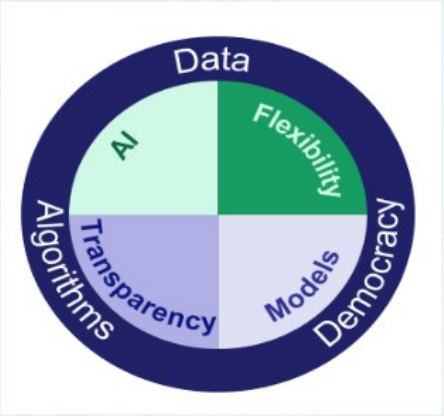
Summerhouses with a pool

Center Denmark: Cloud <-> Edge Spatial-Temporal Thinking Control Room and Data Space

Center Denmark aims at facilitating a trusted data space which put priorities in cyber security and in empowering the partners such that they are able to provide Digitalized and Efficient Solutions for People and Industry without being subject to disproportionate technical requirements, administrative requirements, procedures and charges

Summary

- An efficient implementation of the **future weather-driven** energy system calls for **data-driven Smart Energy Systems – meter data essential**
- We need **digitalisation and IoT solutions for activating flexibility everywhere**
- We need a **hierarchy of Data-Driven Digital Twins**
- **Minimum Interoperability Mechanisms (MIMs) are building blocks** for sector coupling and for implementing IoT solutions with a focus on optimal **Edge – Fog – Cloud computing**
- The **Flexibility Function** is one of the **important MIMs** for linking high-level conventional **markets** with the low-level **physics**
- **Security, GDPR and Privacy by Design**
- We need **transparent**, **safe, fair** and **democratic** solutions
- We have proposed to use **distributed (edge-fog-cloud) control-based methods for activating local flexibility (Smart-Energy OS)**
- **Savings:** Wastewater treatment 40 – 50 pct; Summer houses: 20 – 30 pct



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Thank you !

Connect – Share – Innovate

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