



Visa Simola

GLocalFlex webinar: Flexible Local Energy Systems

28th September 2023

Flexibility need in the power system – and solutions to unlock the flexibility

FINGRID

Power system challenges in the Nordics

Large amount of renewable generation

- Adequacy of grid (location of generation vs. load)
- Adequacy of generation capacity during long, cold periods
- Balance management

Large share of converter connected generation and load

- Lack of inertia
- New stability challenges

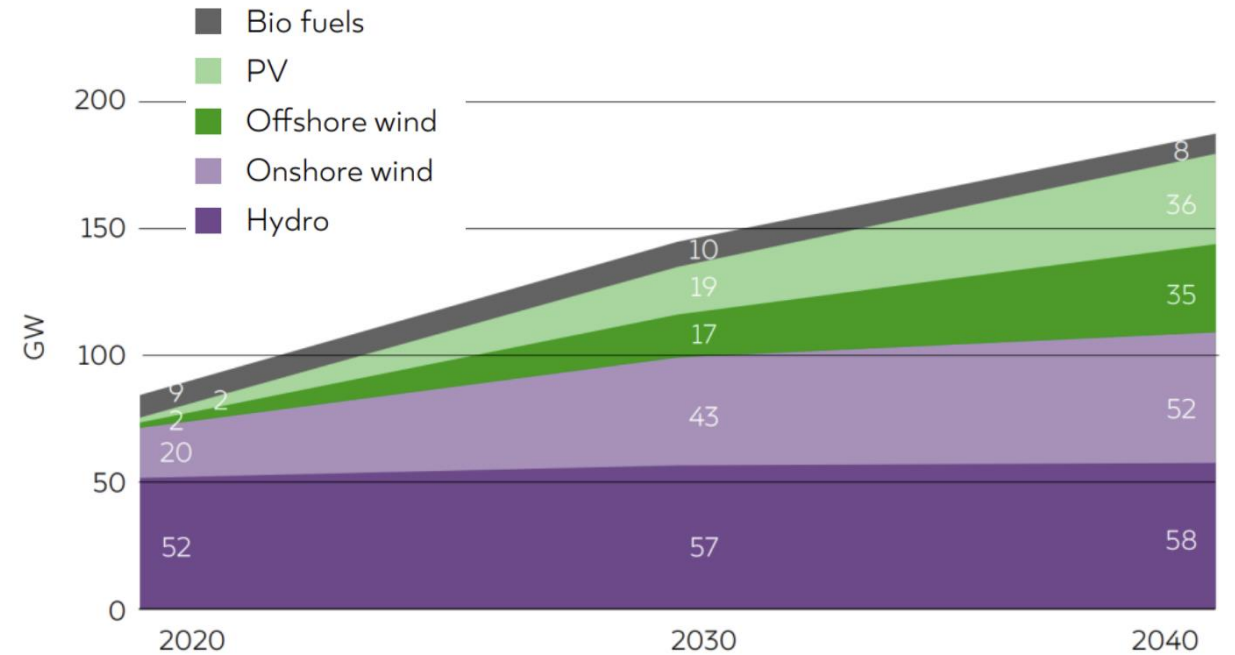
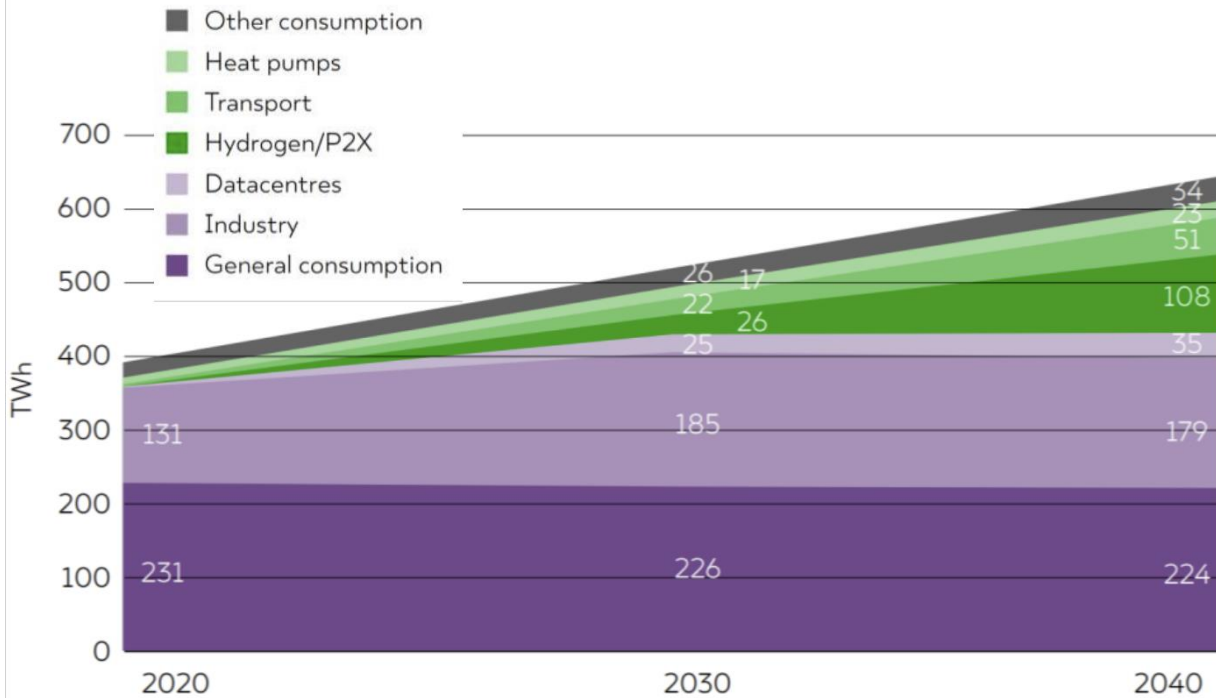
New types of load and generation connected to the distribution grid

- New tools for congestion management needed

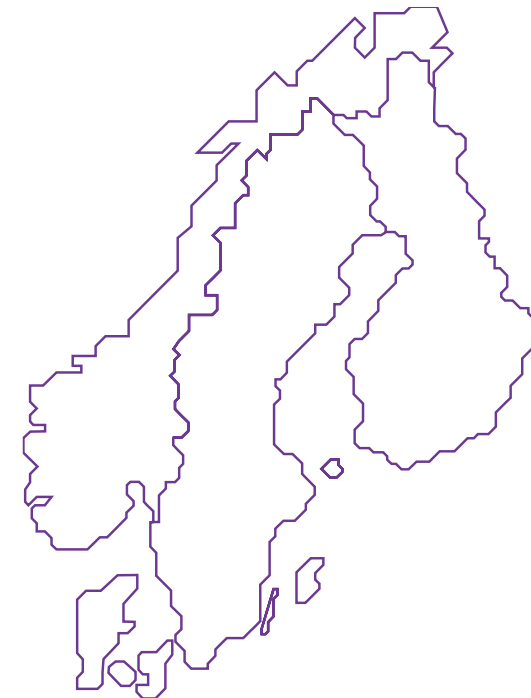
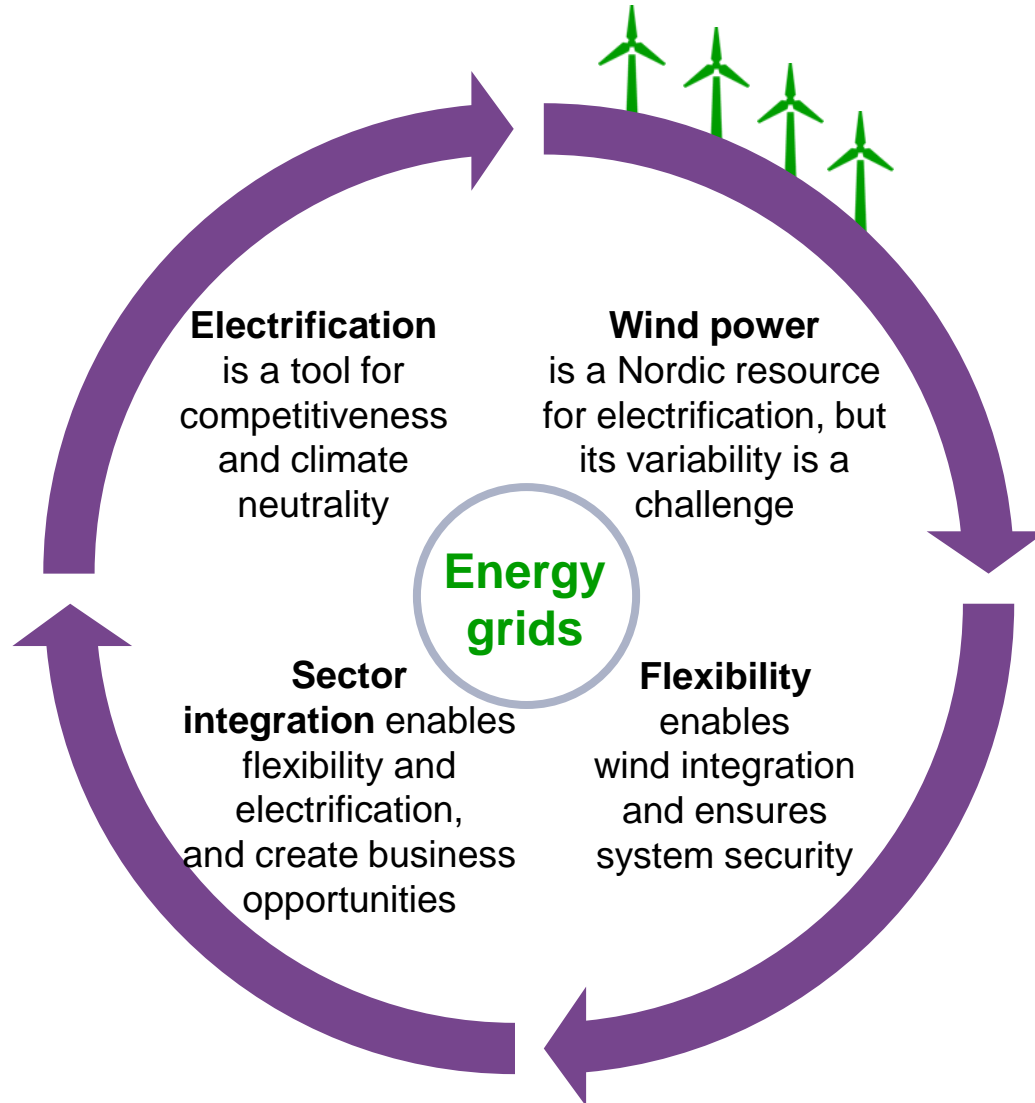
Climate Neutral Nordics

Nordic yearly electricity consumption grows from the current 400 TWh to 530 TWh (33%) by 2030 and 655 TWh (65%) by 2040.

Nordic renewable energy sources capacity increases from the current 85 GW to 145 GW (70 %) by 2030 and 189 GW (122 %) by 2040.



Technological
Development

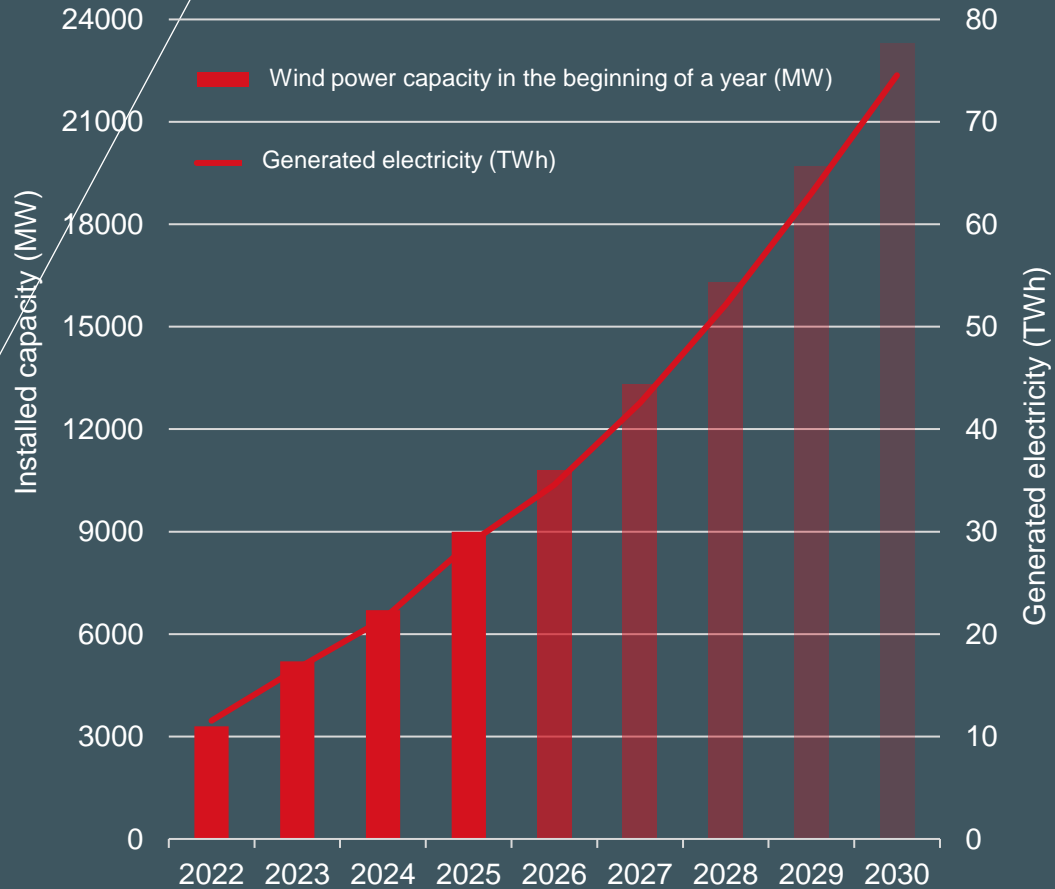


Towards climate goals

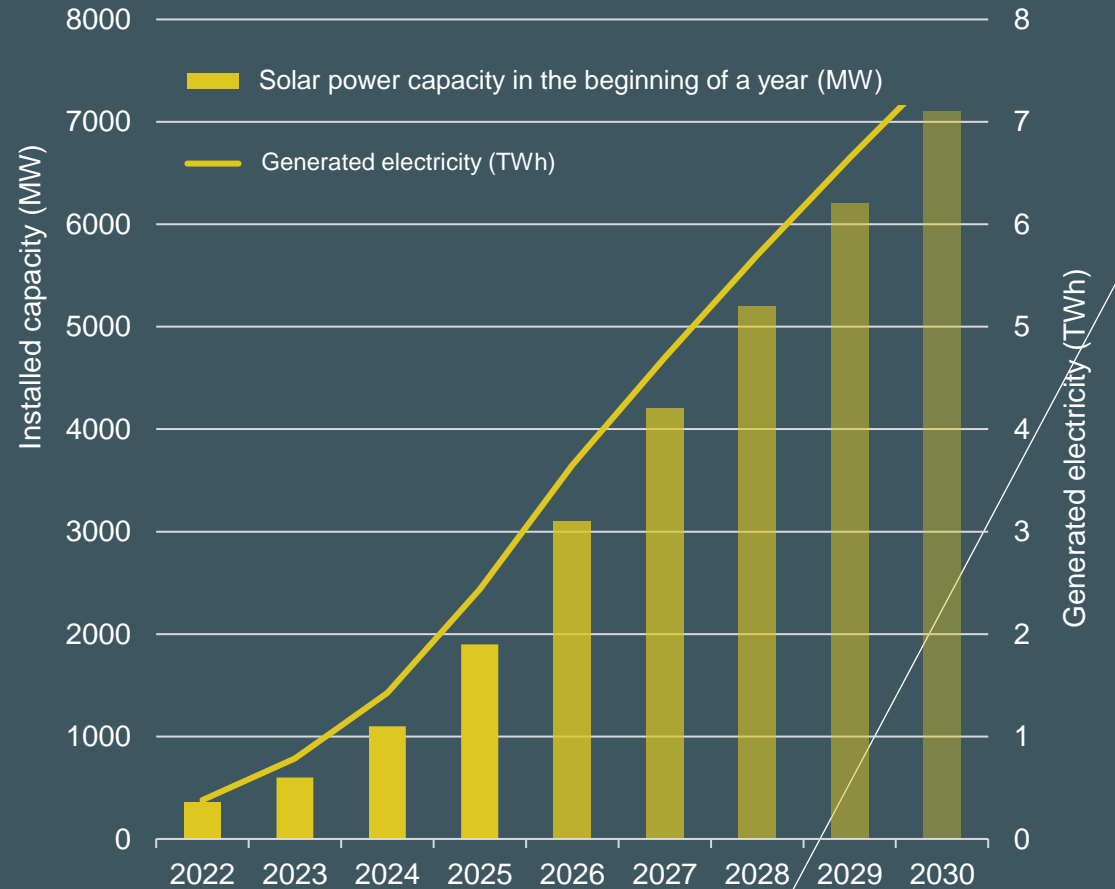


The growth of renewables is accelerating in Finland

Estimate of wind power capacity



Estimate of solar power capacity

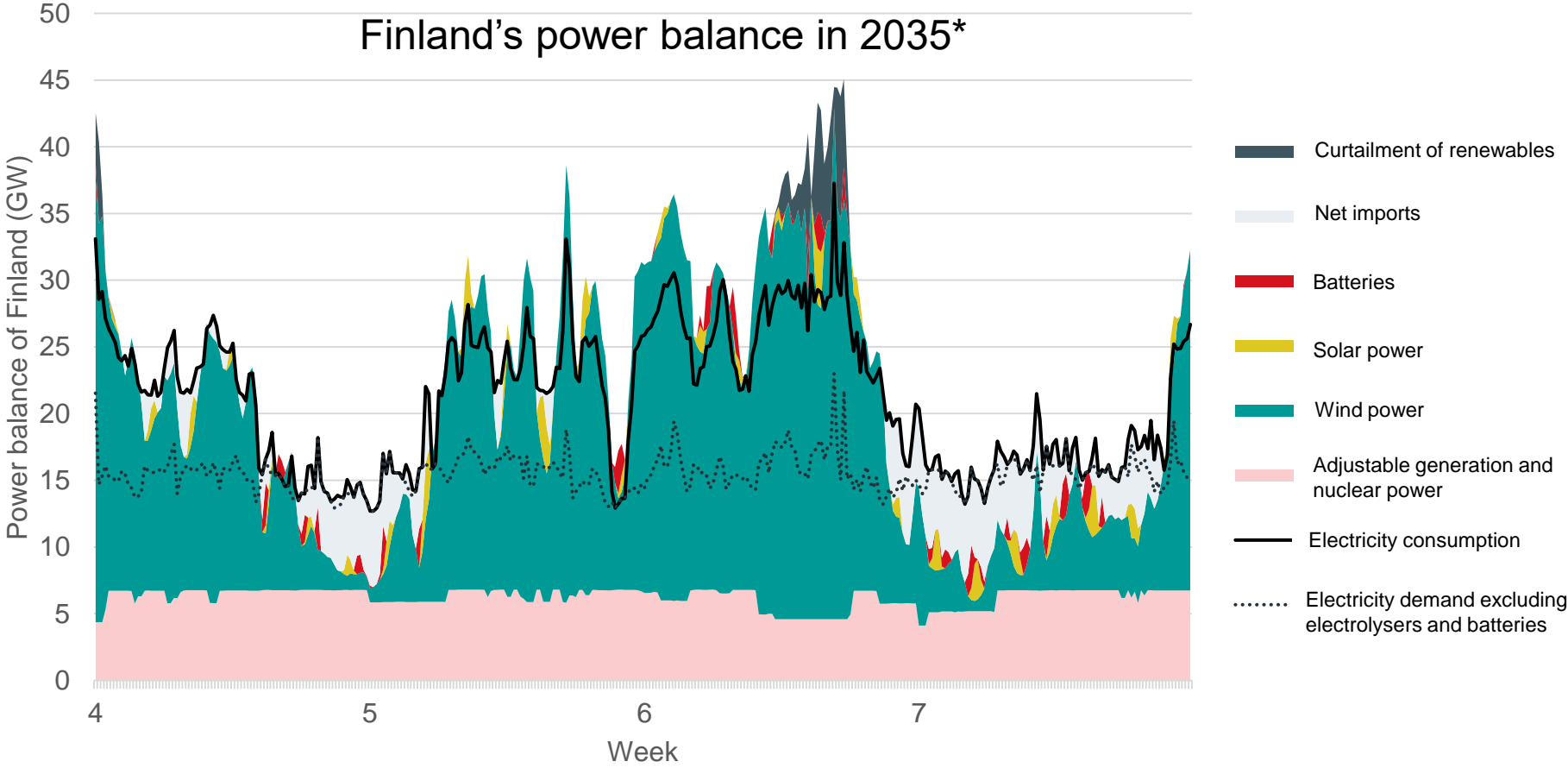


Source: Fingrid Best estimate scenario H1/2023

FINGRID

All solutions are needed to maintain the balance of the power system

Finland's power balance in 2035*



Sources of flexibility

- **Short-term demand:** heating, cooling, electric vehicle charging, industrial processes
- **Energy storages:** batteries, hot water boilers, heat storages, pumped hydro, hydrogen, synthetic fuels



*Based on Fingrid's Electricity system vision's future scenario "Hydrogen from Wind"

Flexibility is needed but its estimation is difficult

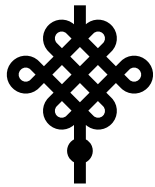


All new flexibility is welcome; from generation, storages and load

- Better use of existing potential
- Readiness for flexibility in new (load) investments

In future, less generation flexibility available -> more demand side flexibility needed

Different flexibility needs for different use cases



Grid congestion management:

fast flexibility with a locational signal

Balance management:

from very fast activation (inertia) to slower activation time and longer duration (weather changes)

Energy use optimisation:

wide range of needs



The need of flexibility depends on several factors, and it will vary over time

- weather (RES generation)
- installed and available transmission capacity
- planned and unplanned outages (transmission, generation and load capacity)
- allowed risk level for the power system security

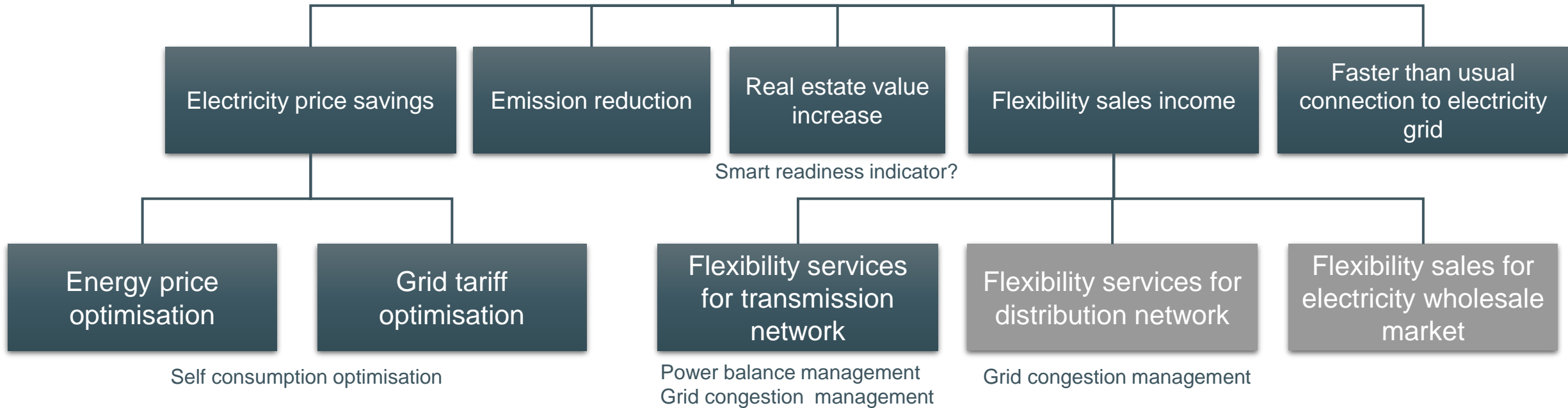


Building energy management system or smart loads

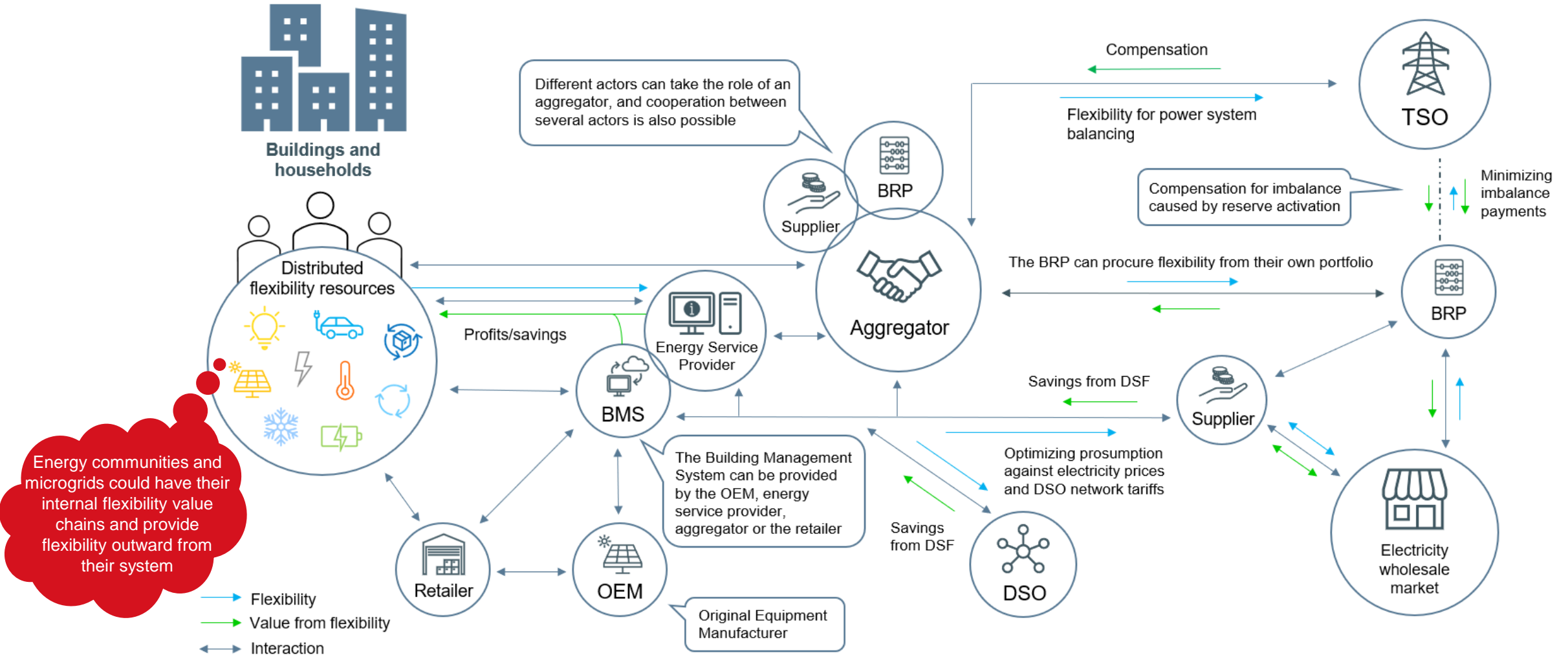


Benefits of demand-side flexibility

(Without compromising comfort and safety)



Value chain of end user demand-side flexibility



Source: Ryhänen Anette, 2023. Unlocking flexibility – electricity market actor roles for value realisation. Master's Thesis. Aalto University. p. 53.

Challenges of promoting end-consumer level flexibility



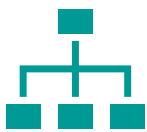
Low end-consumer awareness, comprehension, and thus demand for smart energy devices



High investment costs of energy management devices and unsure payback times

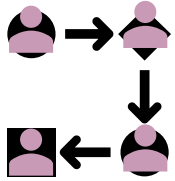


Slow technological advancement: the installation of such devices usually require costly electrician labor



Suitable business models and market rules for aggregation of small-scale demand side flexibility are missing

Keys to unlock flexibility



Considering the whole flexibility value chain to define clear roles and adequate value sharing. Multilateral and interdisciplinary collaboration is key!



Piloting different business models and coordination platforms to find best practices and productize versatile flexibility services



Enhancing prosumer awareness of flexibility participation benefits

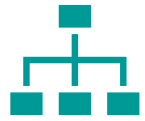


Providing relatable success stories about prosumer activity



Interactive communication to help find suitable solutions for each prosumer

What is Fingrid doing to promote flexibility?



Developing models for independent aggregation



Developing and piloting flexibility market platform concepts and actor roles




Creating a specification for implementing a standardised load control interface for smart meters



Assessing future flexibility needs and potential



Maintaining common understanding about flexibility potential of novel energy technologies (Fingrid) and the benefits of flexibility (service providers)

An aerial night view of a city, likely Helsinki, Finland. The scene is illuminated by city lights, with a prominent Ferris wheel in the upper right. In the foreground, a large, ornate building with a clock tower is visible, featuring a blue sign with the letters 'nvdA'. The background shows a dense urban landscape with various buildings and a body of water in the distance.

***“Future system is more volatile
– flexibility is needed and will
be more profitable”***

(Nordic Grid Development Perspective 2021)