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FLEXIBLE ENERGY SYSTEMS - FLEX^{e}

SHOK Programme

05/2015

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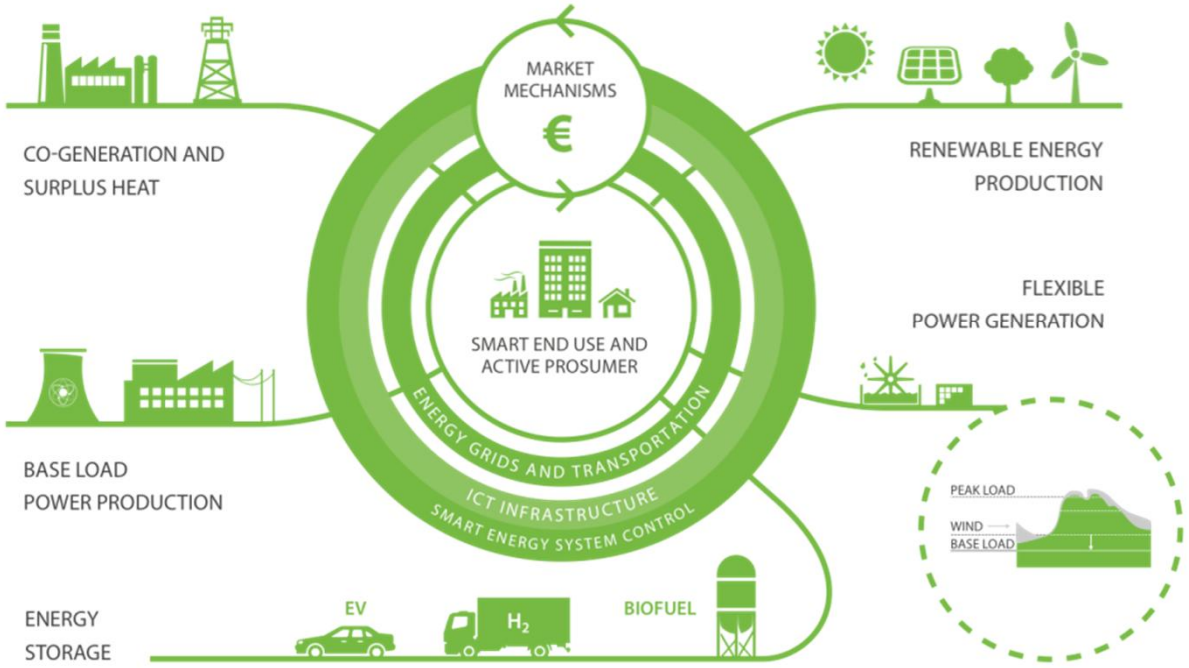
Summary

Aim: leading capability for Finnish companies to build, manage and operate sustainable future energy systems



Duration	1.1.2015 – 30.4.2019, 52 kk
Volume	53 M€, 1. FP 13,7 M€
Consortium	18 companies, 10 research institutions, covering the whole systemic value chain

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Flexibility challenge

Flexibility gap in European electricity systems with different shares of VRES[3]

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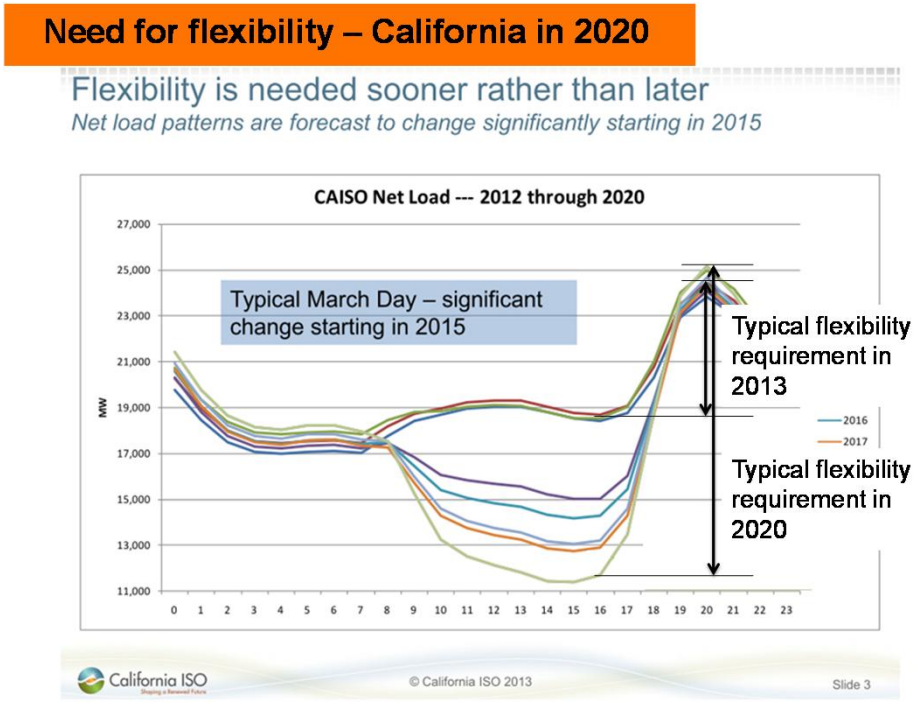

Net load patterns in California from 2012 to 2020

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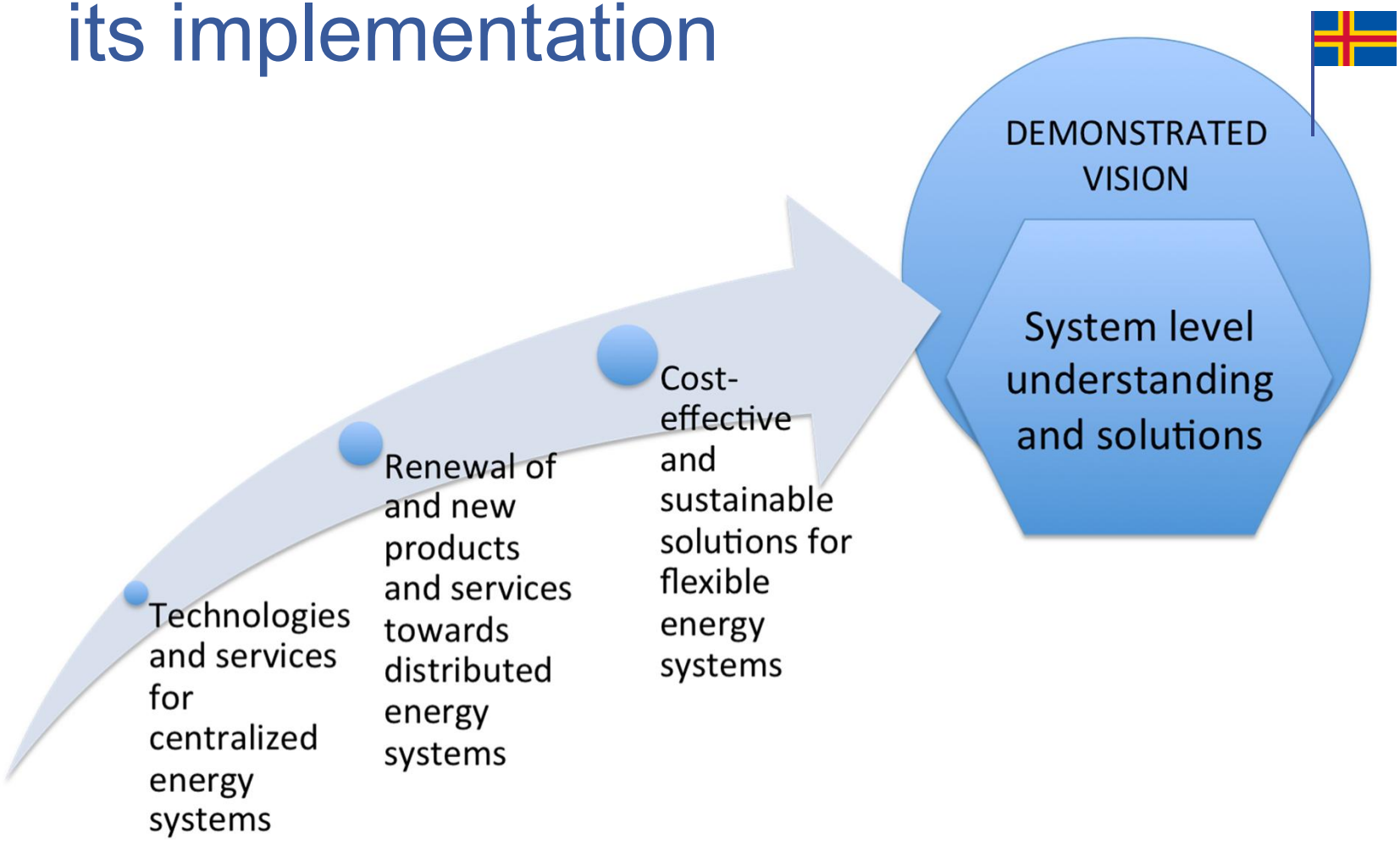
Towards systemic knowhow and its implementation



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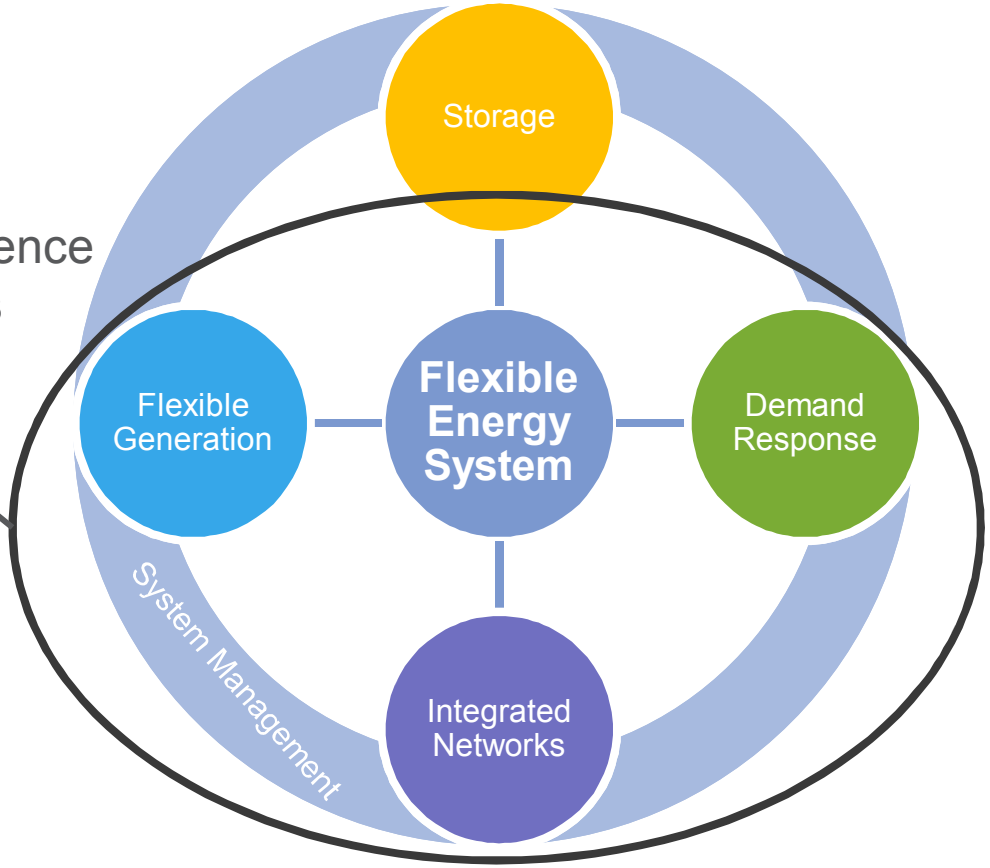
Flexibility options in the future energy system

Systemic value chain through core competence of Finnish companies



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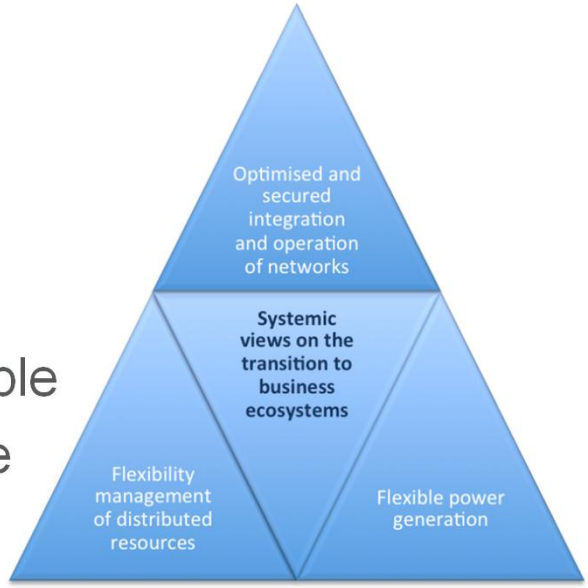
Research needs



1. Systemic views on the transition to business ecosystems of a future flexible energy system – understanding future demand profiles and the role and value of different flexibility options
2. Systems optimisation, integration, interdependency and security
3. Wide application of demand-response – increasing efficiency across the whole energy system and supporting active participation of all partners of the system
4. Flexible generation – new operational modes to secure reliable, affordable and sustainable power production to provide needed generation flexibility

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WP1 Systemic views on the transition to business ecosystems of a future flexible energy system

- Understanding future demand profiles and the role and value of different flexibility options
- Systemic approach- starting point and future scenarios
  - Power and heat networks, energy market
  - Changes in flexibility needs
  - Value of flexibility options in different time scales and markets
  - Market models and business cases are needed in the transition towards a future flexible energy system

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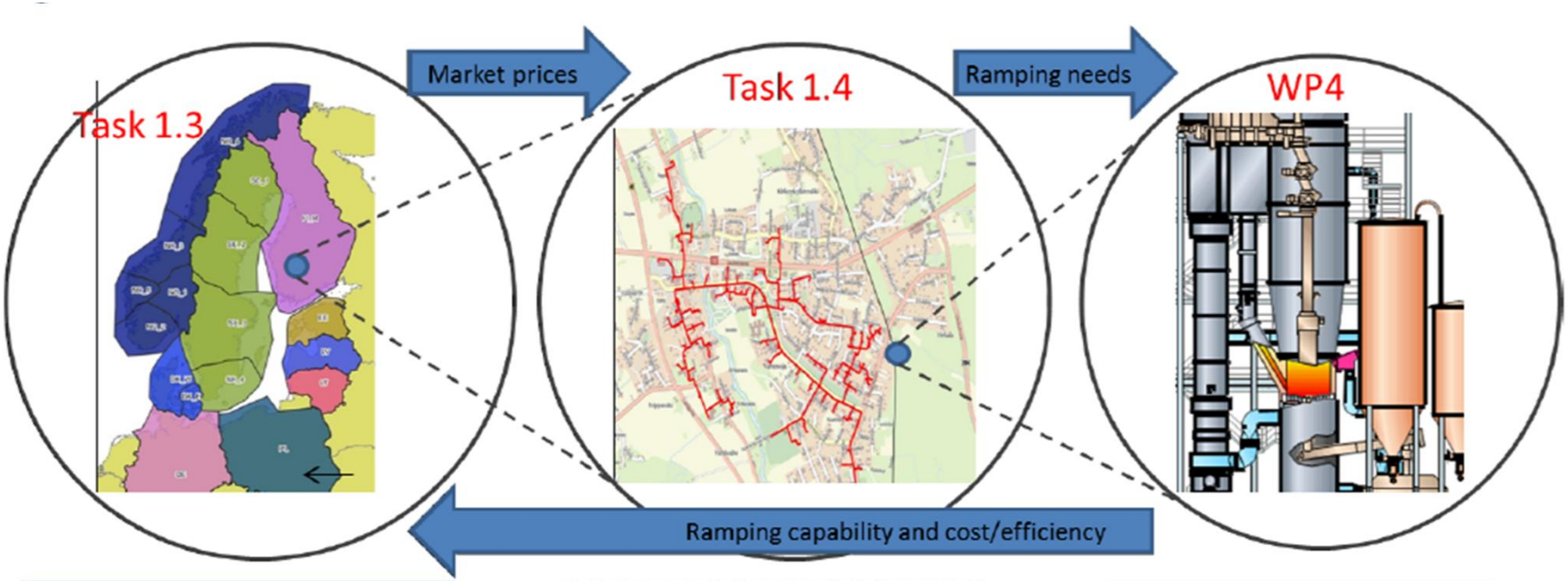

Level 1: Market level analysis
Simulations of whole electricity market area (WILMAR, Plexos) – impact of wind and PV on prices (day-ahead, intra-day, balancing) and need for flexibility.
Simulations over one year – how often ramping and high wind/PV situations occur.

Level 2: Regional level analysis
Simulations of local electricity and heat network (APROS, EnergyPro) – details of flexibility constraints and possibilities.

Level 3: Plant level analysis
a) Simulations of individual plants. Impact of ramping and minimum on-line requirements.
b) Simulations of individual boilers with CFD.

Link to academy project VaGe

Link to Tekes Neocarbon project for future power-to-gas options

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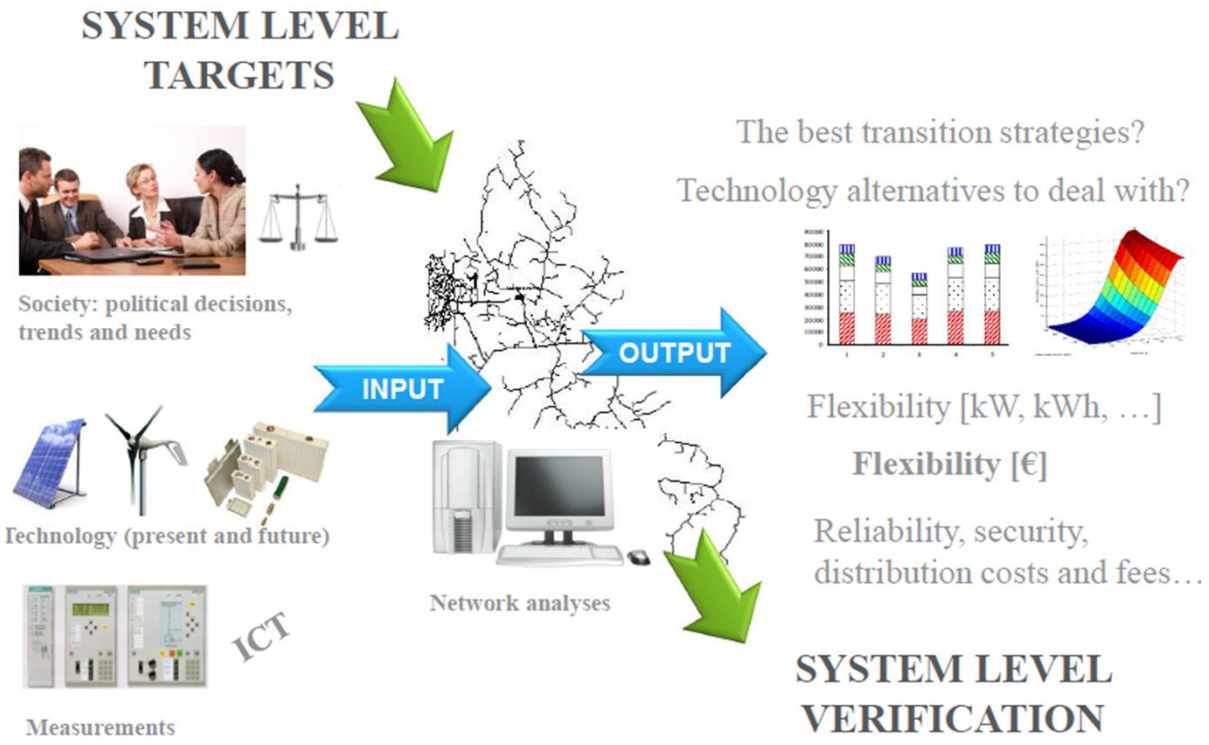
WP2 Optimised and secured integration and operation of future energy networks



- Flexibility requirements for the planning and operation of integrated energy networks
- Novel, high-quality, reliable and secured measurements, telecommunication, data processing and new technological platforms

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WP3 Flexibility management of distributed resources

- Increasing efficiency across the whole energy system
- Supporting active participation of all partners of the system
- Integrate the distributed resources to the energy system and harness the flexibility at the customer & prosumer side for the improved operation of the energy system

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WP4 Flexible generation for future energy system

- New operational modes for secure, cost-effective, clean and competitive supply
- Understand the requirements and limitations that the future energy system poses for flexible generation and how flexible power generation can overcome those limitations and meet the requirements.
- Focuses on the phenomenological challenges related to enhancing the flexibility of power generation both in terms of operation and fuel variety, and on the marginal costs of enhanced flexibility.

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Consortium

- 18 companies, 10 research institutions
- **Cutting edge position: Consortium covers the whole systemic value chain of energy systems**
- Multidisciplinary: technology, economy, social psychology

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FLEX^{e} as a part of the Future Energy System Portfolio of CLEEN