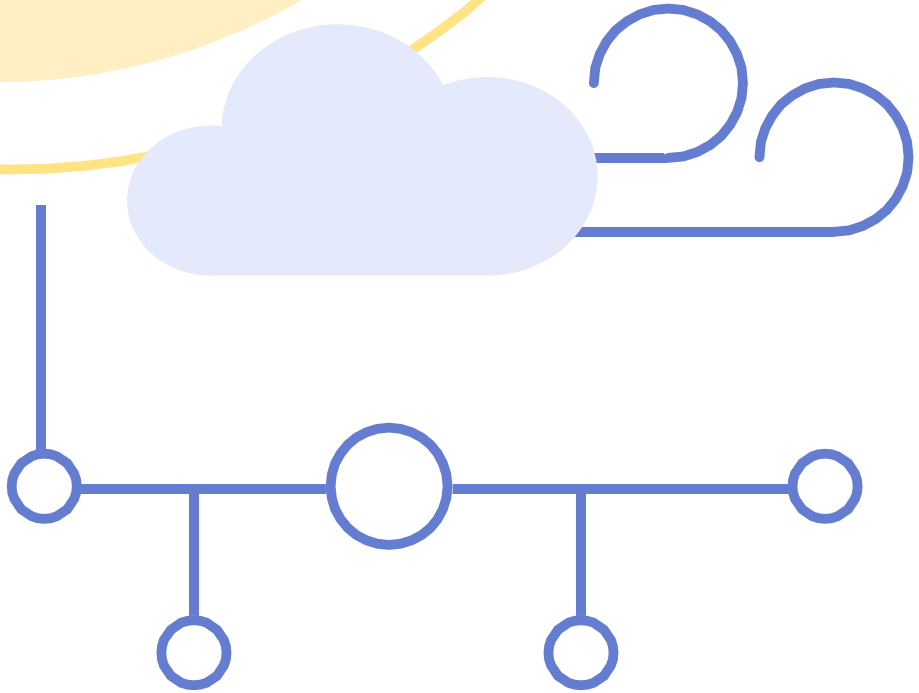
SMART ENERGY °ÅLAND



SMART ENERGY ÅLAND

The Åland Islands - A unique renewable energy system demonstration platform

Smart Energy Åland

– From research to implementation

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Today

2017-2018

Designing a smart and flexible energy system

2017

Flexe-demo conceptualisation

2016

Åland Smart Energy Platform - roadmap

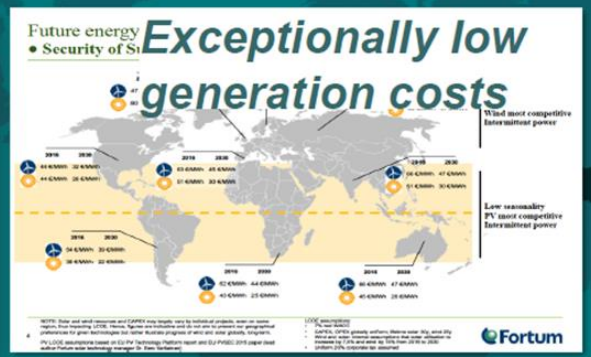
2014

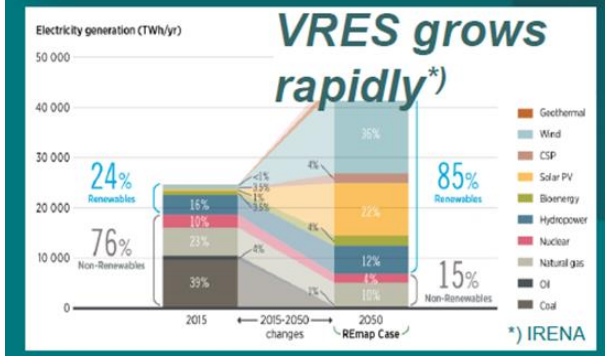
“Aloitetaan Energiakäänne Ahvenanmaalta”

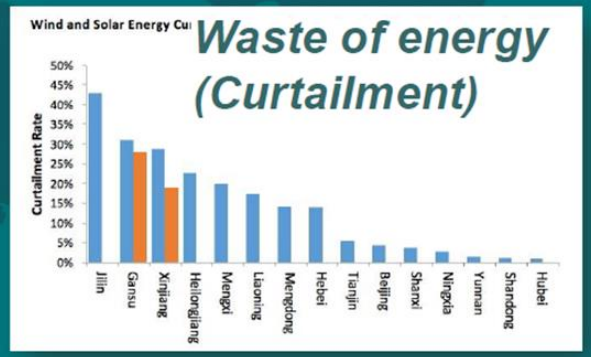
Preceding research programs:
2010-2015 Smart Grids and Energy Markets
2010-2014 Future Combustion Engine Power Plants
2012-2016 Efficient Energy Use
2015-2016 Future Flexible Energy Systems

The challenge

- Integration: Smart and Efficient Use of Renewable Energy







2022*)

RES generation grow by more than 30% to over 8 000 TWh

Wind and solar is 80% of renewable capacity growth

China, India and Brazil, share of VRES generation is to double to over 10%

System integration becomes increasingly important

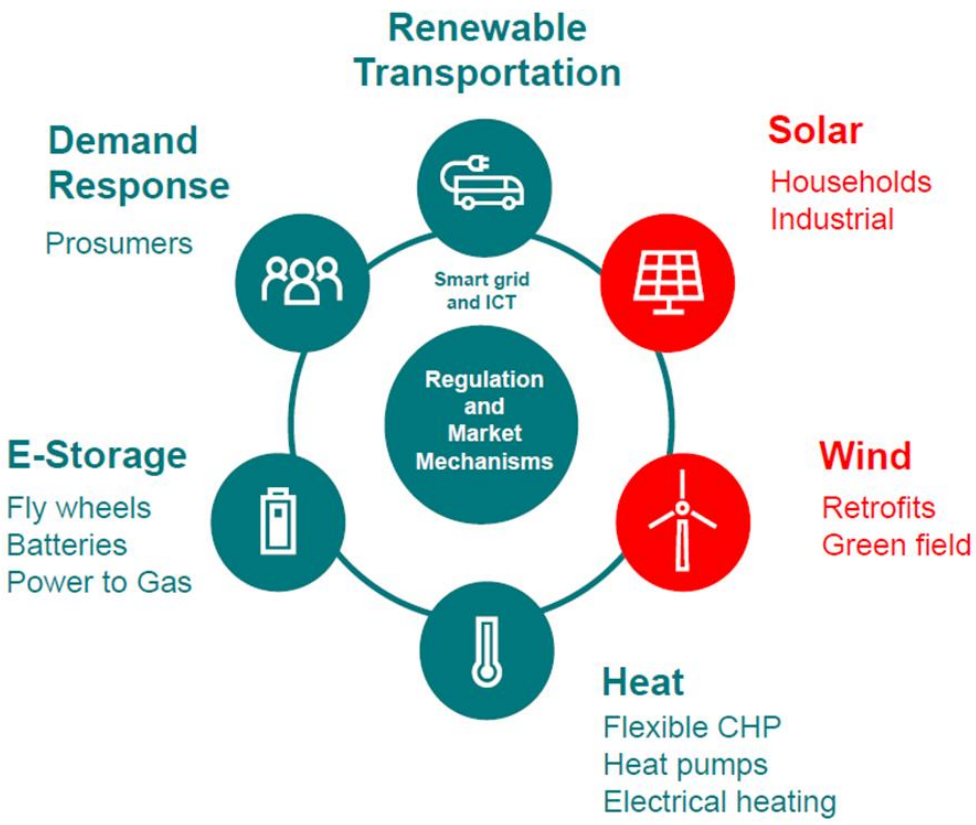
Simultaneous increase in system flexibility

Market and policy frameworks have to evolve

**) Renewables 2017 Analysis and Forecasts to 2022, International Energy Agency 2017*

The solution

- An integrated renewable energy system with sector coupling and system integration in focus



The key is managing the interdependencies between subsystems – the renewables integration challenge

To create a cost efficient energy system the integration must comprise all major subsystems

Electricity

Heating / cooling

Transportation

The Åland Islands

An archipelago in the middle of the Baltic Sea

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Åland – the ideal place for the demo

- Best wind and solar conditions in the region
- Self-governed (own energy market regulation) and own grid area
- An ambitious and recognised sustainability agenda

Full society scale

- 30.000 inhabitants, industry & service sector - Results applicable to large markets
- Operating in a deregulated environment connected to the efficient Nordpool market

Adopting future EU regulation

- Current and future market models enabling investments in flexibility sources in focus

In the tempered climate zone

- Heating and cooling central part of the energy mix

A platform supporting open innovation

- Cooperation with leading R&D&I operator

Åland Energy System Scenarios

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Current situation:

- Wind capacity 21 MW
- Heat 20 MWe
- Peak 75 MW
- Total consumption 318 GWh
- Min load 16 MW
- Capacity mix
  - Import 80 %
  - Wind 20 %

Future 1:

- Wind capacity 85 MW
- Heat CHP 20 MWe
- Solar 15 MW
- Peak 85 MW
- Total consumption 400 GWh
- Min load 16 MW
- Capacity mix
  - Wind 70 %
  - Solar 15 %
  - CHP 15 %

Future 2:

- Wind capacity 170 MW
- Heat CHP 0 MWe
- Solar 20 MW
- Peak 85 MW
- Total consumption 400 GWh
- Min load 16 MW
- Capacity mix
  - Wind 90 %
  - Solar 10 %
  - CHP 0 %

Current grid structure

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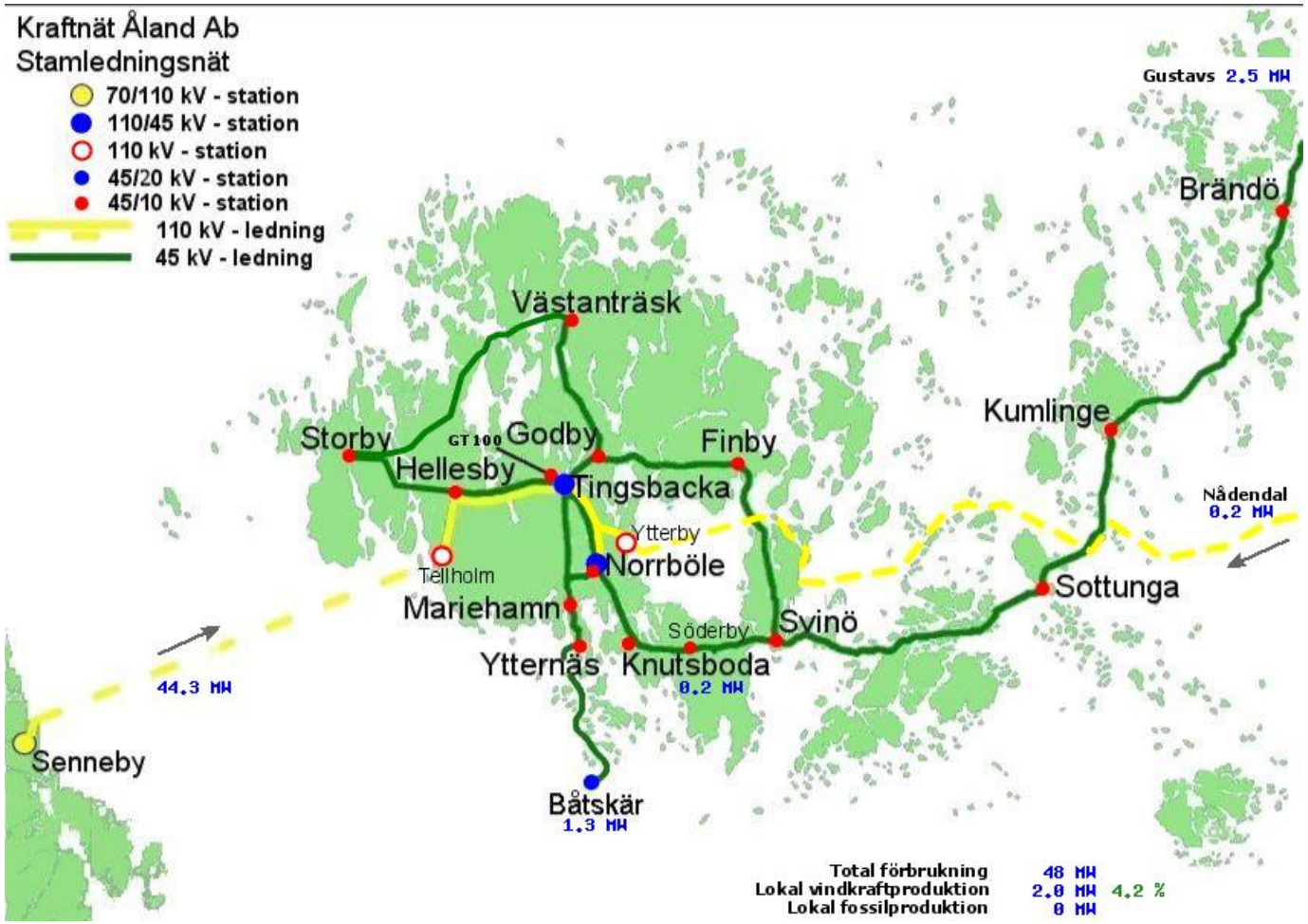

The need for storage

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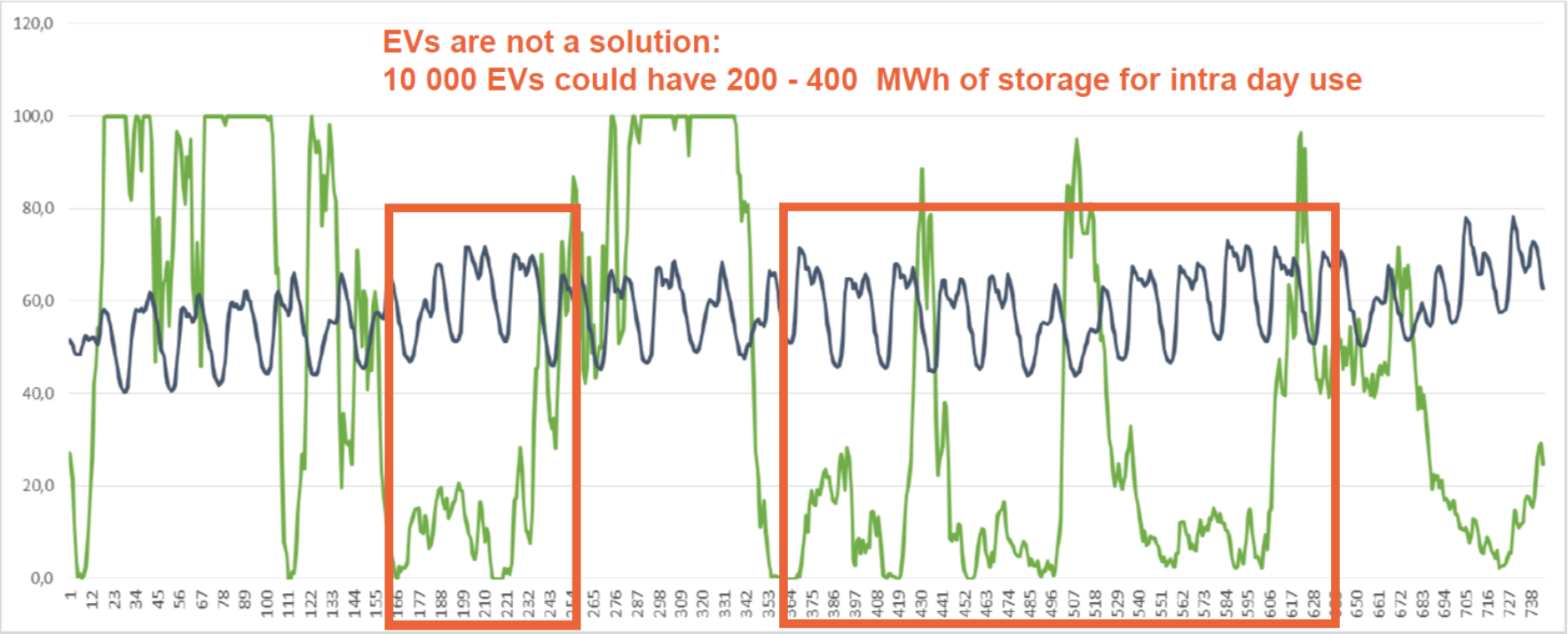
January RE production vs. consumption.
System needs to overcome days of minimal RE production and have storage or DR in +3000 MWh class*



*Figures are based on rough estimation only and not including hourly simulation

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Other estimates put the need at up to 6 GWh

A CO2 free energy system ?
- The challenge

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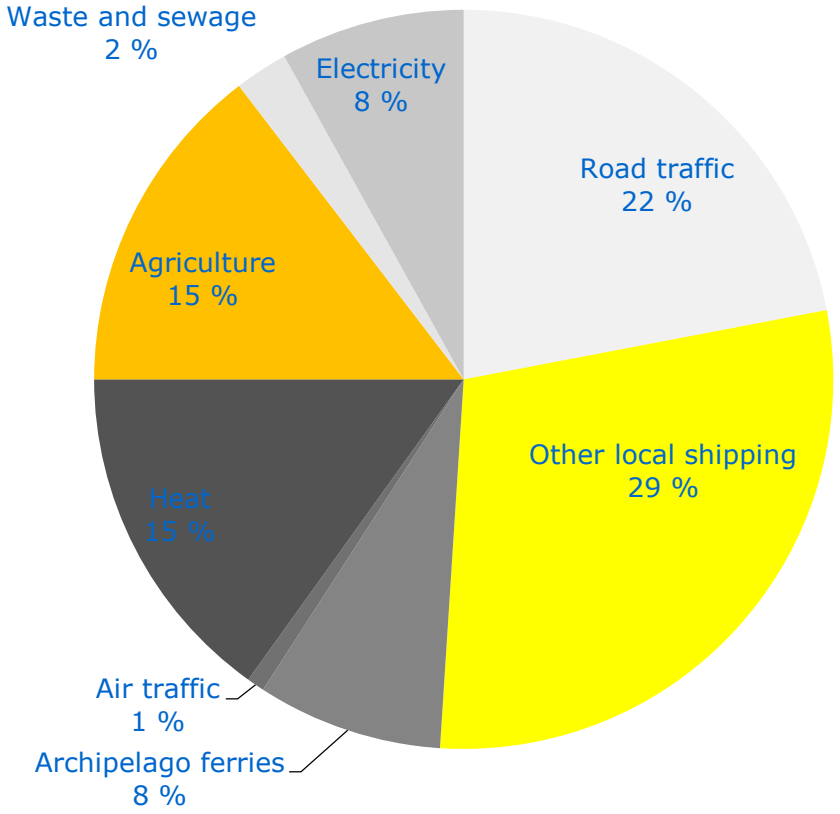
Greenhouse gas emissions in Åland 2015



250 000 ton CO2-eq

The demo contents

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- Citizen Engagement is key
- A novel flexibility marketplace
- Technology demos
  - Flexibility sources: storage in all forms; flexible consumption
  - New forms of e-transport
  - Micro production
- Last but not least, promotion of expansion of solar and wind production

Flexens

The Public Private partnership company formed to build the demo

www.flexens.com

The Company Mission

- **Flexens Oy Ab** is founded to be a company that offers multiparty solutions to the challenge of affordable renewables integration initially based on a full society scale demo built on the Åland Islands under the brand **“Smart Energy Åland”**
- Flexens core competence is to combine the offerings, skills and knowledge of companies participating in the ecosystem built around Flexens in a high level system integrator role
- The whole ecosystem will benefit from cooperating closely with Flexens – the growth engine platform company

Overall value creation steps

Acquire/build and develop capabilities in "Åland demo"

- Project lead
- Raise capital and project finance

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Use the accumulated knowledge / know how in international markets

- Potential customers:
- Both Europe and global
- Priority on R&D&I demo type projects

Build sustainable market position

- Expansion also to commercial capital intensive projects
- Move to position of enabling dividend payments, earliest after five years

Flexens

Flexens owners

Clic Innovation Ltd; 50%

“Åland Parties”; 50%

- Leovind Ab
- Mariehamns Elnät Ab
- Viking Line Buss Ab
- Ålands Elandelslag
- Ålands landskapsregering/Högskolan på Åland
- Ålands Vindenergi Andelslag
- Ålands Vindkraft Ab
- Ålands Ömsesidiga Försäkringsbolag

Ålands Vindkraft Ab

Clic Innovation owners

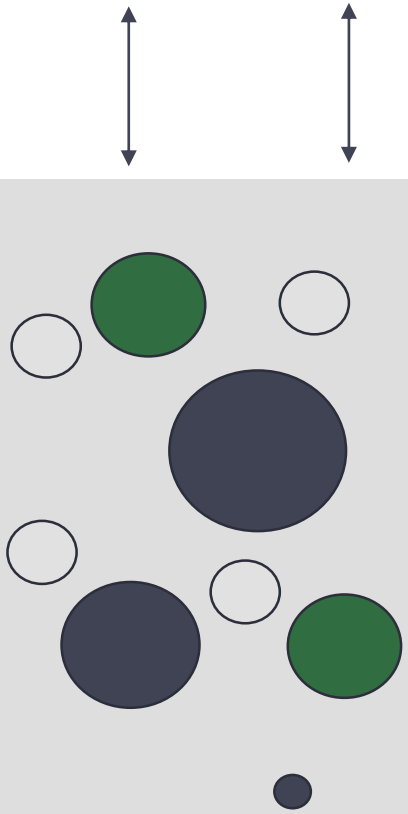
Flexens

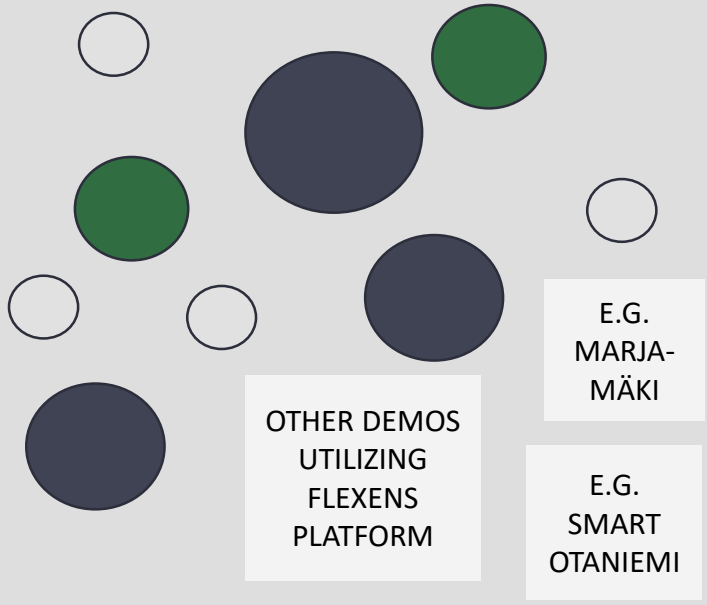
Flexens role in the ecosystem

Access to international partnerships

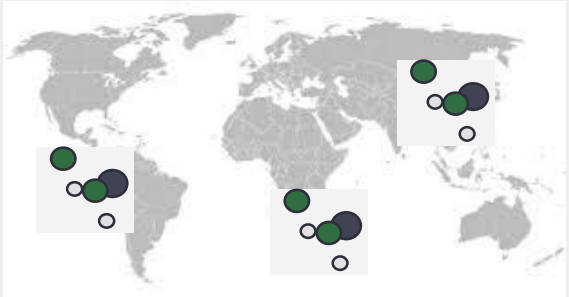
Foreign investments

Direct export revenue
To companies involved





Linking Corporations, SMEs and startups to mutual and international co-operation and business



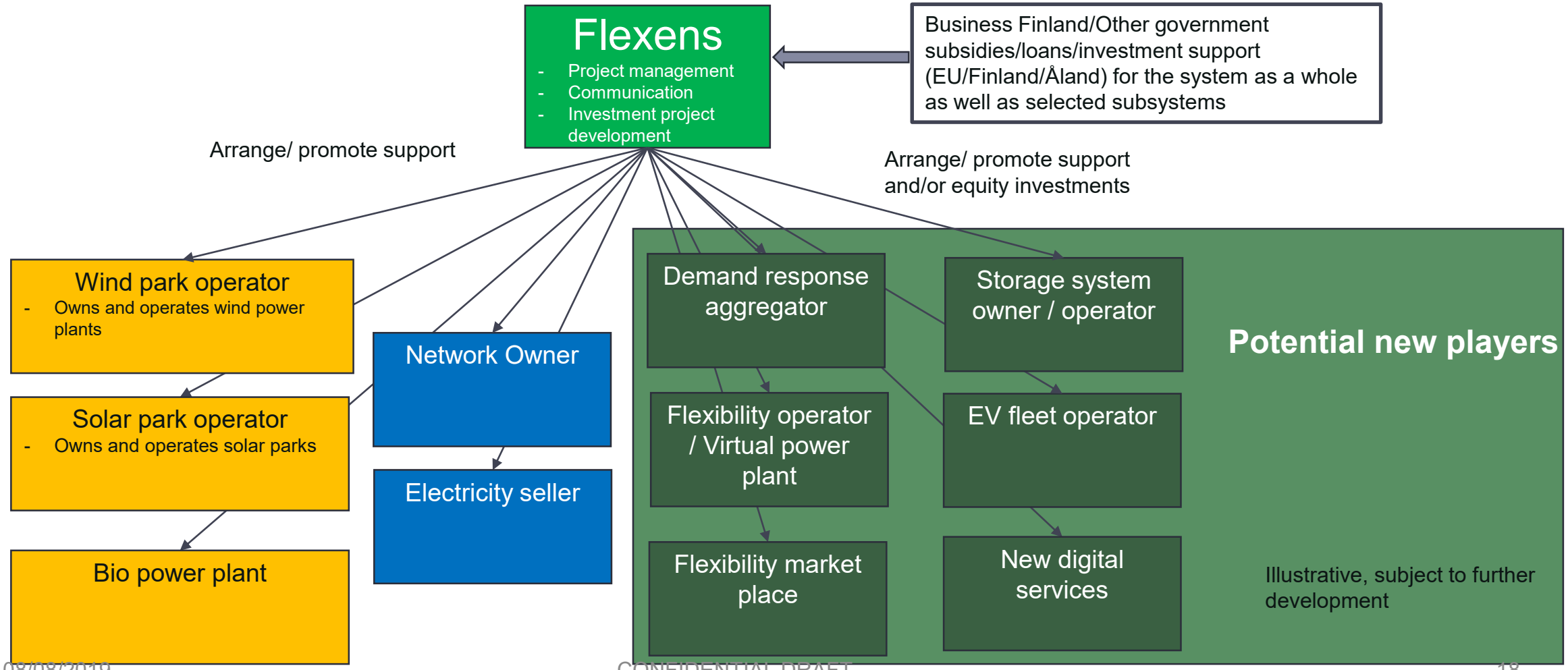
Enabling setup of flexible energy systems demoed on Åland in international locations

FLEXENS LEARNING, INNOVATION AND CO-OPERATION PLATFORM

Flexens

Smart Energy Åland

- Flexens role in the energy system on the island



The Roll Out of Novelty Value Investments

We start with the demonstration of a new market mechanism for flexibility

Novelty value investments

First step
- New market mechanism for flexibility

Expansion of flexibility sources
- Storage
- DR
- Adjustable generation capacity

Ultimate goal
-100% RES
- 100% self-sufficient
- year round

Measure of progress: relative share of locally produced renewable energy
Key driver: Citizen Engagement

Historic and ongoing renewable energy investments

- Åland has been a pioneer in wind power with the first investments over 20 years ago
- Roll-out of small scale solar systems
- EV's and electrification of public transport

Flexens

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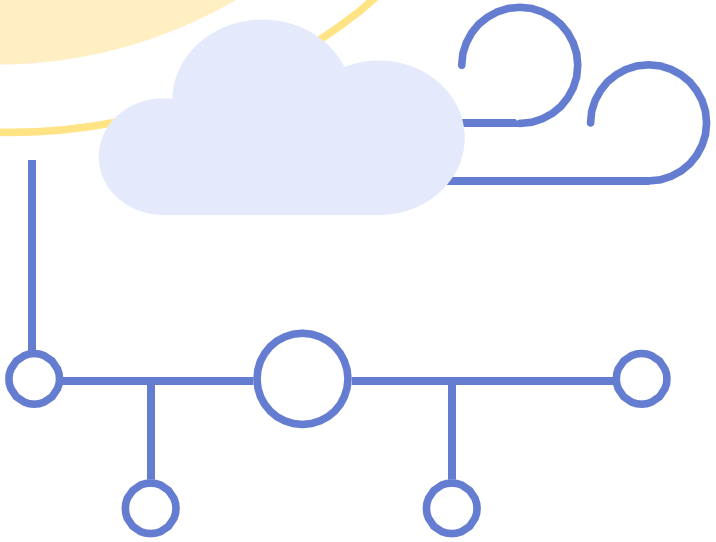

Thank You!