

# Smart Innovation Østfold

## Prosumer Empowerment driving Local Energy Markets Design

IoTSec project meeting  
Oslo 2 December 2015

## SMART INNOVATION ØSTFOLD - HISTORY

- 1996: Commercial spin-out from the Institute for Energy Technology, Halden, Norway
- 2003: Start-up of incubator activities
- 2006: Development of industry cluster within energy and IT
- 2008: Awarded the Norwegian “IT Industry’s Oscar” for Green IT
- 2009: Approved Norwegian Centre of Expertise – NCE Smart Energy Markets

## NCE SMART ENERGY MARKETS – CLUSTER DEVELOPMENT

### Industry

**€2 bill.  
Total revenue  
in Norway**

### Academia

ewi  
Institute of Energy Economics  
at the University of Cologne  
Exploring energy markets –  
enhancing decisions.

IFE

Østfoldforskning

Høgskolen i Østfold

Norwegian University  
of Life Sciences

UNIVERSITAT POLITÈCNICA  
DE CATALUNYA  
BARCELONATECH

NTNU  
Det skapende universitet

HØGSKOLEN  
I NARVIK

### Municipalities

Østfold  
FYLKESKOMMUNE

Halden kommune

Spydeberg  
kommune

FREDRIKSTAD KOMMUNE

Sarpsborg  
kommune

HVALER  
KOMMUNE

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- 2009: First project focusing on research based innovation

## CLUSTER AND RESEARCH BASED INNOVATION

### NCE Smart Energy Markets cluster development project



### Research & Innovation projects



### Incubator – R-based innovation



## RESEARCH PROJECTS 2009 - 2015

- (1) **Energy Trade and Environment 2020** (2009-2011) (RCN RENERGI)
- (2) **Manage Smart in SmartGrid** (2010-2012) (RCN RENERGI)
- (3) **IMPROSUME** (2010-2012) (EU ERA Net)
- (4) **DeVID** (2012-2014) (RCN ENERGIX)
- (5) **VRI-2 Østfold** (2011-2013) (RCN VRI)
- (6) **Smarter Remmen I** (2011-2013) (Statsbygg)
- (7) **Smart energy optimization of municipal buildings** (2013) (RCN Oslofjord fund)
- (8) **The future of smart energy prosumers** (2013) (RCN Oslofjord fund)
- (9) **Klimareg** (2013-2015) (RCN Oslofjord fund)
- (10) **VRI-3 Østfold** (2014-2016) (RCN VRI)
- (11) **Smarter Remmen II** (2014-2016) (Statsbygg)
- (12) **Smart Rural Grid** (2014-2016) (EU FP7)
- (13) **Smart Energy Hvaler** (2014-2016) (Hvaler kommune, Fredrikstad Energi, NCE Smart)
- (14) **National Smart Grid Laboratory** (2014-2018) (RCN RESEARCH INFRASTRUCTURE)
- (15) **ChargeFlex** (2015-2017) (RCN ENERGIX)
- (16) **EMPOWER** (2015-2017) (EU Horizon 2020)
- (17) **FlexNett** (2015-2017) (RCN IPN ENERGIX)
- (18) **IoTSec** (2015-2020) (RCN Forskerprosjekt IKTPLUSS)

**6 years**

**18+ research projects**

**€ 32 mill.**



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### **(16) EMPOWER** (2015-2017) (EU Horizon 2020)

*Develop a complete new energy market where consumers can buy and sell «neighborhood energy» which is produced locally by solar panels, micro wind turbines and other de-central energy production, new market design and new business models will be tested in Malta, Germany and Norway.*

- *Relieve the central and regional grid, balance distribution grid locally*
- *Increase local electricity production and cheap renewable electricity to the customers*
- *Store electricity locally in battery stations and electrical vehicles*

**Coordinator for Horizon 2020 project - total budget of € 6.1 mill.**

- Smart Innovation Østfold AS (NO)
- Schneider Electric Norge AS (NO)
- eSmart Systems AS (NO)
- Fredrikstad Energi Nett AS (NO)
- University of St. Gallen (CH)
- Universitat Politècnica de Catalunya – CITCEA (ES),
- Malta Intelligent Energy Management Agency (MT),
- NewEn Projects GmbH (DE)

# What is the background for



?



This project has received funding from the *European Union's Horizon 2020 Research and Innovation programme* under Grant Agreement No 646476.

In the future,  
most of the energy we use  
will be produced where it is used.



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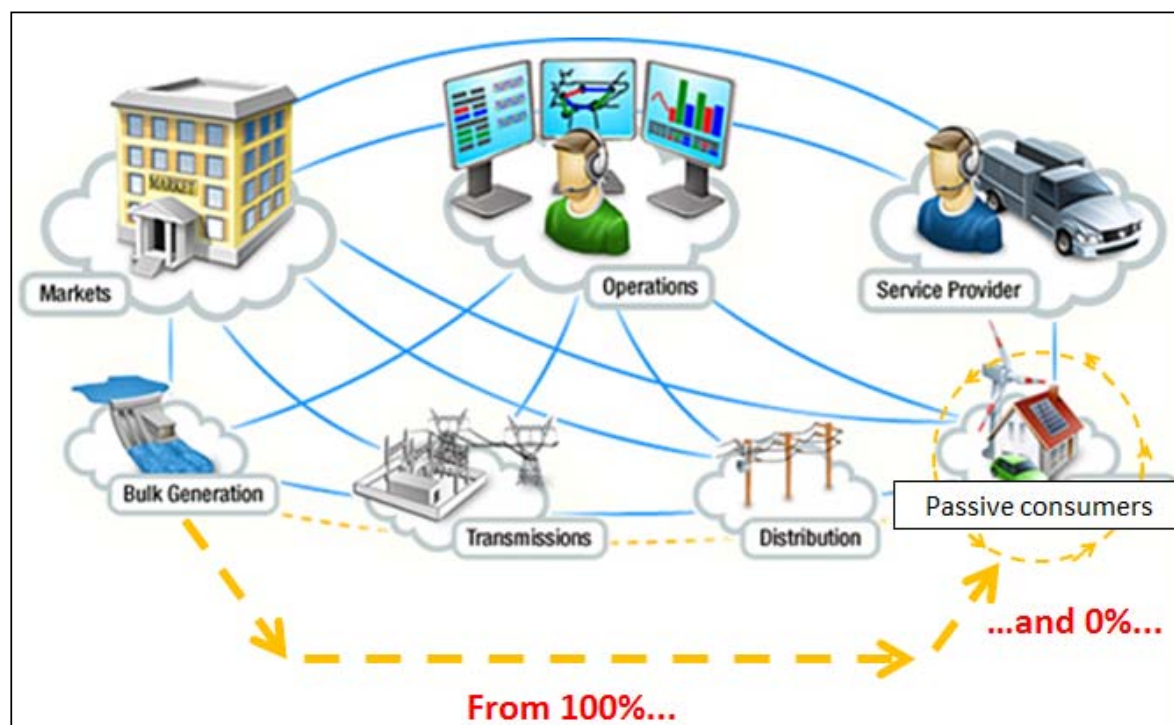
On average 80% of all energy use  
in residential and office buildings  
will be covered by local energy production.

Central power supply will only be used  
as a reserve.



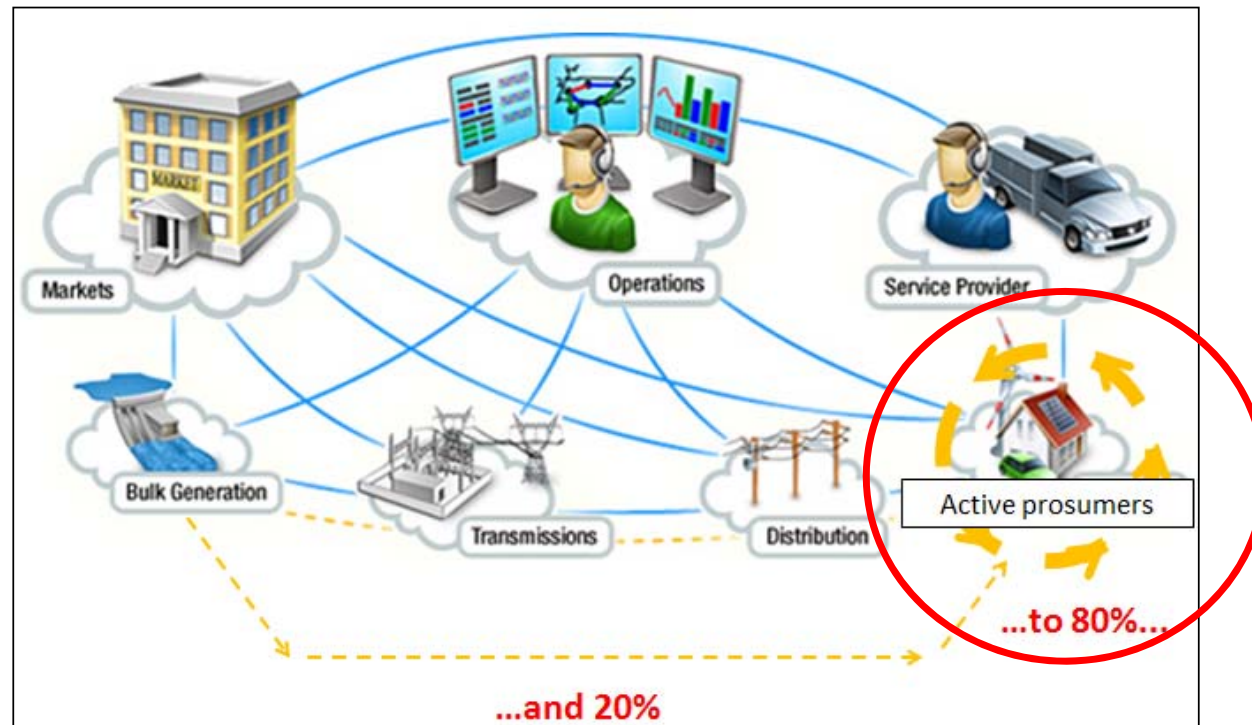
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# PASSIVE CONSUMERS



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# ACTIVE PROSUMERS



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What does it mean for a DSO  
to loose 80% of their grid rental charges ?



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Decentralized renewable energy production  
and storage  
will soon revolutionise the energy sector.



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New roles in the energy market:  
prosumers, aggregators, ESCOs, ...

Many new business models.

Energy companies will have to adapt  
- or get swallowed by their competitors.



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# Why Tesla's battery for your home should terrify utilities

*Elon Musk's electricity empire could mean a new type of power grid*



<http://www.theverge.com/2015/2/13/8033691/why-teslas-battery-for-your-home-should-terrify-utilities>



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# SolarCity



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# SOLARCITY

- Tesla founder Elon Musk is chairman of the board of the SolarCity company.
- SolarCity is building a giant factory for battery production where the main market is not EVs, but storage of electricity produced in homes and office buildings.
- The goal is that the batteries shall cover energy consumption for a whole week.



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# SOLARCITY

- SolarCity has a pilot project with 500 private homes in California.
- 10-kWh Tesla battery packs are used which can supply a home with electricity for about two days during blackouts.



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# SOLARCITY

“SolarCity installs panels on people’s roofs, leases them for less than they’d be paying in energy bills, and sells surplus energy back to the local utility. It’s proven a tremendously successful model. Founded in 2006, **the company now has 168,000 customers and controls 39 percent of the rapidly expanding residential solar market.**”



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Electricity produced **locally**

bought and sold **locally**

For this a new market is needed

for trading electricity **locally**



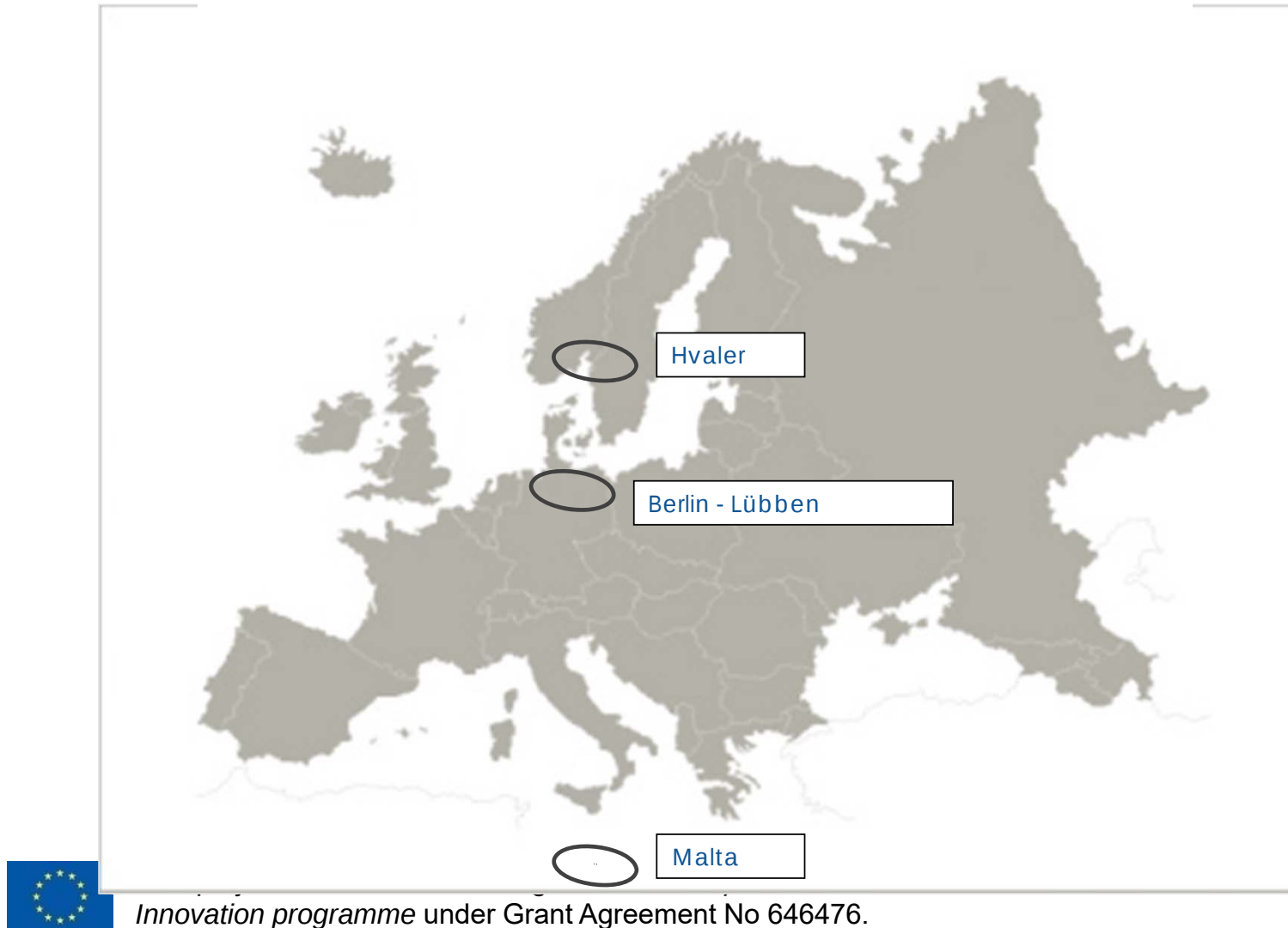
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**EMPCWER**®

2020 Research and

**...to 80%**

## 3 PILOT LOCATIONS



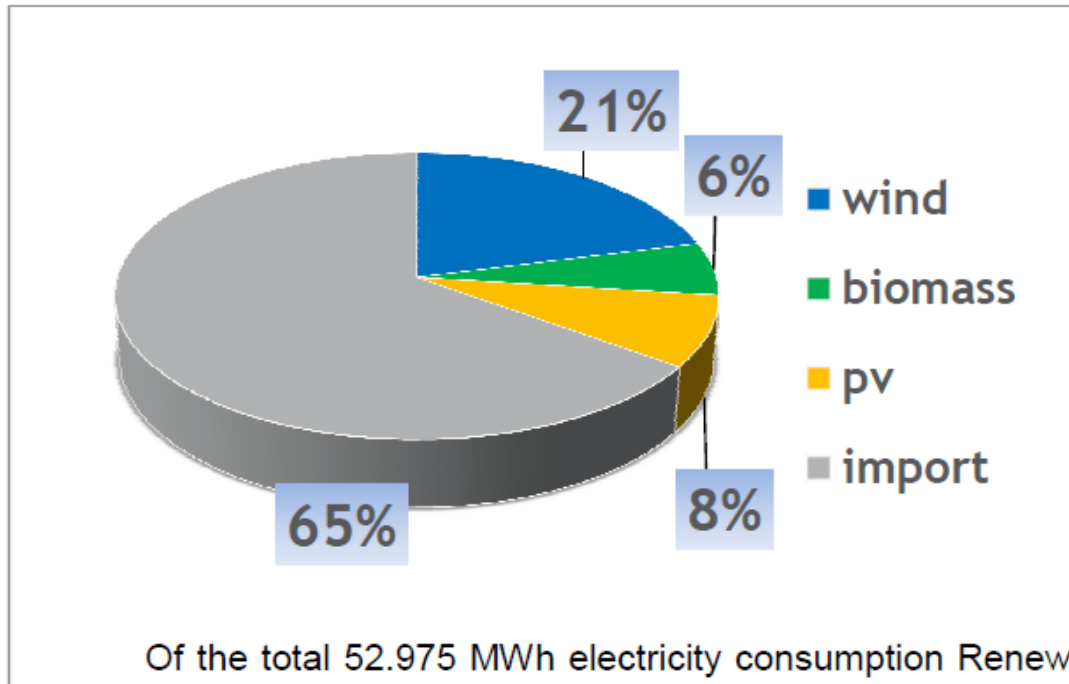


# LÜBBEN

South of  
Berlin

13.700  
inhabitants

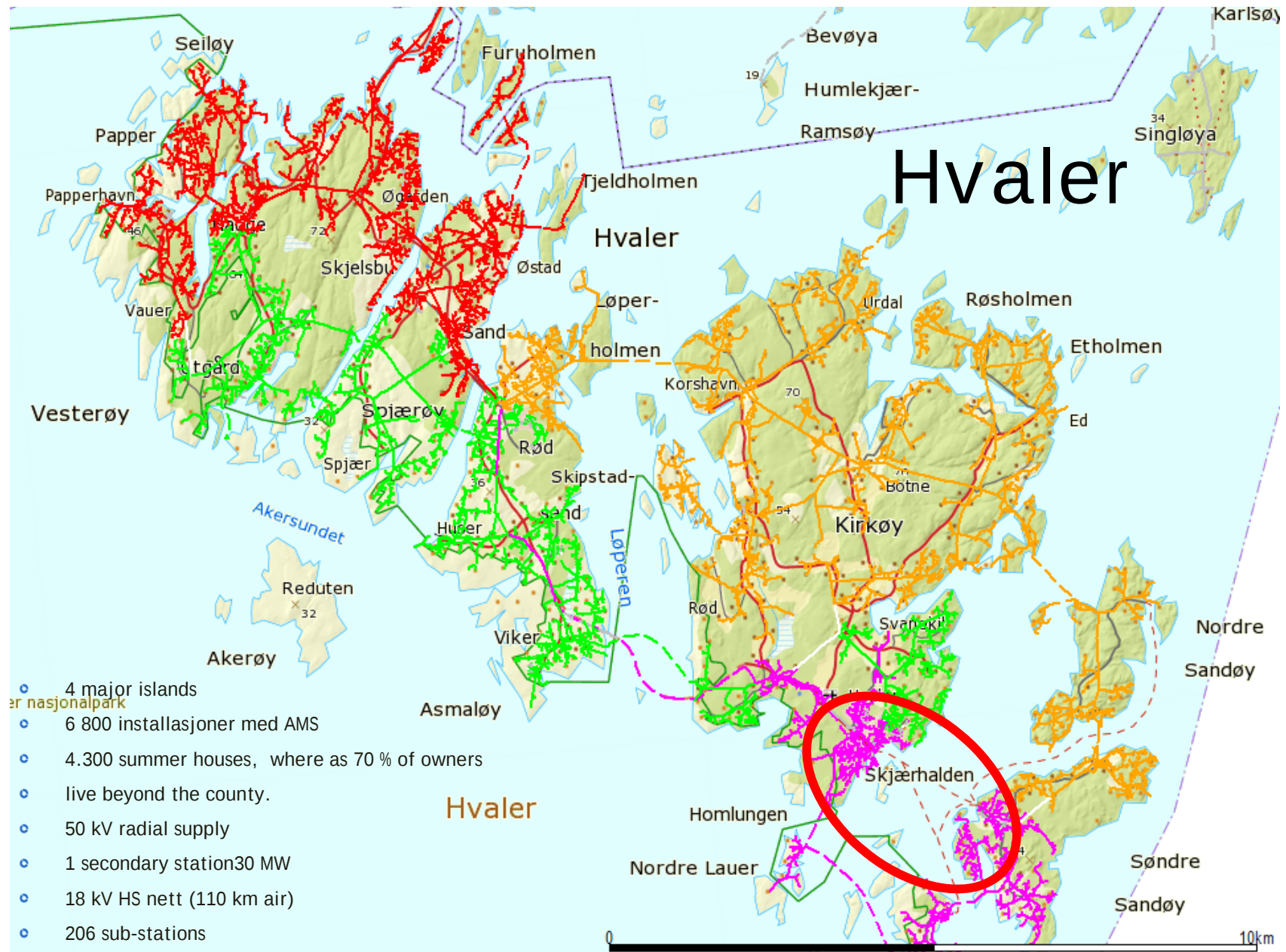
# LOCAL ENERGY PRODUCTION



Lübben

Of the total 52.975 MWh electricity consumption Renewable Energies make up for the following:

- Wind: 11.146 MWh/a
- PV: 3.837 MWh/a
- Biomass: 3.400 MWh



# SMART ENERGY HVALER

- Norway's no 1 demo site for Smartgrid and local energy production
- Smart meters deployed to all households
- Demo site for a number of national and international research projects (DeVID, FlexNett, ChargeFlex, EMPOWER, m.fl)

Solar energy – Citizens meeting  
Hvaler town hall 2.5.15  
Prosumers in the center

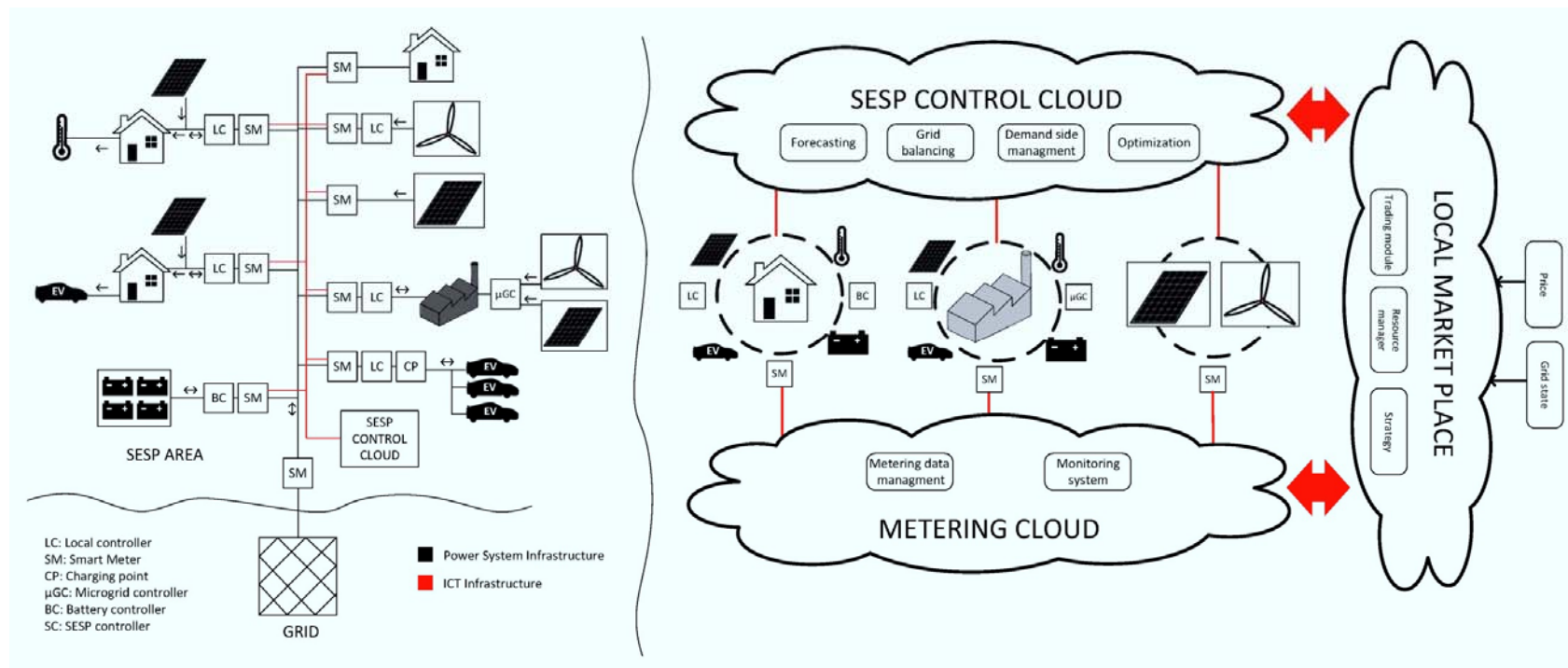


# SMART ENERGY HVALER

- Agenda: local PV production
- Occasion: Hvaler municipality has decided to use NOK 200.000 to support new private PV installations
- 75 attendances
- 61 signed an order for a PV installation



# NEW LOCAL MARKET MODEL



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# POTENTIAL BARRIERS/OBSTACLES TO INNOVATION

- Energy monopolies will fight for their market dominance
- Differences in national regulations may delay decentralized energy market development
- Consumers need to understand the benefits of becoming prosumers – strong incitements are needed
- Cybersecurity in SmartGrids and privacy of prosumer data have to be guaranteed
- Interoperability and standards are needed to guarantee free competition among suppliers

# INVITATION



- EMPOWER Advisory Group
  - invitation to partners from industry and academia
  - meeting once a year
  - access to results from research and innovation



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EMPOWER Coordinator

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**NCE** NORWEGIAN CENTRES OF EXPERTISE  
**Smart Energy Markets**