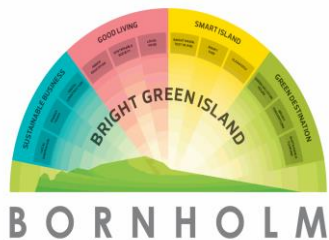


The Ecogrid EU project in a strategic perspective



Danish national goals: Independency from fossil fuels in 2050

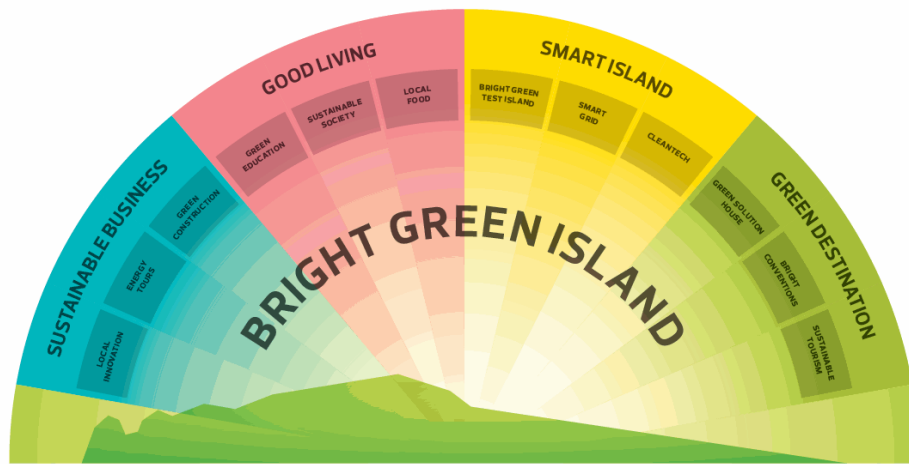
- Wind turbines will be the basic foundation of the Danish energy system. Biomass, wave and solar energy will support the wind turbines.
- The Danish society will be electrified. By shifting we will achieve a higher degree of energy efficiency.
- A further degree of renewables and a higher energy efficiency will automatically lower the CO₂ emissions.

- Exchanging with neighbouring countries.

- Storage

- Smart Grid
(Activating the consumer side)

The Bornholm vision 2025



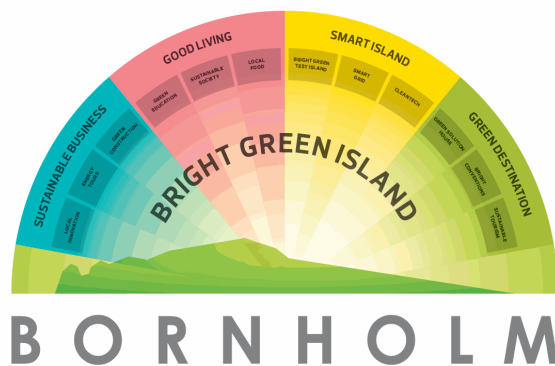
B O R N H O L M

Bright Green Island is the vision of being a 100% fossil free society in 2025.

A society creating local, sustainable and environmental solutions with a focus on creating growth and business opportunities in the process.

Bright Green Island – We started imagining!

Strategic necessity gave us the Bright Green Island-vision



We test tomorrow's solutions - today

Challenges:

- Fossil energy became increasingly expensive and we needed to convert our energy production
- Renewable energy was becoming a demand from politicians and society
- The story we wanted to tell about Bornholm did not correspond with the energy production

Outcomes:

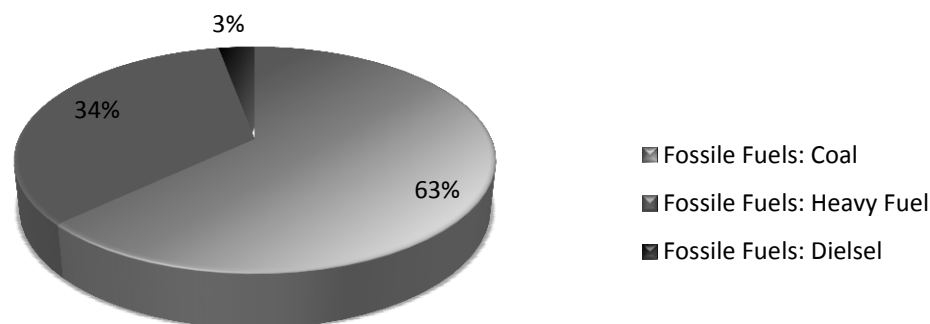
- The vision created a common goal for our community. Together we all work to combine renewable energy with a better economy
- The Bright Green Island-vision has created a common strategy for the energy supply companies on the island.
- We experience financial and environmental advantages in creating a greener profile.

"We are doing it – Working together -Getting the knowledge"

We have made the decision to realize the Bright Green Island vision and we have taken great steps already in the direction of sustainability for a whole society:

Power production at Bornholm 1979

Producing 122 GWh Electricity



Foreningen for

Energiudvikling Bornholm

Forsyning

RVV

BOFA

B

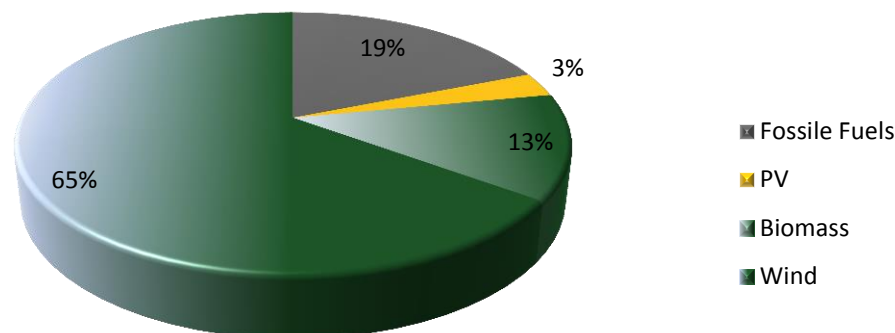
ØSTKRAFT
energi til gode oplevelser

BORNHOLMS
REGIONSKOMMUNE



Power production at Bornholm 2013

Producing 240 GWh heat & Electricity



The challenge – as we see it

Uncertainty about what the future may bring, means that we have to make decisions based on all the background knowledge we can muster...

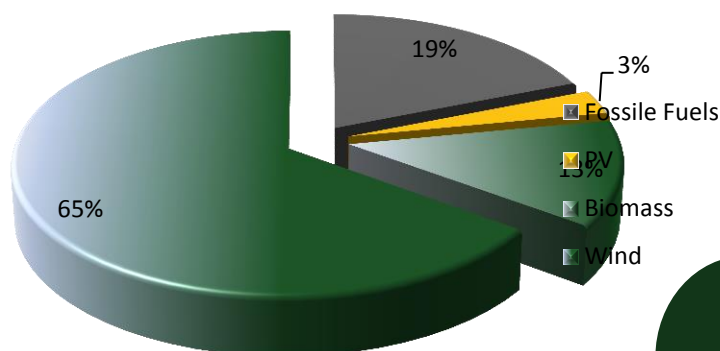
The challenge is making the strategy and the necessary investments, navigating between

- political objectives
- regulation
- environmental needs
- competitive prices
- and running a business with surplus

Demand for continuous improvement

Energy production at Østkraft 2013

Producing 230 GwH heat & Electricity



1

Building knowledge:

- Need for knowledge about the newest technologies and standards
- Need for knowledge of the developing technologies

2

Fact-based decisions:

- Best possible investments
- Impact tracking facing shifting governmental agendas
- Impact tracking facing shifting environmental agendas
- Impacts on the existing system

Building up knowledge and competencies

1

We engage in national and international R&D projects in close corporation with:

- Municipalities & Government
- Private Companies
- Universities



Universidad
Carlos III de Madrid



R & D projects on Bornholm

EcoGrid EU is by far the biggest project,

Other projects are however supporting the knowledge development, securing the position of being test Island for the world



Edison



DFR



Geothermal energy



Powerlab DK



VPILN



Ide4L



PV Island Bornholm



Biomass district heating



BioWaste2Gas



Green Building Renovation



Green Workforce

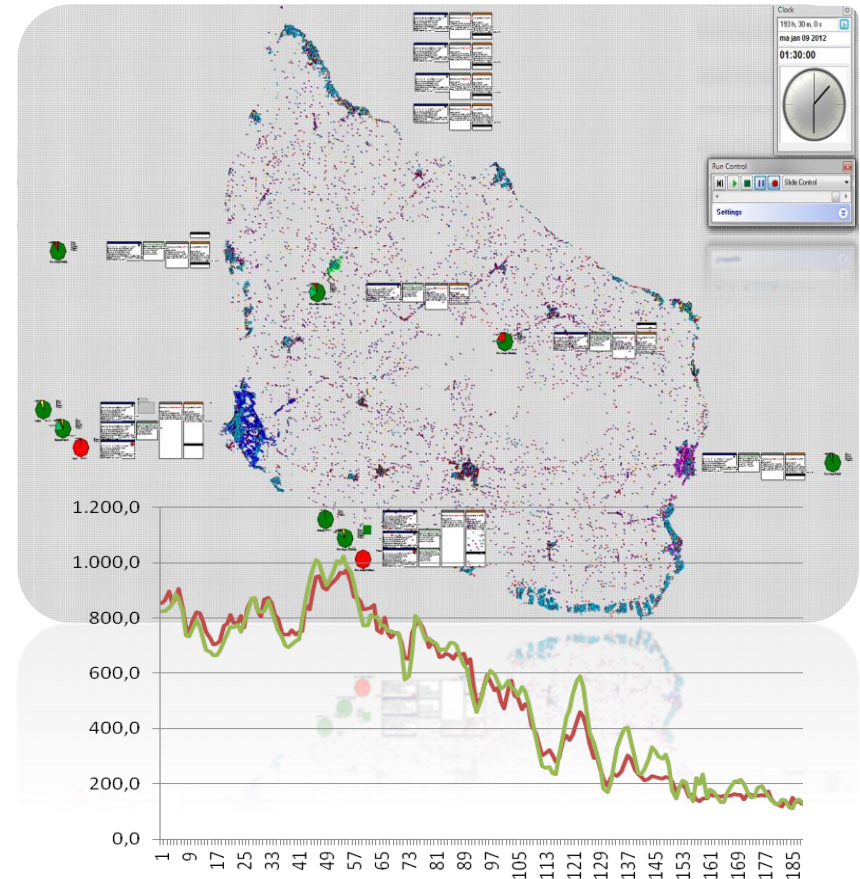


Bright Park Bornholm

Make decisions based on fact – and test out decisions

2

- The island perspective – from weakness to strength
- Modeling impacts over time.
- Foundation for a more fact-based strategic decision-making in terms of energy strategy.
- We build the model with possibility to re-configure it to other societies



The solution: Fact-based decision-making

Before decisions turns to cost,
the consequences are
simulated in an integrated
image, calibrated with the real
world – your environment.

Allowing you to make fact-
based decisions

A computer-based model of your
own energy system,
i.e. all:

- Production units
- Storage facilities
- Grid
- Consumers
- Weather conditions

A virtual testing environment with
simulation of alternatives:

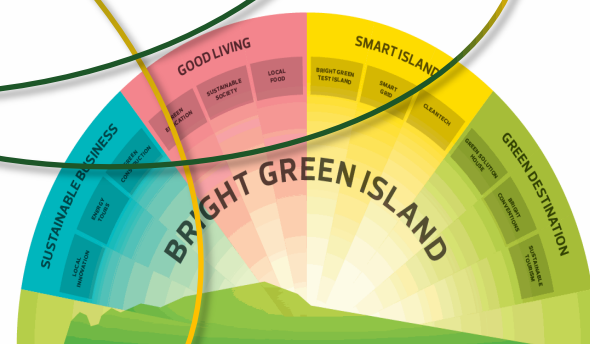
- Unconditional
- Risk free
- Embedded
- Synchronously and,
- With seamless coherence
between strategy and practice

A step back - obtaining knowledge

- Exchanging with neighbouring countries.

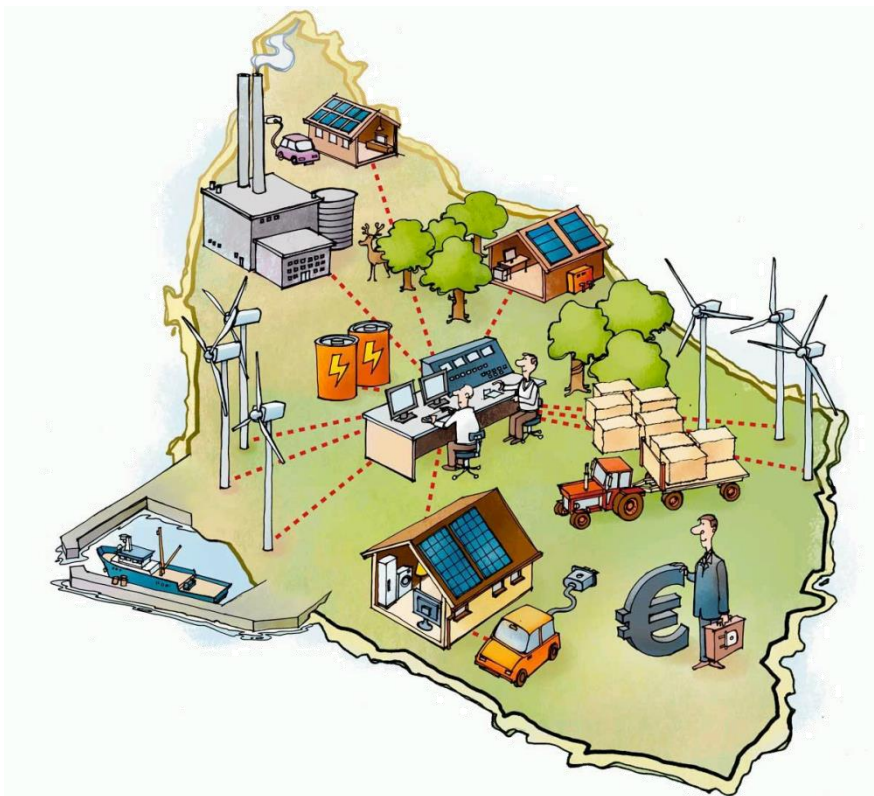
- Storage

- Smart Grid
(Activating the consumer side)



BORNHOLM

EcoGrid EU - A Prototype for European Smart Grids

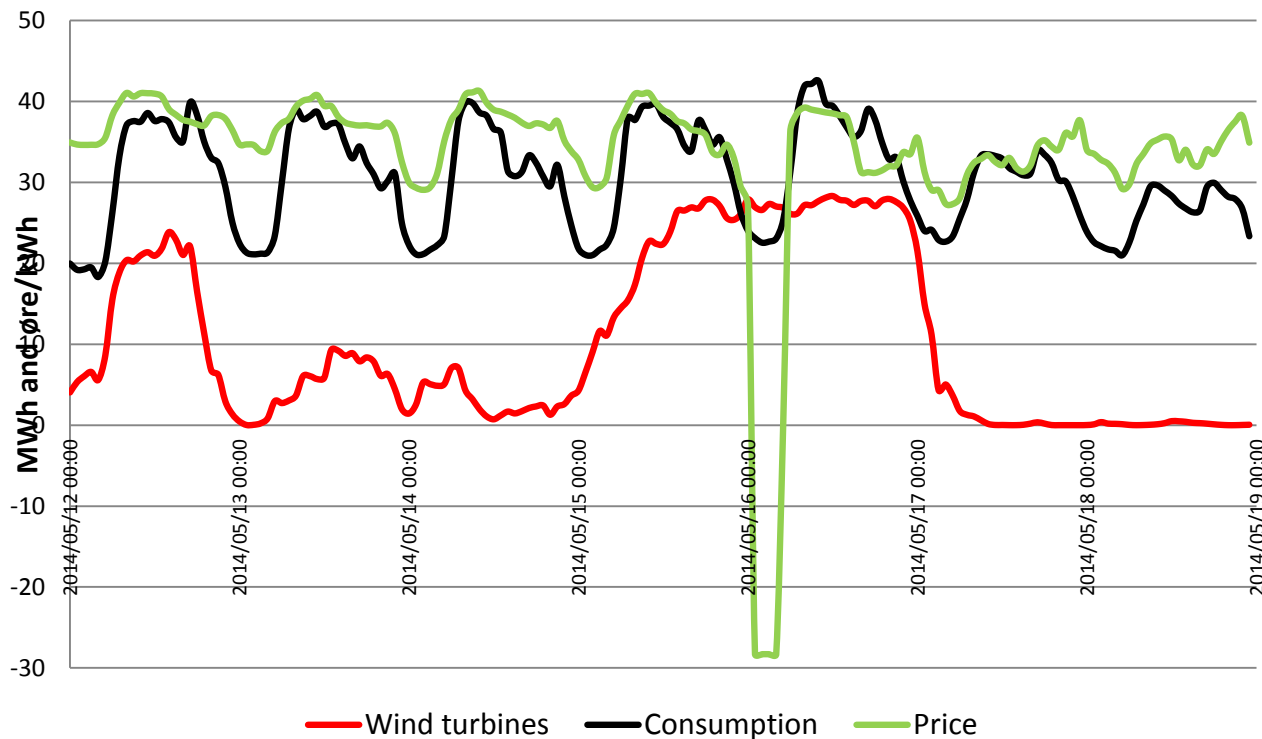


- Co-funded by FP7
- Smart Grid demonstration project
- 16 European partners
- Total budget 20,5 mio. €
- Project period 2011-2015

Wind turbines are the challenge

Production and price will fluctuate more and more

Bornholm maj 2014



In the near future the wind based electrical production will overcome the demand side 10 % of the year

The Grid will experience more load

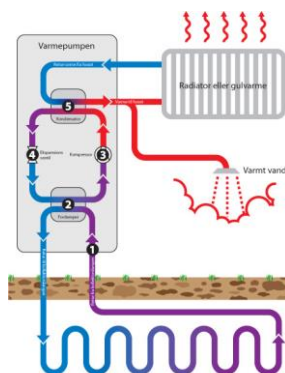
- Society will be electrified, to become more efficient
- More electric processes will be able to overload the grid.

The "future" home



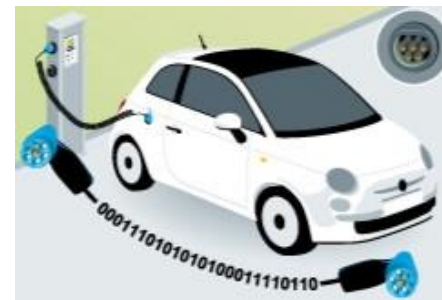
Normal consumption

+



Heatpump

+

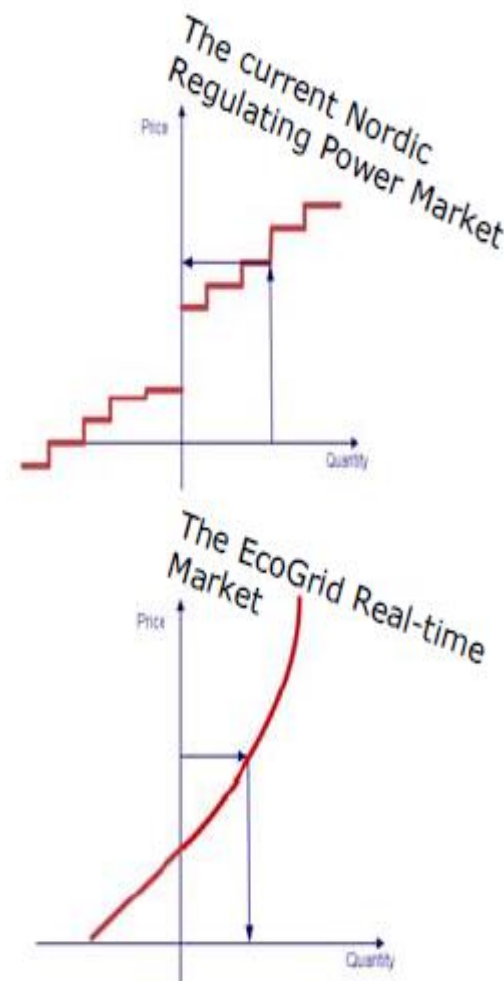


EV

Overload of demand

The EcoGrid EU market

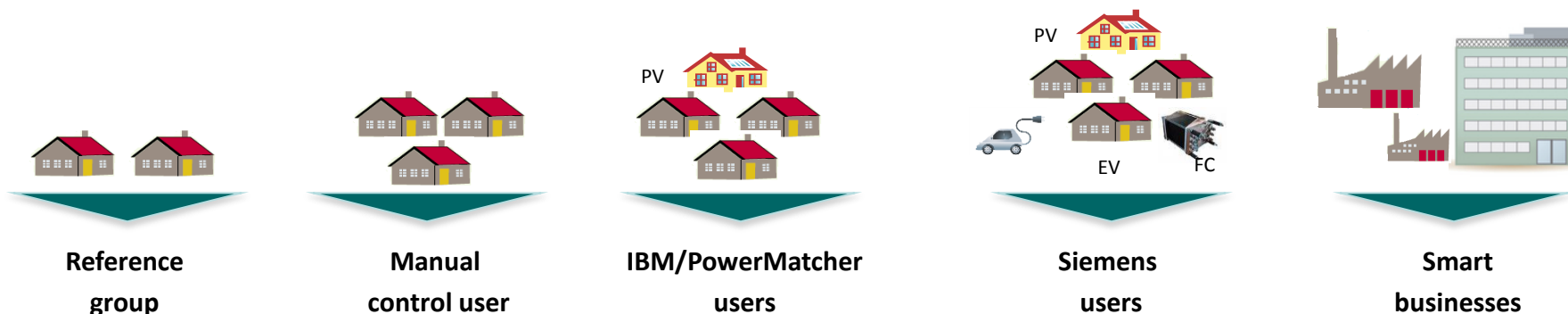
- The EcoGrid market is reversed
 - In the traditional market the requested quantity sets the price, which tends to higher the prices in peak consumption periods
 - In EcoGrid the right price will result in the demand needed by the system . ECOGRID is about peakshaving incentivizing the consumer to use energy when the system has overcapacity, and to lower demand when the system lacks capacity.
- The EcoGrid market settles the price only 15 minutes ahead and the price is regulated every 5 minute to increase the volatility in the market
- Small units, as for example individual households, can participate directly in the market



The EcoGrid EU participants

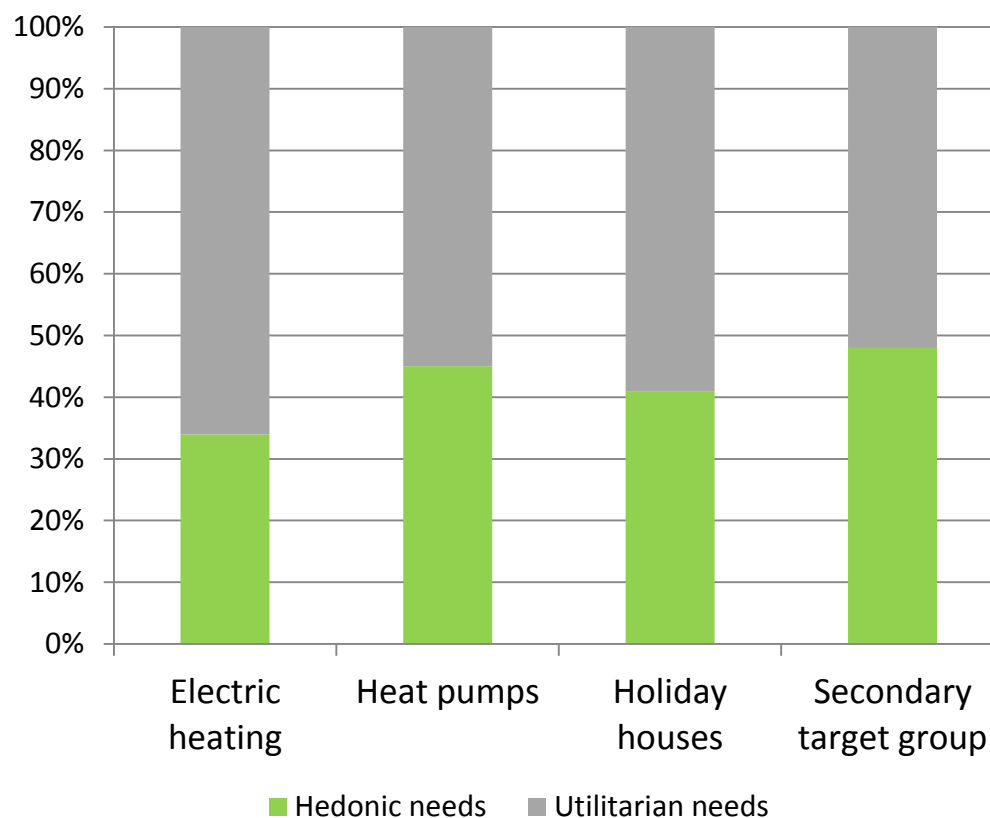
2000 households in
5 segments

- 350 customers in the reference group
- 500 ordinary households. Will be equipped with smart meter. Price prognosis send daily. Price warnings when price exceed certain levels
- 650 IBM/PowerMatcher households. Get smart meter and home automation system. Primarily electric heated or heat pump households
- 450 Siemens households. Get smart meter and home automation system. Primarily electric heated or heat pump households
- 20 businesses with smart meter and energy management system



What motivates our participants?

Different needs
motivates



Utilitarian needs as lower electricity bill is the primary motivation factor for the participants, but their hedonic needs, as supporting renewable energy, should not be neglected

It is important to involve and engage the consumers

Training and communication is a major task, which however is crucial for creating awareness and participation



Østkraft have offered all project participants training in the demonstration house Villa Smart

What does the project results show?

The project is still evaluated, but several learnings have already come from the project

- Consumers with electric heating and heat pump/air-con and automation equipment do show significant demand response.
- Only the consumers who are equipped with automation systems generates significant demand response. Automation of appliances is crucial for developing Smart grids in the near future. This is about volume of participation
- Demand response potential is also challenged by instable systems, which fails to react when signals are send.
- Participants, who manually have to interact, do not react on the varying prices.
- The participants are generally very happy about the project, even though they do not take much part in it in their daily lives.

Bright Green Island – 3 important lessons

COORPORATION

Foreningen for
Energiudvikling Bornholm

Forsyning

RVV

BOFA

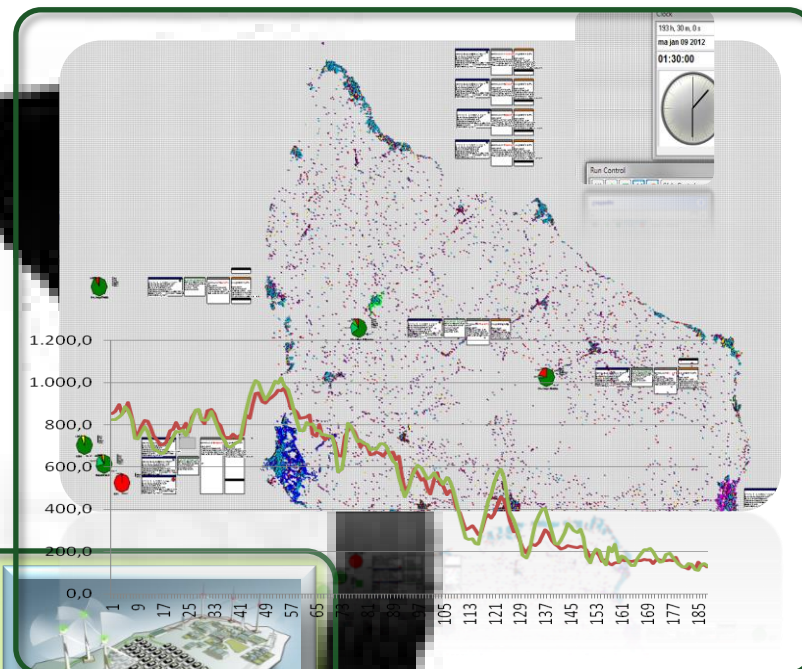
B

ØSTKRAFT
energi til gode oplevelser

BORNHOLMS
REGIONSKOMMUNE



EcoGrid



FACTS

KNOWLEDGE

Thank You



BORNHOLM