Cloud based control of heat pumps

Status so far

May 26th 2015

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Agenda

- Neogrid introduction

- Intelligent heat pump VPP controller

- Future activities

Neogrid Technologies

Who we are

- Founded in 2009

- Telecommunication +30 years

- Cloud based IT solutions for

  – Management of energy used for heat and hot water
    - modelling, forecasting, optimization and control
  – Online logging and display of all residential energy data

- Standardization work within Smart Grid DER communication
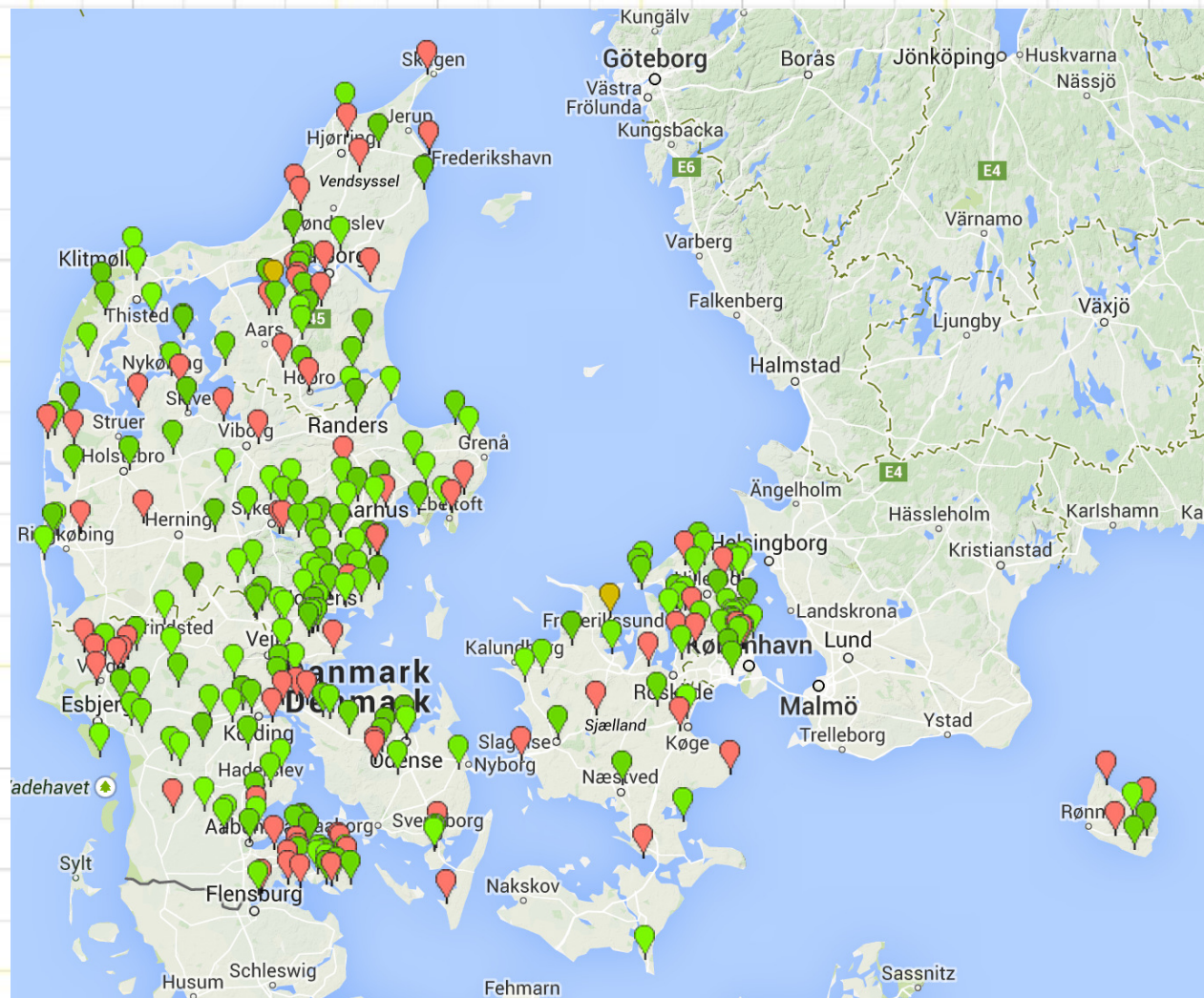
- 5 Employees

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New concept enabling intelligent energy management in private homes and releasing flexibility for Smart Grid Services

Intelligent VPP Heat Pump Controller

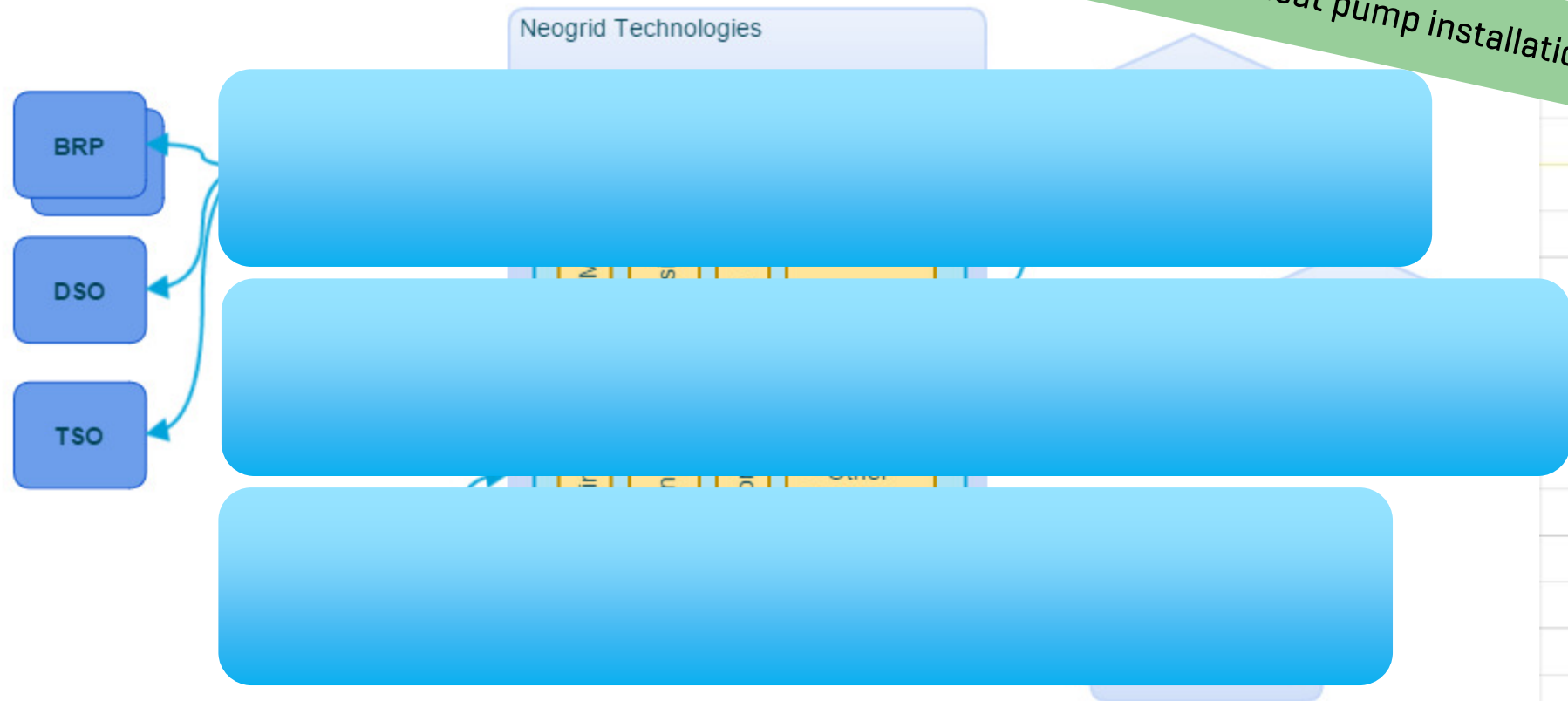# http://www.intelligentenergistyring.dk/ plants

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Virtual Power Plant

System setup

Operating on 100 Live heat pump installation

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BRP

DSO

TSO

Services/benefits available so far

Intelligent heat pump VPP controller

- House owner, typically individual modelling and control

    - Price optimized operation
    - Energy savings (out of house control and sunlight optimized operation)
    - Optimized comfort

- Smart Grid services, typically pool modelling and control

    - Day ahead/intra day/intra hour planning and optimization
    - Load shifting to cope with bottlenecks
    - Primary reserves/Manual reserves

- 3rd party actor/"experienced" house owner

    - Building envelope including guidelines
        - Heat loss/capacity, sensitivity to sun/wind
    - Heat pump key data, operation characteristics
    - Remote diagnostic, monitoring/alarm function
    - User behavior modelling

Some screenshots
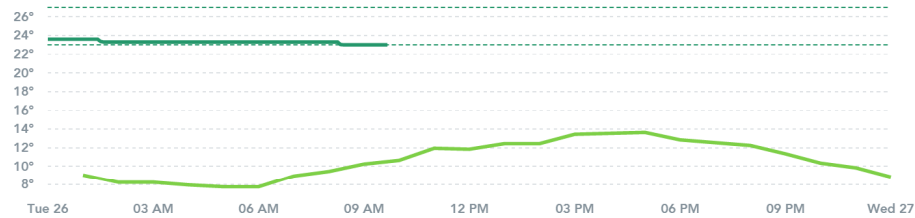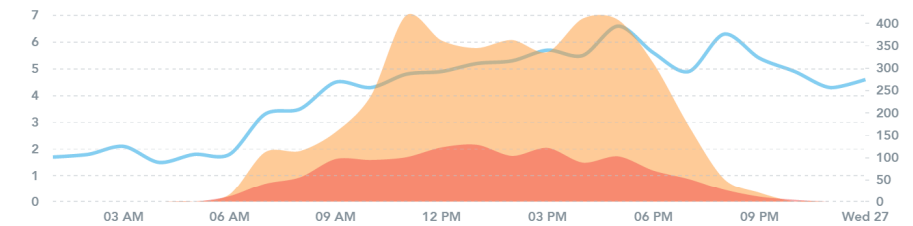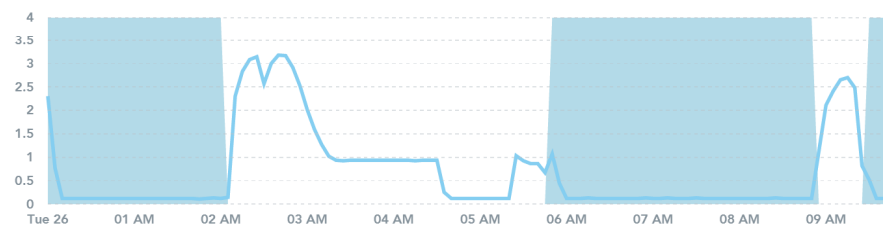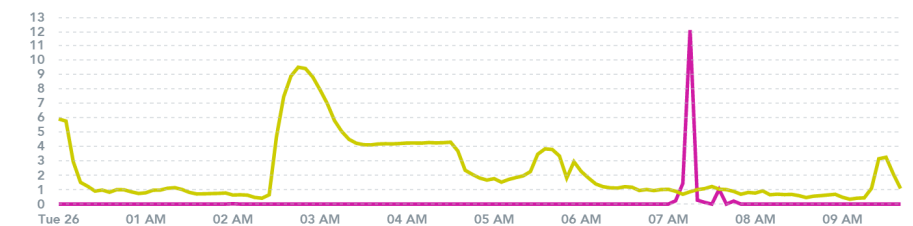
Some screenshots

Measured (avg) (kW)   Bid Up (kW)   Baseline (kW)   Bid Down (kW)   Act. Regulation (kW)   Measured (kW)

09 AM   12 PM   03 PM   06 PM   09 PM   Mon 18
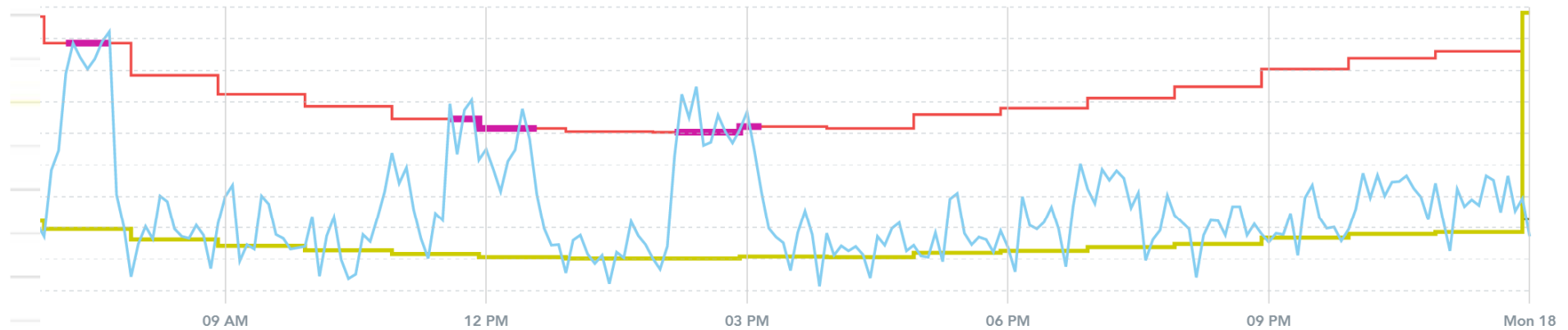
DAY   WEEK   MONTH   YEAR

May 17, 2015   ◀   ▶   +   —   RESET   EXPORT

Standardisation

Focus: IEC 61850-7-420, TC57, Information Models

E Energy measurement

T Temperature measurement

Power in

Hot Water Tank

Accumu-lation Tank
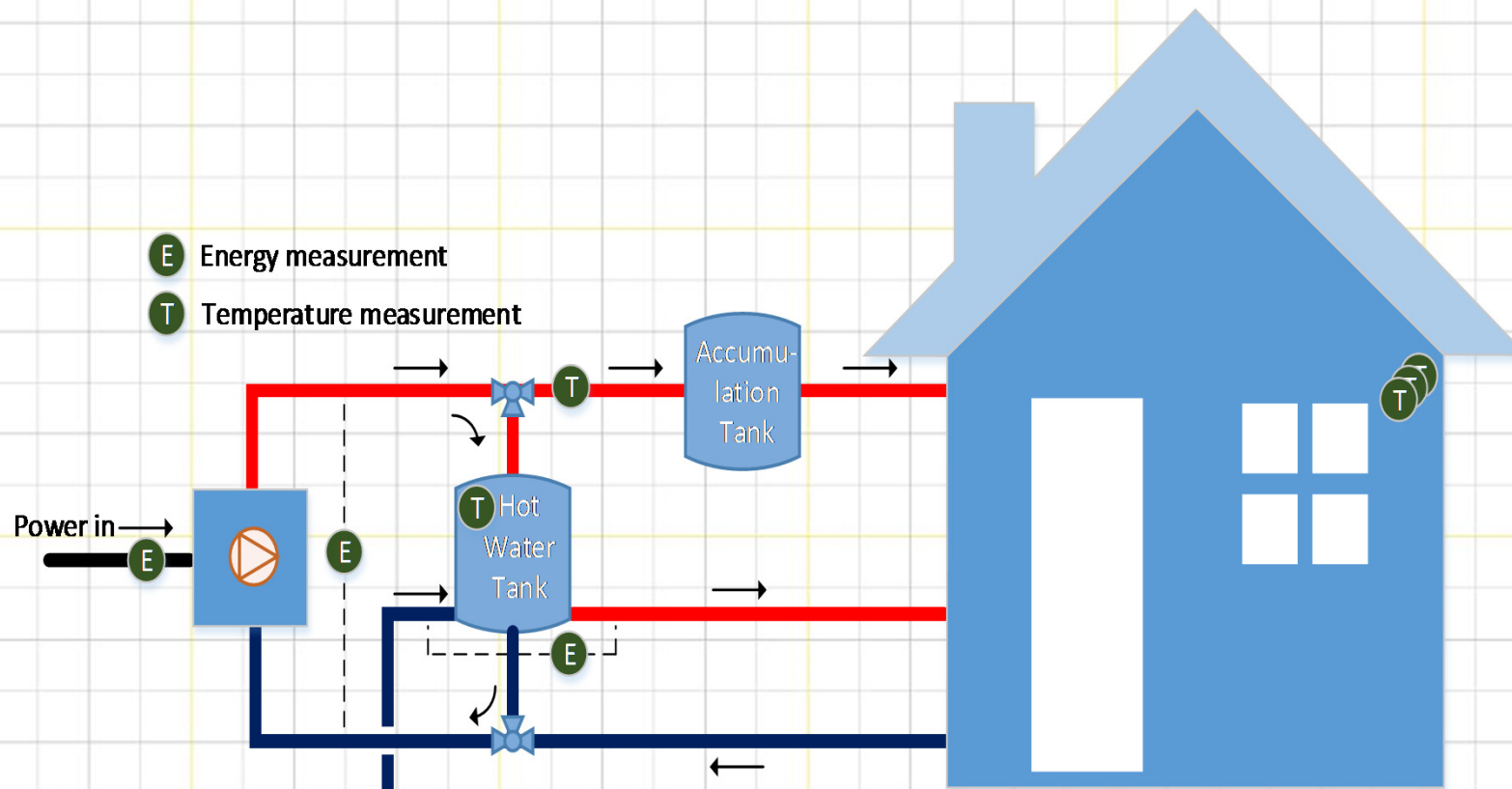
TotalFlex

Market place for flexibility

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Existing electricity markets + Flexibility

BRP

Electricity company

Aggregator

CVPP

flex-offer

TVPP DSO
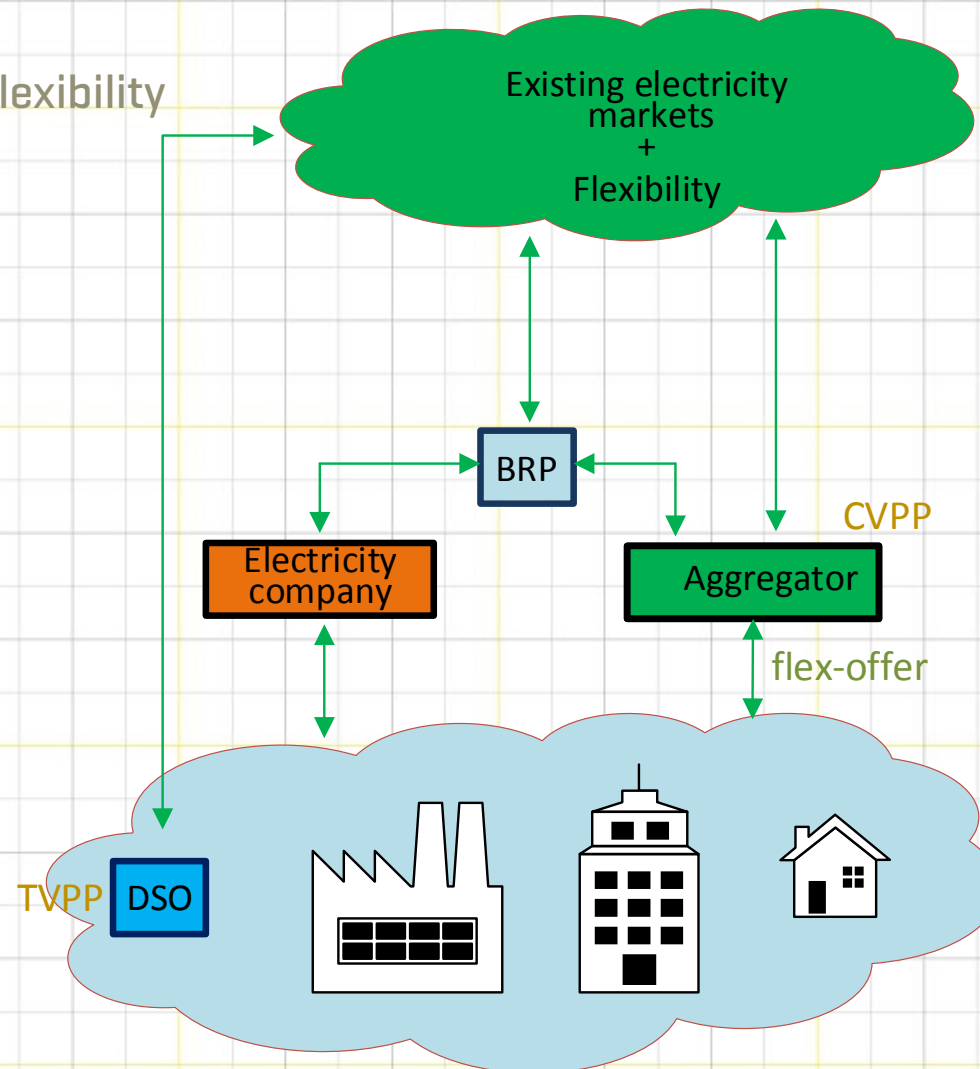
Next step

Activities

- Energy Management

  – Interface to floor heating control
  – Energy Management for district heating

- Flexibility as a commodity

  – Flex-offer
  – Aggregator functionalities
  – Market place for flexibility

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Thank you for your attention
Questions are welcome!

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Back up

Neogrid Partnerships and Research Focus

Projects funded by Energinet.dk's Research Program – ForskEL & EU FP7

NEOGRID TECHNOLOGIES

"IFIV - Intelligent Control of individual heat pumps"

"SDVPv2" – IES a.m.b.a.

"SDVP Connect"

"READY – Smart Grid READY VPP Controller for Heat Pumps"

- to develop an open communications platform that enables commercial players can access and control diverse consumption and production in Denmark

BRP
- Balance between production and consumption

"TotalFlex"

"Arrowhead"

- Predict the heating requirement of the house and the heat pump operation 24-48 hours ahead
- Predict the flexibility (advance and delay consumption)
- Control the heat pumps according to the plan

Consumer

TSO/DSO
- Grid Capacity as limited resource

- to develop a cost-effective, market-based system that utilizes total flexibility in energy demand and production, taking balance and grid constraints into account.
- FlexOffers
- PnP LV Grid Model

"Smart Summer Houses"

The Heat Pump

iPower

"FHEEL – Future High efficient EV integrated in the grid"

The Challenge

The triangle

Facilitate flexibility

C-VPP

Unclear interaction, conflicting interests

BRP

Balance between production and consumption (Power)

Neogrid NeoHeat VPP

Consumers

TSO/DSO Grid Load (Voltage)

Green Profile
Potential savings
Use power when needed

Limited capacity,
Optimize throughput

T-VPP
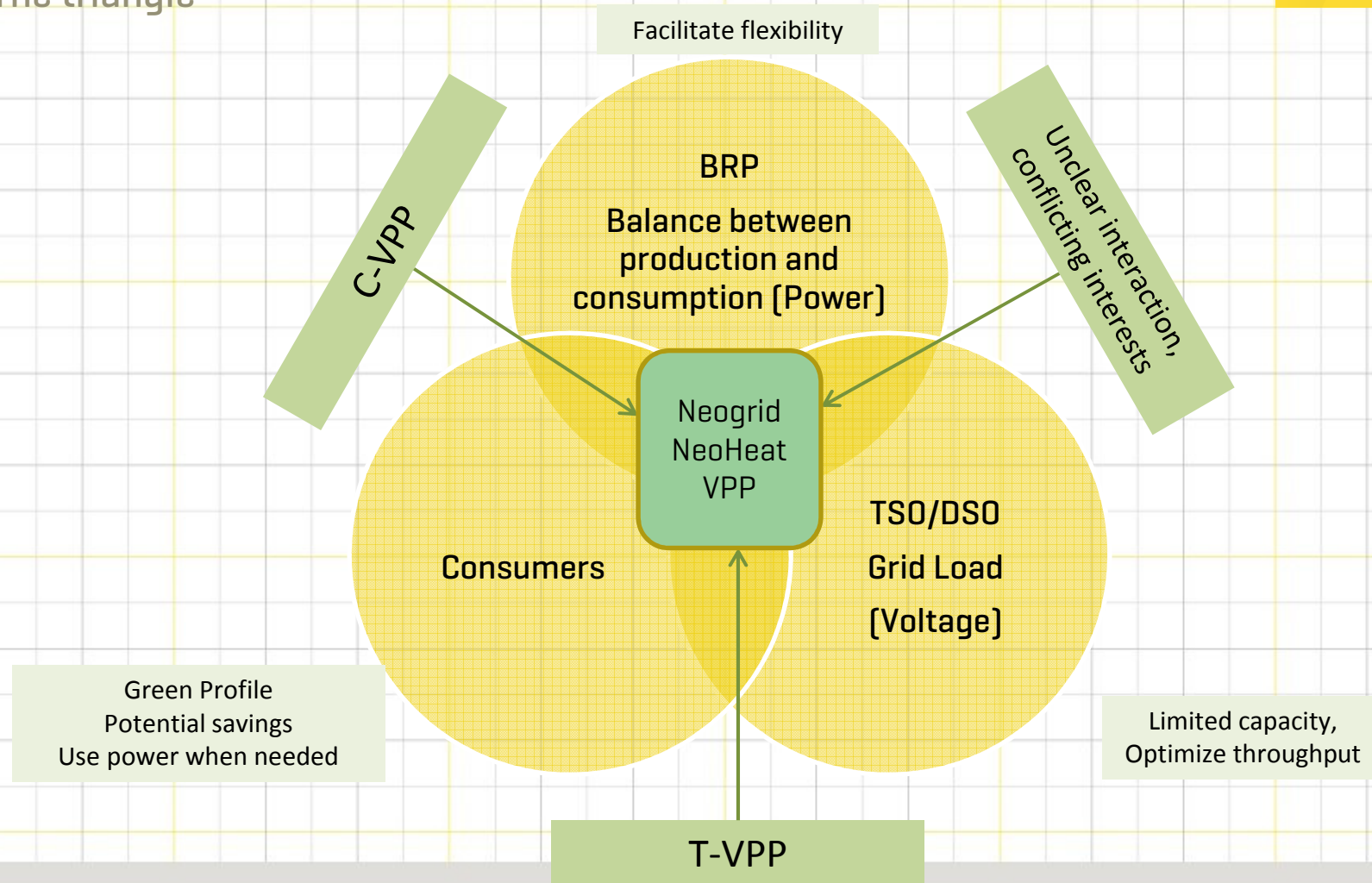
Flex-offer concept

A generic representation of flexibility

Scheduled

Aggregated

$$\sum amount(micro) = amount(macro)$$

Disaggregated

- Flexoffers put a value on flexibility
- Various types of flexibility can be combined

Collected from prosumers

Distributed back to prosumers