A market based smart grid pilot

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Field test in Hoogkerk (the Netherlands)

- PMC is the first real-life smart grid community
- Selected during the VN conference RIO+20 for Sustainia100, the global list of sustainable solutions
PowerMatching City

1 Introduction

2 Smart meter allocation

3 Establishing the smart grid business case

4 Involving consumers through smart propositions
Multiple functions of the system – Multiple Goals

1. Cost Effective Use of Energy
   *(In home optimization)*

2. Capacity Management
   *(reduce peak loads)*

3. Commercial Optimization
   *(Virtual Power Plant)*

4. Integration of Renewable Energy
   *(Valorisation and Imbalance Reduction)*
PowerMatching City – 2 phases

PowerMatching City is a field test for a *smart energy system*:

- **Phase 1 (2007-2011)**
  - Design, implement and demonstrate the (technical) feasibility of a *Smart Energy System* in an existing neighborhood

- **Phase 2 (2011-2014)**
  - New smart energy propositions
  - End user participation and interaction
  - Role of the DSO: Capacity management
  - Extension Electric Transportation & Demonstration Project
  - Business Case
  - Electricity wholesale and retail processes
PowerMatching City

1. Introduction
2. Smart meter allocation
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4. Involving consumers through smart propositions
Restrictions current market models

ERGEG recommends that smart metering systems should be capable of recording consumption on a configurable time basis (hourly or 15 minutes). This will optimize the use of electricity, and stimulates innovative pricing formulas.

However in many E.U countries, synthetic profiles are used for the allocation of small consumers. As a consequence:

- Domestic consumers have no access to wholesale energy markets.
- The energy retailer is not able to create a direct relation between the purchase and selling of electricity.
- The retailer is not able to stimulate or incentive energy consumption during cheap periods (e.g. with excessive wind energy available).
- The customer is not able to take advantage of cheap energy.
Smart Meter Allocation

Smart meter allocation faces resistance due to
- Big data: Providing each day 96x2 values for 7M connections requires excessive data transfer, data processing and data storage
- Energy prices for synthetic-based allocated consumers may rise, as non-allocated consumption is assigned to this group.
- Energy suppliers and consumers may show no interest in innovative pricing volumes, as peak – off peak price spread is limited.

Objectives PowerMatching City 2 (wholesale processes)
- Redesign wholesale processes, rendering these future proof (supporting flexible Time of Use and VPP concepts)
- Proof the design in practice: implementation of wholesale processes electricity in shadow environment).
- Draft recommendations for the sector.
• Big data issue can be minimized by aggregating at an early stage in the measurement data chain.
• Incomplete metering data is hardly an issue as there is sufficient data available for a proper extrapolation (based on standard annual usage).
• Non allocated consumption may be assigned to a larger group of consumers.
• Many energy suppliers are looking for new products and services to escape the commodity trap.
PowerMatching City

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Reduce sourcing costs retailer / balance responsible party:
- Day ahead optimization on spot market prices.
- Active (real time) participating in imbalance market (secondary reserve)
- Active (real time) participating in local balancing market (capacity management)

Reduce energy costs of prosumer directly by
- In home matching of use and generation
First findings on business case assessment

Day ahead optimization shows some, but little benefits

• Typical load and generation can only be delayed by 1-2 hour
• Spread in spot prices is low

Active participation in balancing markets is attractive, yet involves risks

• Marginal costs of demand response is zero (profits need to be shared with consumer however)
• Spread in balancing prices is relatively high, and are likely to increase
• Sign of imbalance volume changes frequently during the day
• However a position is taken on the market when load is shifted

Passive imbalance should be taken into account

• Latency in the system, as well as overrides by the consumer, may lead to imbalance in the system.
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Clarify customers’ needs, hopes & worries

Costs

“Quota voor luxe apparaten (airco) of piekuren”

“Goede kosten informatie”

Independence

“Dan moet ik controle uit handen geven over mijn eigen leven, wanneer ik dingen doe”

Meer bewustwording en zuiniger gedrag

Sustainable

Technologische ontwikkelingen gaan zorgen dat ik comfortabel kan blijven leven

Comfort

SMARTUTILITIES

SCANDINAVIA 2013
Two propositions are developed based on customer drivers

Together more sustainable

Maximize the usage of sustainable energy from the community

Smart costs savings

Profit from the lowest energy prices

Sustainable

Independence

Comfort

Costs
Working out the propositions in more detail

Together more sustainable

Smart costs savings

3 Energie Opwekken
Zonne-energie op afstand:
Als het huis niet geschikt is voor zonne-energie
Als investering in PV panelen te hoog is
100

12 Energiestromen managen
Maximaal benutten duurzaam aanbod
Apparaten reageren op basis van beschikbaarheid duurzame energie
150

14 Energiestromen managen
Overstollende energie aanbieden aan andere huishoudens
100

6 Energie Opwekken & Opslaan
Warmtepomp - met zonne-energie en warmteopslag
200

17 Energie Monitoren
Display / energie monitor
50

SMARTUTILITIES SCANDINAVIA 2013
PowerMatching City
Smart costs savings

Profit from the lowest energy prices

Advantages for customers

• Sell your own energy at the best price.
• Get the lowest energy price for your usage

Automatic devices

Smart devices

Display

Variable pricing
Together more sustainable

Maximize the usage of sustainable energy from the community

Advantages for customers

- More independent
- Using own solar energy
- Profit from being part of a sustainable community
Display
Next steps

- **Implementation**: adjust the PowerMatcher
- **Customer research**: Which parts of the proposition are most valuable?
  - Expectations and perception
  - Behavioural changes
  - Actual measurements
Thank you for your attention

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