11th Symposium on EnInnov
The Economics of implementing Smart Metering in Europe

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Section 1

European perspective
Section 1 - European perspective

Drivers for the implementation

- Energy Services Directive 2006/32/EC
- EUR 30 billion market until 2014
- E-mobility, decentralised production
- Supply assurance, aging infrastructure and capacity management
- Reducing process costs

Source: PwC Analysis
Section 1 - European perspective

Countries implementation mandatory (1/2)

- Italy (95% by 2011)
- Germany (starting in 2010 for new buildings)
- Sweden (100% by 2009)
- Spain (by 2018)
- Portugal (by 2015)
- Norway (by 2013)

Source: PwC Analysis
Section 1 - European perspective

Countries implementation voluntary (2/2)

- Austria
- Czech Republic
- Cyprus
- Denmark
- Finland
- France
- Greece
- Ireland
- Netherlands
- Poland
- UK

Source: PwC Analysis
Section 1 - European perspective

Largest European rollout in France

- Estimated costs EUR 4 to 5 billion, 50% of which are planned to be installation costs.
- Largest project Europe-wide.
Section 2
Cost-benefit analysis and Smart Metering
Connecting Smart Metering and CBA

Six important steps to do, when conducting cost-benefit analysis

- Defining alternatives
  - Scenarios for implementation
- Model timing
  - Lifetime, roll out, operation
- Stakeholders
  - Benefits
  - Costs

- Net-Present-Value
  - Discount rate
- Sensitivity analysis
- Recommendation
Section 2 - Cost-benefit analysis and Smart Metering

Stakeholder in Austria (1/2)

<table>
<thead>
<tr>
<th>Grid Operator</th>
<th>Supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>– Purchase, installation, IT, OPEX</td>
<td>– New tariff models</td>
</tr>
<tr>
<td>– Meter reading</td>
<td>– Balancing energy, peak/off-peak</td>
</tr>
<tr>
<td>– Load profile management</td>
<td>– Back office – invoicing</td>
</tr>
<tr>
<td>– Back office</td>
<td>– Postpone investments</td>
</tr>
<tr>
<td>– Peak/off-peak demand</td>
<td></td>
</tr>
</tbody>
</table>
Customer

- Timely information on usage
- Reduced consumption
- Saved time
- Lower invoices
- Supplier switching
- Efficient competition
Energy efficiency and CO$_2$ emissions

**Change in consumption behaviour**

- Timely information on consumed usage through monthly invoicing, SMS, email, mail.
- 1% - 20%
- i.e. Norway -4% (space heating)
- High grade of penetration

**Energy efficiency effect depends on**

- Change in consumer behaviour
- Penetration grade
- Level of energy efficiency in a country
- CO$_2$ savings depend on the energy efficiency effect
Section 2.1
CAPEX, OPEX
### Key numbers and their implication

<table>
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<th>Device</th>
<th>Unit</th>
<th>Range</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smart Meter Power (AMI)</td>
<td>EUR</td>
<td>34 – 60</td>
<td>Without communication module</td>
</tr>
<tr>
<td>Smart Meter Gas (AMI)</td>
<td>EUR</td>
<td>50 – 80</td>
<td>Without communication module</td>
</tr>
<tr>
<td>Installation Costs per Power Smart Meter</td>
<td>EUR</td>
<td>15 – 60</td>
<td>Installation, licensing, project costs, rollout method</td>
</tr>
<tr>
<td>Server + implementation</td>
<td>EUR</td>
<td>30,000 – 48,000</td>
<td></td>
</tr>
<tr>
<td>Meters per server</td>
<td>Number</td>
<td>10,000 – 50,000</td>
<td></td>
</tr>
<tr>
<td>Concentrator</td>
<td>EUR</td>
<td>1,000 – 2,000</td>
<td></td>
</tr>
<tr>
<td>Meters per concentrator</td>
<td>Number</td>
<td>100 – 300</td>
<td></td>
</tr>
</tbody>
</table>

Source: PwC Analysis

**European Case – implementing 250 Mio power Smart Meters**

- Investment: EUR 8.5 – 15 bn
- Installation: EUR 4 – 15 bn
- Overall: EUR 12.5 – 30 bn
Section 2.2

Communication
### Communication technologies

<table>
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<tr>
<th>Technology</th>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
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<td>Power line (PLC)</td>
<td>Widely tested in trial projects, Existing infrastructure</td>
<td>500 meters range, Slow data read-out, Signal may interrupt other devices</td>
</tr>
<tr>
<td>GSM/GPRS/UMTS</td>
<td>Direct transmission, Reliable, secure, Non susceptible to interference</td>
<td>Running costs based on data volume</td>
</tr>
<tr>
<td>DSL</td>
<td>Long ranges possible, Hardly susceptible to interference</td>
<td>Running costs based on data volume, Modem switched on (vacation, work,…)</td>
</tr>
<tr>
<td>IP, Fibre optic</td>
<td>Nationwide penetration (IP), Reliable, secure, non susceptible to interferences, FO: high transfer rate</td>
<td>FO: not available, FO: high investment costs, Service provider -&gt; capacity, Running costs based on data volume</td>
</tr>
<tr>
<td>WLAN, ZigBee</td>
<td>Open standard, Low energy consumption, No connection costs</td>
<td>Line of sight, Bandwidth decreases with number users, No licensed radio range</td>
</tr>
<tr>
<td>Satellite</td>
<td>Penetration</td>
<td>Installation and connection costs, Data transfer low, Available capacity, time lag signal</td>
</tr>
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Section 2.2 - Communication

Topology of technology model (1/2)

Source: PwC Analysis
Section 2.2 - Communication

Topology of technology model (2/2)

Source: PwC Analysis
Section 2.3

Economy
Key drivers of CBA

7 Main drivers for CBA result

- Consumption behaviour
  > 1% up to 20%
- Load shifting
  > 1.9% to 4.7%
- Investment Costs
- Potential energy price reductions
- Discount rate
- Roll out
- Penetration grade

Source: PwC Analysis
Section 3
Credentials and contact
A selection of our global capability in Smart Metering

Canada
- SMI strategy and business case, grid modernization vision, procurement and negotiations, and financial modelling for a major utility

UK
- Mergers and acquisitions experience within the metering landscape

Netherlands
- Smart metering programme business case analysis and development

Norway
- Outsourcing of metering, settlement, billing and debt collection

U.S.A
- Smart metering implementation programme and transformation management including regulatory support, risk management, scheduling support and process design

France
- Smart metering deployment analysis in order to secure internal and legal reporting production and publication

Italy
- Smart metering implementation planning support

Germany
- Advising on implementation of smart metering
- Implementation of IT solutions for smart metering
- Issued sector survey - “State of realisation and strategic implications for the German utility market”

India
- Implementation of advanced metering in distribution companies

Australia
- Currently assisting development of a consistent national framework for the rollout of smart metering infrastructure across the Australian electricity market to small customers.
“State of realisation and strategic implications for the German utility market”

Goal: Evaluation of the expectations and perceptions of the utilities and strategic considerations.

Publication in November 2008
Section 3 - Credentials and contact

Thank you for your attention

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