Smart Cities and Citizens Behavior

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November, 2012
Cascais, Portugal
Agenda

1. The power of Consumer engagement
2. Évora InovCity
3. Energy Efficiency Study – Results
4. The future ahead
5. Summing Up
Consumer engagement is key to unlock Smart Grids’ potential

- Detailed billing information
- Energy reports and price differentiation
- Demand response, Distributed generation, Evs, ...
- Technical benefits for the Grid

**Edp distribuição**
Some companies are already using big data to provide detailed consumption information to consumers – the Opower example

"Last 12 months we have consumed 29% less energy than our most efficient neighbours"

"I like the fact that they are sharing the information"

"It gives me good comparison data with houses with more or less the same area"

"When we got the first report, my husband said: We are using too much energy"
Consumers interact yearly for only 9 minutes (on average) with their electricity provider

**Consumer diversity**

Consumer preferences are evolving. And they are all different.

Consumer segment types:

- **Self-reliants (13%)**
  - “I prefer to manage my electricity consumption on my own”

- **Social independents (18%)**
  - “I like testing new technologies”

- **Cost sensitives (22%)**
  - “I look above all for the best financial rewards”

- **Service centrics (18%)**
  - “I want the best service for my family and me”

- **Traditionalists (15%)**
  - “I prefer a familiar experience”

- **Tech-savvys (14%)**
  - “I value convenience and efficiency”

**Top 4 moments of truth for consumer interest**

Consumers’ interest in learning about electricity management programs can be met by specific events so timing is of the essence for utilities/providers.

Below the consumers’ reply when asked when they would be interested in learning about product and service bundles from their electricity provider:

- New product/service bundle is introduced: 49%
- Move into a new home: 48%
- Electricity bill is higher than usual: 47%
- Signing up new service: 43%

*In the last 12 months consumers have interacted with their electricity provider for 9 minutes (on average)*

*source: Revealing the values of the new energy consumer – Accenture 2011 and 2012*
Utilities face big issues today as they search to maximize consumer engagement

• Consumers are different from each other and want and value different things
• Utilities need to crack the millions of data available to start to understand consumers

Data analytics

• Traditionally, consumers were defined as the person that pays the bills
• Address the different consumer segments and serving all consumers with the set of channels favored by each segment

The new consumers

• Utilities need to think outside the traditional grid-centered innovation and focus on beyond-the-grid products & services
• Tailor made products & services based on data analytics need to be developed

Innovation in Operations

• Consumers are changing and the way they chose providers and purchase energy-related products is completely different
• Utilities need to engage consumers, develop new solutions and became much more consumer-focused

Maximize value
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The evolution towards a smarter grid is touching a number of different areas of Network Operators.
Évora is a living lab for InovGrid project, with different valences from smart metering, Public Lighting, EV, Energy Efficiency and Client interaction.

Évora is the first Iberian InovCity with more than 30k smart meters and 340 DTCs in operation.

Évora InovCity has the dimension, the network diversity, the customers and the context to support a thorough evaluation of the solution.
The project developed a strong involvement of local stakeholders and population which was key for its success.

- Presence in the local press
- Energy Bus in Évora
- 3D Model at InovCity Store in City Centre
- Test of new products and services
- Client research and Social studies
- Mailing and information to Évora Clients
- In-home displays in stores at the historical centre
- InovCity website and local social networks and blogs
- Involvement of the Town Hall and other local public Authorities
- Monthly Newsletter to all Energy related professionals in Évora region
- Collaboration with Évora University
- Smart Grids conferences and meetings in Évora
Sociological studies allowed us to understand clients expectations about feedback on energy efficiency and satisfaction with EDP Box installation

Client Interest on New Services related with Energy Efficiency:

<table>
<thead>
<tr>
<th></th>
<th>Alerts</th>
<th>Displays</th>
<th>Information</th>
<th>Tariffs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alert when Consumption</td>
<td>6,7</td>
<td>7,0</td>
<td>7,3</td>
<td>5,8</td>
</tr>
<tr>
<td>varies more than xx%</td>
<td></td>
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<tr>
<td>Alert about &quot;Contracted</td>
<td></td>
<td></td>
<td>5,8</td>
<td></td>
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<tr>
<td>Power&quot;</td>
<td></td>
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<tr>
<td>Suggestion about ideal</td>
<td></td>
<td></td>
<td>6,0</td>
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<tr>
<td>Tariff plan</td>
<td></td>
<td>6,2</td>
<td></td>
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<tr>
<td>Display</td>
<td></td>
<td></td>
<td>5,8</td>
<td></td>
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<tr>
<td>installation</td>
<td></td>
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<tr>
<td>Display Alerts</td>
<td></td>
<td></td>
<td>6,2</td>
<td></td>
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<tr>
<td>Software with information</td>
<td></td>
<td></td>
<td>5,4</td>
<td></td>
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<tr>
<td>Intelligent system</td>
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<td></td>
<td>2,5</td>
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<tr>
<td>connected with Smart</td>
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<tr>
<td>meter</td>
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<td></td>
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</tr>
<tr>
<td>Consumption Segmentation</td>
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<tr>
<td>Tariff</td>
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<tr>
<td>Pre-paid Tariff</td>
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</table>

In general, Clients showed a great interest for the new services InovGrid infrastructure will allow

Pre-payment was considered the least interesting functionality by consumers, but it can be relevant for suppliers and vendors to decrease fraud and bad collects

Evaluation of Client Satisfaction with EB installation process:

- Installation process was well perceived and evaluated by clients (above average)
- Appropriate training to the installations teams was a critical factor of success

Source: Estudo da Adesão das Comunidade Locais à Energy Box no Contexto do Projecto Évora InovCity, ISCTE-IUL (Sociological Study on Local Community relating Energy Box perception)
InovGrid, selected by EC/JRC/Eurelectric as the single case study for assessment of smart grid projects in Europe and winner “Utility of the Year Award 2012”

**Smart Grids Project Catalogue 2011 (source: JRC/EC):**

Over 5 billions of investments, but still at the beginning of the Smart Grid transition

**InovGrid project selected among more than 200 smart grids projects by Joint Research Centre of the European Commission (JRC) and Eurelectric as the single case study for testing and validation of Business Case assessment methodology (EPRI)**

**JRC / Eurelectric InovGrid Reports**

InovGrid used as the single reference project for the JRC report on “Guidelines for conducting a cost-benefit analysis of Smart Grid projects” (http://ses.jrc.ec.europa.eu/images/stories/deliverables/2012.2783-jrc_rr_cba_for_smart_grids_online.pdf)

Eurelectric used InovGrid findings to publish a report about a methodological framework to systematically estimate the different benefits of smart grid projects in seven steps “The Smartness Barometer – How to quantify smart grid projects and interpret results”


**“Utility of the year Award 2012”**

“European Smart Metering Awards 2012”
“Smart Metering UK & Europe Summit 2012”, London

“Utility of the year Award 2012”
- EDP Distribuição
- Smart grids,
- Energy efficiency
- Customer oriented
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The Energy Efficiency Study in Évora aims at understanding the impact of a Smart Grid infrastructure in the consumption of residential Clients.

Energy Efficiency Study in Évora

Goal

→ Evaluate the level of efficiency obtained within smart grid Clients

➢ Evolution of consumption
➢ Behaviour analysis
➢ Attitude towards new services & equipments

Specialized and independent Team

Qmetrics

With 2 Professors & Researchers from

The results of this Study can be certified, both scientifically and methodologically by the market research company Qmetrics. In addition, this Project was led by 2 professors & researchers from the New University of Lisbon.
New Products & Services are being tested on selected segments of customers and validated against control groups.

Around 1,300 customers, statistically meaningful, were selected for testing special services; their behaviour will be compared to selected control groups, inside and outside Évora.
The results of the Study in Évora show that the implementation of a Smart Grids infrastructure led to an increase in energy efficiency of 3.9%.

**Energy Efficiency Study – Smart Grids**
- Main goal: determine the potential of energy efficiency with a Smart Grids’ infrastructure
  - 30,000 EDP Boxes installed
  - Invoices based on real consumption
  - Participation in sessions with small groups of clients
  - Energy Bus in Évora
  - Presence in both Local and National press
  - Energy Efficiency tips (Mailing)
  - Web access to EDP Online
  - Conferences and Events about Smart Grids

**Results**
- Increase in energy efficiency of 3.9% with a 2.1% margin of error - positive effect in energy efficiency (indirect feedback)
- Reduction between [1.8%; 6%] – confidence interval 95%

**Changes in Consumption**
- Average Daily Consumption between 2010 and 2011

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2011</th>
<th>Δ</th>
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<tbody>
<tr>
<td>Évora</td>
<td>9.2 kWh</td>
<td>8.2 kWh</td>
<td>-10.9%</td>
</tr>
<tr>
<td>Reference Group (1)</td>
<td>9.0 kWh</td>
<td>8.4 kWh</td>
<td>-6.7%</td>
</tr>
</tbody>
</table>

**Rigorous methodology and scientific approach**
- The results of the Study are aligned with several other international Projects; Results can be scientifically certified by Qmetrics, company specialized in market research, that worked together with 2 Professors & Researchers from Universidade Nova de Lisboa (UNL)

(1) The Reference Group was chosen based on geographical proximity and on the similar climate conditions and socio-economic characteristics when compared to Évora.
We are studying the impact of different incentives in consumer behaviour towards energy consumption.

**Tariff simulation**
- Tariff simulation for new tariff schemes:
  - 3-period tariff
  - kWh goal tariff
  - Consumption level tariff

**Indirect feedback (after consumption)**
- Alerts (SMS, email or mail) containing info on:
  - Consumption level
  - Power use
  - High-consumption periods/days

**Direct feedback (real time)**
- Displays with real time connection with the EDP Box

Évora Pilot Group

Web portal with historic data

Évora Pilot Group
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EDPD plans to install 100k Energy Boxes in 6 locations with different network characteristics, with a focus on PRIME, GPRS and RF MESH technologies

<table>
<thead>
<tr>
<th>Municipality</th>
<th>EDP Region</th>
<th>Rational</th>
</tr>
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</table>
| Guimarães (center)   | Norte      | • Urban center with strong development  
                     |                         | • European Capital of culture 2012                                       |
| São João da Madeira  | Porto      | • High density of Domestic and Industrial Clients                           |
| Lamego               | Mondego    | • Municipality in the interior zone of the country  
                     |                         | • Rural network                                                            |
| Marinha Grande       | Tejo       | • Challenging quality of service                                           |
| Alcochete            | Lisboa     | • Field lab for new technologies  
                     |                         | • Close to Lisbon                                                           |
| Faro (ilhas)         | Sul        | • Testing for Island operation  
                     |                         | • High operation costs                                                      |

![Map of Portugal showing locations]
EDP Distribuição is aligned with the most important standardization projects in Europe and actively participates in several international forums and projects.

- Union of the Electricity Industry
- European Distribution System Operators Association for Smart Grids
- JRC-EDP Collaboration Protocol
- Single case-study and reference project for JRC and Eurelectric
- Reports on Smart Grid assessment and Business Case
- Smart Grids: Grid+, Meter-ON
- Aggregators: EcoGrid
- Microgeneration/ Renewables: Reservices
- Consumers: S3C
- Distributed Resources: SuSTAINABLE
- Storage: Stabalid
- Secondary Substation: Open Node
- Security: Tclouds

International electricity distribution community
International council on large electric systems
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Summing up...

1. Consumer engagement is the key to unlock the smart grid potential, and Utility companies know it.

2. Utilities face big issues today as they search to maximize consumer engagement – being able to manage the millions of data available, understanding the new and all different consumers, being able to build-in innovations in their operations and also focusing on maximizing value for all stakeholders.

3. Évora is a living lab for the InovGrid project, with different valences from smart metering, Public Lighting, Electric Vehicles, Energy Efficiency and Client interaction, and the project has developed a strong involvement of local stakeholders and population which was key for its success.

4. The results of the Energy Efficiency Study in Évora show that the implementation of a Smart Grids infrastructure led to an increase in energy efficiency of 3.9%. Additionally, new Products & Services are being tested on selected segments of customers to understand the impact of different incentives in consumer behavior.

5. EDP Distribuição is looking ahead in the Smart Grids and Consumer Engagement topic: first, it plans to install 100k Energy Boxes in 6 locations with different network characteristics; secondly, EDP Distribuição is aligned with the most important standardization projects in Europe and actively participates in several international forums and projects.