Consumer demand side flexibility in Europe

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Meet APPLiA
APPLiA - Home Appliance Europe represents home appliance manufacturers from across Europe.

By promoting innovative, sustainable policies and solutions for EU homes, APPLiA has helped build the sector into an economic powerhouse, with an annual turnover of EUR 50 billion, investing over EUR 1.4 billion in R&D activities and creating nearly 1 million jobs.
26 National Associations in 24 countries
Direct Members
200,000 people directly employed in home appliance manufacturing, 900,000 indirectly

1.4 bn euros invested in Research & Development

67 bn euros direct & indirect valued added to EU GDP
Demand side flexibility
Demand side flexibility

Consumer adapting his energy consumption behaviour to variable energy prices or market incentives:

- postponing a cycle
- scheduling in advance
- adjusting the temperature
Benefits and obstacles

- more efficient use of RES
- alleviation of the strain on the grid
- management of increased demand
- avoiding blackouts
- balancing demand and supply in real time

- use of real-time price tariffs
- lacking knowledge among users
- lacking building automation and control systems
Smart appliances

Current trends
Smart appliances

Capable of automatically changing and optimising its consumption patterns in response to an external stimuli

- energy efficiency
- enhance use of RES
- empower consumers

New challenges ahead

- IoT
- Cyber Security
- Data Privacy
Appeal of Smart Home products

Appeal of Smart Home products categories, in 2015, in 7 markets (Brazil, China, Germany, Japan, South Korea, UK and USA). Leading edge consumers indicate market evolution.

Source: GfK
Number of smart devices @home

- **2008**: 2.4 devices
- **2015**: 8.6 devices
- **2022**: >500 devices

Source: Strategy Analytics/Gartner
The expected development of the Internet of Things

By 2020, it is estimated that there will be 50 billion connected devices, globally.

Source: Cisco IBSG
Smart homes* in the European Union

The number of smart homes in the EU is expected to increase tenfold by 2021.

* Homes which use digitally controlled lighting, heating, ventilation, air conditioning, security, as well as home appliances.

Source: European Commission
The share of connected appliances in total household electricity consumption is set to grow rapidly, presenting opportunities for demand response.

Source: International Energy Agency
Unit cost of a smart appliances

Source: International Energy Agency
Smart appliances in Europe

- **Revenue of smart appliances in Europe**, in million Euro:
  - 2018: 4000
  - 2019: 6000
  - 2020: 8000
  - 2021: 10000
  - Average annual growth rate: 29%

- **Users of smart appliances in Europe**, in millions:
  - 2017: 10
  - 2018: 20
  - 2019: 30
  - 2020: 35
  - 2021: 40
  - Average annual growth rate: 30.9%

- **Average revenue per user, in Europe**, in million Euro:
  - 2017: 350
  - 2018: 350
  - 2019: 350
  - 2020: 350
  - 2021: 350
  - 2022: 350
  - 2023: 350
  - Average annual growth rate: 1.5%

*Source: Statista*
Demand side management
DSM techniques

- **Peak clipping**
- **Valley filling**
- **Conservation**
- **Strategic load**
- **Load shifting**
- **Flexible load**
Two main approaches

Incentive-based
• consumer to agree to adapt his consumption
• direct load control, interruptible service & emergency demand response

Price-based
• customer to participate in DR based on price info
• real time pricing, time of use, peak-time pricing
Use cases
Interoperability

Is key to unlock the flexibility potential

**Solutions:**

**SAREF**
- Smart Appliances REFerence ontology

**SPINE**
- Smart Premises Interoperable SPINE
Use case: overload protection
Use case: overload protection
Use case: overload protection
Use case: usage of surplus energy
Flexibility
potential
benefits

Appliance categories
## Energy consumption in households

### Table: Energy Consumption in Households

<table>
<thead>
<tr>
<th></th>
<th>Total Residential/Households</th>
<th>Space heating</th>
<th>Space cooling</th>
<th>Water heating</th>
<th>Cooking</th>
<th>Lighting &amp; appliances</th>
<th>Other end uses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electricity</strong></td>
<td>24.4</td>
<td>3.6</td>
<td>0.3</td>
<td>2.8</td>
<td>2.7</td>
<td>13.8</td>
<td>1.2</td>
</tr>
<tr>
<td><strong>Derived Heat</strong></td>
<td>7.6</td>
<td>6.0</td>
<td>0.0</td>
<td>1.6</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Gas</strong></td>
<td>36.9</td>
<td>28.1</td>
<td>0.0</td>
<td>7.0</td>
<td>1.8</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Solid Fuels</strong></td>
<td>3.4</td>
<td>3.1</td>
<td>0.0</td>
<td>0.2</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Oil &amp; Petroleum Products</strong></td>
<td>11.8</td>
<td>9.6</td>
<td>0.0</td>
<td>1.5</td>
<td>0.7</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Renewables and Waste</strong></td>
<td>16.0</td>
<td>14.3</td>
<td>0.0</td>
<td>1.4</td>
<td>0.2</td>
<td>0.0</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0</strong></td>
<td><strong>64.7</strong></td>
<td><strong>0.3</strong></td>
<td><strong>14.5</strong></td>
<td><strong>5.4</strong></td>
<td><strong>13.8</strong></td>
<td><strong>1.3</strong></td>
</tr>
</tbody>
</table>
Estimation of flexibility potential

- 4.86 GWh for washing machines
- 3.03-9.47 GWh for tumble driers
- 8.17 GWh for dishwashers
- 1.56 GWh for refrigerators
- 100 GWh for electric heating
- 65 GWh for air conditioning
Conclusions
Opportunities and challenges

Opportunities
• benefits for consumers & system
• RES integration
• grid stability

Challenges
• motivation of consumers
• incentives & informed choices

Materializing the potential
• home energy manager
• interoperability

New incentives
• legislation
• business cases

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Thank You