Energy@home

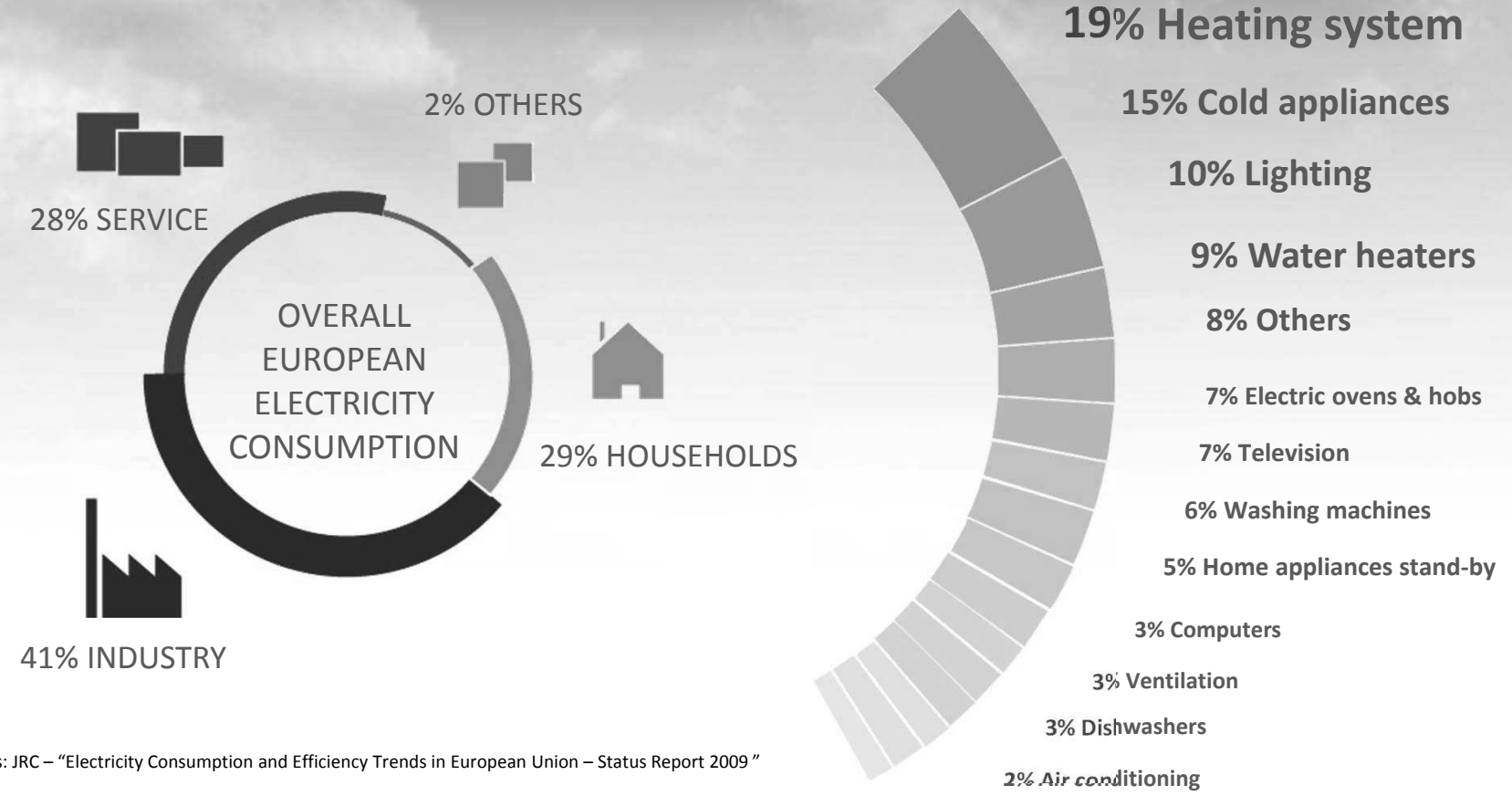
Sistema ICT per la valutazione della domanda energetica

Udine, 23/06/2014
Edi Fabbro

1. Vision
2. Achievements and trials
3. Association and governance
4. Next steps for 2014 and beyond

1. **Vision**
2. Achievements and trials
3. Association and governance
4. Next steps for 2014 and beyond

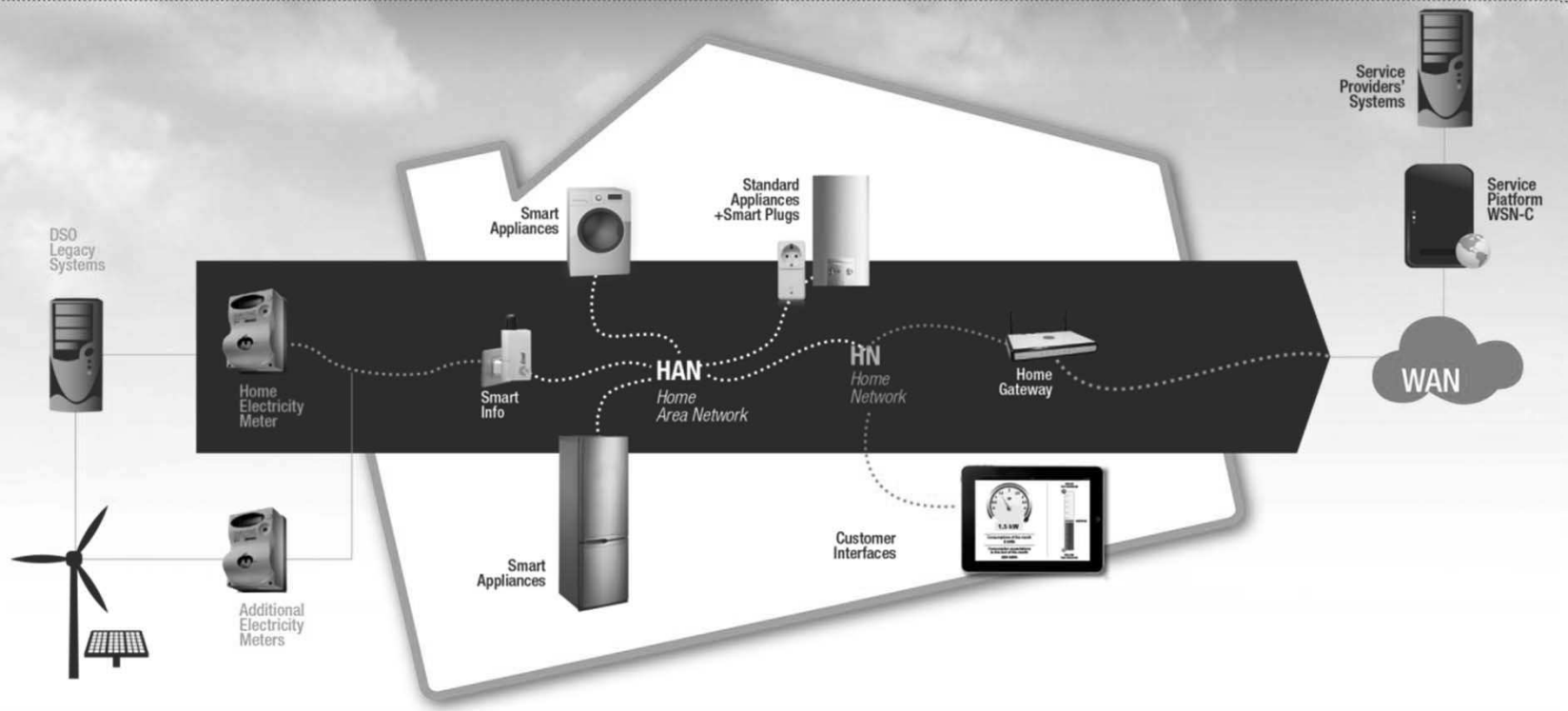
Energy Consumption Scenario



Sources: JRC – "Electricity Consumption and Efficiency Trends in European Union – Status Report 2009 "

Household: highly fragmented consumptions ; high flexibility.

Basics: consumer's flexibility can be managed and valued



All customers have a degree of demand side flexibility

- in time, in power, in energy

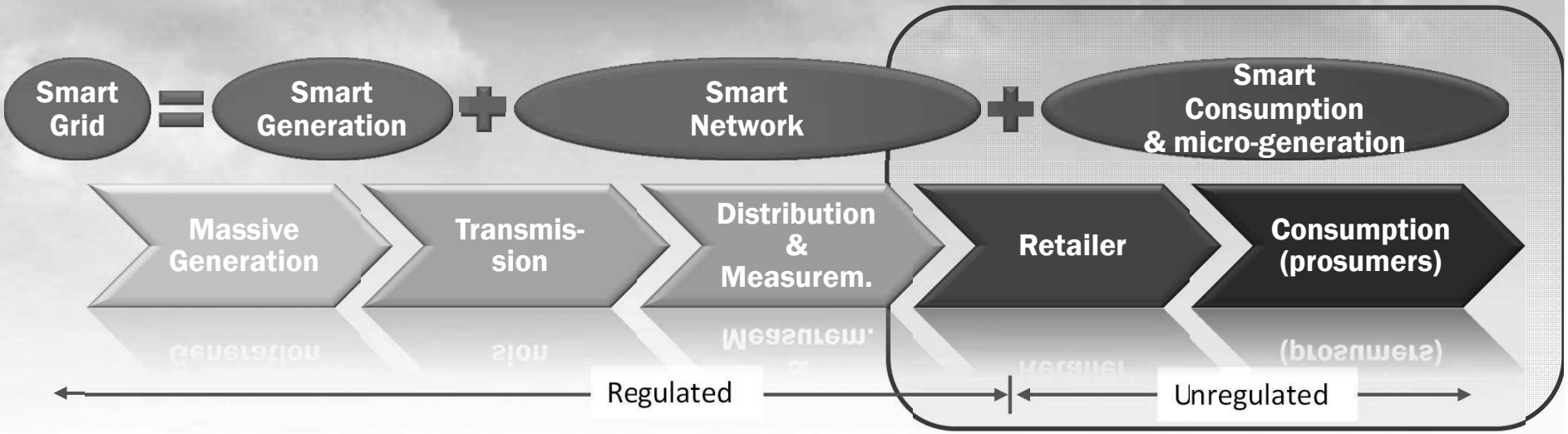
Flexibility can be managed to adapt & locally optimise the demand

- time of use pricing, reduced contractual power, maximise investment through self-consumption
- It can exploit the same service provisioning infrastructure of the Smart Home Services

Flexibility enables also Customer 2 Grid Services

- to increase grid quality and grid reliability and to reduce balancing costs

Scope: Smart Consumption

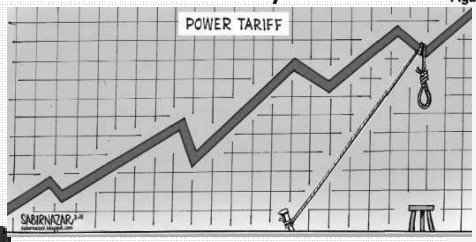


Some trends in Smart Consumption

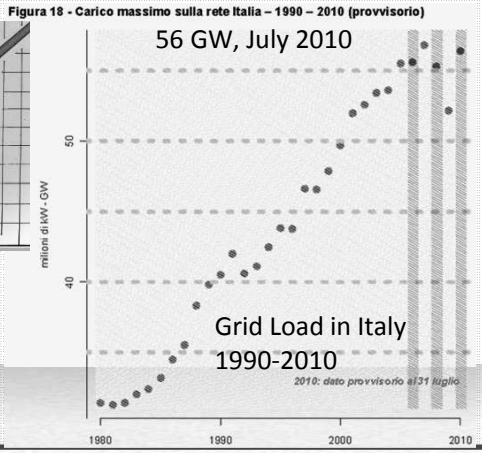
Electric Cars

Distributed Renewables

Time of day Tariffs



Peak reduction



Efficiency

Tools to empower consumers

Energy@home

Smart Grid & Smart Appliances: Energy benefits evidence

MDA's account for ~43% of the residential electricity consumption
They can provide flexibility in the way and timing they can be used

REFRIGERATION

- Pre-cooling prior to peak
- Optimize defrost to run it during off peak

LAUNDRY

- Delay start: auto start for laundry cycle to off peak hours
- Dryer – short delay and/or power down heating element

DISHWASHING

- Delay start: auto start for laundry cycle to off peak hours
- Short delay and/or power down heating element

AIR COND

- Auto set from cooling to dehum
- Reduce power during peak hours
- Suggest settings

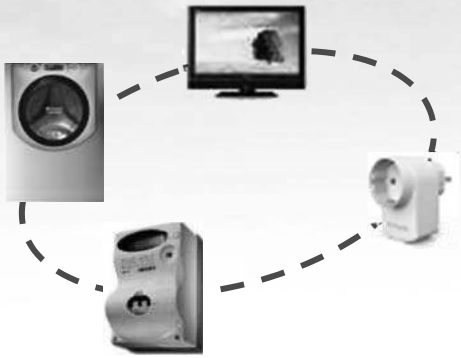
WATER HEATER

- Plan water heating based on tariff and energy availability
- Reduce power during peak hours

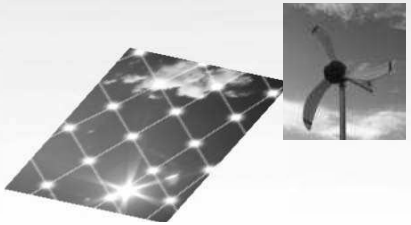
(source: CECED Italia)

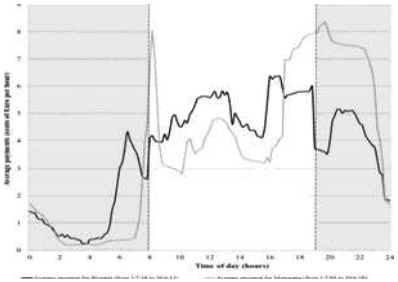
Energy@home vision

Energy@home envisages a progress from the consumption optimization of each appliance towards an household holistic approach comprising:



- **coordinated energy consumption optimization between all the appliances**
- **energy micro-generation and consumption**
- **education of the consumer to a virtuous use of appliances towards a more sustainable lifestyle**
- **time of use and dynamic tariff schemes**





Energy@home

1. Vision
2. **Achievements and trials**
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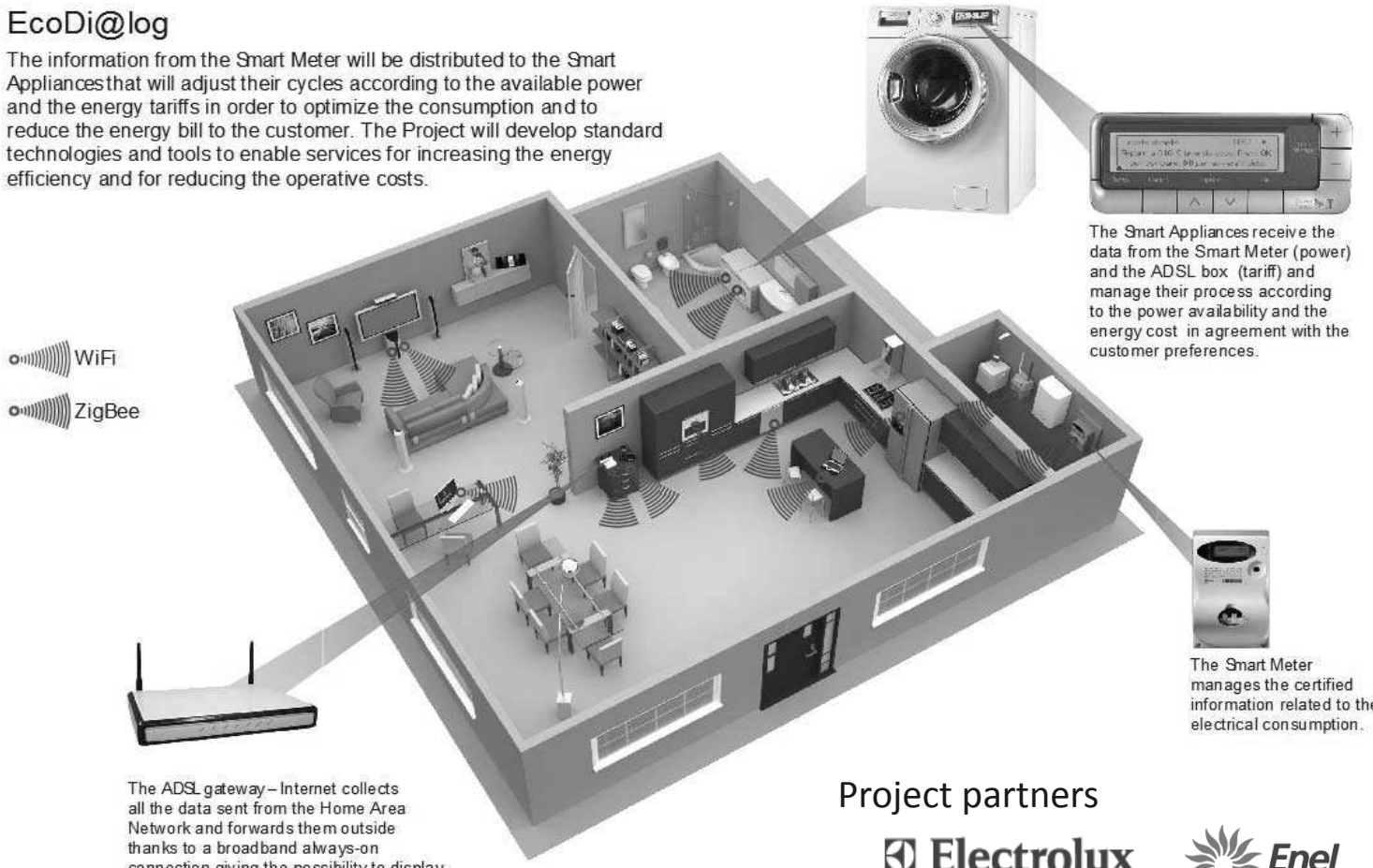
Energy@home: the first project (2009)

EcoDi@log

The information from the Smart Meter will be distributed to the Smart Appliances that will adjust their cycles according to the available power and the energy tariffs in order to optimize the consumption and to reduce the energy bill to the customer. The Project will develop standard technologies and tools to enable services for increasing the energy efficiency and for reducing the operative costs.



The Smart Appliances receive the data from the Smart Meter (power) and the ADSL box (tariff) and manage their process according to the power availability and the energy cost in agreement with the customer preferences.

The Smart Meter manages the certified information related to the electrical consumption.

The ADSL gateway – Internet collects all the data sent from the Home Area Network and forwards them outside thanks to a broadband always-on connection giving the possibility to display the information about energy on any web portal or a mobile phone.

Project partners

Electrolux Enel TELECOM ITALIA INDESIT company

STATEMENT

Energy@Home is a collaborative project among different industries.

The aim of the project is to **develop a communication infrastructure that enables provision of Value Added Services** based upon information exchange related to energy usage, energy consumption and energy tariffs .

Energy@Home aims to **leverage existing standards**, in particular the Zigbee wireless technology.

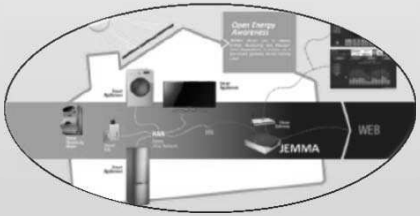
The resulting **protocol will be open** to any stakeholder that will be free to define its own services and supporting business models, while being assured that **the common communication platform will be able to ensure interoperability** among platform of different vendors

Main achievements so far (1Q 2014)

ZigBee
Control your world

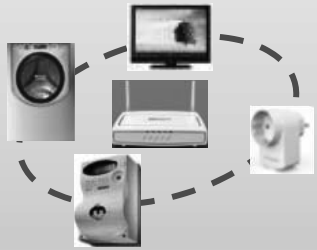
Standard ZigBee Home Automation 1.2

- acknowledges Energy@home in standard, press release & public webinar
- Integrates Energy@home use cases and technical specifications



Prototype system

- Integrates 11 different devices and systems from E@h partners/off-the shelf products
- Presented at EU Utility Week in Amsterdam
- Permanent demo at ISMB and Telecom Italia premises



Trials

- 5 trials in Europe, one is in Italy

JEMMA
Open Source Project

Open Source

- ZigBee Gateway
- Sw of the client side
- Java for OSGi

Cost Benefit Analysis

- Submitted to Confindustria
- Available as public document
- Main Contributors Enel, TI, CECED
- For some classes of users PP in 3 years is possible under some conditions

Energy@home *adapts and adopts* International Standards

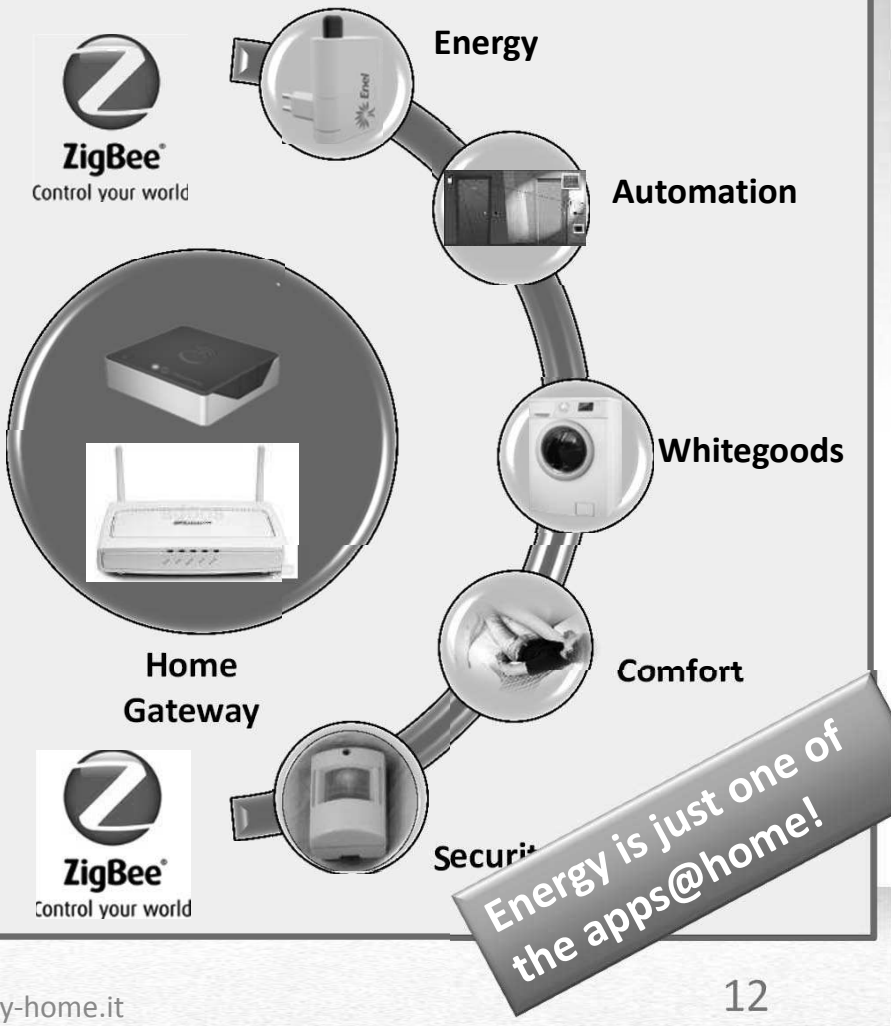
On Jul. 2011, Energy@home and ZigBee Alliance signed a collaboration agreement that brought on July 2013 to the ZigBee Home Automation 1.2 standard

ZigBee Alliance:

- 400+ member companies (40% Americas, 30% EMEA, 30% Asia)
- 800+ certified products

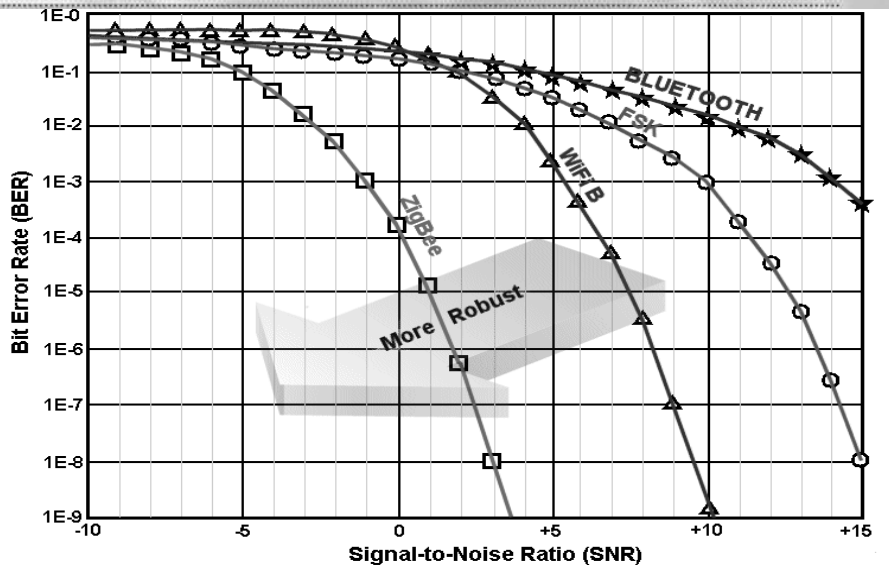
Market leader with most deployed low power wireless mesh standard

A plethora of services can be based upon the same service provisioning infrastructure: communication standard + home gateway + cloud



Why ZigBee Protocol

- Cost
- Performance of IEEE 802.15.4
  - Energy efficiency
  - Performance in low SNR environments
  - Extended coverage through mesh topology
- Openness & Diffusion
  - Open specifications
  - Multiple vendors,
  - Large availability of products
  - Certification Program available
- Extendible



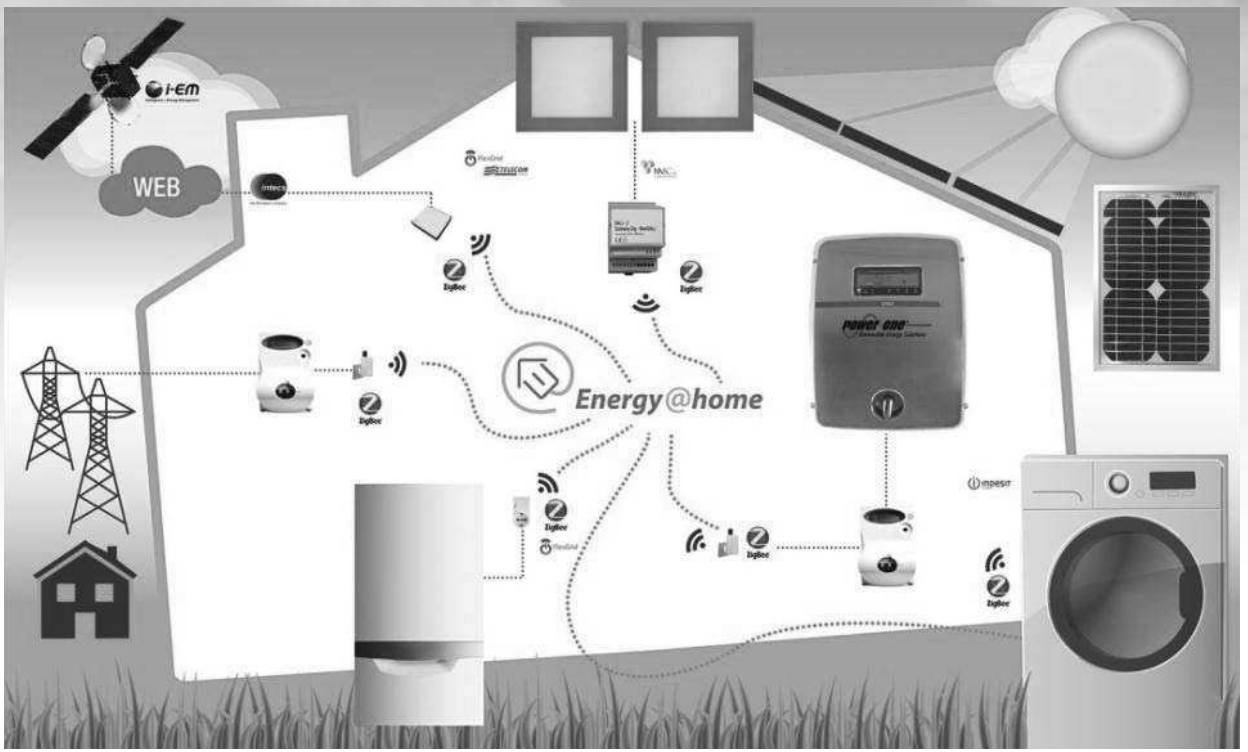
Excellent performance in low SNR environments

Specifications of Public Profiles

Energy | Home | Telecom | Health | Building

Other protocols might be adopted depending on Energy@home Members Products

Energy@home demonstrator



- Integrates devices and sub-systems from 11 different vendors
  - Gateway, smart meter, inverter, whitegood, thermostat, lights, smart plugs, temperature sensor
  - Cloud platform, gateway sw environment, PV forecast system
- Permanent demo at Telecom Italia and at ISMB premises

European Utility Week

15-17 October 2013 • Amsterdam • The Netherlands

www.european-utility-week.com

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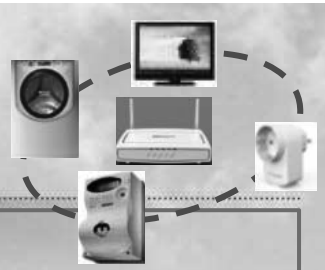
Main achievements: trial



1

Size: 50 private dwellings in Italy (20 prosumers)
What: Indesit Smart Aqualtis, Smart Info, Smart Gateway, 5 Smart Plugs
When: October 2012 – December 2013
Functions: energy awareness, scheduling, overload warning, remote access

TELECOM ITALIA · INDESIT company · Enel Distribuzione

2

Enexis in Netherland

What: time-of-use tariffs and green energy
Size: 300 Indesit Smart Aqualtis
When: August 2012 -> December 2015

FLEXI · Technolution · logica · TU/e Technische Universiteit Eindhoven University of Technology · DONG energy · IBM · INDESIT company · sWz · ENEXIS · Greenchoice · TU Delft Delft University of Technology · KIES marvin

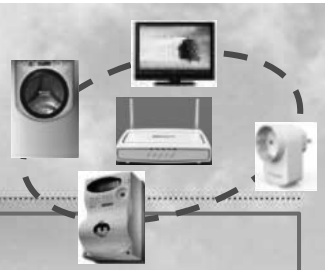
3

British Gas in UK

What: time of use tariffs to reduce CO2 emissions
Size: 150 Indesit Smart Aqualtis
When: March 2013 -> December 2014

ofgem · LCN Fund Low Carbon Networks · INDESIT company · British Gas

Main achievements: trial



E.On in UK

4

What: Customer energy awareness and flexibility

Size: 25 Indesit Smart Aqualtis

When: May 2013 -> December 2014

imbalance reduction

Power Matcher City in Netherland

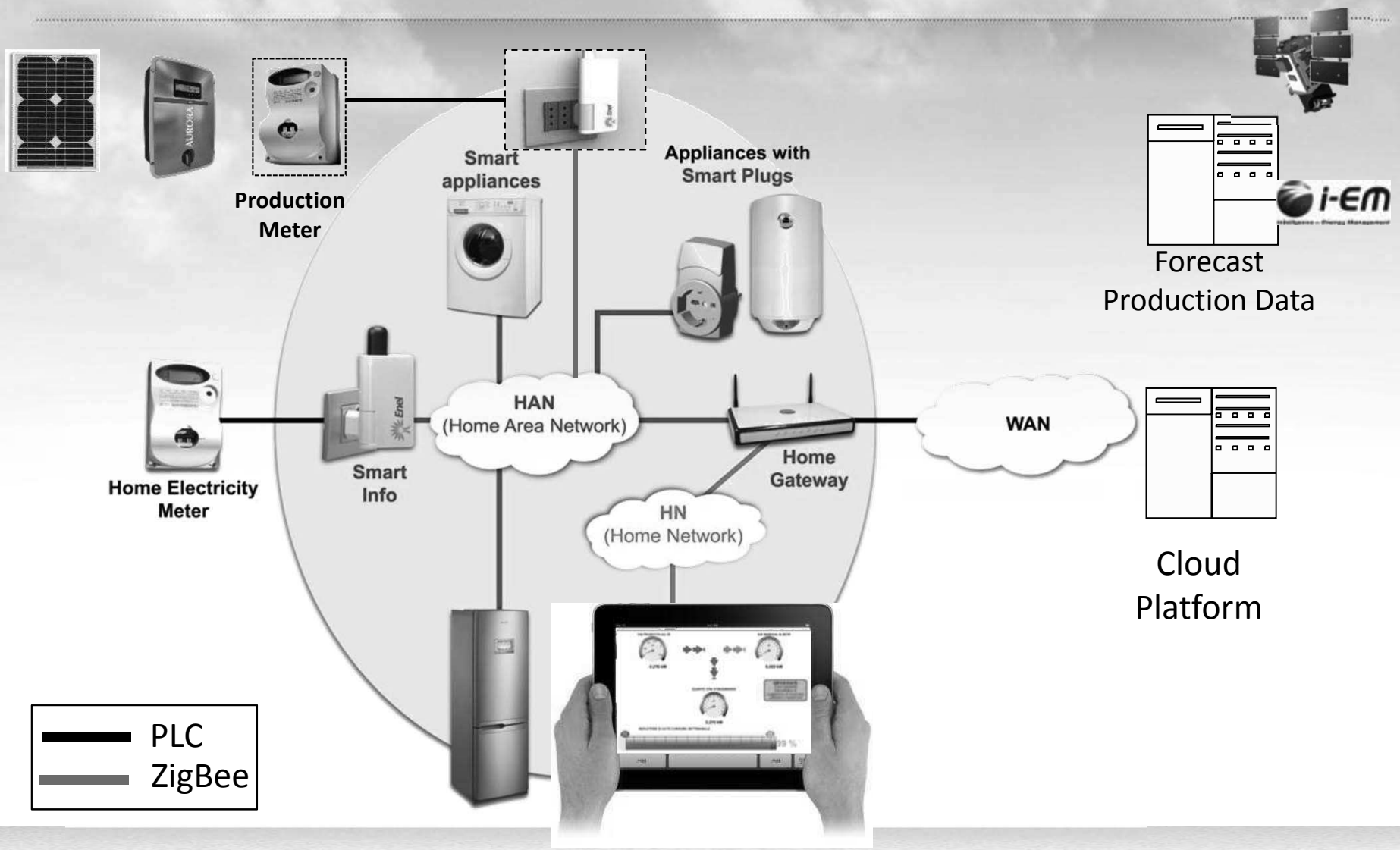
5

What: Grid imbalance reduction

Size: 25 Indesit Smart Aqualtis

When: May 2014-> December 2015

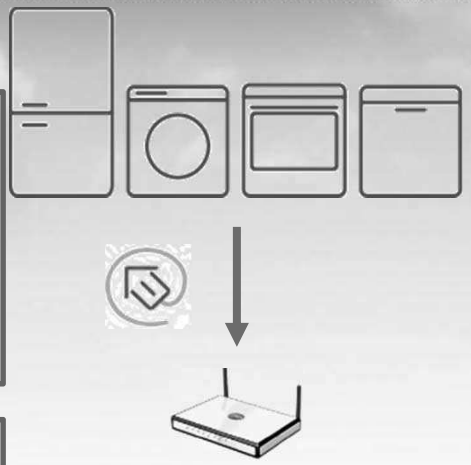
Energy@home: Italian trial architecture

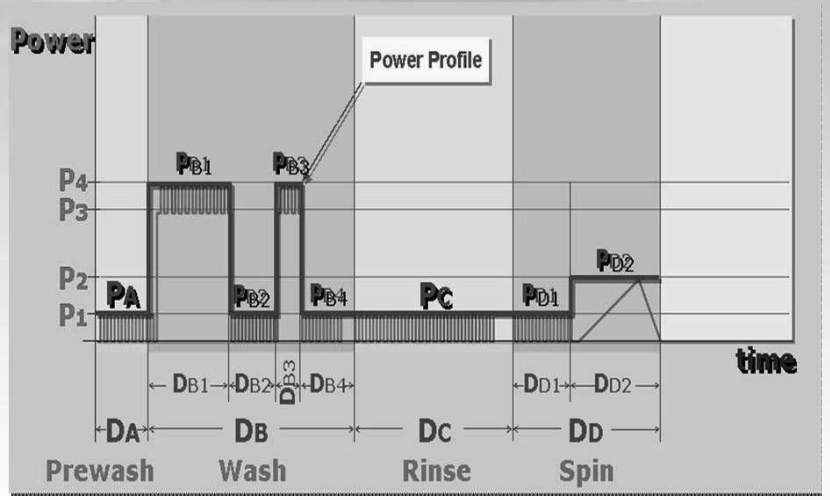


Energy@home: Power profile and appliance control data structures

Status
- Status
- Current Cycle and Phase
- Time To End
- Start and Finish Time

Events
- Faults
- Warnings





Appliance control

Power Profile

Power Profile

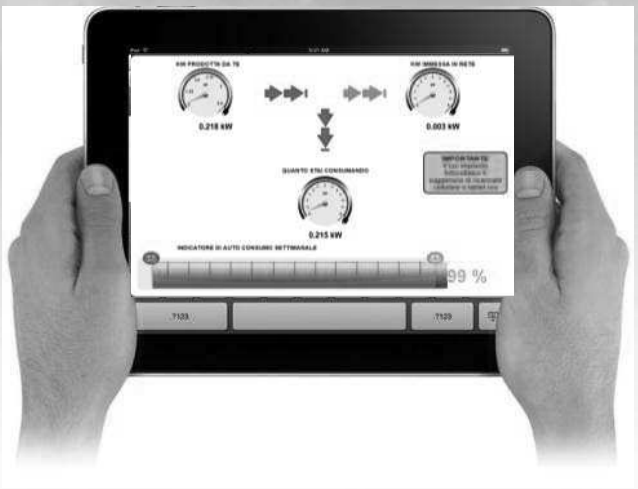
▪sequence of electrical loads activation/ deactivation (Power phases); basic "uninterruptable" elements:
- ✓ Expected duration
- ✓ Peak Power consumption
- ✓ Maximum activation delay
- ✓ Expected Energy consumption

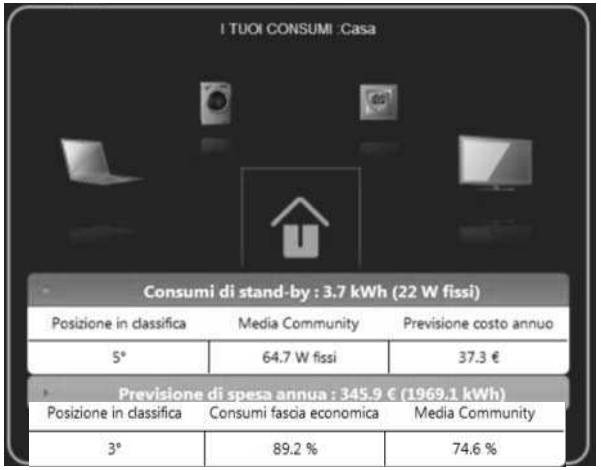
• Sequence of Power phases -> Power Profile

No more monolithic cycles

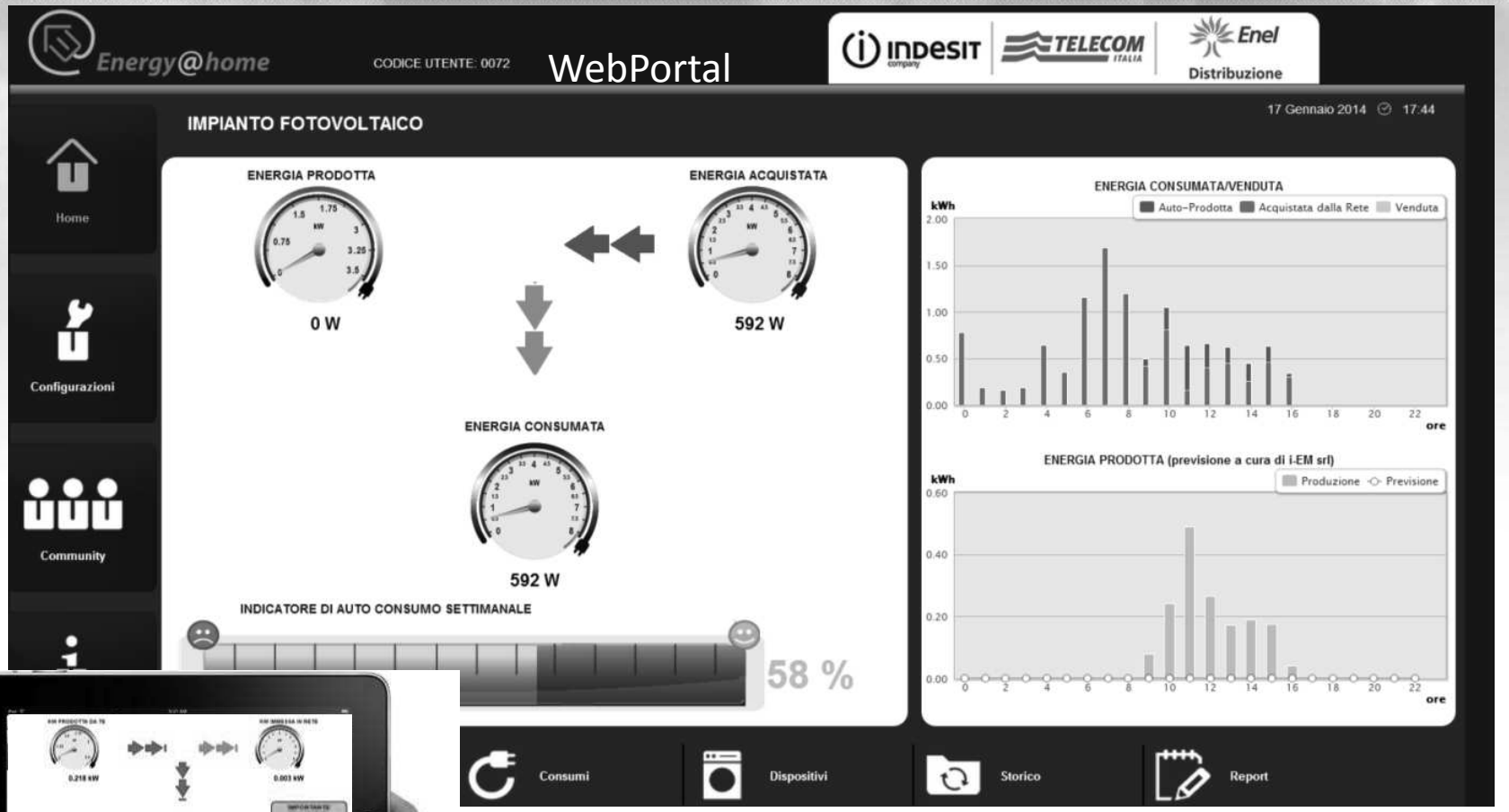
Energy@home: Functionalities

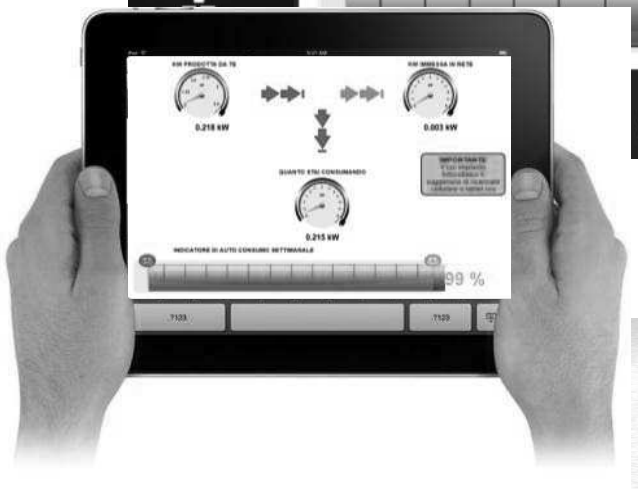
- Energy awareness (kWh, €)
  - Total House, per-device
- Scheduling (PV + time of use pricing)
- PV Production: forecast + comparison with actual
  - Real-time visualization of buy/sell/self energy
- Overload warning
- Weekly summary per-device usage reports (includes also stand-by report)
- Consumer's behaviour benchmark





Functionalities: (1) Energy/cost Awareness on user displays





Tablet, mobile

Washing Machine Display