



Energy@home

ENERGIA@HOME

Energy@home: an eco-system approach to Smart Consumption & Demand Side Flexibility

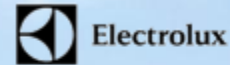


Outline of the talk

- Energy@home Association
- Organization of the activities
- Main achievements so far
- What's next
- Conclusions

Energy@home Association

Founding Members:



Ordinary Members:



Aggregate Members:



Non-profit Association founded on July '12

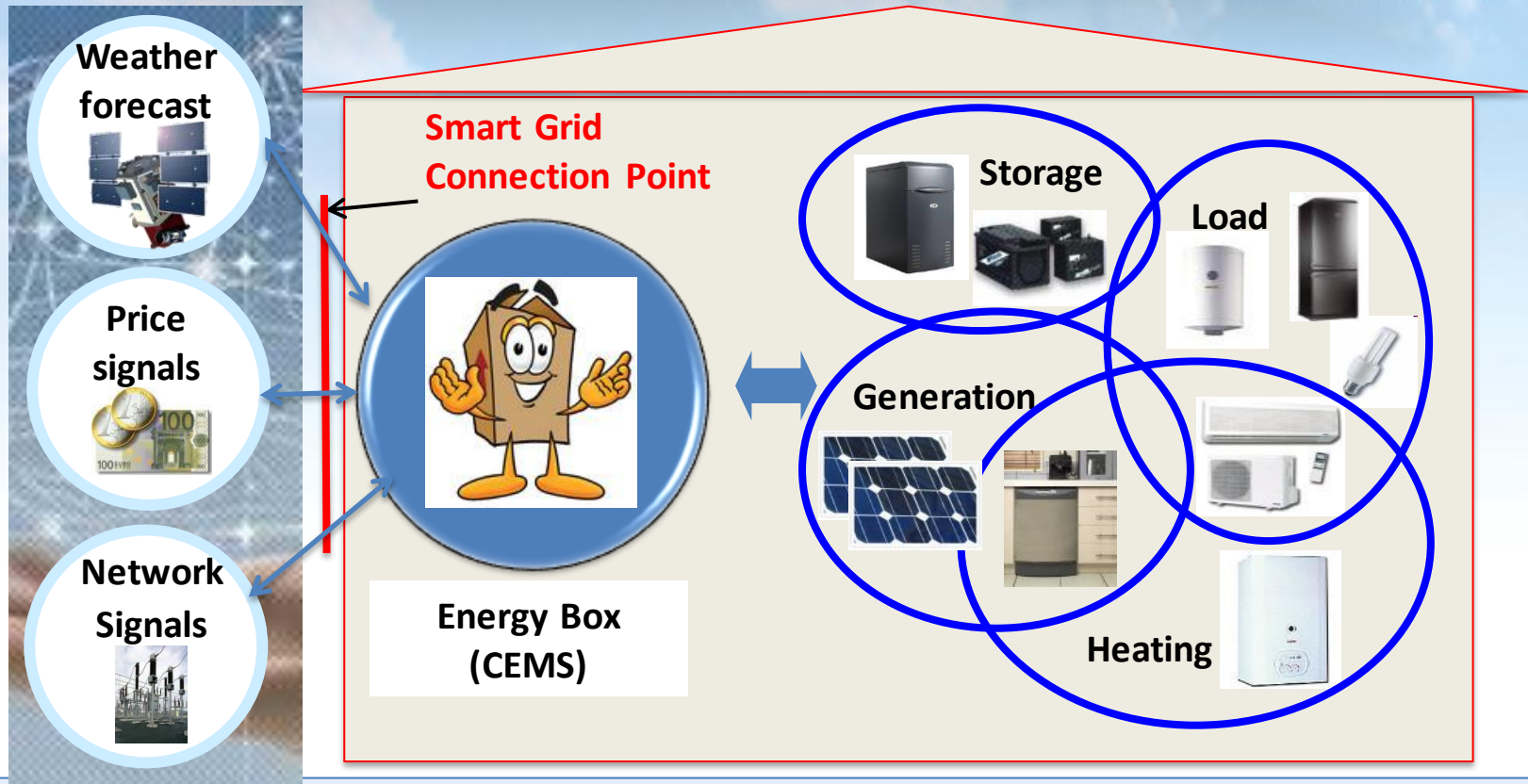
19 members

Scope: demand side management & home energy efficiency, not limited to the Italian market

Goal: create a market for new Value Added Services based upon device-to-device communication and demand side management

Approach: Open and International Standard

Energy@home **vision**: communication and a Home Energy Box to enable energy efficiency and demand side flexibility



The Smart Grid requires a Smart Home able to communicate and provide value added services:

- > making users aware of their consumptions
- > driving users towards efficient behaviours
- > supporting users to exploit ToU Pricing
- > making demand side flexibility a service of the home

Communication is the main enabler of these scenarios (Device2Device in the HAN, Grid2CEMS, ...)

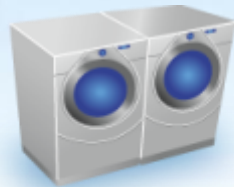
Smart Grid & Smart Appliances: Energy benefits evidence

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



CLEANING

- Delay start: remote 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

Device connectivity enables new value propositions



Connected devices enable a new type of continuous relationship with the customer

- e.g. profiling, one-to-one marketing, remote diagnosis



The features of the product can be improved over time via software updates

- E.g. to download a new washing programme optimized for particular detergent



New value added services are possible in partnership

- Smart appliances can be smart-grid ready
- E.g. smart thermostats company in USA are partnering with utilities to incentivize consumers to participate to demand-response programm

(source: Berg Insight, 2013)

Energy@home **vision**: energy is one of the apps@home ...



Open Standard Value Proposition:

- world-wide standard
- Integrated eco-system of home applications, devices and household appliances
- Single gateway (i.e. no silos of home boxes)
- A standard adopted by more than 400 companies offering more than 800 certified products
- Availability of a Certification Program carried out by Independent Test Houses
- Coherent with CENELEC EN 50523

July 2013, ZigBee Alliance, in collaboration with Energy @home, releases the new ZigBee Home Automation 1.2 standard

Energy@home approach: Open and International Standard

On Jul. 2011, Energy@home and ZigBee Alliance signed a collaboration agreement that brought 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

On Dec. 2012, Energy@home and EEBus E.V. Initiative signed a collaboration agreement with the goal of

converging on a common (and standard) Data Model

EEBus E.V. Initiative:

- sets the focus on open and inter-operable standards
- with the goal of permitting energy suppliers and households to exchange apps and services to improve comfort and efficiency



Members



Organization of the activities

Board of Directors

- Fabio Bellifemine, Telecom Italia, Director
- Sergio Brambilla, Enel D, Secretariat & Treasurer
- Stefano Frattesi, Indesit Company
- Nicolas David, Electrolux
- Lorenzo Montelatici, Edison
- Antonino Cucuccio, ST Microelectronics
- Davide Cabri, Whirlpool



Paola Petroni, ENEL D.
honorary chairman

General Assembly
(all Member Companies)

Working Groups

Standard

A. Ranalli,
E. Arione

IP & Data Model

F.Fedecostante

Use Cases

S. Di Carlo

Policies & Regulations

E. Molinari

Reference Implementa tion

R. Tomasi

Main achievements so far



Standard ZigBee Home Automation 1.2

- Integrates Energy@home use cases and technical specifications



Prototype system

- Integrated demo that includes partner devices and s off-the shelf products



Trials

- 3 trials in Europe, one in Italy



ZigBee Alliance



Why ZigBee?!

- Can be deployed globally
- Plenty of products choice
- Product competition
 - Quality
 - Product Feature Innovation
- Price Competition
- No vendor lock-in to specific chip manufacturer

Energy@Home already supports lots of those products!!!



...more than 400 companies!

ZigBee Home Automation 1.2

- Enhanced device definitions and functionality from 1.1 (OTA Firmware Upload, Pairing, Pool Control, Door Lock, etc...)
- Tested and proven standard for connecting devices in the home (finalized in June and public available from March 2014)
- Technical improvements for easier installation and upgrades (best practices, commissioning procedures, etc...)
- Energy management together with Energy@home



19 products already achieved Golden Unit Status!

Energy@Home clusters in ZigBee Home Automation

1.2

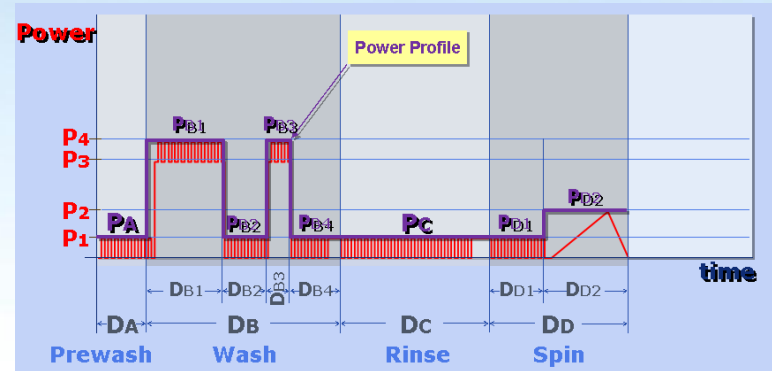
EN50523 Appliance Identification

- Manufacturer, Brand
- Product Type
- CECED Specification Version



EN50523 Appliance Control

- EN50523 Signal States
- Selected Cycle and Current Phase
- Duration & Remaining Time To End
- Start and Finish Time



EN50523 Appliance Events and Alerts

- Faults
- Warnings

Appliance Statistics

- Statistics about usage

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 devices in ZigBee Home Automation

1.2

Home Gateway
(EMS – 0x0050)



Smart Plugs
(0x0051)



Meter Interface
(0x0053)



White goods (0x0052)

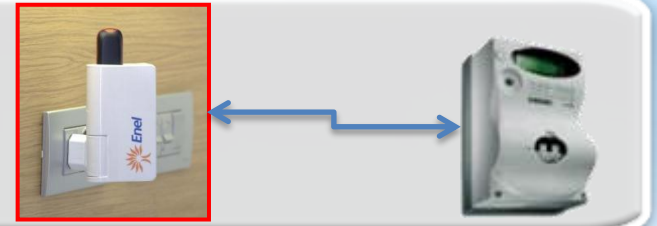




Energy@home demonstration

ENEL Smart Info

- Plugged into any house electricity socket
- Univocally associated to the meter
- Makes available consumption, generation, and contractual data
- Compatible with already deployed smart meters



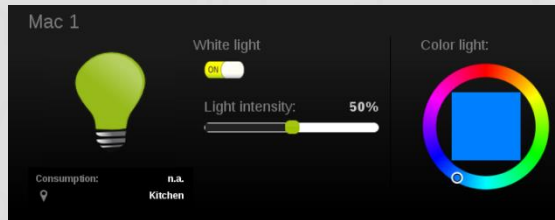
Smart Appliances

- React to external signals (price, energy colour, pause/resume)
- Per-phase schedulable
- Visualize cost and consumption



Lighting

- On/off
- dimming
- colour



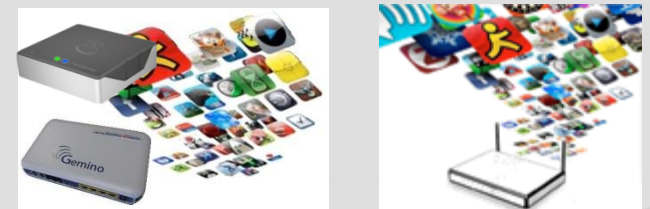
Other Commercial Devices

- ZigBee HA 1.2 compliant
- Energy/power meter
- Switch on/off
- Presence, Thermostat
- Water leak, door...

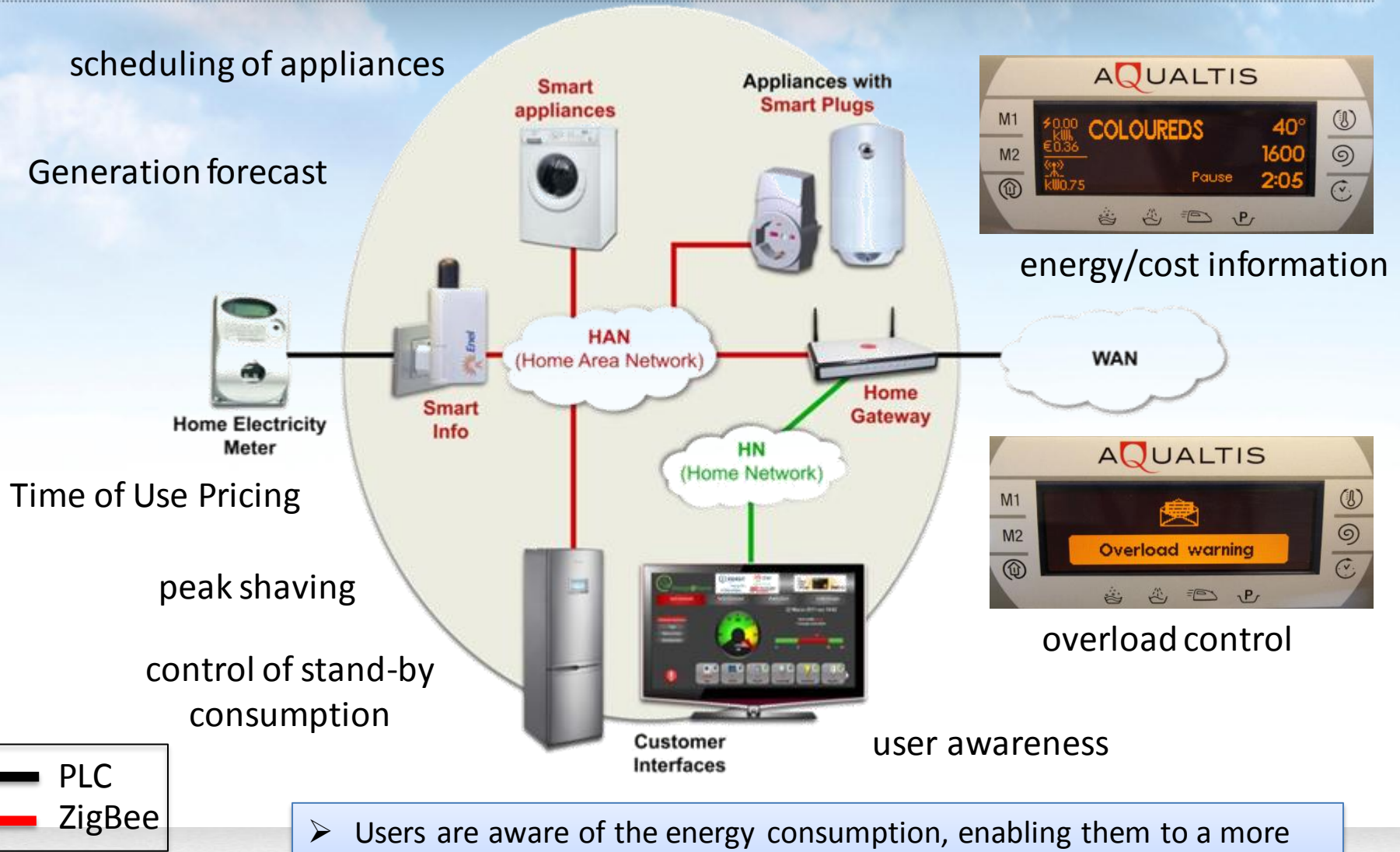


Energy Box (as a function of the Broadband Gateway)

- Home Area Network Controller
- ZigBee Trust Center
- OSGi framework to manage VAS's via single box

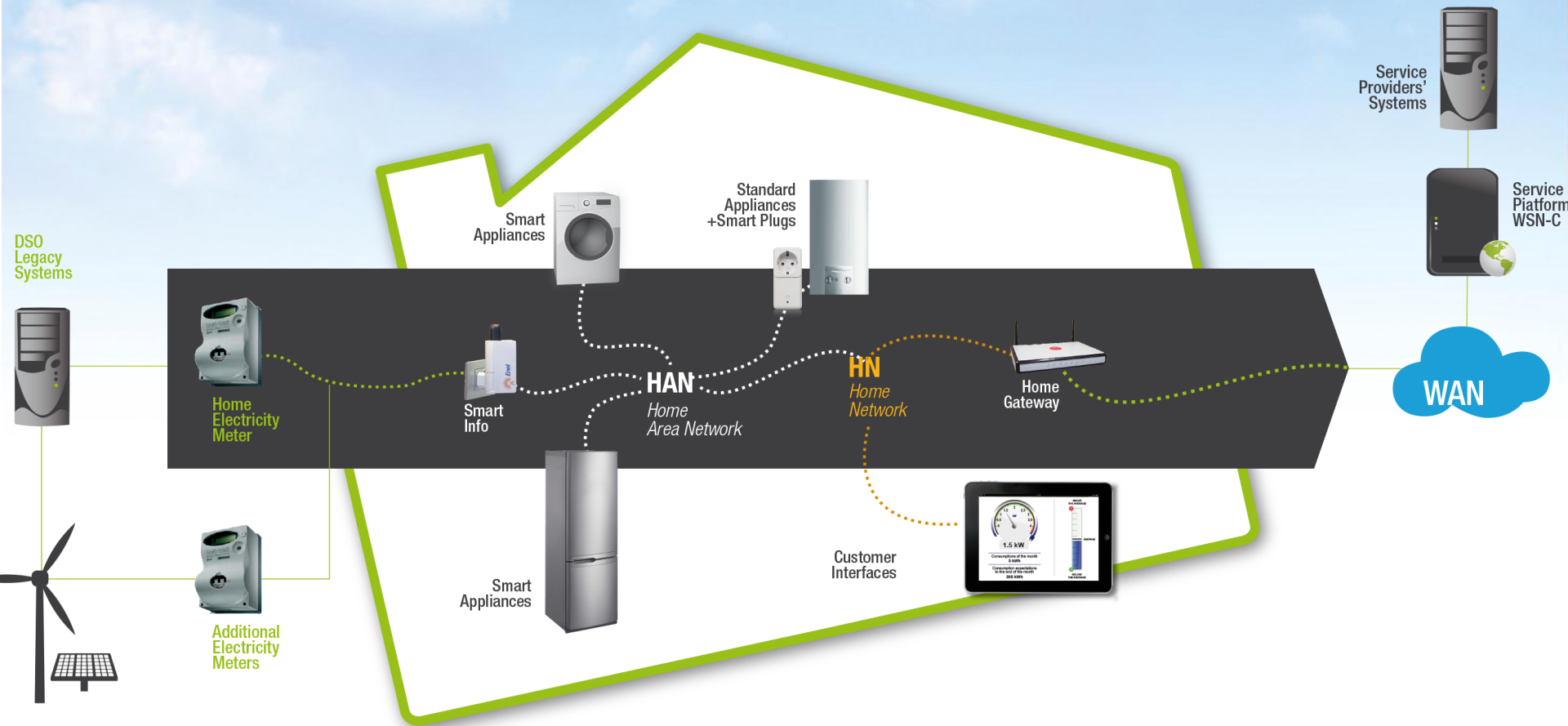


Energy@home Architecture & Functionalities



- Users are aware of the energy consumption, enabling them to a more rationale usage
- Smart appliances can automate decisions and can coordinate each other

Energy@home Expanded Architecture



Main achievements: trial



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



Enexis in Netherland

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

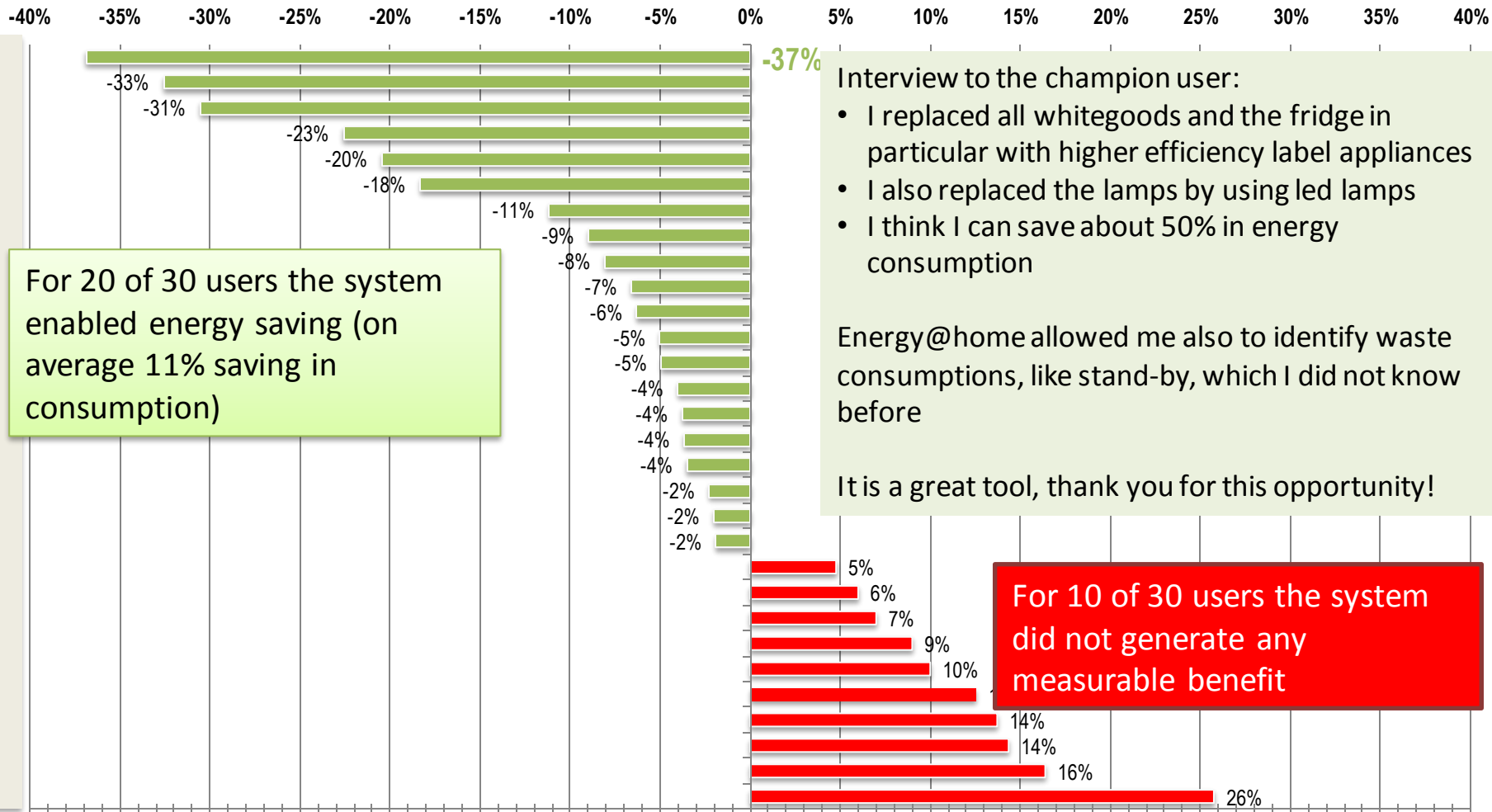


British Gas in UK

What: time of use tariffs to reduce CO2 emissions
Size: 150 homes
When: to start soon



Energy@home trial: energy saving achievement



Interview to the champion user:

- I replaced all whitegoods and the fridge in particular with higher efficiency label appliances
- I also replaced the lamps by using led lamps
- I think I can save about 50% in energy consumption

Energy@home allowed me also to identify waste consumptions, like stand-by, which I did not know before

It is a great tool, thank you for this opportunity!

What's next



Technology Independent DataModel



Goal

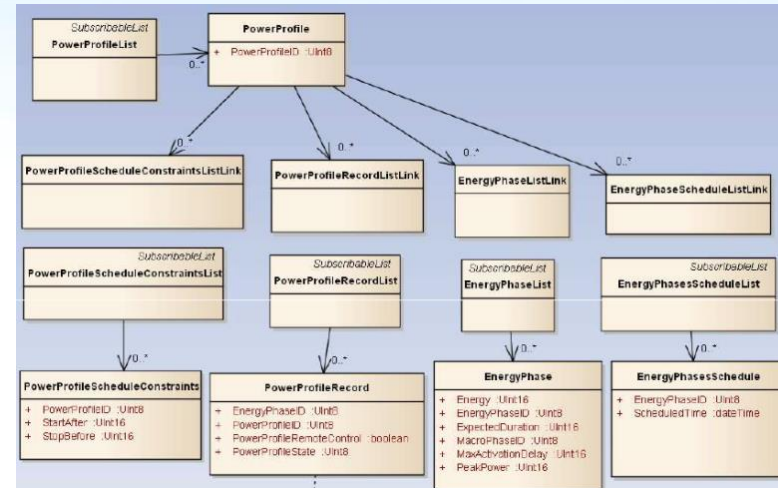
- Define a model for resources and devices in E@H system that is abstract and independent from a specific communication technology

Approach

- not reinventing the wheel
 - extended the SEP 2.0 Data Model
- open and international standard
 - in collaboration with EEBus to define a common DataModel for the home system
 - our extensions have been submitted to ZigBee Alliance for inclusion in next release of SEP 2.0 standard

Results so far

- Energy@home Data Model in UML (to be published by end of the year)

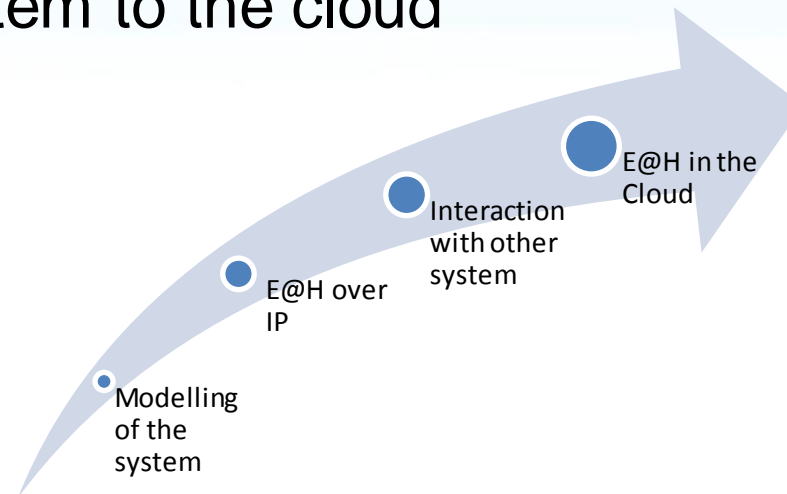


E@H and IP devices

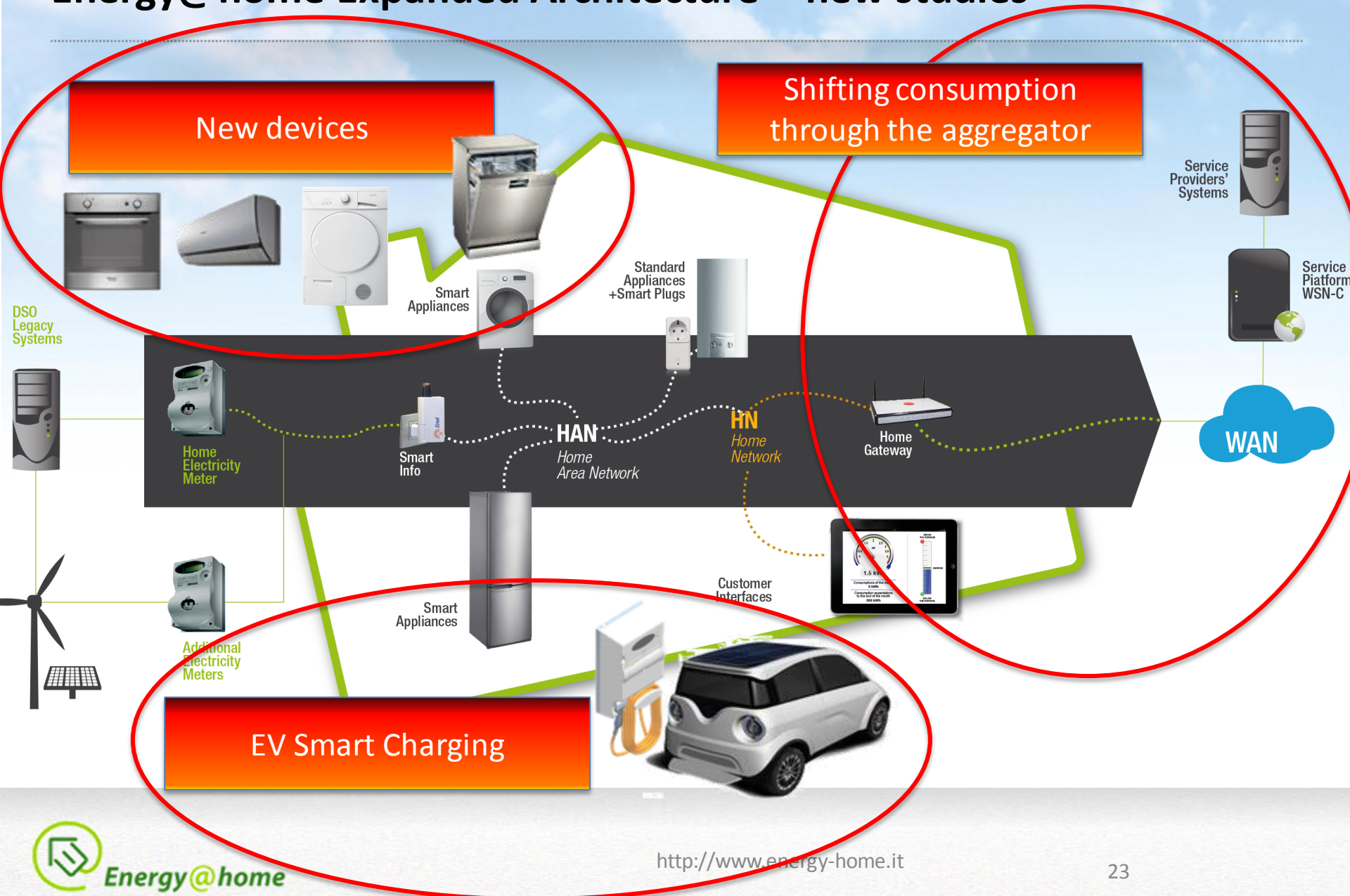


Next year main activities

- Integration of native IP devices in E@H system
- Open E@H system to the cloud



Energy@home Expanded Architecture – new studies



Looking at the future

Which should be the completed architecture of the E@H house?

Which could be the added value services to be offered to the end consumer?



Join US! and propose new Use Cases



WG Policies & Regulations



- **Scope of the WG:**
 - to manage any relations between the Energy@home Association and Institutions / Regulatory bodies.
 - to identify and foster a regulatory framework with the aim to develop post-meters and demand-response services.
- **Activities in developing:**
 - evaluate how to support the Italian Regulator (AEEG) to develop the demand response in the domestic energy market
 - create occasions to discuss with the Institutions and Regulatory bodies to find the right solutions for the market (the round table of the workshop is an example)

What's next



Summing up: Unique Value Proposition of Energy@home Association

Integrated communication
with the Smart Meter

Integrated communication
with Smart Appliances

Seamless integration with other
smart home services

Consumer-centric

Open and International Standard

Bringing together key stakeholders
from different industries

Integration events, integrated
demonstrators, trials



Customer Value Proposition (based upon current market rules)

(elaboration based upon Smart Energy Project, Confindustria, Sept 2013)

User Category	ADDED VALUE	€ / year
Prosumers	Optimal self-consumption of generated energy <i>from 30% to 60%</i>	100 – 180
High power users	Overload control : lower max contractual power <i>from 4.5 kW to 3 kW with same energy consumption</i>	190-240 (*)
Every Consumer	Energy awareness : self-optimization of energy consumption <i>-5% / -10% consumption</i>	37 - 70
	Dynamic pricing schemes: reduction of cost	Market value of flexibility
Every Consumer	Low impact in installation (wireless)	Non Quantifiable
	Greater comfort thanks to overload control	
	Ready to internet connection and new VAS	

Cost estimations based on average consumption in Italy 2.700 kWh/year, tariff «maggior tutela», data from trovaofferte AEEG
 (*) 190 € for a consumption of 4047 kWh/year, 240 for 2700 kWh/year

Conclusions: Energy@home vision on Smart Consumption

Eco-system open
& standard
approach

HEM is one
of the
apps@home

Smart appliances, storage systems and connected energy boxes are the most obvious tool for the introduction at large scale of demand side flexibility. And viceversa! So, how to bootstrap the market?

Time of use
pricing

Occupant
behaviour
matters



Active
Participation
& Incentives
to Flexibility

Flexibility as
a service