



ENERGY@HOME: AN ECO-SYSTEM FOR THE ENERGY-AWARE SMART HOME

FABIO BELLIFEMINE, TELECOM ITALIA



OUTLINE OF THE TALK



Context

Energy@home Association

Customer Value Proposition

Occupant Behaviour & Data from the Pilot

Conclusions



FINSENY, Energy@home, and KIC EIT

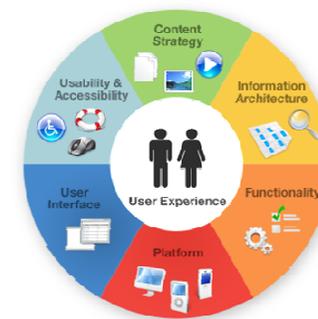
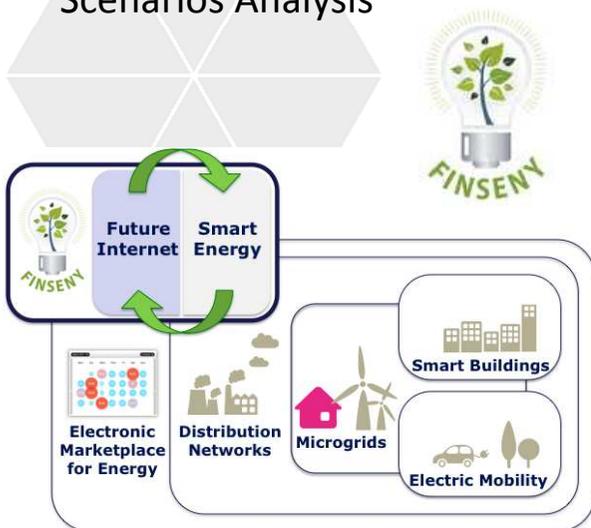


Smart Home use cases (WP4)
Marketplace for Energy (WP6)
Scenarios Analysis

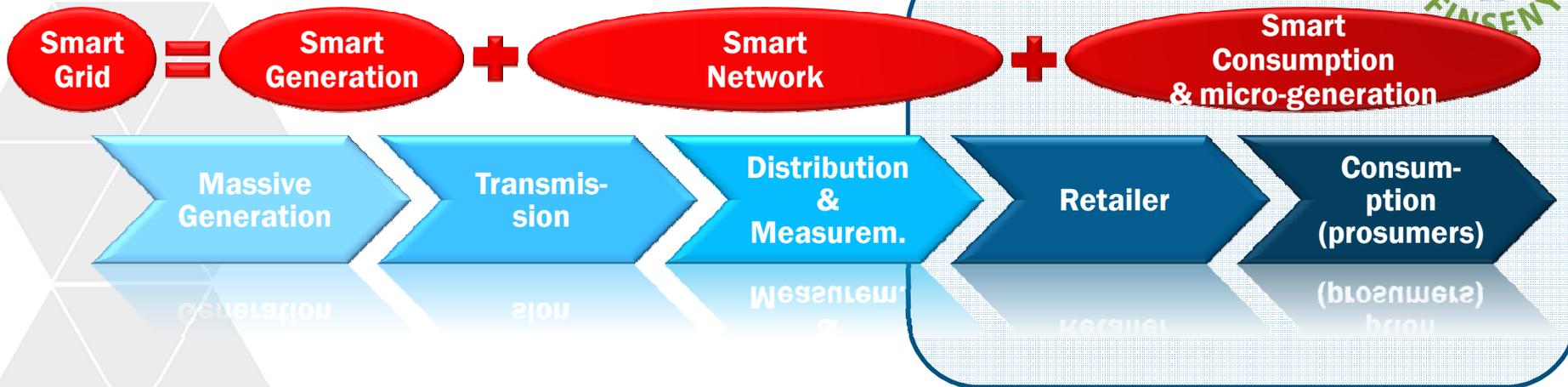
WP4 and WP6 DSEs validation

- Technical Specifications
- Implementation
- Trial

Smart Home Gateway
Analysis of Prosumer Experience



SCOPE OF THE TALK: SMART CONSUMPTION



Some trends in Smart Consumption

Electric Cars



Time of day Tariffs

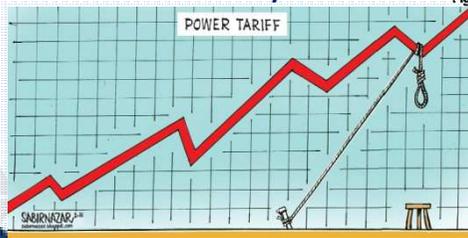
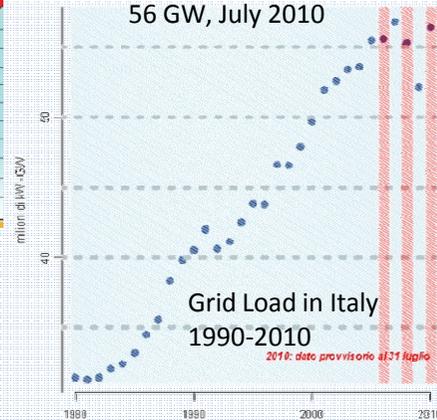


Figura 13 - Carico massimo sulla rete Italia - 1990 - 2010 (provvisorio)



Efficiency

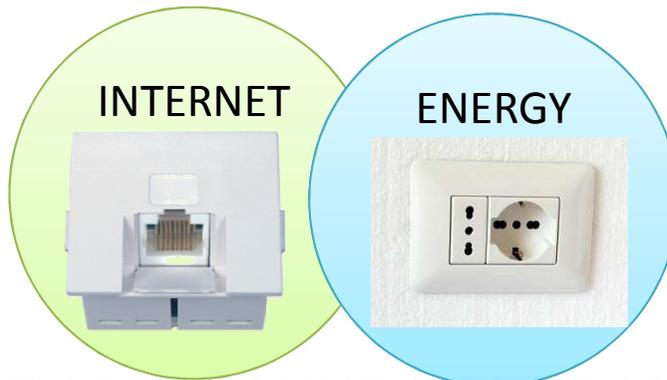


Tools to empower consumers

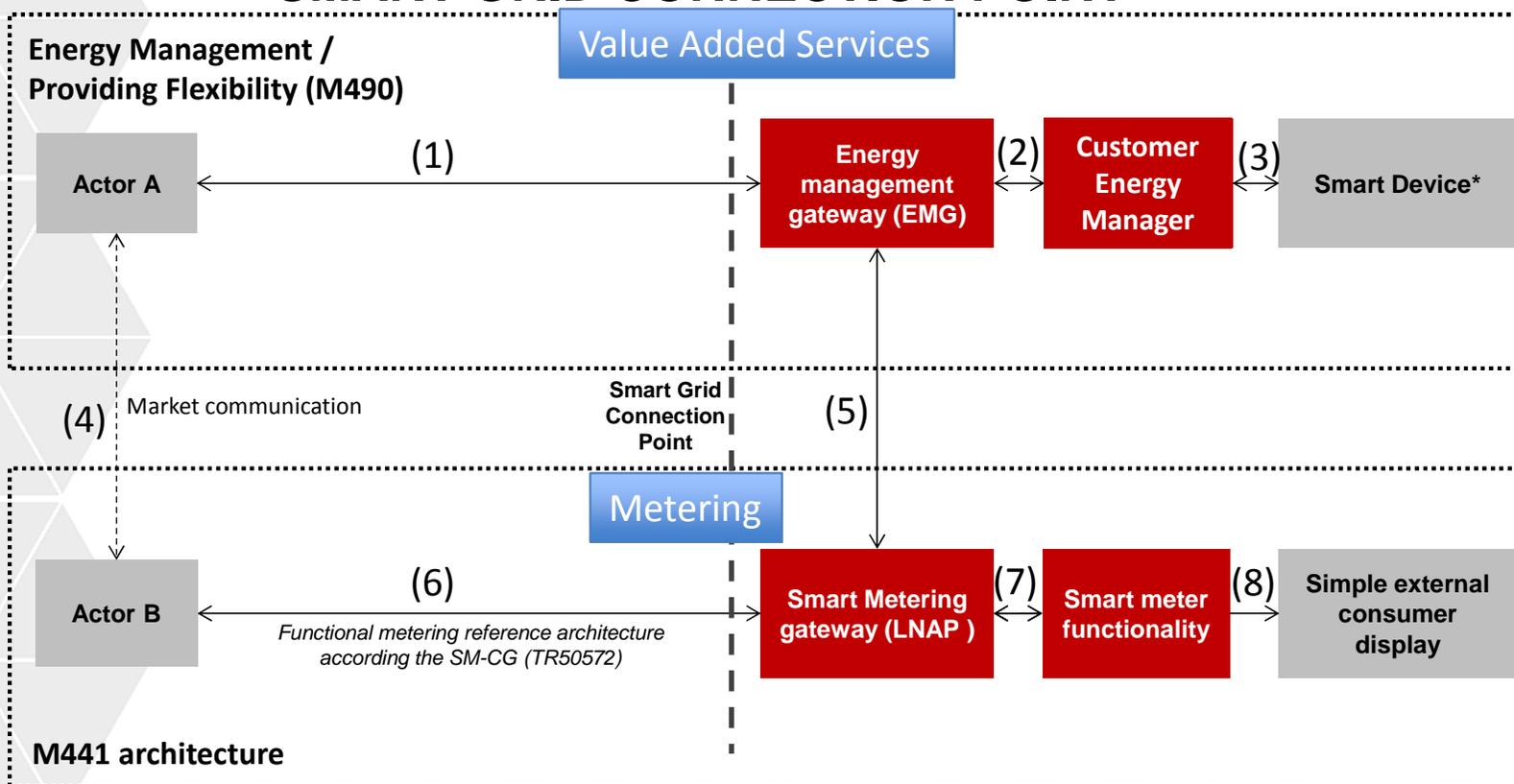


Distributed Renewables





SMART GRID CONNECTION POINT



* e.g. HBES device, smart appliances, storage, generator, domestic charger for EV, complex display
 (source Smart Grid Coordination Group)

Energy@home Association

Smart Consumption is a challenge that requires involvement of several types of industries

Energy@home is a no-profit association registered under the Italian laws with the purpose of developing & promoting technologies and services for home energy efficiency based upon device to device communication.

Founding Members



Electrolux



Distribuzione



INDESIT
company



Ordinary Members



EDISON



life.augmented



vodafone

Aggregate Members



FlexGrid



NNAC srl
Developing the Unexpected



the Brainware company



Istituto Superiore Mario Boella



power-one
Renewable Energy Solutions



applied research solutions



radiant comfort systems



Energy@home

Devices integrated in Energy@home, so far

ENEL Smart Info

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



Telecom Italia Home Gateway

- Home Area Network controller
- ZigBee Trust Center
- OSGi framework to manage VAS via a single box



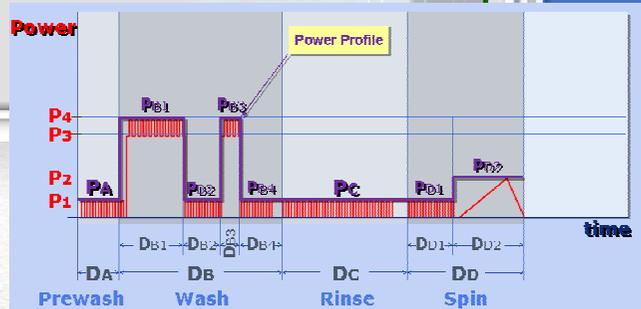
Smart Appliances

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

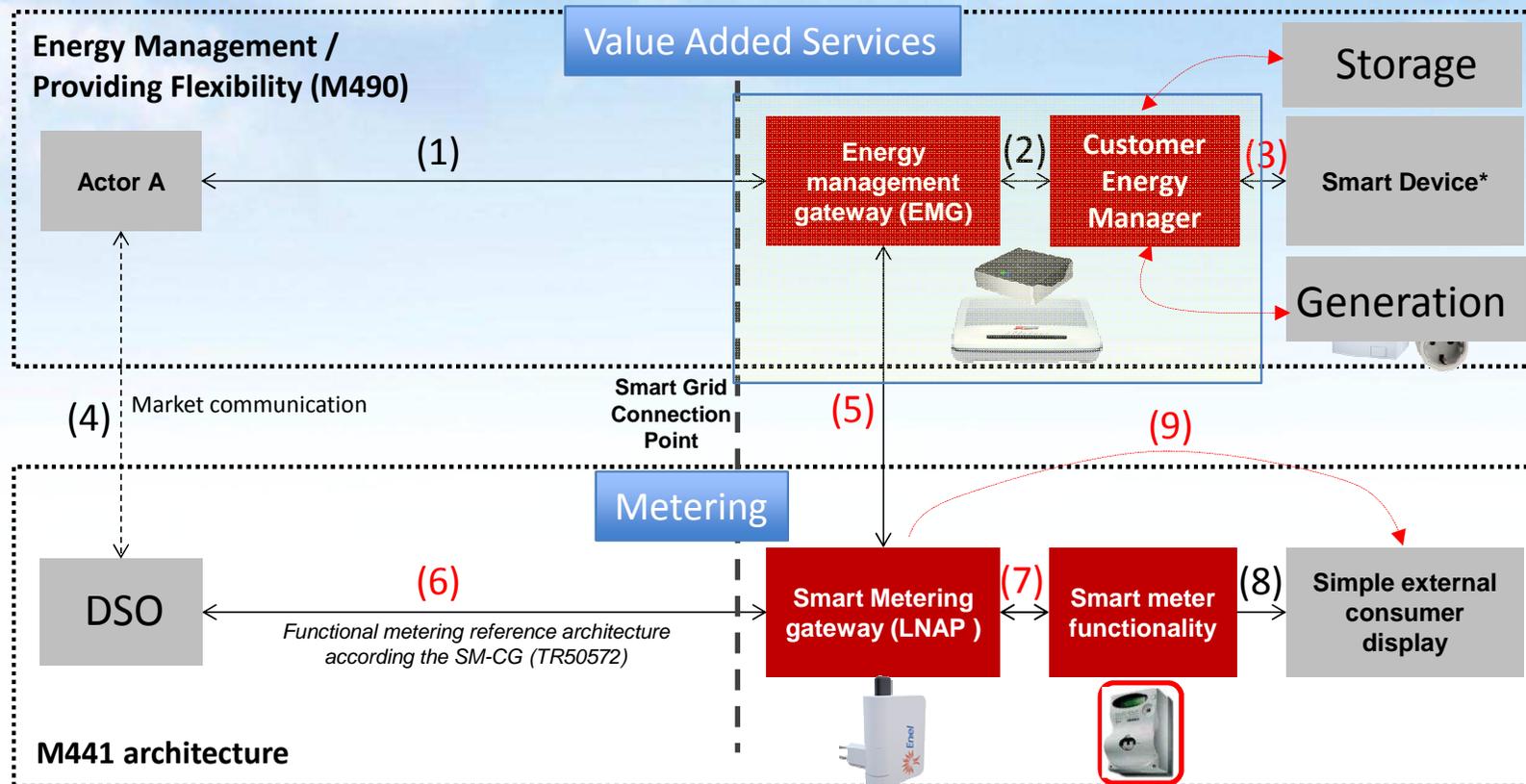


Commercial Devices

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



Smart Grid Connection Point & E@h reification (so far)



* e.g. HBES device, smart appliances, storage, generator, domestic charger for EV, complex display

List of i/f already defined in E@h:
 (3, 5): ZigBee HA extended with E@h functions
 (6,7): Enel PLC, proprietary
 (9): USB in alternative to (3,5)

(source Smart Grid Coordination Group)

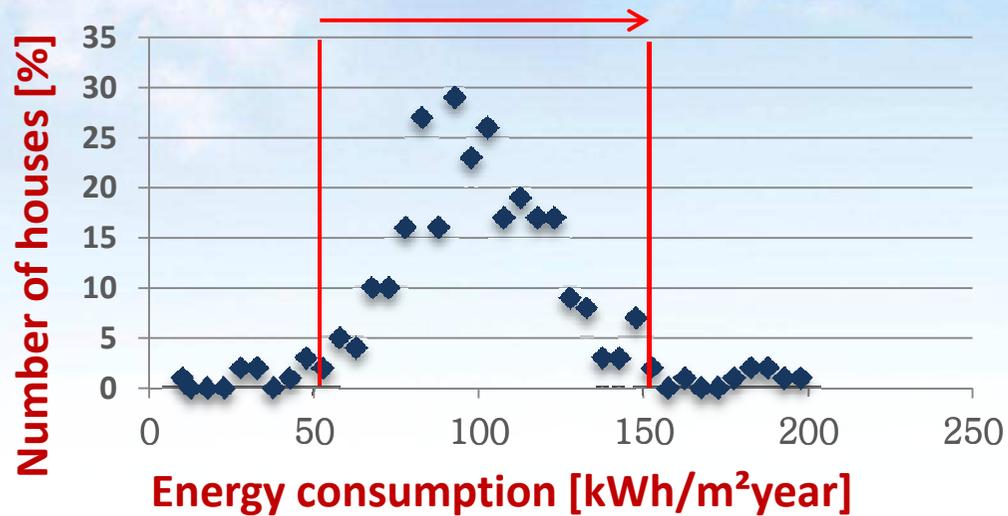
CUSTOMER VALUE PROPOSITION



	ADDED VALUE	€ / year
Quantifiable	Optimal self-consumption of generated energy <i>from 40% to 70%</i>	100 – 280
	Overload control : lower max contractual power <i>from 4.5 kW to 3 kW with same energy consumption</i>	190-240 (*)
	Energy awareness : self-optimization of energy consumptions <i>-5% / -10% consumption</i>	37 - 70
	Dynamic pricing schemes: reduction of cost	In the future
Non Quantifiable	Low impact in installation (wireless)	
	Greater comfort thanks to overload control	
	Ready to internet connection and new VAS	

Occupant Behaviour: how to design proper stimuli?

SPACE HEATING ENERGY DEMAND IN 290 "IDENTICAL" HOUSES IN DENMARK



HIGHEST CONSUMPTIONS
MORE THEN
3 TIMES
HIGHER THAN THE
LOWER ONES

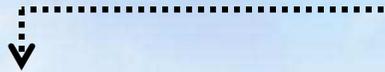
OCCUPANT BEHAVIOUR IS A
CRUCIAL ASPECT INFLUENCING
THE REAL BUILDING ENERGY
CONSUMPTION



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Empowering user awareness

antecedent strategies general



announce the availability of positive or negative consequences

information, prompts, demonstration

brochure, notice, booklet posted through the door, TV programmes or Internet sites

consequences strategies feedback



provide advices about the action carried out at the moment

rewards, feedback information

persuasive energy consumption displays

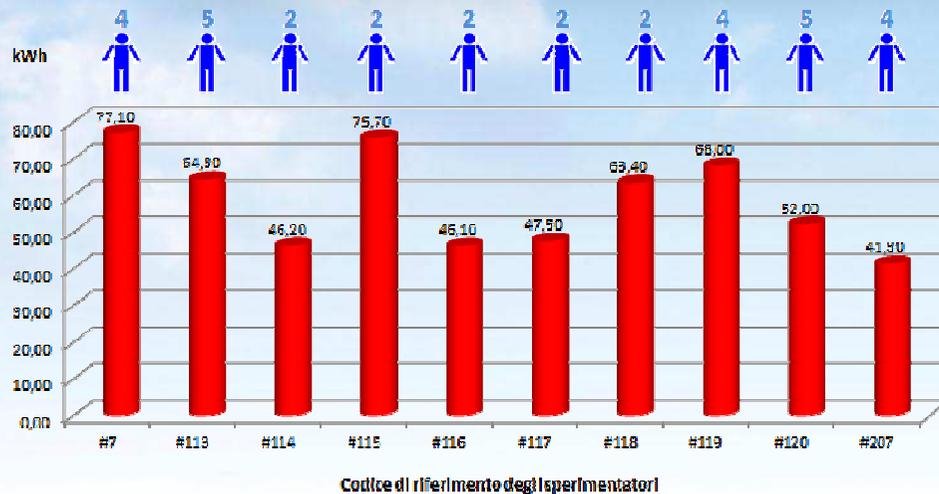
The most effective feedback immediately follows an action.

Strategies in the Energy@home trial:

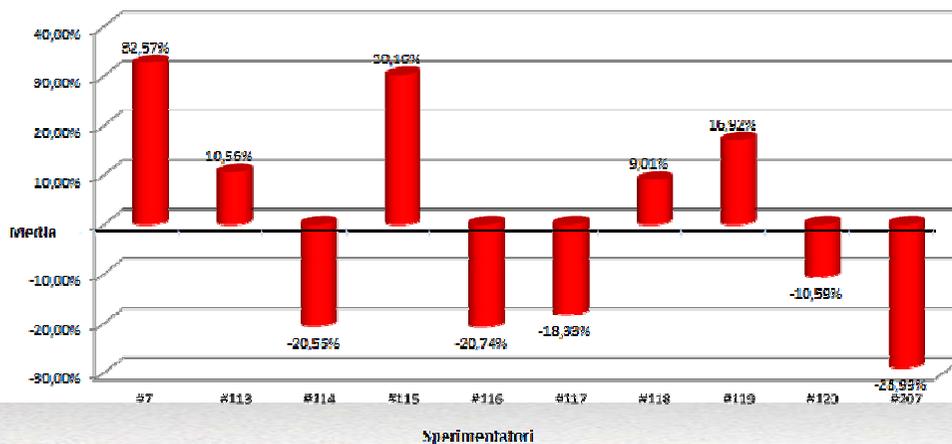
- Antecedent strategies (selected relevant news in the home page of the app)
- Users competition (see next slide)
- Comparison versus a benchmark (under development)
- Goals achievement (under development)

Occupant behaviour – Persuasive Feedback

Energy consumption this week [kWh]



... in comparison with the average [%]



«I'm pleased this week I saved 3.84 KW/h in respect to last week: a small quantity but it's a good start.»

«Since when I saw the consumption of my PC, I never leave it again switched-on when I don't use it»

«I discovered where I have a large consumption: it is the fridge! Thanks for let me discover that.»

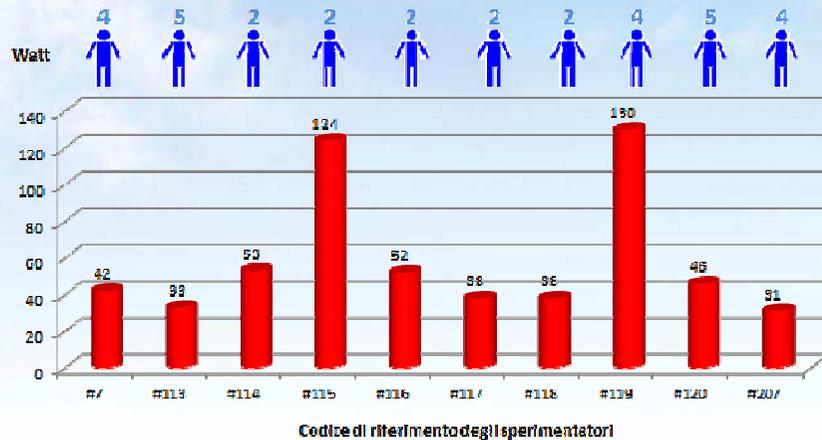
«the verdict was very cruel to me given that only a family with four members has consumed more than me, while I have consumed more than other families with five and four components, and all the other trialists have consumed much less than me.»

«We attempted to reduce costs by operating appliances such as washing machine and dishwasher in the off-peak times, but we can get small cost savings. However I am satisfied with seeing the other participants' consumption because I am in the middle of the classification, even if of course I would be pleased to further improve my position»

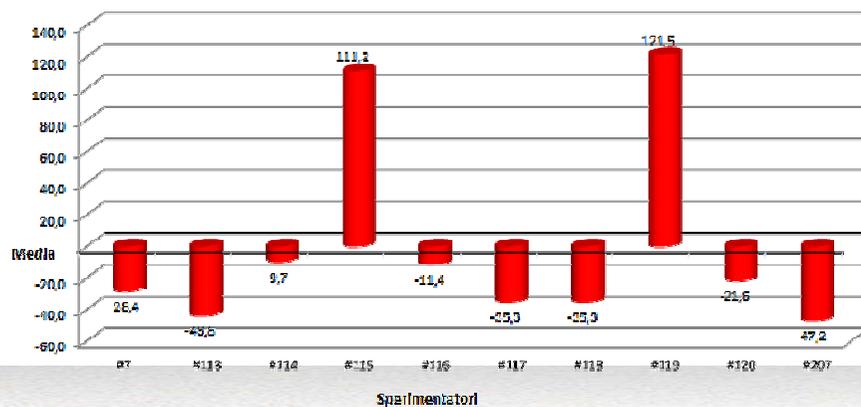
Stand-by consumptions: Persuasive Feedback



Stand-by consumption [Watt]



... in comparison with the average [%]



«This report is absolutely interesting as I can see I am quite virtuous! I knew already stand-by consumptions have a significant impact on annual bill and so I use to switch off electrical extensions»

«Very interesting, I am quite virtuous but my stand-by is quite high. How can I reduce it?»

«Thank you, I have 22 devices with standy-by consumptions (follows the list of devices with the exact stand-by consumption of each device...)»

«Thanks. I want to improve my position and reduce stand-by. I decided to switch-off TV and to switch-off the courtesy lights that I have in my corridor»

CONCLUSIONS



Association as a tool to facilitate eco-system

Founding Members



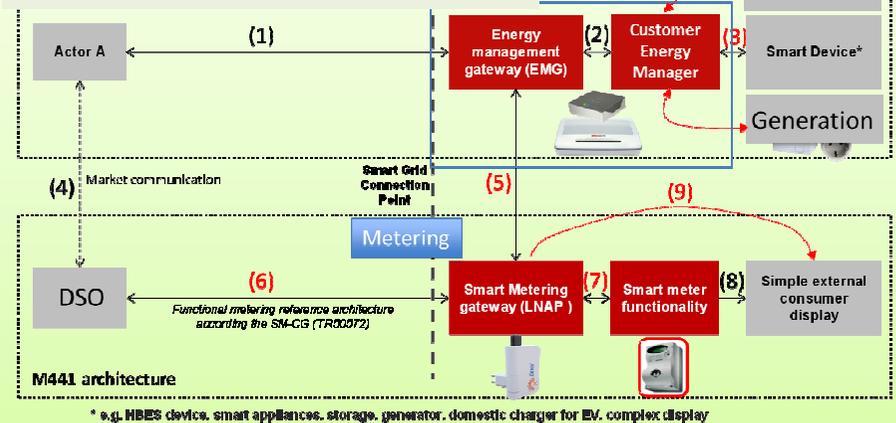
Ordinary Members



Aggregate Members



Smart Grid Connection Point



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Occupant Behaviour: Value of Data

