Energy@home

Energy@home: an eco-system approach to Smart Consumption

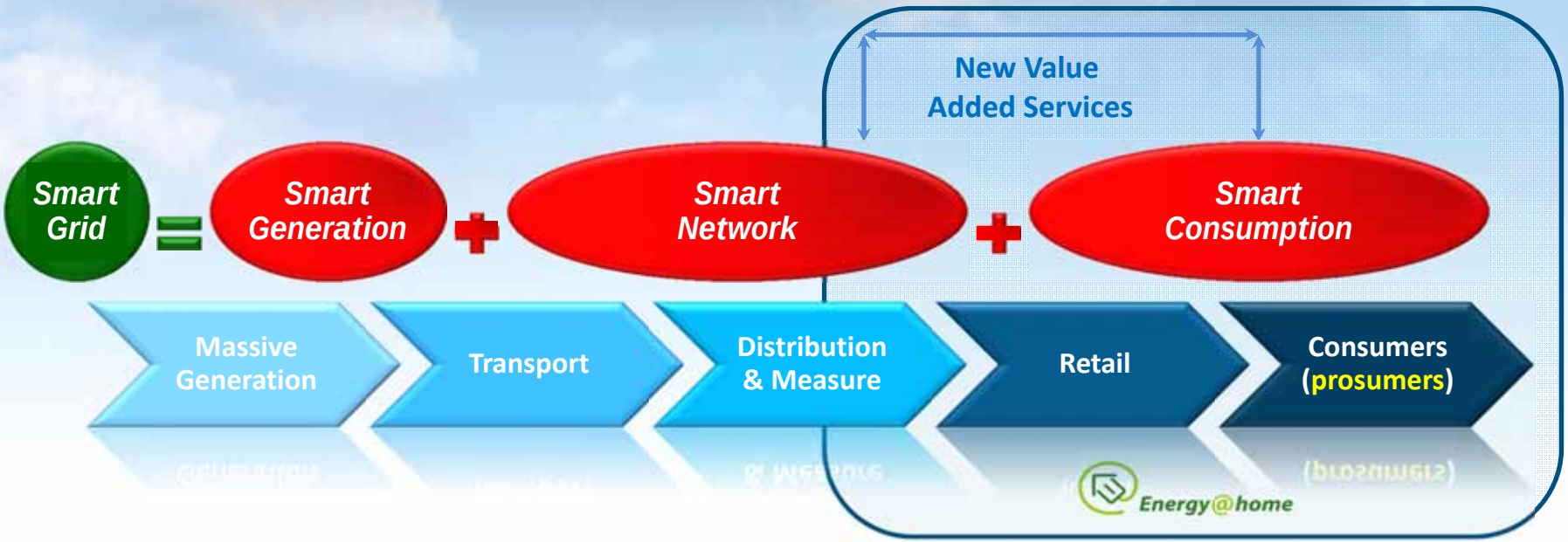
Fabio Bellifemine
Smart Grid Services, Innovation, Telecom Italia
Director of Energy@home

TELECOM ITALIA

Outline

- Smart Consumption
- Energy@home Association
- Customer Value Proposition
- First results from the field trial
- JEMMA Open Source Project
- Conclusions

Energy@home: a Smart Home for the Smart Grid



Our nation's electric power infrastructure is rapidly running up against its limitation.

– U.S. Department of Energy

Potential of residential energy saving at 2020 (source McKensey): -90% in new dwellings, -35% in existing ones

The Smart Grid requires a Smart Home able to:

- Increase efficiency
- make users aware
- support users to exploit Time of use Pricing
- provide services to the grid

Energy@home Association

Energy@home

is a **no-profit** association that, for the benefit of the environment, aims at developing & promoting technologies and services for energy efficiency in the home based upon device to device communication.

Founding Members:

Electrolux

Enel Distribuzione

INDESIT

TELECOM ITALIA

Ordinary Members:

EDISON

vodafone

ST

Whirlpool

Aggregate Members:

eurotherm

MAC

FlexGrid

i-EM

freescale

intecs

Gemino

SMB

power-one

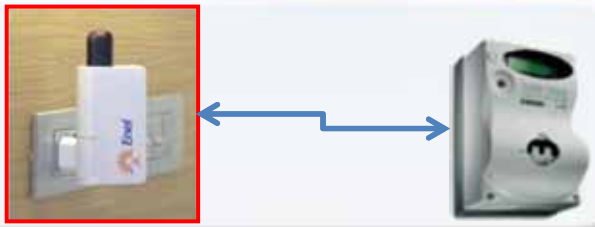
RENESAS

ALTRAN

Devices integrated in Energy@home, so far

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…

Telecom Italia Home Gateway

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

White Goods: Power Profile and Appliance Control Data Structures

Appliance Identification

- Manufacturer, Brand
- Product Type
- CECED Specification Version

Appliance Control & State

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

EN50523 Appliance Events

- 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

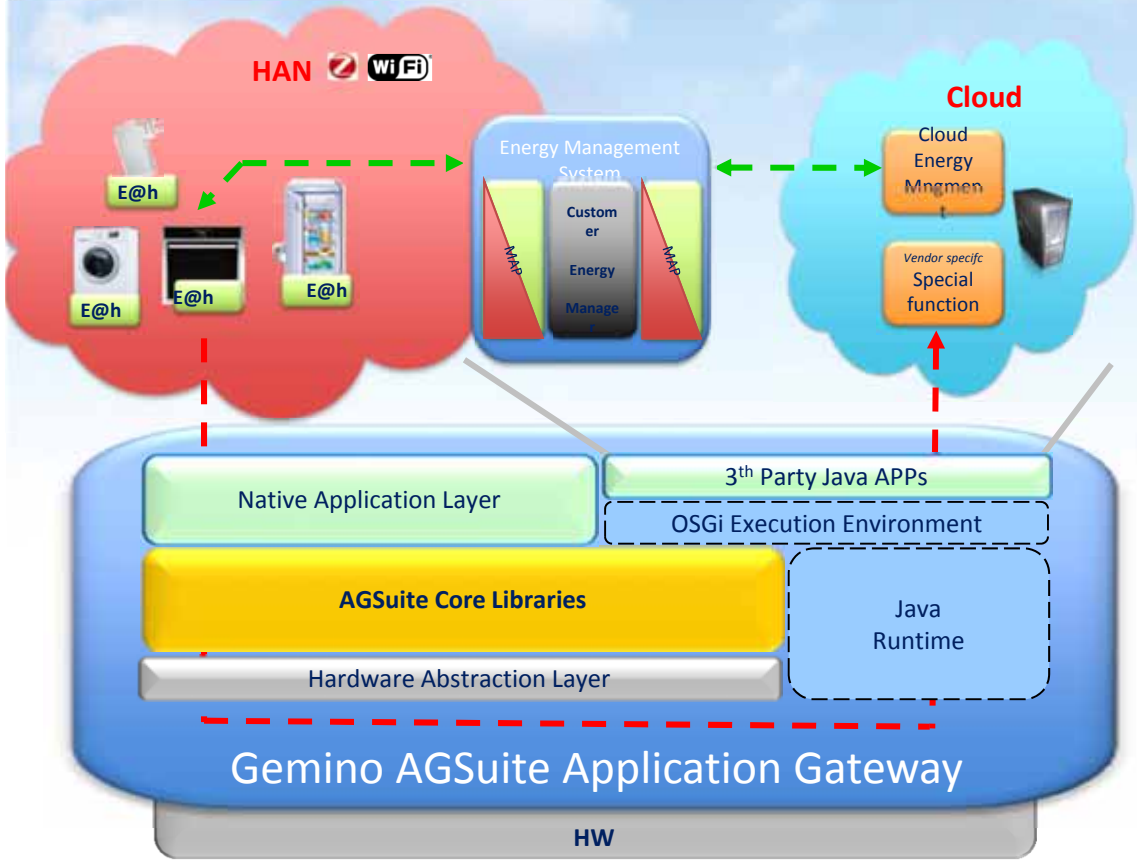
Energy is one of the apps@home …

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 600 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

Application Gateway enabling the Smart Home



03/10/2013

Ikanos and Gemino Launch Industry-First 'Applications Gateway' to Automate and Centralize Home Energy Management

PRESS RELEASE

Ikanos and Gemino Launch Industry-First 'Applications Gateway' to Automate and Centralize Home Energy Management

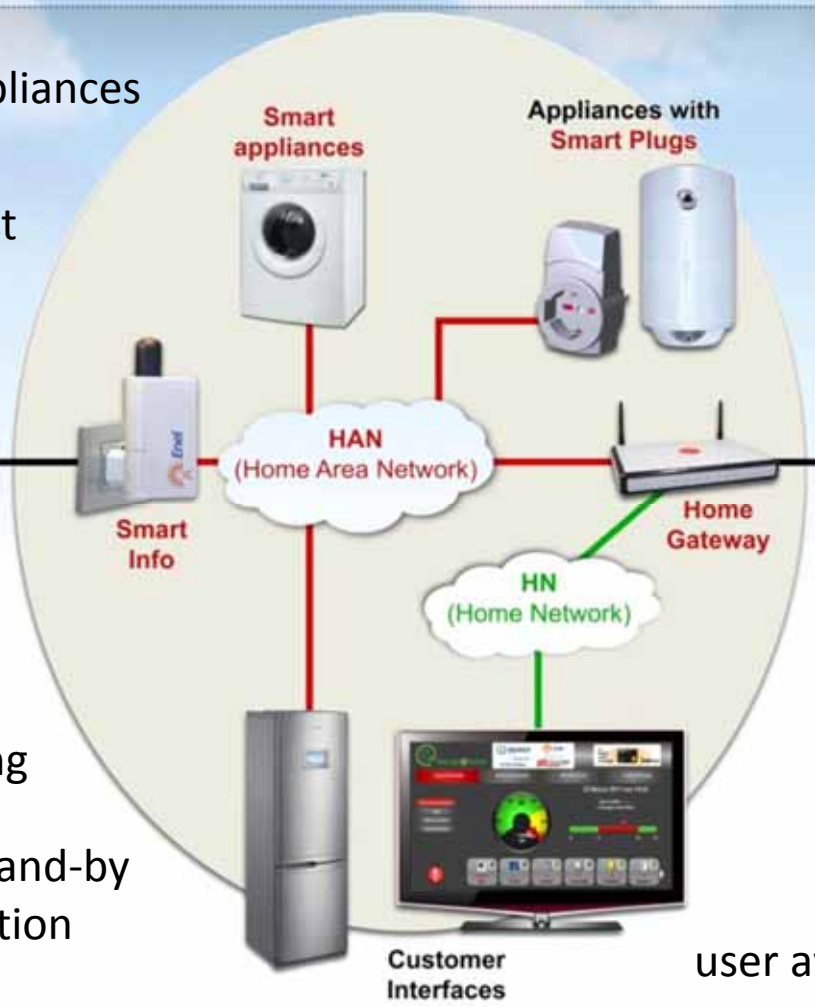
Ikanos Fusiv® Vx185-based Platform Manages Home Power Consumption, Overload Prevention, and Power Profiles based on Energy-Management Applications from the Energy@home Association

FREMONT, Calif., and ROMA, Italy – Oct. 3, 2013 – **Ikanos Communications, Inc** (NASDAQ: IKAN), a leading provider of advanced broadband semiconductor and software products for the digital home, today announced an industry first 'applications gateway' that hosts a range of energy-management applications from the Energy@home Association using a single gateway processor. Built around Ikanos' Fusiv® Vx185 processor and AGSuite software from Gemino-Srl, the 'applications gateway' enables M2M (machine-to-machine) communication in an ecosystem of connected and interacting appliances to optimize energy consumption, increase efficiency, prevent overloads, and create new services for consumers. In homes equipped with the gateway, residents will benefit from a user-friendly, single-point energy management system controllable via an in-home console or a smartphone. Ikanos and Gemino will showcase the gateway at the Energy@home stand at European Utility Week 2013 in Amsterdam, October 15-17.

Energy@home: Architecture & Functionalities

scheduling of appliances

Generation forecast



energy/cost information

Time of Use Pricing

peak shaving

control of stand-by consumption

overload control

user awareness

- Users are blind to energy consumption, making it visible is the first step to simulate a more rationale usage
- Smart appliances can automate decisions and can coordinate each other

Customer Value Proposition

User Category	ADDED VALUE	€ / year
Prosumers	Optimal **self-consumption** of generated energy *from 30% to 60%*	100 – 280
High contractual-power users	**Overload control**: lower max contractual power *from 4.5 kW to 3 kW with same energy consumption*	190-240 (*)
Every Consumer	**Energy awareness**: self-optimization of energy consumption *-5% / -10% consumption*	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	

Energy@home

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

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Energy@Home in 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

TELECOM ITALIA · INDESIT company · Enel Distribuzione

Enexis in Netherland

What: time-of-use tariffs and green energy
Size: 300 Indesit Smart Washing Machines
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 · marvin

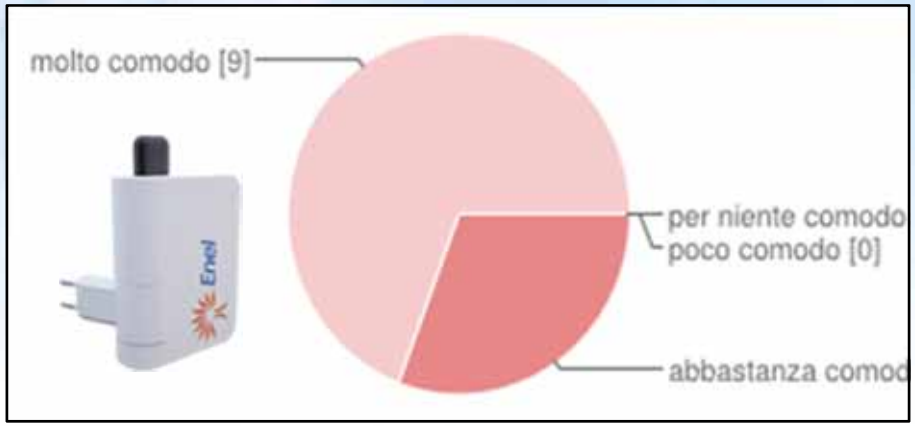
British Gas in UK

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

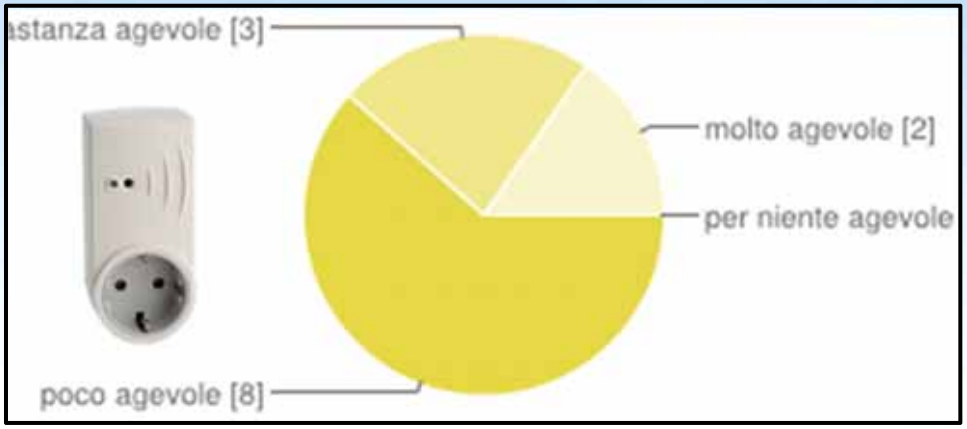
ofgem · LCN Fund Low Carbon Networks · INDESIT company · British Gas

DIY User feedback: Kit installation

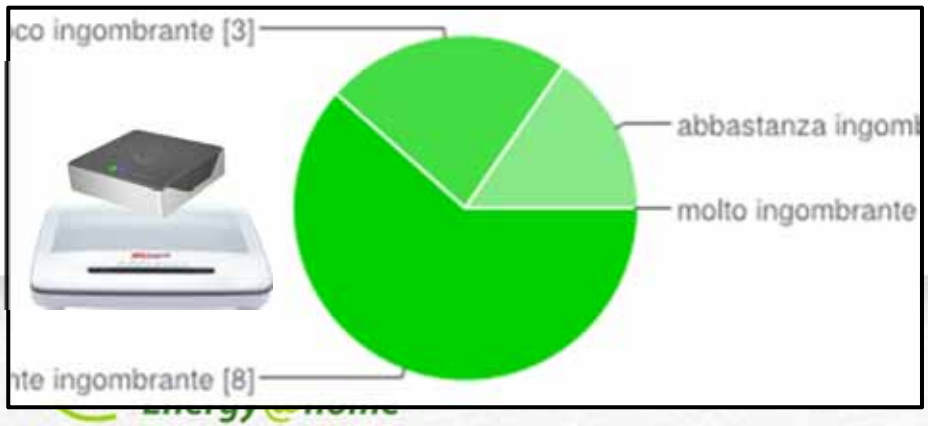
Connecting the smart info of Enel is «easy» for all users. 70% said «very easy»



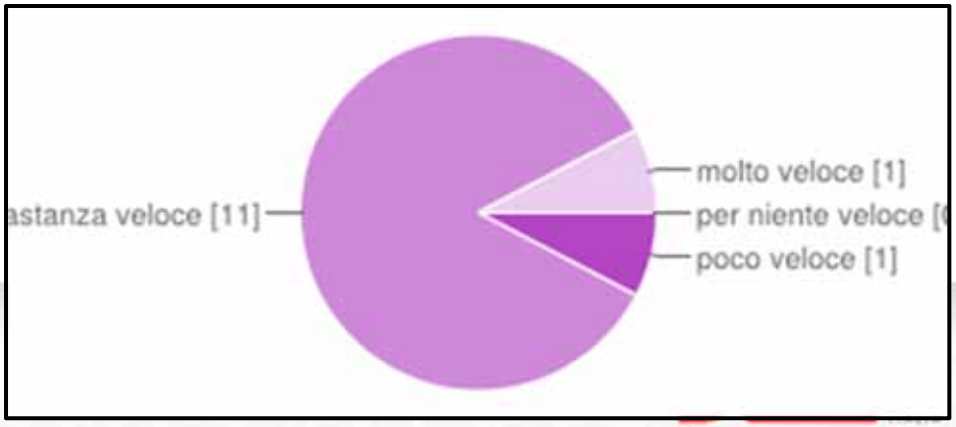
Connecting the Smart Plugs to the whitegoods is «quite easy». 62% said «not easy»



The box on the broadband gateway is not cumbersome. 62% said «not cumbersome»

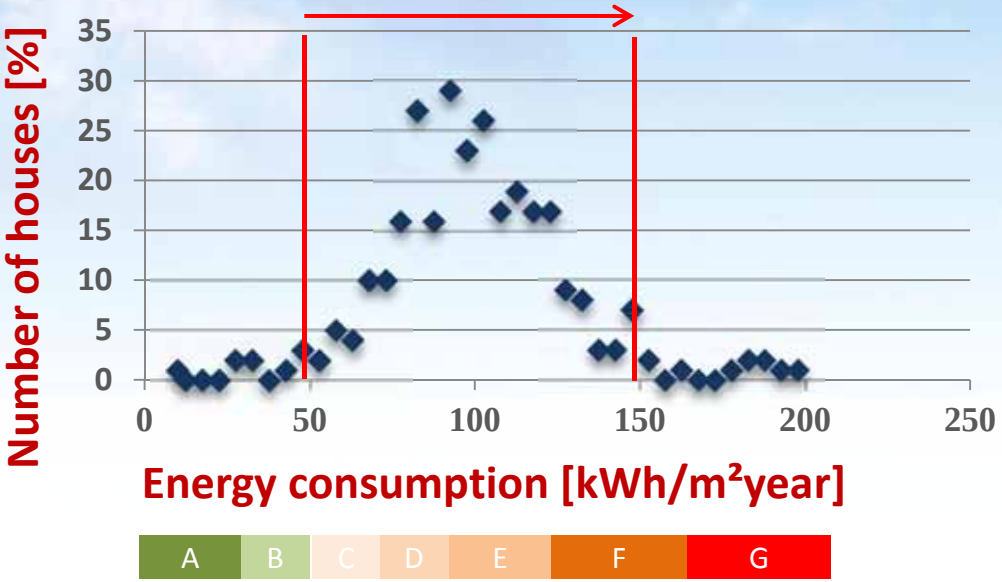


Installing the kit is quick.
Just 1 user said «not quick»



Occupant Behaviour matters!

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

Energy@home

V.Fabi[1,2], R.V. Andersen[2], S.P. Corgnati[1], M. Filippi[1], B.W. Olesen[2]
[1]Polytechnic of Turin (Italy) – Energy Department
[2]Denmark Technical University DTU– Department of Civil Engineering

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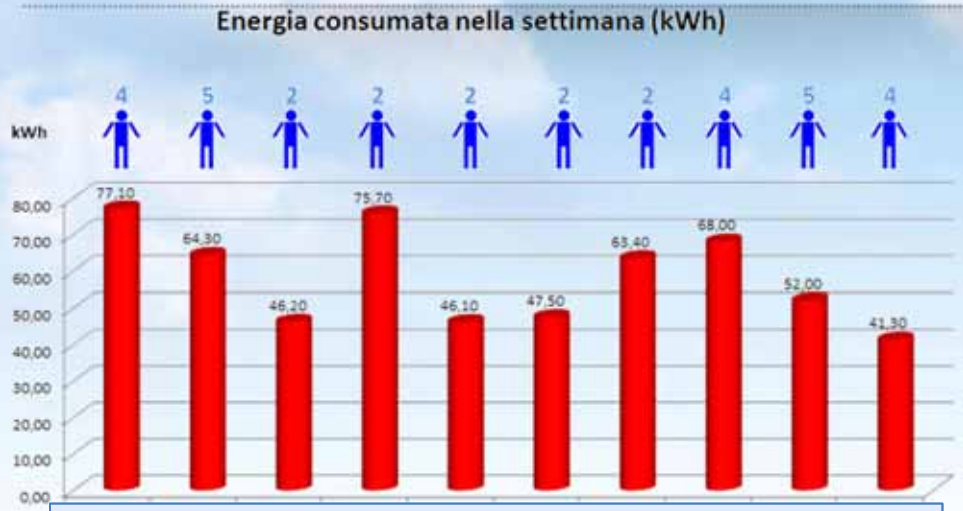
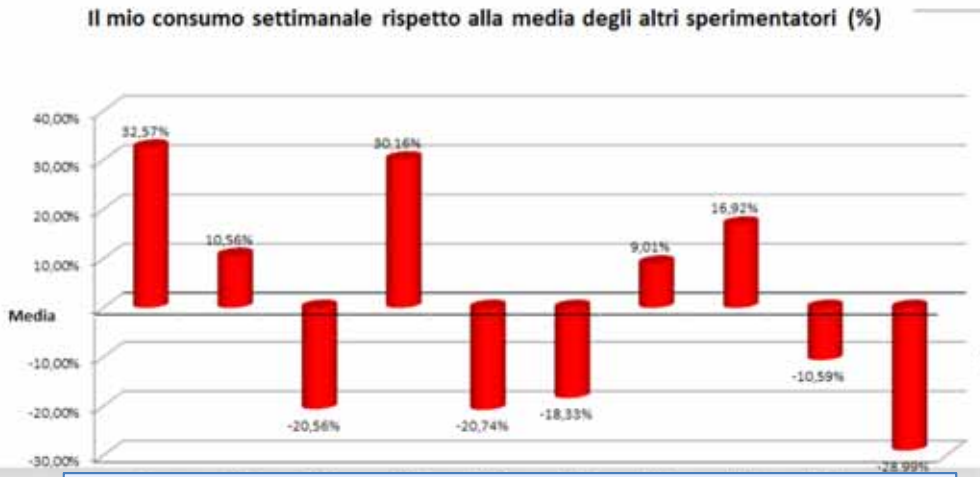
Occupant behaviour – Persuasive Feedback



Weekly energy consumption [kWh]



… in comparison to the average consumption

«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.»

«Thank you for the info. I suspected stand-by consumption impacted but I had no idea how much»

«the verdict was very cruel to me given that only a family with four members has consumed more than me, […] and all the other trialists have consumed much less than me»

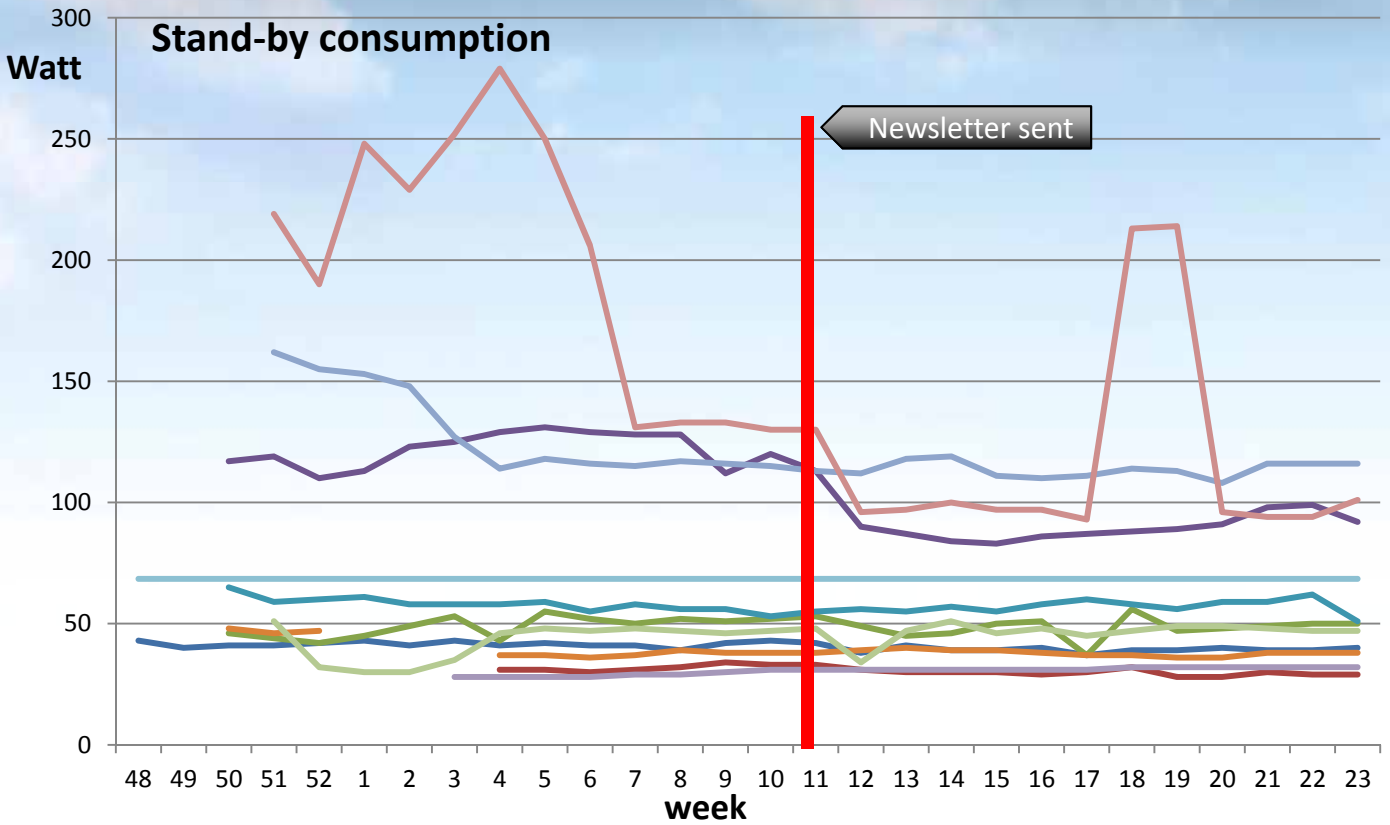
«[…] I am satisfied when seeing the other participants' consumption because I am in the middle of the ranking, even if of course I would be pleased to further improve my position»

«I am very satisfied that my fridge has the least consumption: it is an A+ class!»

«If the others can, it means there must be a way also for me to save energy…»

Effect of the newsletter

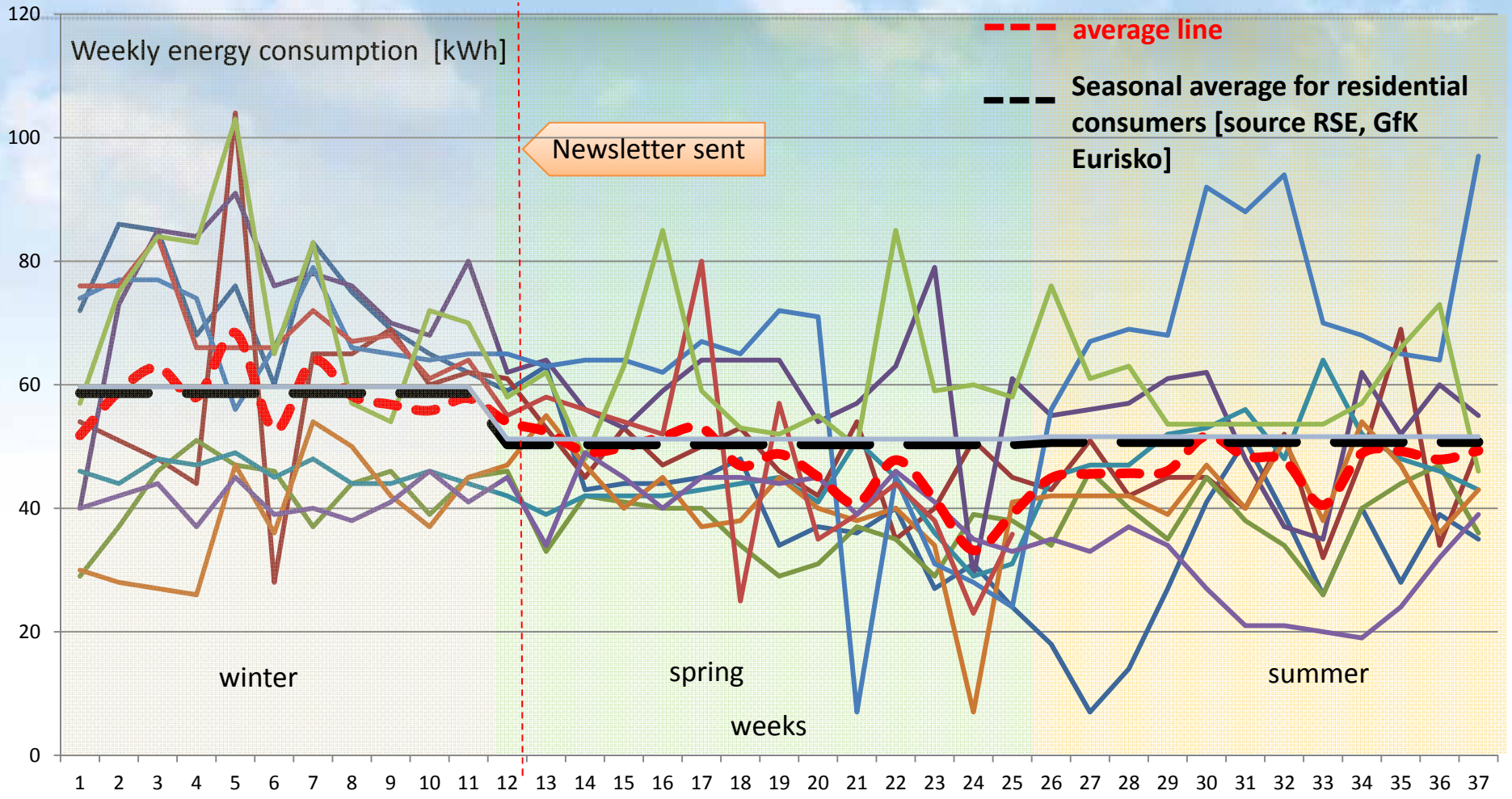
10 users only: the sample is not statistically significant!



- 6 users (over 10) reduced stand-by consumption after the newsletter
- 3 users reduced by more than 10 Watt
- The champion saved 77 Watt (-40%), corresponding to an annual saving of ~125€; another user saved 34 Watt (-27%) corresponding to ~ 50€/year

Effect on the energy consumption

10 users only: the sample is not statistically significant!



- 9 users reduced energy consumption after receiving the newsletter
- Discarding best&worst, on average they saved 10 kWh/week (-18%) corresponding to ~100 €/year
- The champion saved 21 kWh/week (~ 200 €/year), 60% of which thanks to the 77W saving in stand-by; another user 18 kWh/week, 25% of which thanks to 28W saving in stand-by
- **In respect to the seasonal average we measured 7% further saving**

Energy@home: what's next

- **Trial**
  - Analysis of collected data and behavioral patterns
- **Data Model**
  - Independent of the communication technology
  - In collaboration with EEBus
- **Integration of IP appliances**
- **New use cases**
  - Active demand, extension of whitegood-related functionalities
- **Regulatory framework**
- **JEMMA**
  - Reference Implementation as an Open Source Project

JEMMA Open Source Project

JEMMA (Java **E**nergy **M**anage**M**ent **A**pplication Framework)

Implements the Energy@home Technical Specifications and the Energy@home gateway application

Implements the ZigBee Home Automation 1.2 standard and the ZigBee Gateway Device standard

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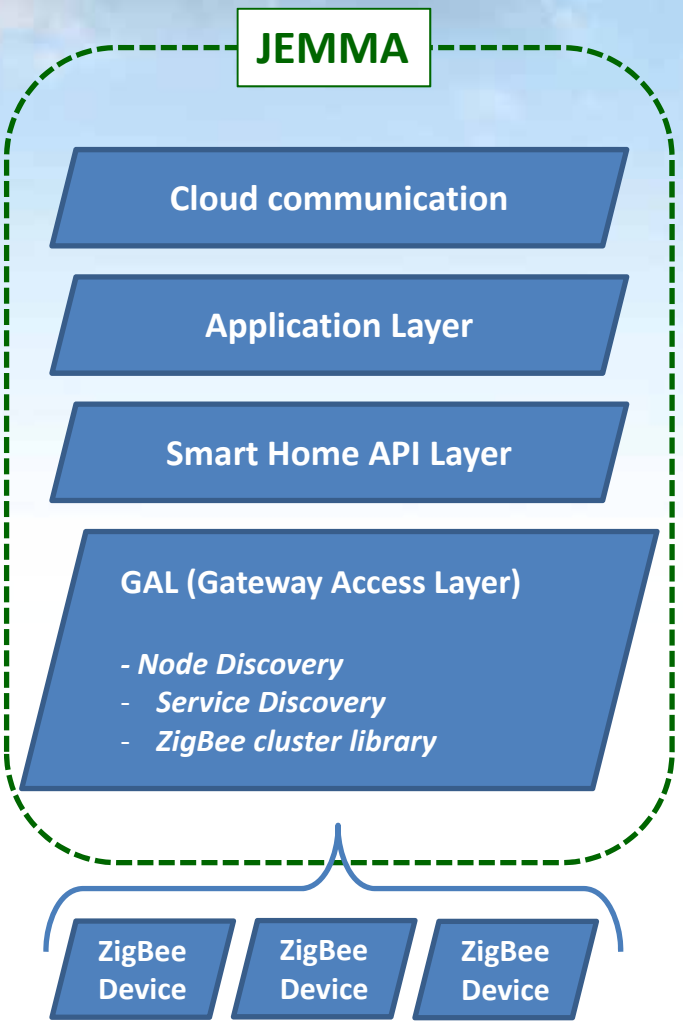
It is on github at
http://jemma.energy-home.org



Conclusions: Energy@home vision on Smart Consumption

HEM is one of the apps@home

Time of use pricing

Eco-system approach

A Smarter Grid requires a Smarter Consumption eco-system

Visit us at Boot 4H.11

Occupant behaviour matters

Pricing based on peak load

Flexibility as a service