



Energy@home

Association



Latest update 27/9/2013

Overview

- Energy@home Vision
- Achievements of the Energy@home project in 2012
 - Use cases
 - Products
 - Specifications & Standardization approach
- Energy@home Association
 - Strategic Objectives
 - New ongoing working groups
- Trials

Energy@home Association

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



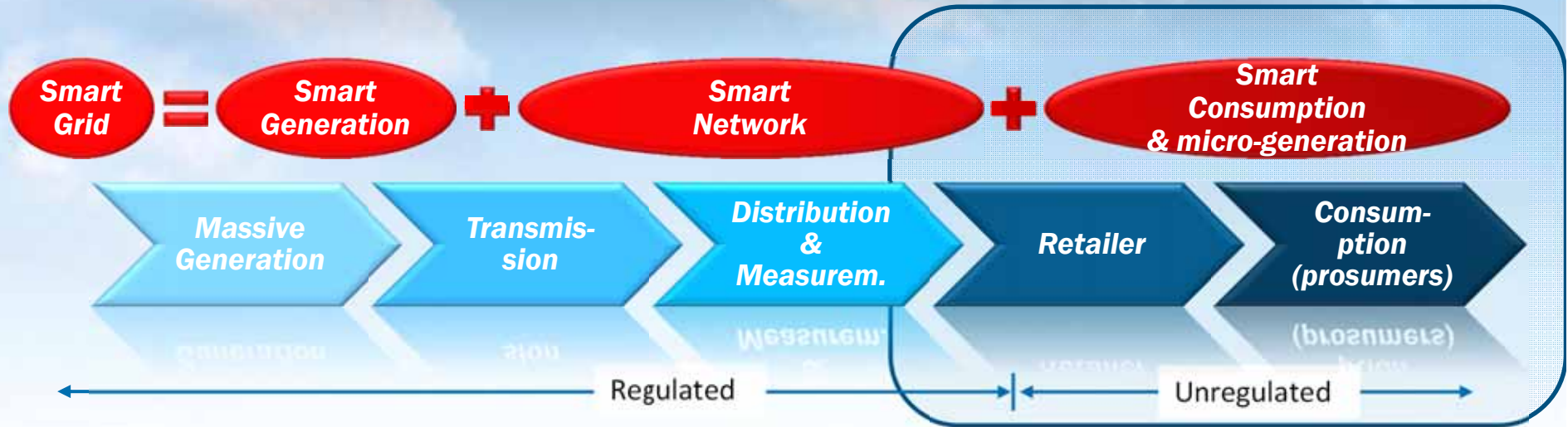
Ordinary Members



Aggregate Members



Scope: Smart Consumption



Some trends in Smart Consumption

Electric Cars

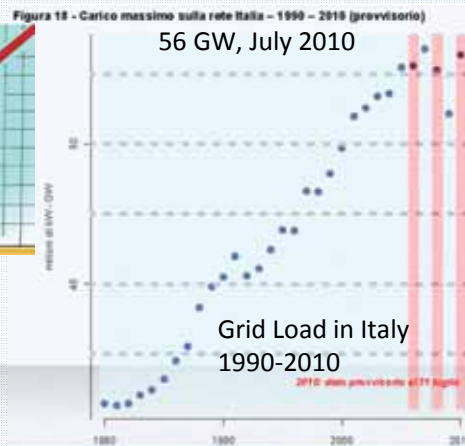


Time of day Tariffs



Peak reduction

56 GW, July 2010



Efficiency



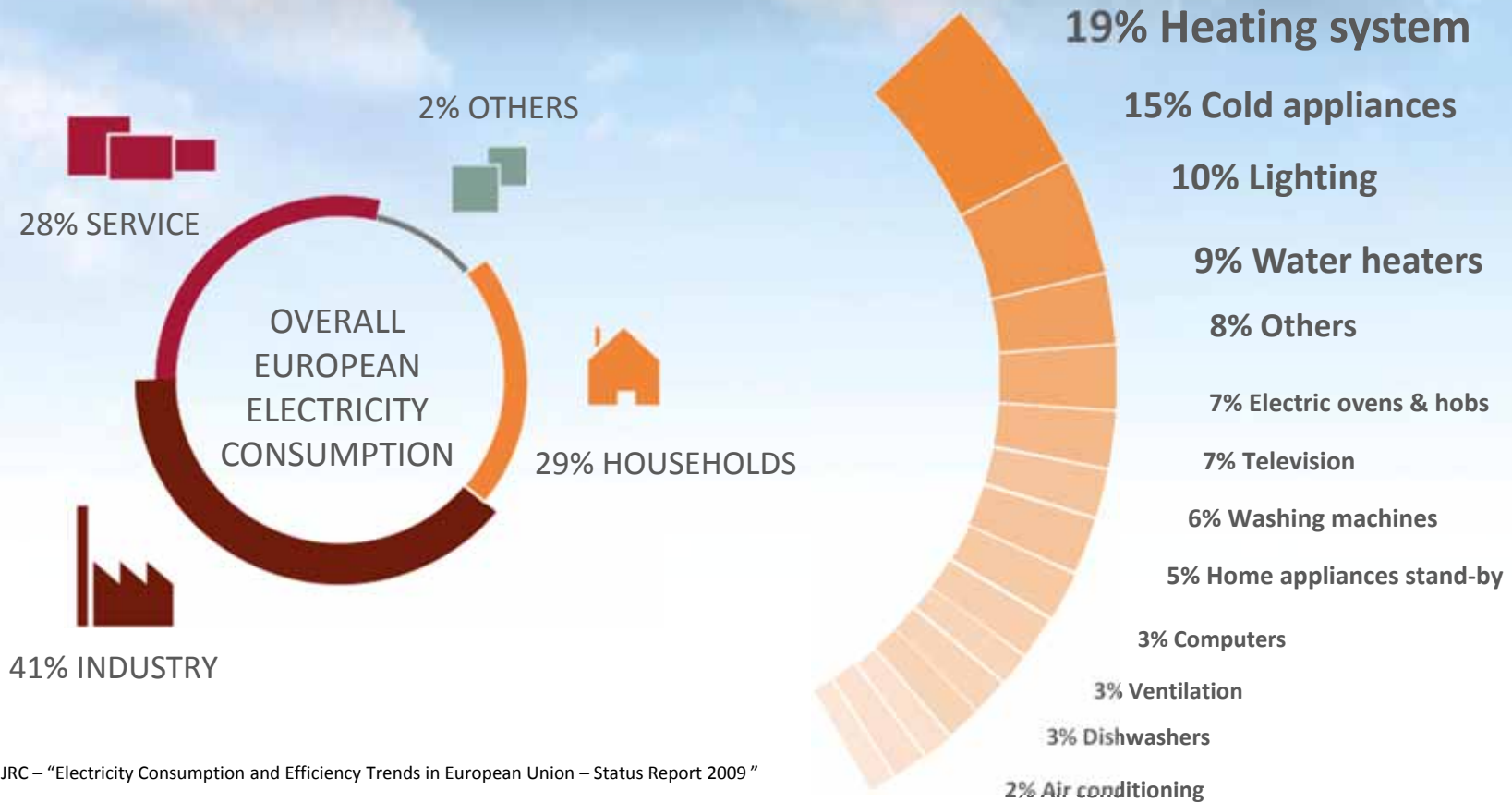
Tools to empower consumers



Distributed Renewables



Energy Consumption Scenario



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

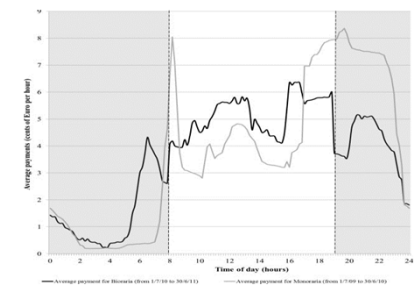
An important effort from many different organizations is currently dedicated to reduce these highly fragmented consumptions.

Energy@home vision

Energy@home Association envisages a progress from the consumption reduction 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 vision

Energy@home is gaining a more and more important role in the definition and promotion of innovative and advanced solutions based on its holistic vision of the house system:

an **ecosystem of interconnected and interacting appliances.**

We started from Italy, but we target the European market, through the collaboration with other active organizations.

Energy@home vision

The openness to new partners is crucial for the success of Energy@home, especially from many different industries.

As well as a strict collaboration with other Associations and Institutions already working to reach our same ambitious goal.

The result of our work is open, believing that this is a critical success factor of the initiative.

We started in the late 2009...



Energy@home started as collaborative and spontaneous project between Electrolux, Enel, Indesit Company and Telecom Italia in 2009.

Its goal was to promote the development and widespread of products and services based on the interoperability and collaboration of the appliances within the household.

www.energy-home.it

... and we reached important results



- **Technical specifications** of the Home Area Network currently under standardization within the Zigbee Alliance
- An interoperable fully-**integrated system** comprising smart gateway, smart meter, smart plugs, and smart domestic appliances
- Interoperability **test events** (including some ZigBee events hosted by Energy@home)
- An **Italian field trial** involving 50 users
- **A field trial in The Netherlands** involving 300 users , where Enexis utility is using the E@h protocol
- Foundation of the Energy@home **Association**

Early Use Cases

Customer Energy awareness

It allows the user to easily access to information and warnings coming from the grid or from the Smart Appliances:

- Cost of each appliance cycles
- Power and energy usage
- User and contract references
- Historical data
- Tariff scheme
- Alarms



Early Use Cases

Appliances Coordinated Management

These advanced functions involve the full interaction of the home appliances with the network, providing active planning and coordination as a result of the information coming from the meter and the user needs.

These functions include:

- energy consumption monitoring;
- coordinated appliance planning;
- coordinated temporary reduction of power consumption;
- dialogue with the network to exchange information...



Available Products

Home Gateway



Smart Plugs



Remote Interface



Meter interface (Smart Info)



White goods



certified products

White goods: 1.0 Energy Saving Approach

MDAs are responsible for 43% of residential consumption



TRADITIONAL TECHNOLOGIES FOR ENERGY EFFICIENCY



Reducing the quantity of water



Designing low energy cycles



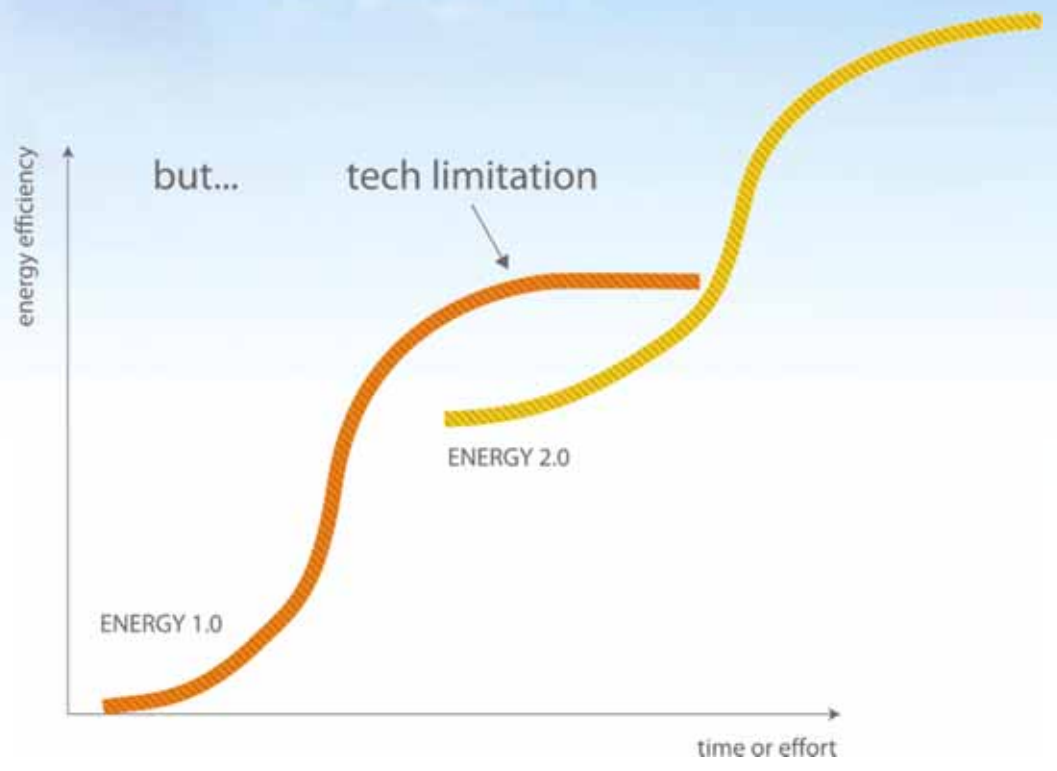
Using higher efficiency actuators and motors



Bettering the thermodynamics

White goods: From Energy 1.0 to Energy 2.0

We reached outstanding results but....



LIFECYCLE OF INNOVATION CURVE

White goods: Smart washing machine

designed to be integrated in “Smart” ecosystems, covering a wide range of use cases:

Calculation, visualization and dispatch to the HAN of the energy and power consumption before and during the cycle execution

Forecast and visualization of the estimated cost for the selected cycle based on time based tariff

Visualization of the total power consumption of the house

Coordination with the others connected appliances and to micro-generation to optimize the power consumption in the house

Scheduling of the starting time to ensure the cheapest or the greenest cycle, always respecting the users constraints



The active role of smart appliances

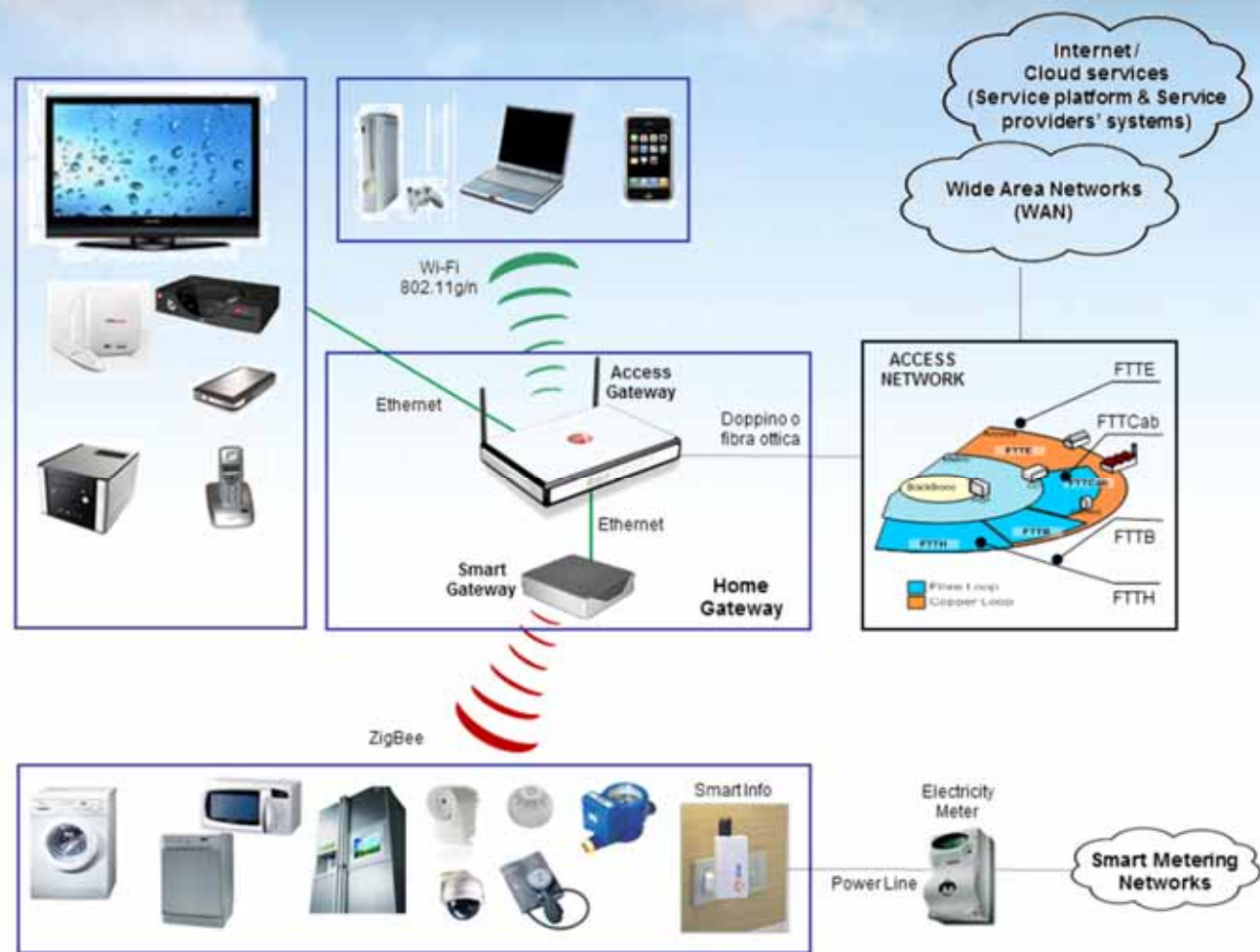
For an effective use of the energy, the Smart Appliances must have an active role in the energy management systems:



being able to completely control the processes as they are fully responsible for the final result;

offering, thanks to an active dialog with the customer and the energy sources, a valuable flexibility in terms of time and energy profile (best tariff)

The devices: Telecom Italia Gateway



The devices: Telecom Italia Gateway

from connectivity to Value Added Services



Enables always-on connectivity of home devices

- ▶ is connected to the broadband network
- ▶ is always-on, power consumption < 10W
- ▶ provides multiple network interfaces (WAN xDSL, LAN Ethernet&WiFi, HAN target ZigBee)
- ▶ acts as the ZigBee controller and the Trust Center of the HAN
- ▶ Provides API's to discover, manage, and communicate with HAN devices

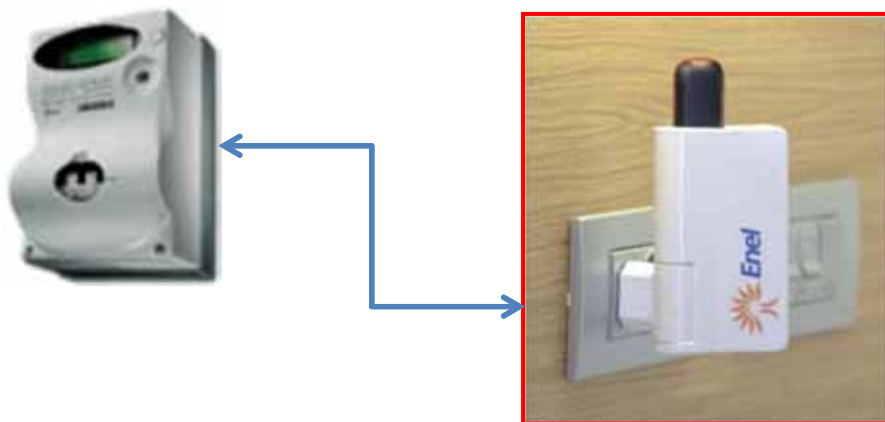
Enables development of VAS's at home

- ▶ is a managed Linux device, target 256 MB RAM
- ▶ OSGi framework to host applications
- ▶ is connected to the service platform in the cloud

The devices: ENEL Smart Info

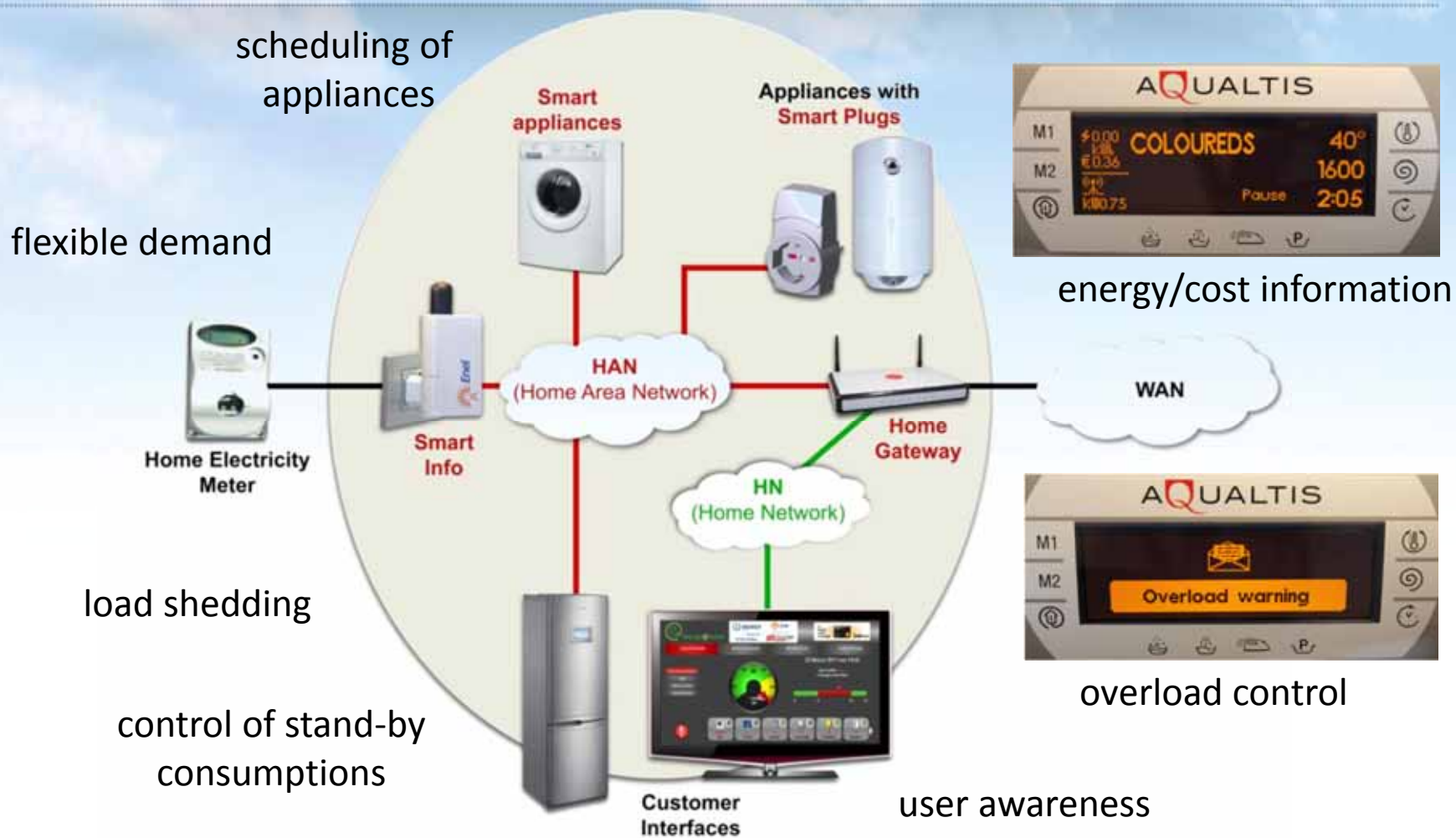
Enel Smart Info has been designed to provide end users with the certified information on electricity consumptions managed by the electronic smart meter.

It can be plugged in every domestic socket to start data collection from the smart meter through powerline.



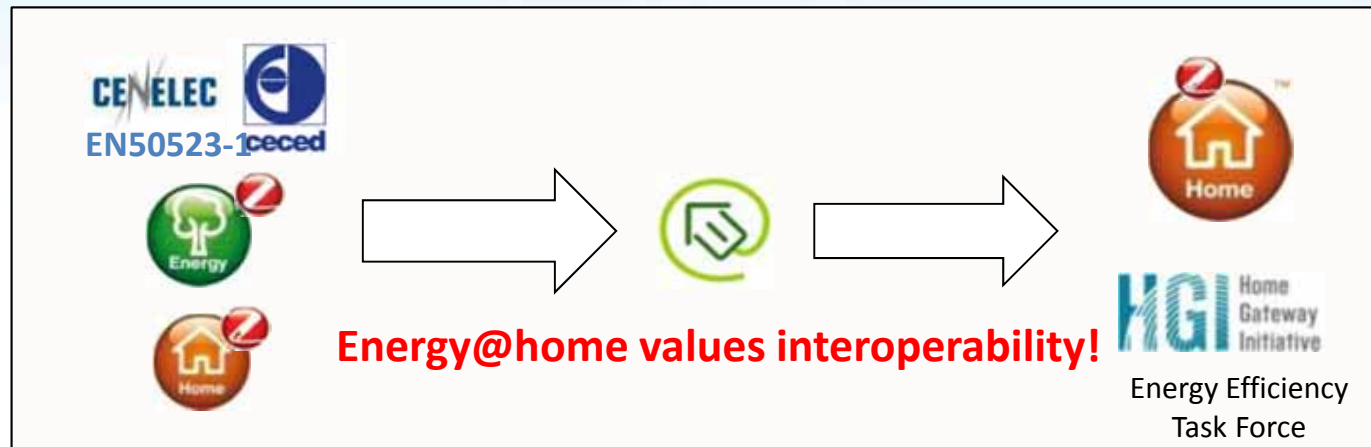
Metering Data	
Metering data	Active and negative energy in current billing period and in different tariff intervals.
	Active and negative energy in previous billing period and in different tariff intervals.
	Maximum power of active and negative energy in current billing period and in different tariff intervals
	Maximum power of active and negative energy in previous billing period and in different tariff intervals
	Average positive and negative power (different integration periods)
	Reactive Energy in different billing periods and tariff intervals
	Instantaneous power
	Active and reactive energy of current day and previous one.
Contractual and configuration information	Contractual power and power thresholds.
	Customer ID
	POD (Point of delivery) code
	Tariff intervals
	Credit left (for pre-paid contracts)
	Date and time (from the Smart Meter)
	Last alarm with type and timestamp
	Meter device details
	Bidirectional transmission of custom data.

Architecture & Functionalities



Energy@home 2012 specifications

- define the wireless protocol, the data model, the set of application messages and the sequence activity diagrams
- extend the existing EN50523-1 (standard CENELEC-Cenelec EN50523-1: “Household appliances interworking”) and ZigBee Home Automation profile by integrating power meter device and smart appliances
- submitted to ZigBee, CECED, HGI

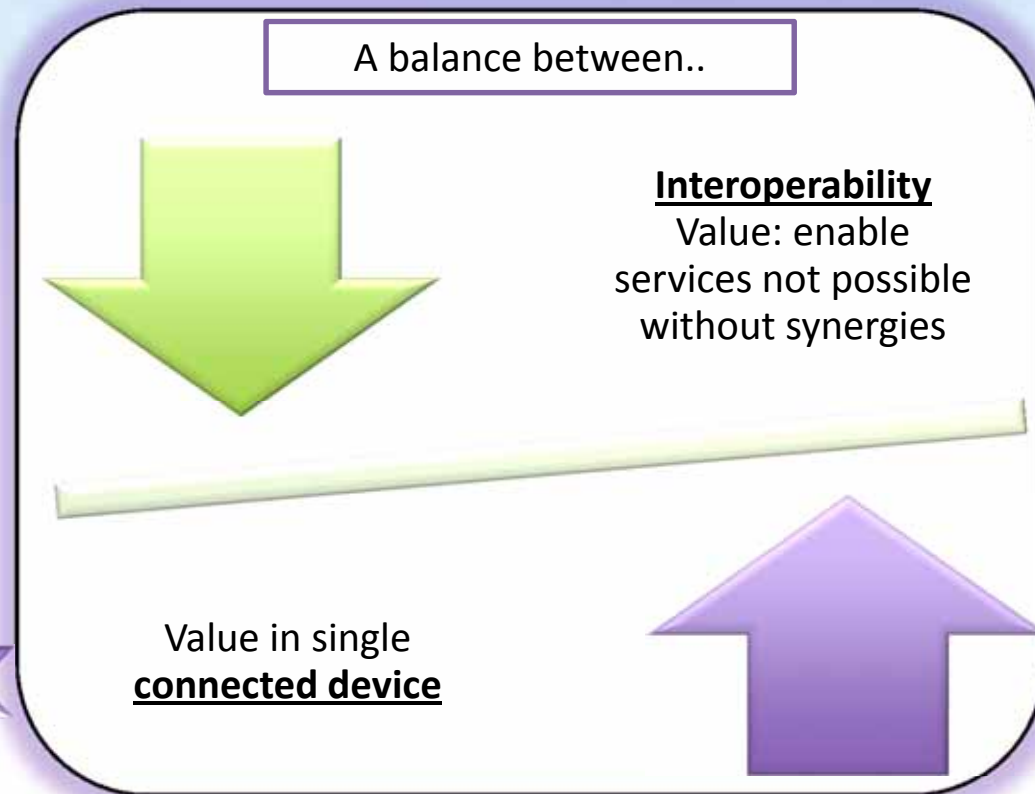
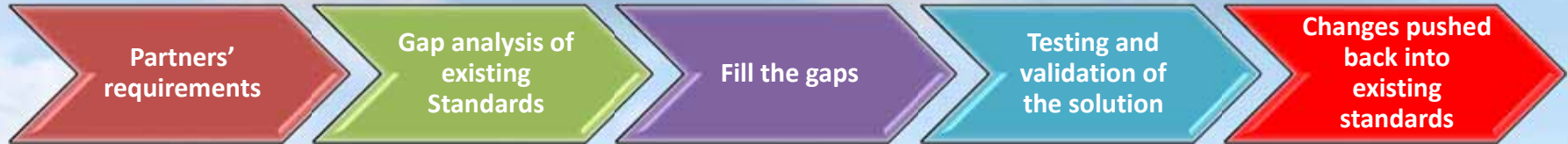


- Expected to be integrated in ZigBee Home Automation 1.2 by 1Q2013
 - ZigBee interop events have been hosted by Energy@home



Abstraction from Zigbee towards the IP has started

Energy@home standardization approach



Value added in the **system**: value bigger than simple summation of parts

Product differentiation and competitive value

Power profile and appliance control data structures



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

- Events**
- Faults
 - Warnings



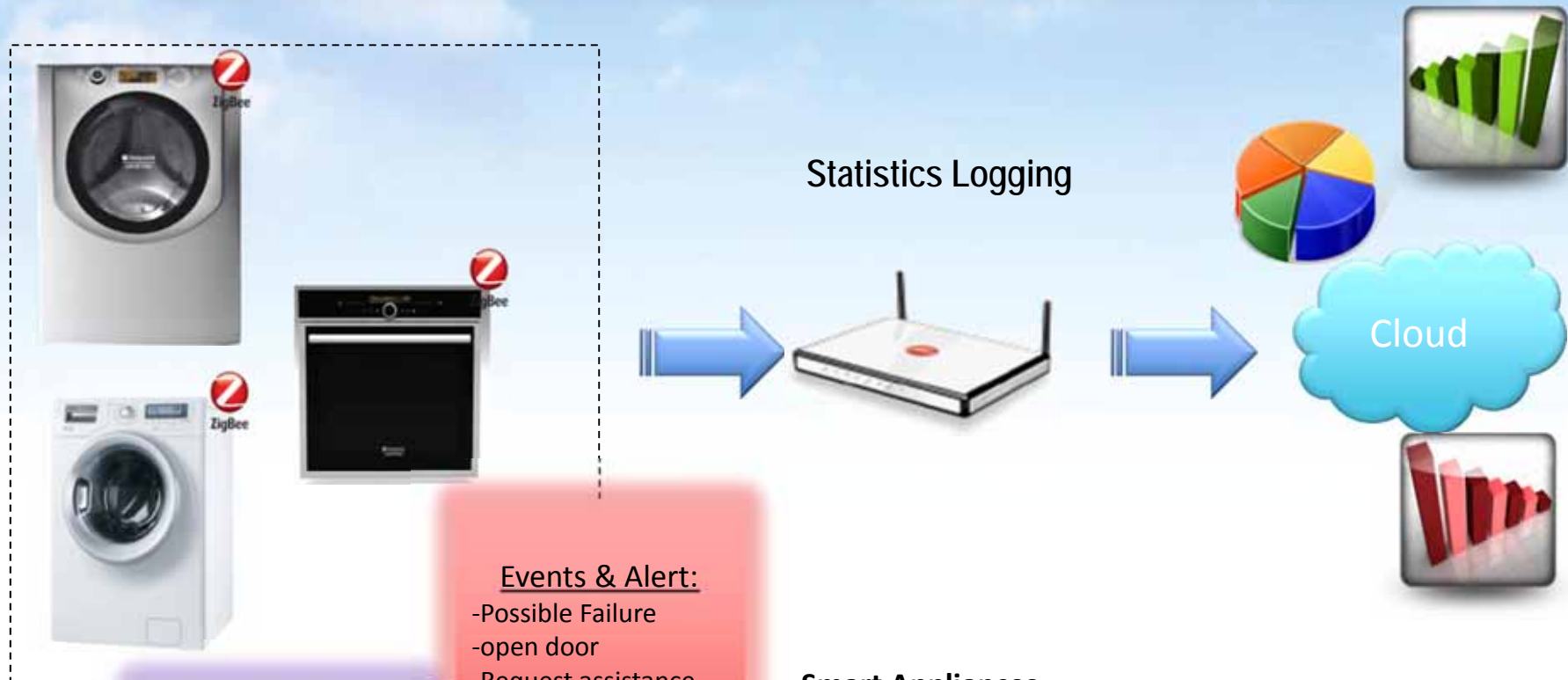
- Power Profile**
- sequence of electrical loads activation/ deactivation (Power phases); basic “uninterruptable” elements:
 - ✓ Expected duration
 - ✓ Peak Power consumption
 - ✓ Maximum activation delay
 - ✓ Expected Energy consumption
 - Sequence of Power phases -> Power Profile

No more monolithic cycles

Appliance control

Power Profile

Events and Statistics



Statistics:
-Water used
-Program set
-option selected
-etc

Events & Alert:
-Possible Failure
-open door
-Request assistance
-option selected
-etc

Smart Appliances

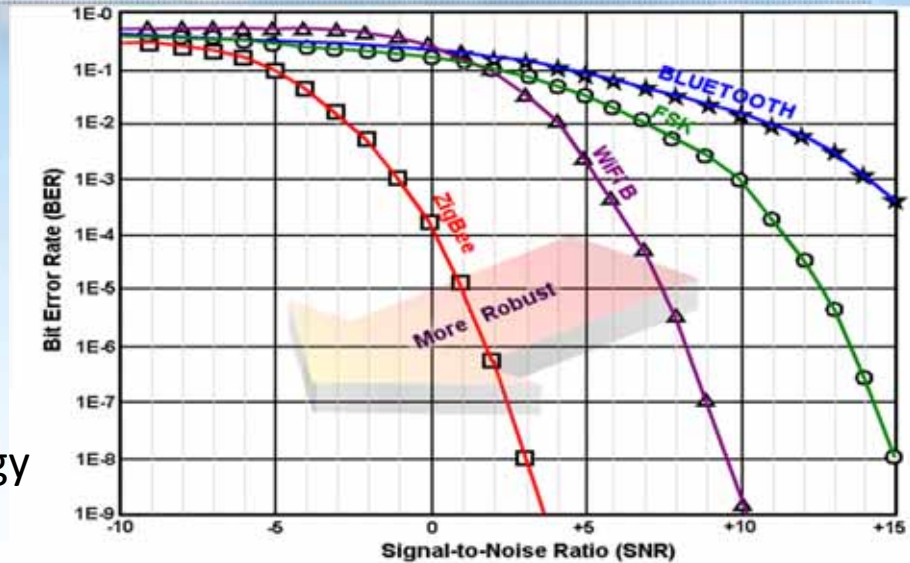
- Send Appliance statistics to the cloud
- Send Events and Alert
- Connected appliance: a mine of information

E@H features into ZigBee Home Automation

- **Appliance:**
 - **Power Profile cluster:**
 - it provides an interface for transferring power profile information from a device (e.g. Whitegood) to a controller (e.g. the Home Gateway).
 - The Power Profile transferred can be solicited by client side (request command) or can be notified directly from the device (server side)
 - **Appliance control cluster:**
 - it provides an interface to remotely control and to program household appliances. (e.g. Start, Stop and Pause commands)
 - The status read and set is compliant to the EN50523 “Signal State” and “Execute Command” functional blocks. Some appliances parameters (e.g. Duration and Remaining Time) have been added, since they were missing from the original specs.
 - **Appliance Identification cluster :**
 - Attributes and commands for determining basic information about a device and setting user device information.
 - The Appliance Identification Cluster is a transposition of EN50523 “Identify Product” functional block.
 - **Appliance statistics cluster:**
 - Information on usage of appliance
 - Specifics statistics to be logged into the cloud
- **Smart Info:**
 - **Meter Identification cluster:**
 - Attributes and commands for determining advanced information about utility metering device.
- **Home Gateway:**
 - All complementary clusters for being able to interface with Appliances and Meter
 - (Power Profile-client, Appliance control-client, Metering-client, Meter identification-client)

Why ZigBee Pro 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

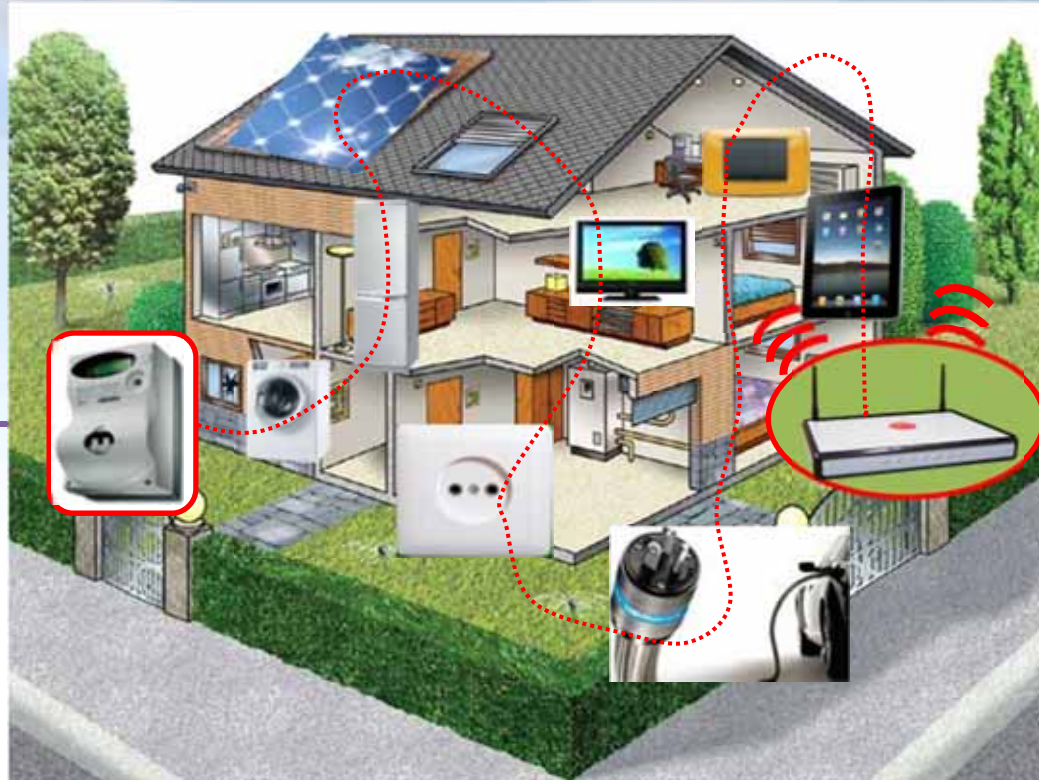
Other protocols might be adopted depending on Energy@home Members Products

The E@h Association

- The Home requires an eco-system approach based upon interoperability between much more vendors and larger systems
- On 4th Jul 2012 the Partners founded a not-for-profit Association open to all interested partners.
- The Association will be the way to:
 - Continue the activities with a larger number of Partners
 - Enrich the collaboration scenarios
 - Enlarge range of industries
 - Influence regulation, consumer & manufacturer associations, and standards

Communication as the enabler of energy efficiency

Grid network



TLC network
& cloud

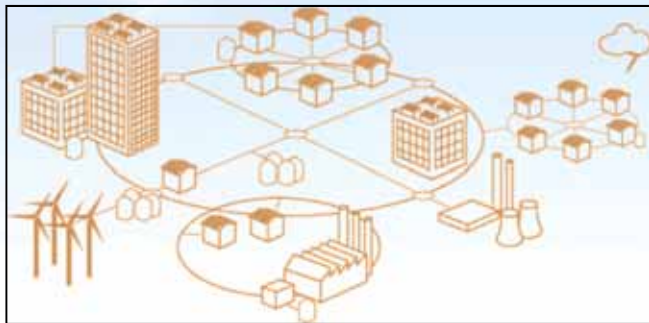
- Our goal is to define and promote the home wireless bus to enable:
- communication between white goods, meters and other used devices
 - provision of new value added services (electrical or not)

Energy@home Association: Strategic Plan for 2013

- **Consolidate established results** (trial, ZigBee HA)
- Foster new partnerships towards the Association and extend the knowledge on **new use cases** based on the communication and interoperability with **new smart devices**
- Release a new version of Energy@home specification comprising new use cases, new smart devices and new functionalities.
- Establish liaisons for a **European common roadmap**
- Promote the Association through **demos and live events**
- Add value for all our partners through the organization of **technical workshops and integration/interoperability test events**
- Install the E@H demonstrator in **permanent exhibition**
- Establish relationships with **AEEG, CECED Italia and Consumers Associations** in order to influence the Italian electricity market to open to new tariff schemes and to new Value Added Services

The major challenges of this revolution

FROM PRODUCT TO SYSTEM...



NETWORKING AND COMMUNICATION STANDARD

Technology

Interoperability of protocols

SYSTEM INTEGRATION

Business Model: from products to services

Appliance producers, Telcos, Energy Utilities,

Domotic systems suppliers as actors of the eco-system

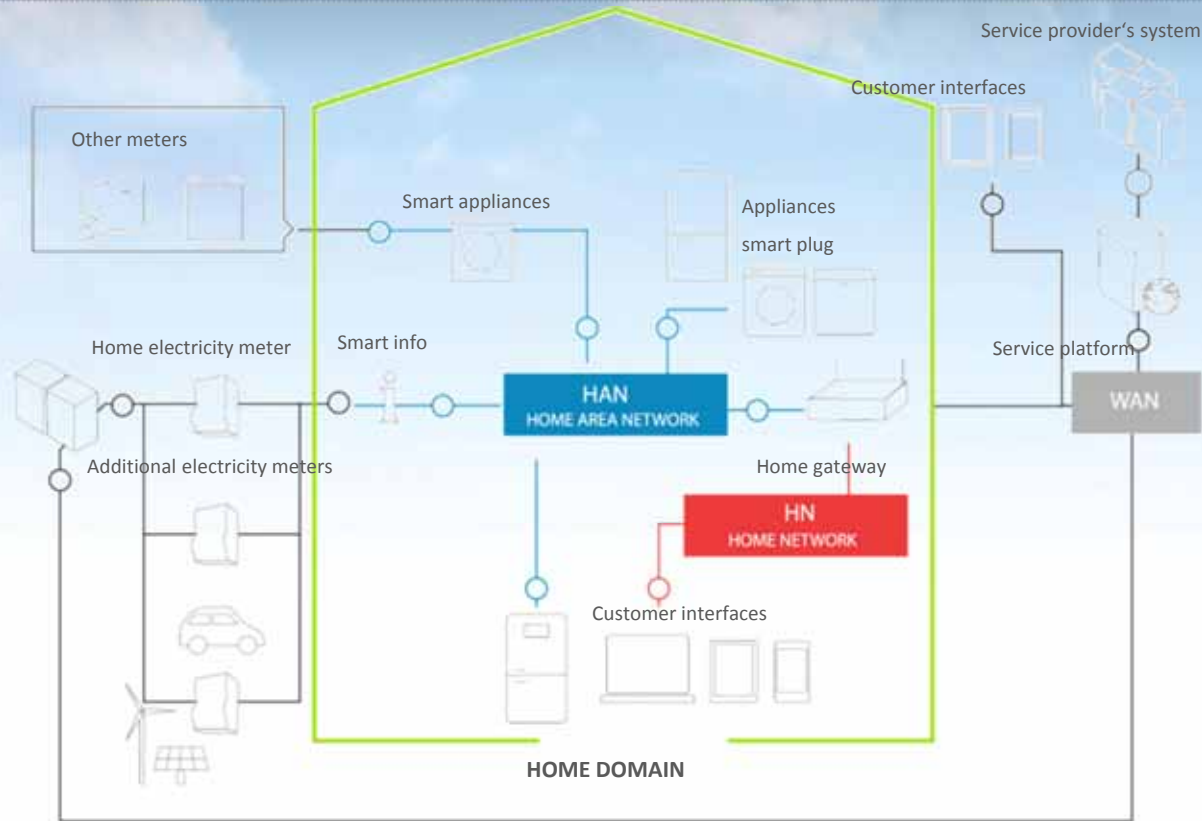
CUSTOMER SATISFACTION

Which values for our customers?

Which simple mechanism for customer revenues?

Avoid “Big brother” effect...

Technology



E@h is designing a communication infrastructure and an open protocol that enables brand new Value Added Services based upon information exchange related to energy usage, energy consumption and energy tariffs.

Organization in Working Groups

Board

Standardization Committee

- Organization of test and integration events
- Relationships with standard bodies, liaisons with EEBus and ZigBee Alliance
- Evolution and Maintenance of Energy@home specifications

IP Integration

- Definition of a protocol-neutral representation of E@h devices
- Define suitable IP based solution for the E@h communication interfaces
- Extension to Wi-fi, relationship with SEP2.0,...

New Use Cases

- Other appliances and devices integration
- New use cases

Policies & Regulations

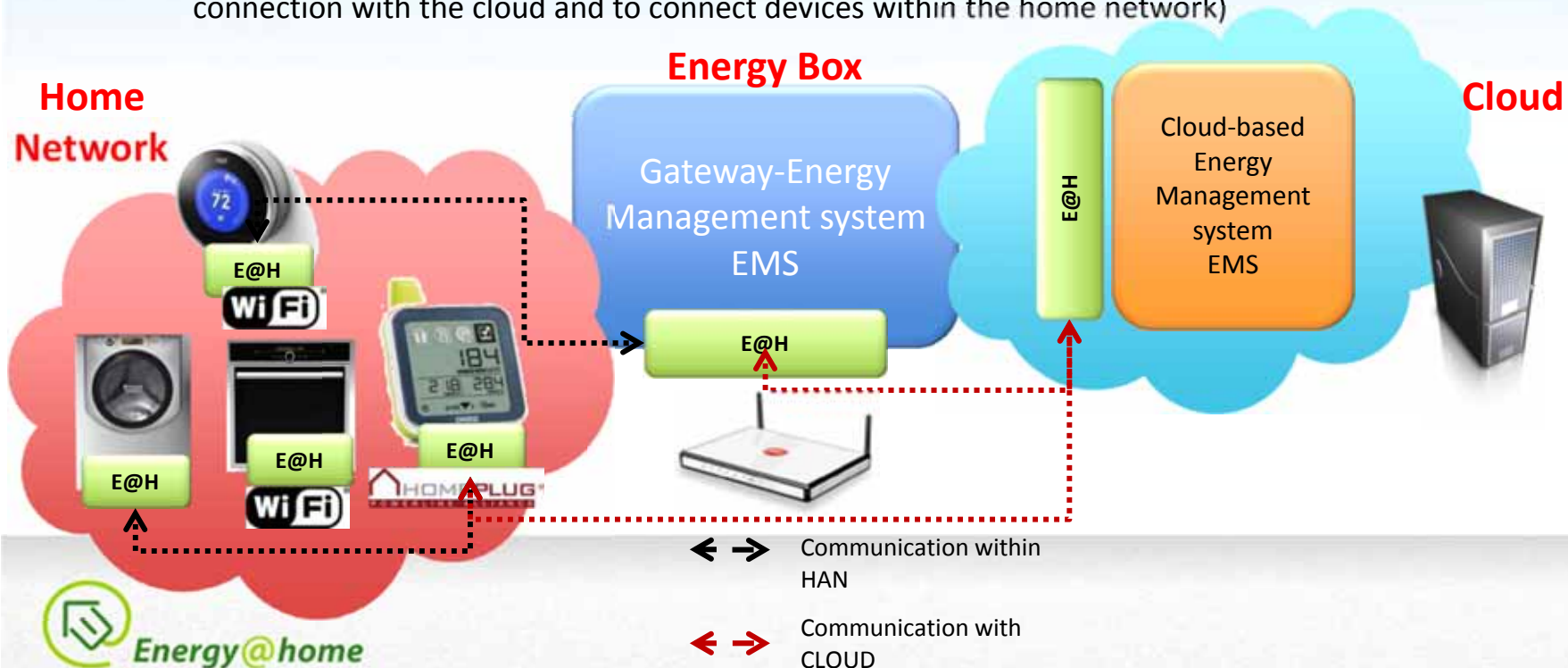
- Identify and foster a regulatory framework with the aim to develop post-meters and demand-response services
- Disseminate the activities of the Association towards Institutions, Regulatory bodies and Consumers' Associations.

Working group: new use cases and appliances

- **Mission:**
 - Extend Energy@home features, devices and use cases;
 - Maintain an updated map of international activities in the area
- **Examples of enhancements:**
 - Extension to other domestic appliances (fridges, oven,...)
 - Benchmark and user comparison => Design of stimuli to incentivize efficiency
 - Active Demand & Synchronization of loads with micro-generation
 - Non Intrusive Load Monitoring
 - Dual-fuel heating
- **New Use cases**
 - New partners are bringing new use cases
 - PV and HVAC integration
 - Remote assistance, software update,...

Working group: IP integration & data modeling

- **Mission:**
 - Define a model for resources and devices in E@H system that is abstract and independent from a specific communication technology.
 - Identify the communication interfaces of the E@H system and define a suitable IP based solution for these interfaces, considering already defined IP standards in the IoT domain;
- **Abstraction** of communication interfaces
- **Ontology** defined for smart grids in residential environment
- Application Programming interface (**API**) based on web services to connect with devices (to be used for connection with the cloud and to connect devices within the home network)



How to join

Energy@home is an open Association, willing to increase the consensus around it to reach its ambitious goals.

MEMBERS TYPE

- **Ordinary members:** can participate to all Association activities, have right vote, have right to elect/be-elected in the Management Board, 10K€ yearly fee
- **Aggregate members:** can participate to all the Association activities, but have no right to vote neither to elect members of the Board, 3K€ yearly fee

Why to join

- An opportunity to collaborate with other industries and integrate your products into the Energy@home eco-system
- Participate to the definition of use cases and technical specifications
- Test your systems in ad hoc interoperability events

How we work

The Association activities are mainly conducted via electronic means: mailing lists and conference calls organized by each of the working groups (about every 2 weeks)

Implementation, debug and system integration is done in each company's laboratory.

3 plenary meetings/year are planned plus ad-hoc interoperability test events.

The first **Energy@home workshop** will be held in Rome, the 11th December.

IPR rules

**Any member accepts to release its own necessary(*) IPRs under FRAND
(Fair, Reasonable and Non Discriminatory)
license**

(*) "Necessary IPRs" means those IPRs (including, but not limited to, all patents and patent applications, database rights or copyrights) throughout the world, existing now or hereafter issued or filed, that cover or directly relate to one or more of the Proposed Specifications, i.e., that would necessarily be infringed by implementation of one or more of the Specifications.

Management Board

Paola Petroni (Enel) is our Honorary Chairman



*Paola Petroni is a
vice president at Enel*

Management Board (*):

- *Fabio Bellifemine* (Telecom Italia), managing director
- *Sergio Brambilla* (Enel Distribuzione),
- *Nicolas David* (Electrolux Appliances),
- *Stefano Frattesi* (Indesit Company).

The Working Groups are composed of about 20 people from the member companies.

(*) The Board has 7 seats: 4 are reserved to founding members, 3 will be nominated by the General Assembly.

Liaisons



DRAFT NOT FOR IMMEDIATE RELEASE

ZIGBEE ALLIANCE AND ENERGY@HOME COLLABORATE ON EUROPEAN RESIDENTIAL ENERGY PLATFORM

Four ZigBee standards to play key role in new value added service platform

Milan, Italy and San Ramon, Calif. – Oct. 4, 2011 – The ZigBee® Alliance and Energy@home will cooperate on the creation of an integrated residential energy value added services platform for Europe by leveraging four ZigBee standards. Under a liaison agreement announced today, the groups will focus on blending the strengths of ZigBee Home Automation™, ZigBee Smart

Energy@home and ZigBee Alliance collaborate to extend the ZigBee Home Automation specifications to integrate new devices (smart appliance, smart meter, smart plugs, and smart gateway) and implement new use cases.

"The collaboration with Energy@home will increase the scope and value of ZigBee Home Automation," said Bob Heile, chairman of the ZigBee Alliance. "Energy@home recognizes the tremendous value of the growing family of standards developed by the ZigBee Alliance and we look forward to helping Energy@home seize the numerous time-to-market advantages our standards offer because improving the use of energy is a global issue."

ZigBee Smart Energy is the world's leading standard for home area networks used by Smart Grid programs to boost energy management and efficiency in homes around the world. ZigBee Telecom Services provides telecommunication network operators with a variety of value added services through the use of mobile devices. ZigBee Home Automation creates smart homes with more control conveniences that improve comfort, convenience and efficiency. ZigBee Gateway offers a global device standard for connecting ZigBee networks seamlessly to the internet with service providers, including telecom operators. For more information on each standard, visit: www.ZigBee.org/standards

- more -



Cooperation Contract



between

EEBUS Initiative e.V.,

represented by Til Landwehrmann,

Von-Hünefeld-Straße 3, 50829 Cologne,

- hereinafter EEBus Initiative -

and

Energy@home Association

represented by Fabio L. Bellifemine.

Energy@home and EEBus Initiative N.V. collaborate for the benefit of a common pan-european Smart Home approach. The two initiatives intends to jointly work to pursue the idea and realization of an European Smart Home, in order to adopt a common data model, and bring in support from the European Standardization Committee.

The no-profit organization EEBus Initiative e.V. is the official platform for standardization initiatives and formation of opinions. The aim of the organization is to link leading companies, associations and key actors within German and international energy and electronics management. Its goal is to develop EEBus further as a standardized and consensus-oriented networking concept for Smart Grid and Smart Home Technologies and establishing it on the market.

2.

Energy@home is a no-profit Association registered under the Italian law. Energy@home has the goal of developing and promoting technologies and services

Energy@Home Trial



Where: Italy (Fabriano, Jesi)

What: 50 Indesit WM, Smart Info, Smart Gateway, Smart Plugs

When: October 2012 – December 2013

- ▶ To validate the proposed technical solution based on the smart gateway, smart info and smart washing machines
- ▶ To prove the maturity of the Energy Management solution for residential consumer capable of an active load control and simplifying the use of time of use and dynamic tariffs
- ▶ to guarantee a proper growth of the Association ecosystem through the trial results



Trial: user functionalities

Energy consumption monitoring and awareness



Trial: user functionalities

Cost monitoring and awareness



Trial: user functionalities

Appliances coordinated management

The screenshot displays the Energy@home mobile application interface. At the top, it features logos for Indesit, Telecom Italia, and Enel. The main screen is titled "CONTROLLO DISPOSITIVI" and shows a grid of appliance controls. A sidebar on the left contains navigation options: Home, Configurazioni, Community, and Tutto sul trial. The appliance grid includes: Lavatrice (Washing Machine) with status "ACCESO" and power consumption "4.0 W"; Mansarda (Lamp) with status "ACCESO" and power consumption "1.3 W"; Forno-Cappa (Oven-Extractor) with status "ACCESO", power consumption "50.5 W", and a note "Sta consumando"; TV with status "ACCESO" and power consumption "1.1 W"; and Garage with status "SPENTO". A bottom navigation bar includes icons for Consumi, Costi, Dispositivi, and Storici. A detailed view of a washing machine cycle is shown in a pop-up window, displaying "COTTON Whites" at 60°C, a cost of €0.43, and a duration of 1600 minutes, ending at 3:08.

Device	Status	Power Consumption	Location
Lavatrice	ACCESO	4.0 W	Studio
Mansarda	ACCESO	1.3 W	Altro
Forno-Cappa	ACCESO	50.5 W	Cucina
TV	ACCESO	1.1 W	Soggiorno
Garage	SPENTO	-	-

Appliance UI

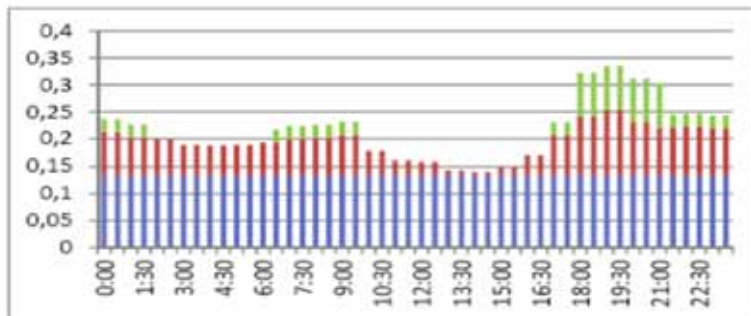
COTTON Whites 60°
€0.43 1600
OFF Ends in 3:08

system speaks E@h to the Smart Appliances



In-Home Smart Display from Enexis's trial

Where: The Netherland (Breda and Zwolle)
What: 300 Indesit Smart Washing Machines
When: from August 2012 -> December 2015



Time to Use Tariffs (example)

Understand the customer reaction to a flexible usage of energy, based on economic incentive through time of use tariffs and micro generation (PV)



- Promote energy efficiency and cost saving through time of use tariffs (cheap mode)
- Promote eco-behavior and cost saving through PV generated energy (green mode)
- Integration with the thermal control of the house



Thanks for your attention