Energy@Home
www.energy-home.it

Torino, 30/3/2011

E@H: the project

Energy@home is a collaborative and spontaneous project between Electrolux, Enel, Indesit and Telecom Italia

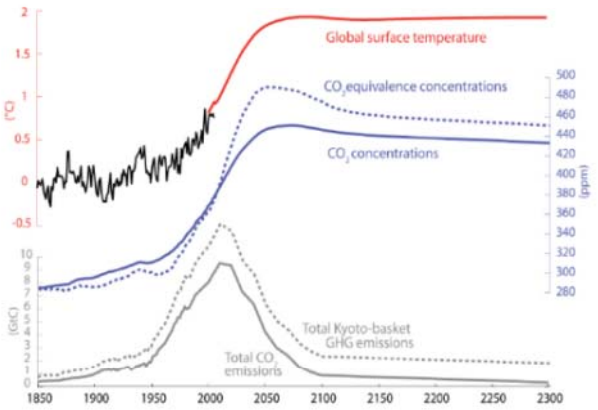
*The aim of the project is to develop a communication infrastructure that enables provision of **Value Added Services** based upon information exchange related to energy usage, energy consumption and energy tariffs in the Home Area Network (**HAN**).*

*The project envisions a **protocol** that shall be used to build an integrated platform to allow cooperation between the main devices involved in **residential energy management**.*

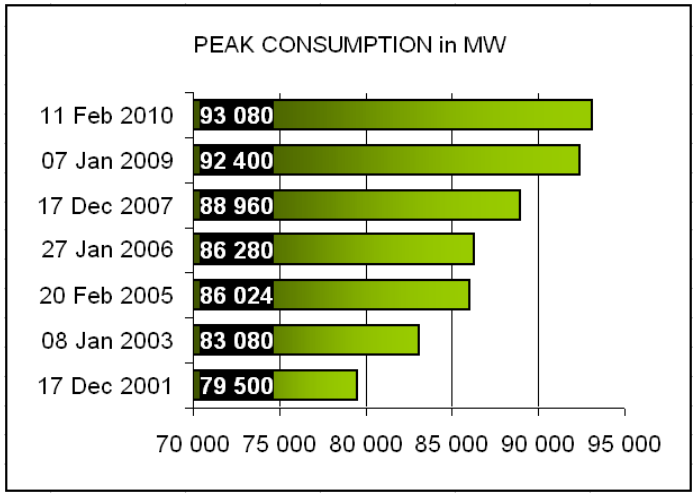
*The collaboration and consensus between **3 different industries** (TLC, Energy, Whitegoods) represents one of the main values of the project.*

Why Energy@Home?

Increasing Energy Demand

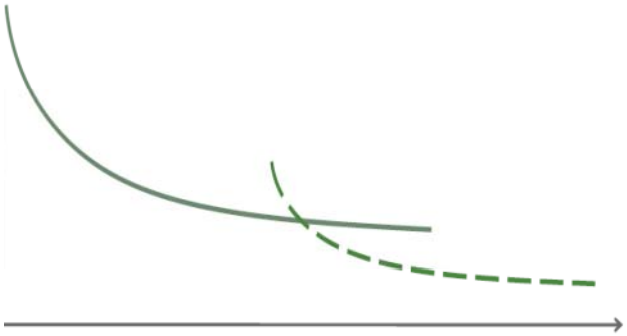


Increasing Peak Demand



(source Yves Dherbecourt, EDF)

White good efficiency reaching physical limits

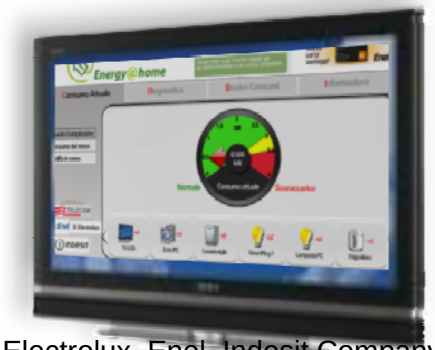


Lack of tools to empower consumers

Why Energy@Home?

Another way to improve the energy efficiency is to integrate appliances in wider systems and optimize the overall performances

Communication enables new Services that increase awareness and empower consumers



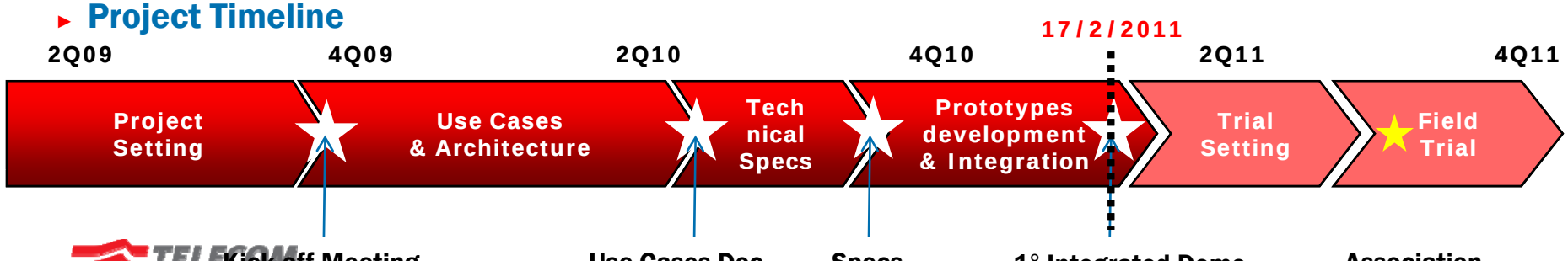
Energy@Home

- **Goal**
  - define a open and standard platform for the indoor communication between home appliances, smart meter and broadband gateways to enable energy efficiency services

- **Approach**
  - open standards to ensure interoperability between systems from different vendors
- **Use Cases**
  - Awareness, overload & stand-by control, scheduling of appliances & cost efficiency, mngmt
- **Project Partners**

Enel L'ENERGIA CHE TI ASCOLTA · INDESIT · Electrolux · TELECOM ITALIA

- **Project Timeline**



Energy@home

Smart Grids for the telco operator

Traffic?

of tx parameters

frequency	2	4	8	16	32
1 hour	0.8	1.5	3.1	6.1	12.3
15'	3.1	6.1	12.3	24.6	49.2
5'	9.2	18.4	36.9	73.7	147.5
1'	46.1	92.2	184.3	368.6	737.3
5 sec	553.0	1105.9	2211.8	4423.7	8847.4

kbit/day transmitted by each meter

For comparison:

Average size of an e-mail: 59 kBytes

(source School of Information Management, Berkeley: How Much Information? 2003)

Services!

- **Ecosistemi**
- **Interoperabilità**
- **Modelli di business**

(hypothesis: each parameter is codified with 16 bits without any data compression)

Energy@Home for Telecom Italia

Home Network (HN)

Ethernet

Ethernet

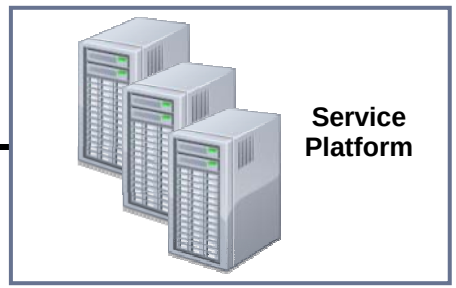
ZigBee

Home Area Network (HAN)

Trend towards 2 networks @ home

- **Home Network, high bandwidth, multimedia**
- **Home Area Network, low bandwidth, low consumption (*), automation**

(*) 10 devices @ 3W = 260KWh/year = 10% increase for avg italian family!



Telecom Italia Cloud

Telecom Italia Components to enable a multitude of VAS:

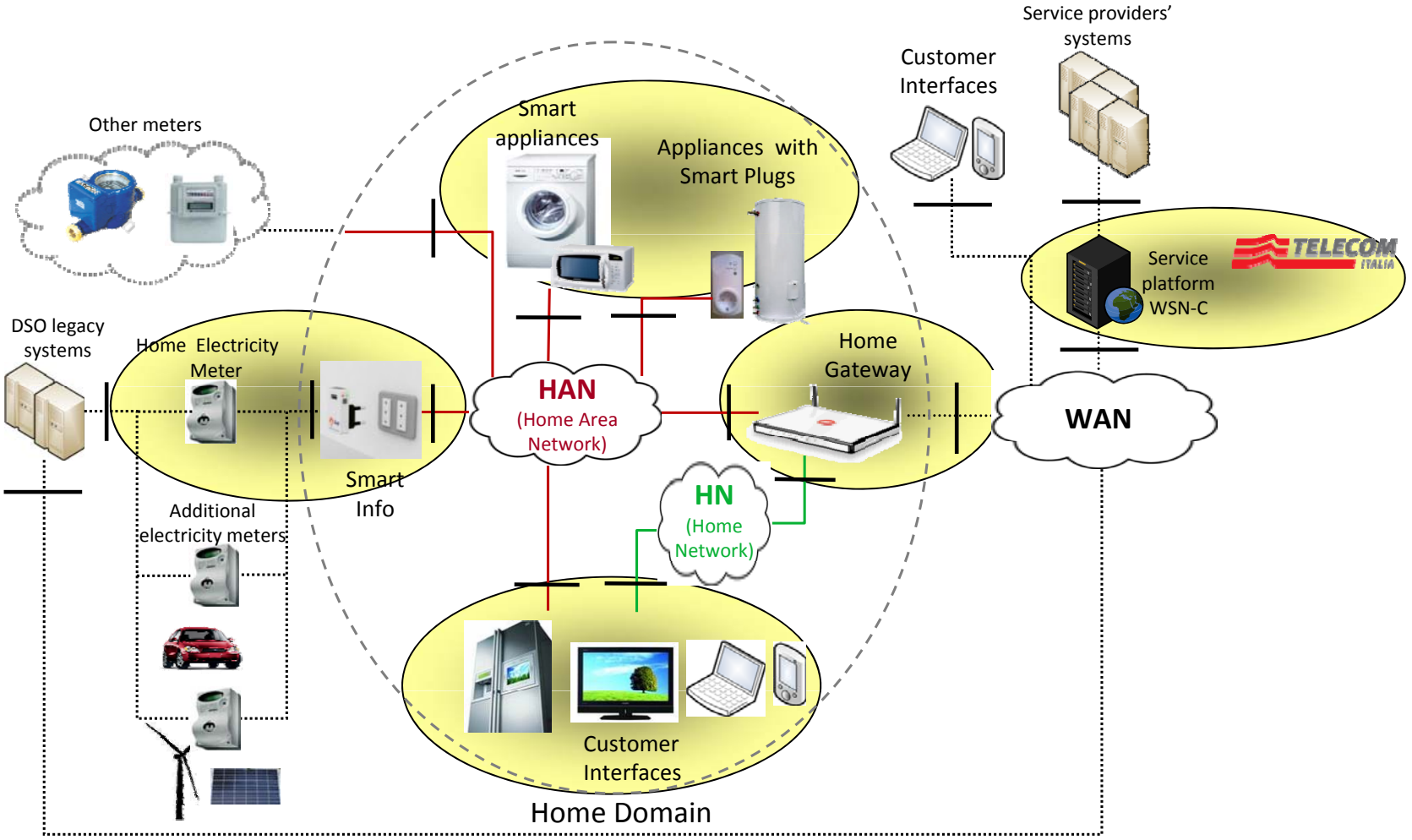
- **Broadband Gateway with ZigBee Gateway Functionality & OSGi execution environment**
- **Horizontal Service Platform in the Data Center**

Energy@Home for ENEL

The goal of the ENEL Smart Info Project is to develop a solution to enable:

- consumer awareness towards energy consumptions by making available, through several media(personal computer, ad-hoc display, TV, white good, etc.), energy consumption-related information with the ultimate purpose of promoting energy efficiency
- active participation of consumers to the electric market
- development of a platform to create new services, including:
  - **Automatic control of electrical loads**
  - **Integration of smart white goods**
  - **Active demand Services**

Energy@Home : Architecture



E@H: Active role of Smart Appliances

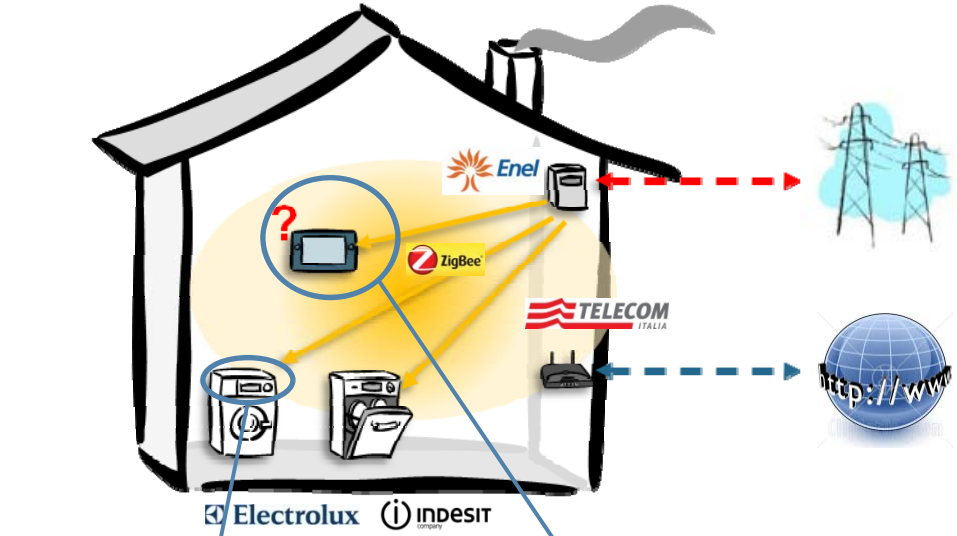
For an effective use of the energy, the **Smart Sustainable Appliances** must have an **active role** in the energy management automatic systems:

- 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)

Smart Appliances Scenarios in E@H

Customer energy awareness

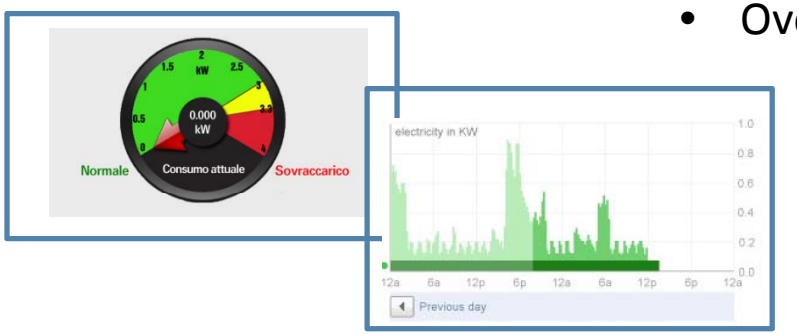
Customer energy awareness alone could reduce up to 15% energy consumption (Darby – Oxford university).



The user could improve her/his awareness on energy consumption and cost using information coming from the grid and the home itself.
Data and information refer to:

- User and contract references
- Current power use
- Historical data
- Current tariff and tariff time frames
- Overload Alarms

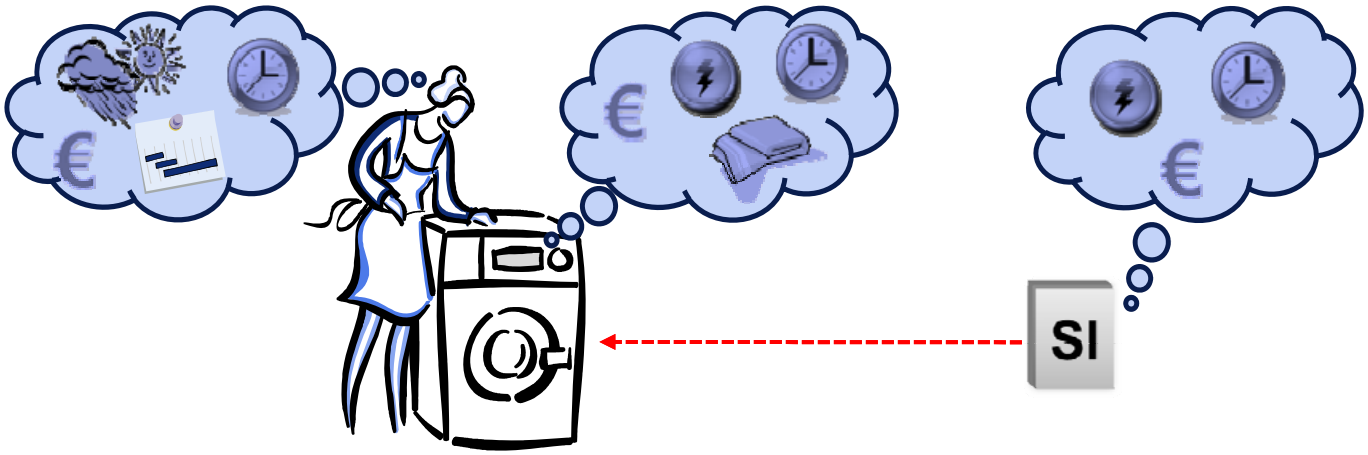
The cost for the selected cycle is…



Smart Appliances Scenarios in E@H

Self Management Appliance Regulation

The **Self Management Mode** is the condition where any Smart Appliance receives Price and Volume Signals from a device (Smart Info or Smart Meter or basic Home Gateway) and proposes the customer the proper **starting time** to take advantage of the most advantageous tariff. The customer could override the proposal if needed. This is made independently and without any coordination with the other devices.

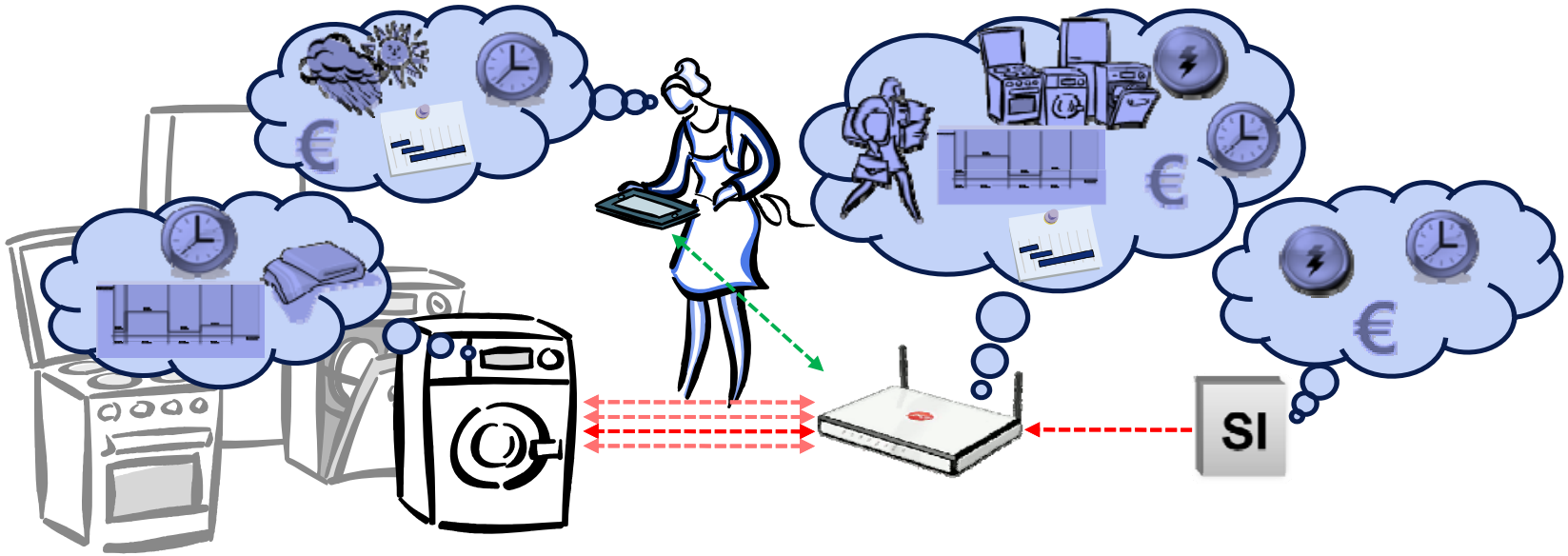


Smart Appliances Scenarios in E@H

Coordinated Management Appliance Regulation

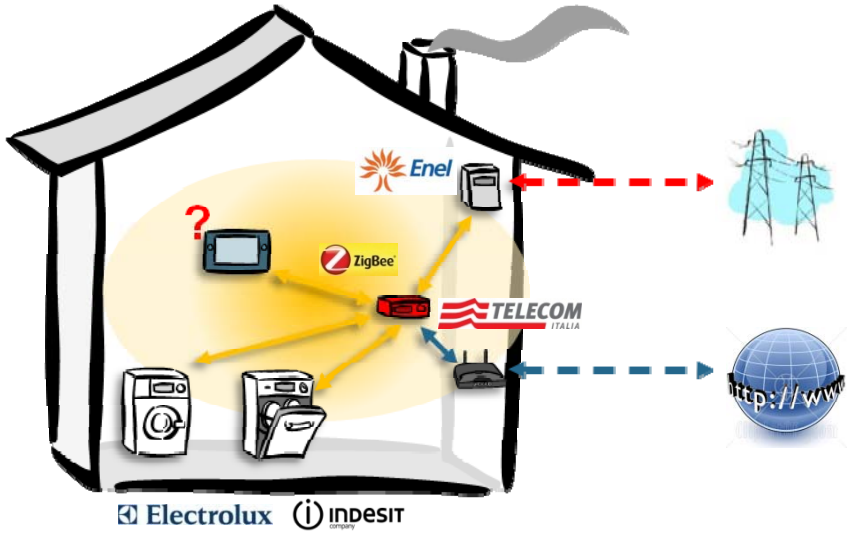
The **Coordinated Management Mode** is the condition where any Smart Appliance coordinates its operations with the Home Gateway.

The Home Gateway, through a dialogue with the Smart Appliances, **plans** their operations taking into account Price and Volume Signals, selected Household Appliances programs and Customer needs and constraints.



Smart Appliances Scenarios

Enabler for new Value Added services



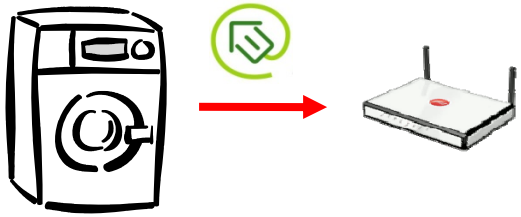
The infrastructure for “Smart Grid” and Energy Management advanced functions enables also the extension to a **new set of services** dedicated to the appliance users as:

- remote access for monitoring and control;
- remote preventive maintenance;
- dedicated marketing services

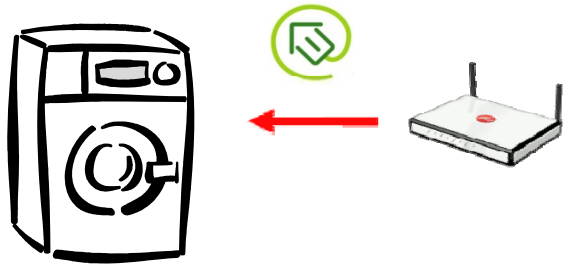
Smart Appliances in E@H: Status and Power Profile

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

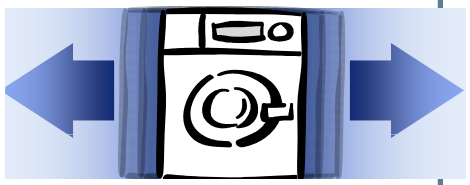
Events
- Faults
- Warnings



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



Commands
- Based on Smart Appliances Reactive Actitude **(Load Shifting)**
- Depending on Smart Appliances **set up** and **constraints**
- Commands**:**
  - ✓ **DELAY START**
  - ✓ **PAUSE BETWEEN PHASES**
  - ✓ **OVERLOAD PAUSE**



Energy@Home Technical Specification

- Specifications of the **HAN communication** protocol that enables the set of use cases defined by the Energy@Home partners
  - Defines the **wireless protocol**, the data model, the set of application messages, and the sequence activity diagrams
  - Extends standard ZigBee Public Profiles by integrating connected appliances (as specified by CECED) and power meter
- Submitted to ZigBee HA, CECED, HGI
- **Expected to be integrated in ZigBee Home Automation next releases by 4Q2011**
  - **Next ZigBee interop event will be hosted in Italy (under negotiation)**