



- The Beywatch project
- Main Results and learnings
- Considerations on the flexibility of energy use

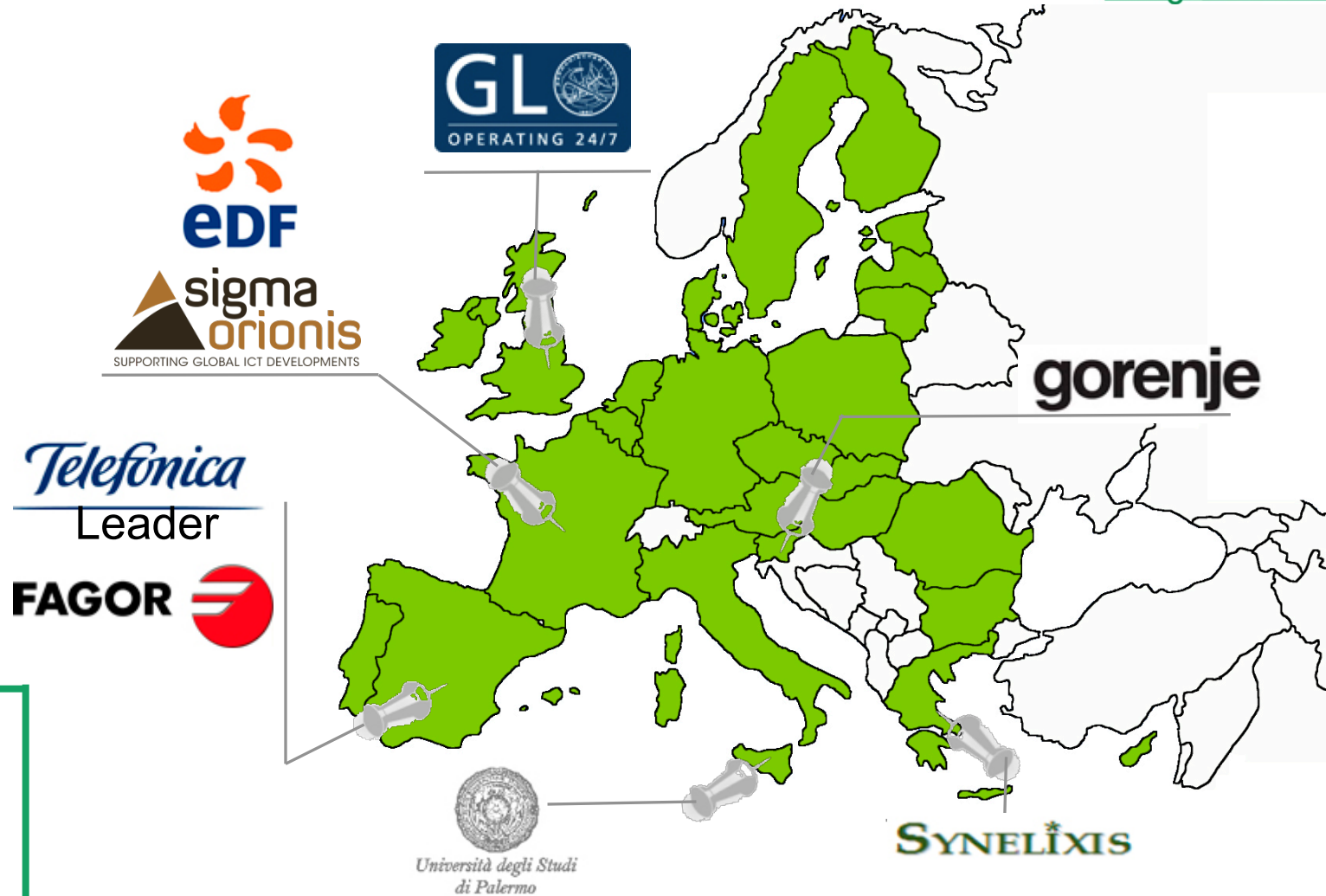
24th October 2011 – ICT for sustainable homes

Yves Dherbécourt - EDF R&D

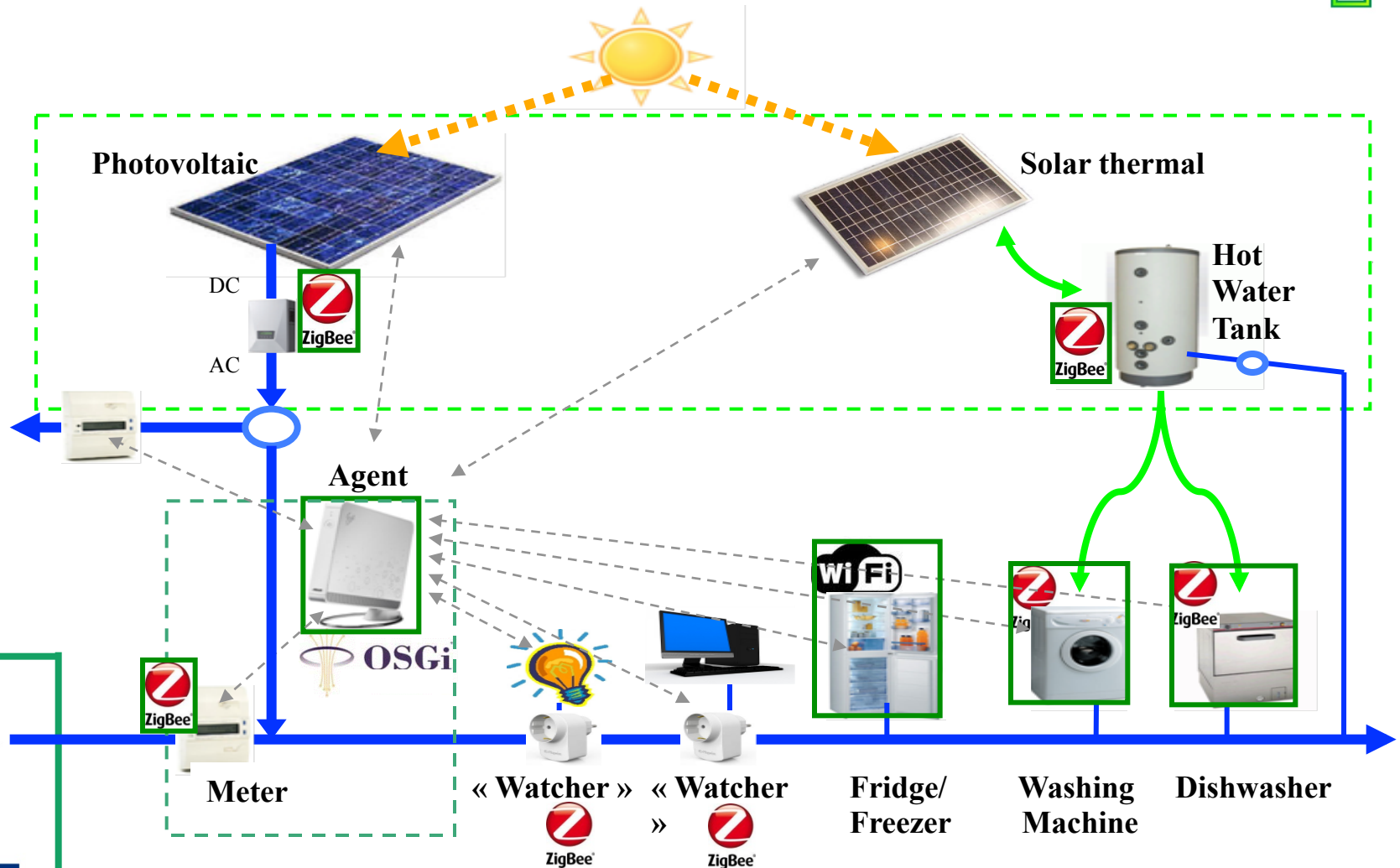
Building **Energy WATCHer**

- **FP7 European Project**
 - ICT-2007-6.3 : ICT for environmental management and energy efficiency
 - From 01/12/2008 to 31/05/2011
 - STREP – budget 4,9 M€ (financement CE 2,9 M€)
- **Objectives :**
 - **Prototyping**
 - Smart & Low Consumption **Appliances**
 - A whole **Smart Home system** including them and Solar panels
 - **Evaluation** of the prototypes:
 - **Energy efficiency**
 - User

Beywatch Partners



The Beywatch Smart Home Prototype



European Commission
Information Society and Media



Components of scenarios



- **PV panel**
 - Electricity either consumed or exported to the grid
- **Freezer :**
 - Storage of cold in order to limit consumption on peak hours.

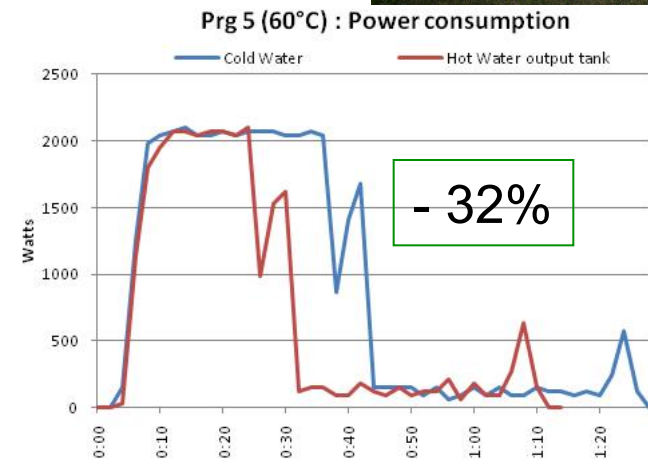
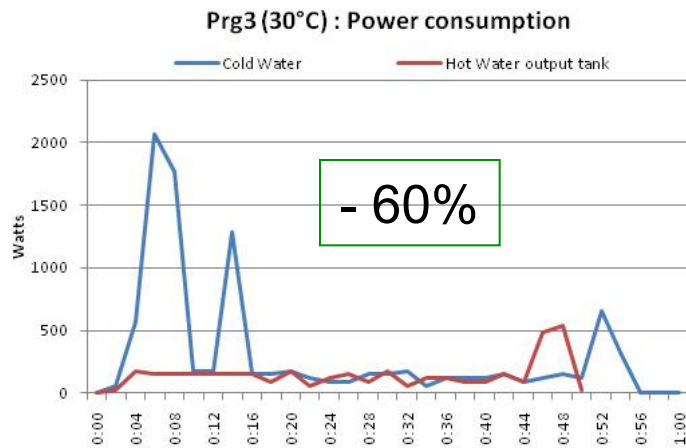
- **Dishwasher – Washing Machine – Hot Water :**
 - Appliances using **hot water** produced by the **solar panel**.
 - **Delayed start**, controlled **interruption** of cycle, adaptation of temperature and cycle duration.
 - **Simple** for the user
 - Beywatch Button on the appliance
- **Demand Management Incentive :**
 - Mainly through **dynamic energy prices**
 - And/or modulation or max total power (« power cap »)

Provide the customer with a global but **transparent** and **simple** cost **optimization** to satisfy his **needs** while participating to the **smartgrid**

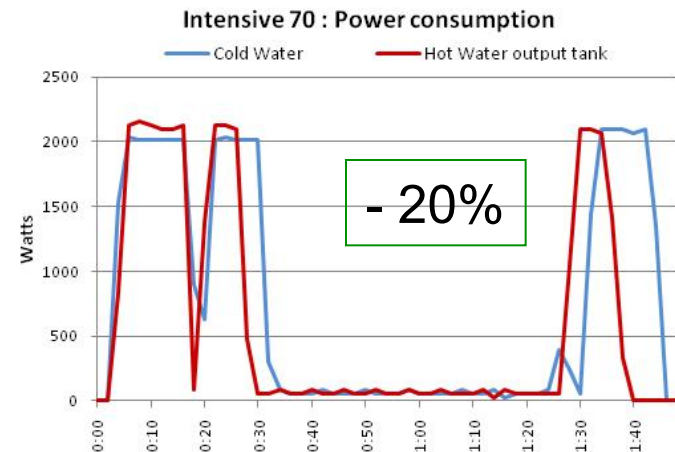
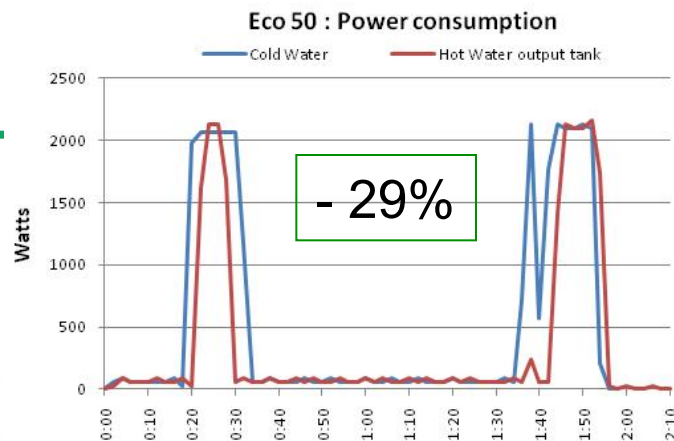
Results : lowering consumptions



- Fridge/Freezer → 25,6% less than reference (almost class A++)
- Washing Machine with Hot water input

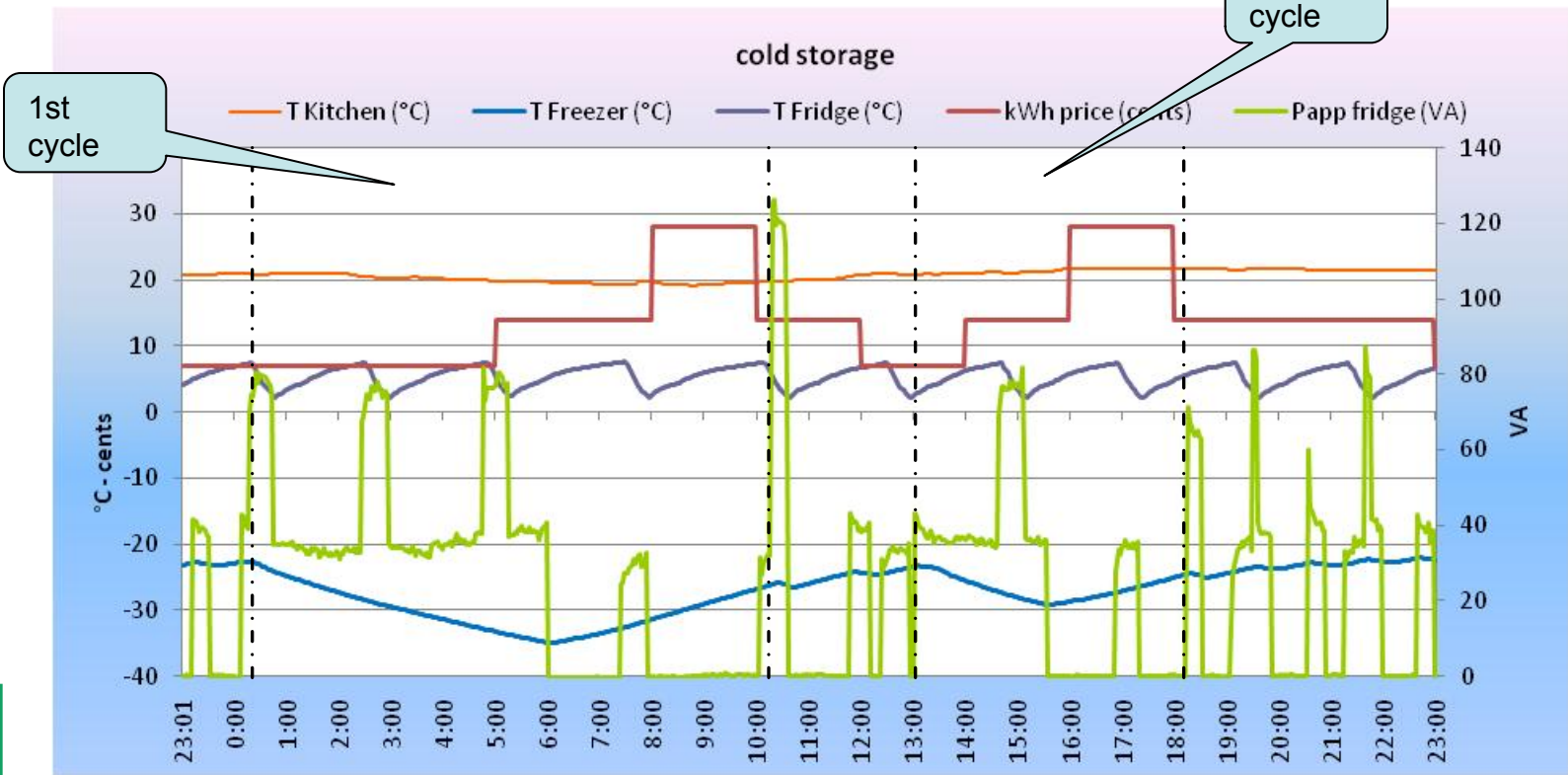


- Dishwasher with Hot water input



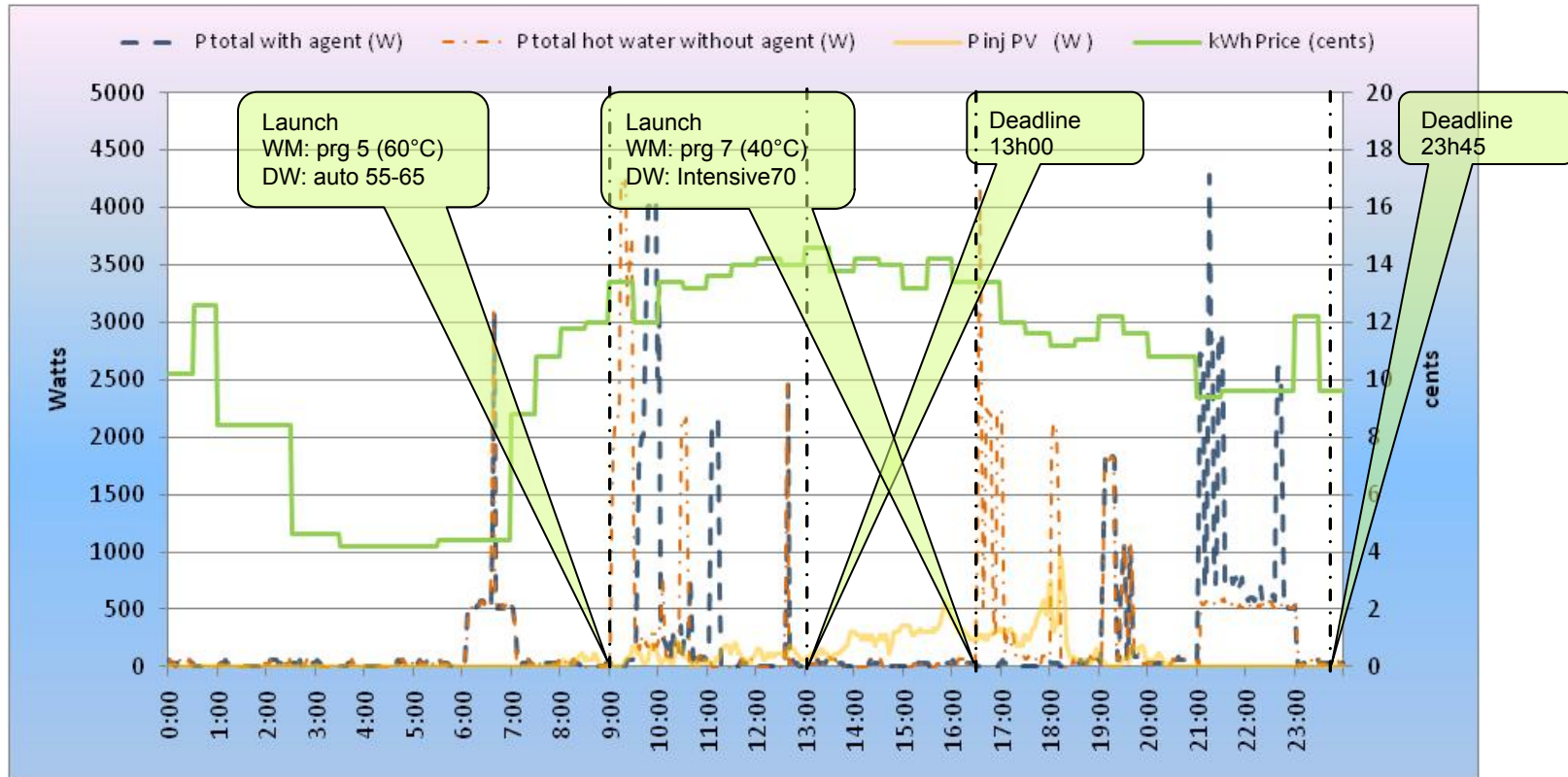
Results : Flexibility with freezer

- Cold storage during low cost periods, no consumption in high cost periods



- Consumption over one day : increase 15%
- 10% cost saving

Results : Agent optimization with “spot” tariff



- 1st case (morning – high prices) : 2% gain
- 2nd case (afternoon/evening – low prices at night) : 31% gain

Main lessons from Beywatch



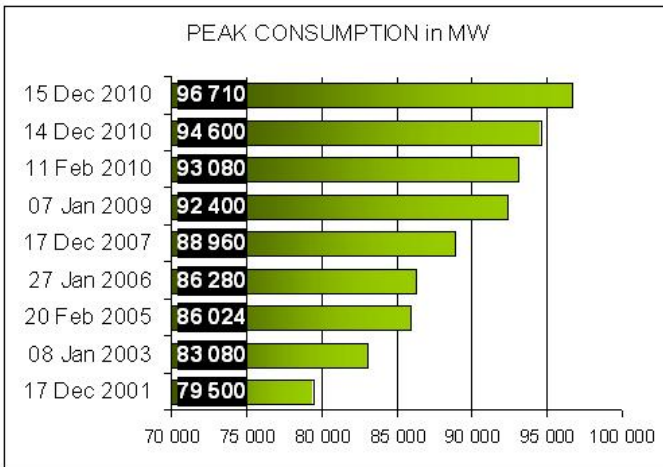
- Energy Efficiency = Low consumption + Flexibility on energy use

	HVAC	Hot Water	WM	DW	Dryer	Fridge / Freezer	Lights	MultiMedia
May use external heat	X	X	X	X				
May store energy	X	X				X		
Shifting possibilities		X	X	X	X	X		
Dimming possibilities	X	X	X	X	X	X	X	X

- This flexibility may be **handled** :
 - **By the agent**, as a « flexibility » manager, for complex home system (many smart appliances)
 - **By the appliance itself** :
 - For simple home systems (only 1 or 2 flexible smart appliances), the agent should not be mandatory.
- **How to accelerate dissemination of flexible smart appliances ?**



Flexibility of appliances energy use : a key issue

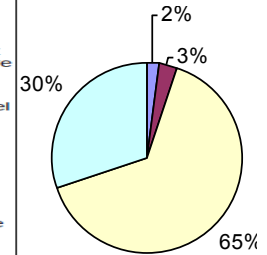
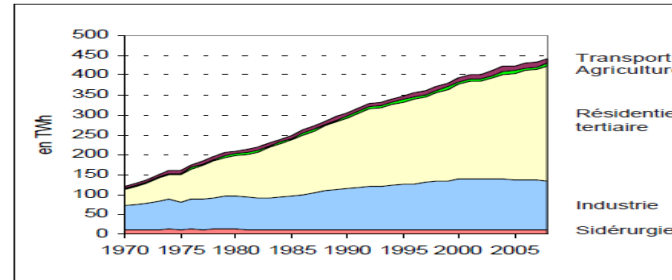


Increasing consumption peaks



Increasing renewable generation (20/20/20)

Example of France



Increasing annual consumption (due to residential)



New consumptions

↘ Flexibility in generation } → ↗ Need for generalized flexible consumption
 ↗ Constraints in networks }

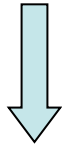
- A major goal for smartgrids, smart homes, smart appliances
- Beywatch : a demonstrator of flexible smart homes and appliances

Flexibility of appliances energy use : still unknown

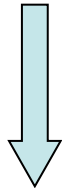
Energy Efficiency =

Low consumption ⊕ Flexibility

■ Metric



■ Label



■ Regulation

■ If not ...

■ kWh or %reduction



■ Directives, laws

■ ↗ consumption

■ ?

■ No

■ No

■ Problem for DER or VE development, Massive use of storage, etc.

Priority #1 on Flexibility : Characterization



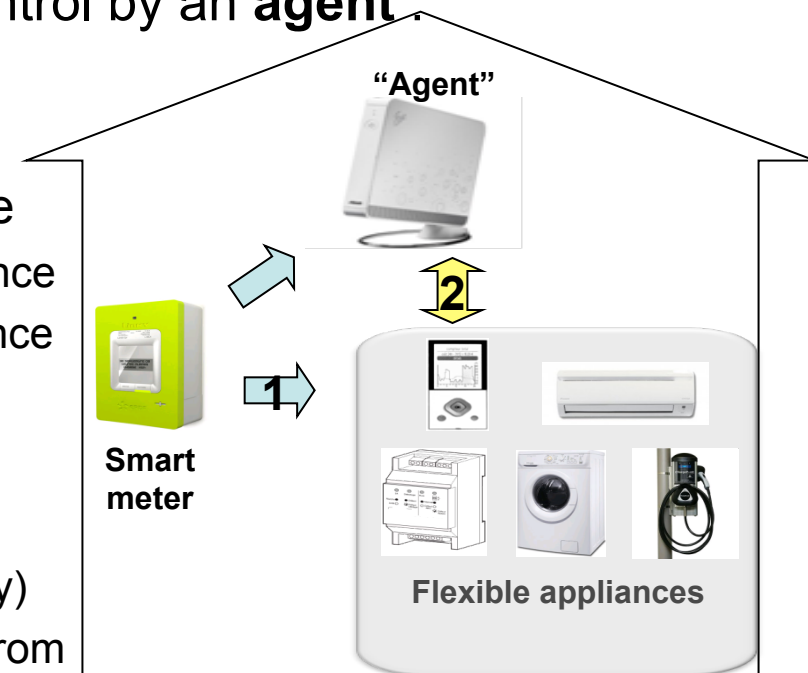
- Main Idea : Progress towards **flexibility quantification and metric**, that will then allow labelling, regulation, ...
- Categorize the different types of flexibilities and define their metrics.
 - For each type of appliance :
 - What flexibility it may bring to the electric system,
 - What conditions of its exploitation
 - What limits, what involvement of the consumer
 - How it may be exploited
 - Find **metrics** that do **not depend on energy costs, nor on business models** exploiting this flexibility.
 - The flexibility as a resource in itself, that can then be exploited with various business models.
 - A condition of the integration of flexibility functions in appliances by manufacturers.



Priority #2 on Flexibility : Implementation

- Implementation of flexibility in appliances, either in an **autonomous** way, either under control by an **agent** :

- For every type of appliance :
define data models / data exchange
 1. Between the **meter** and the appliance
 2. Between the **agent** and the appliance
- For
 - Energy monitoring of the appliance
 - « Control » (exploitation of flexibility)
 - Self learning by the agent of data from appliances that are needed for the optimization.



- Objective : **Standardization** of data models / data exchanges and implementation in the appliances

- If the Smart **Grid** was a **body**
 - The Smart **Home** would be the **hands**
 - The Smart **Appliances** would be the **fingers**
- ➔ Let's better consider and investigate the key role of their flexibility.

Thank you for your attention

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