

ADDRESS field tests in France

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active demand

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interactive
energy



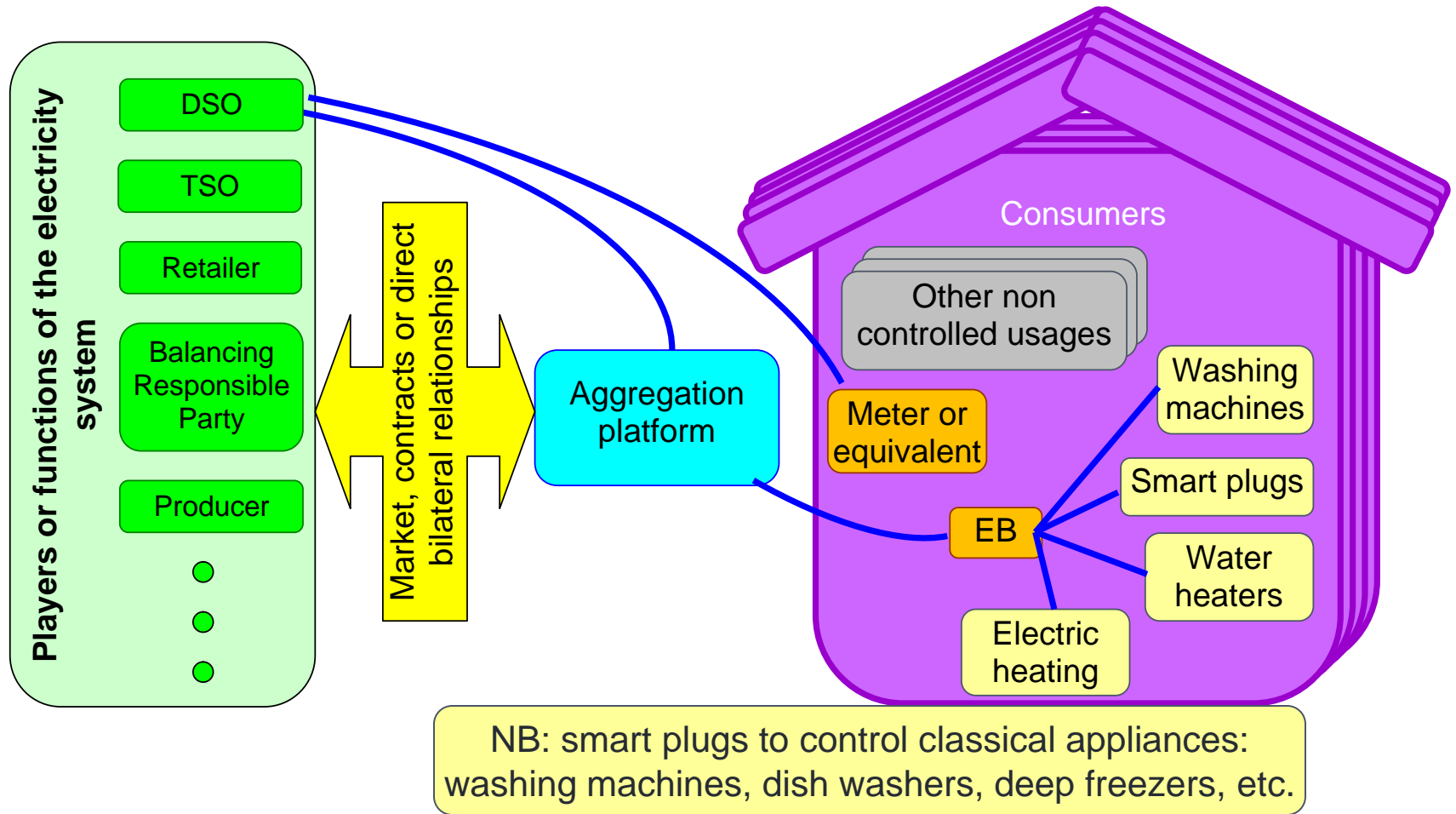
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The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 207643

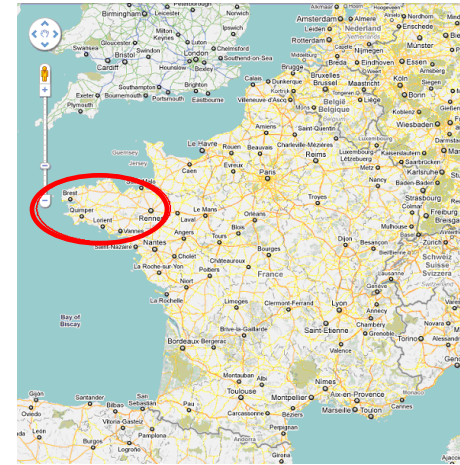
Validation of the whole ADDRESS “chain”...

... from AD buyers to controllable appliances



Field test site

Houat and Hoëdic islands

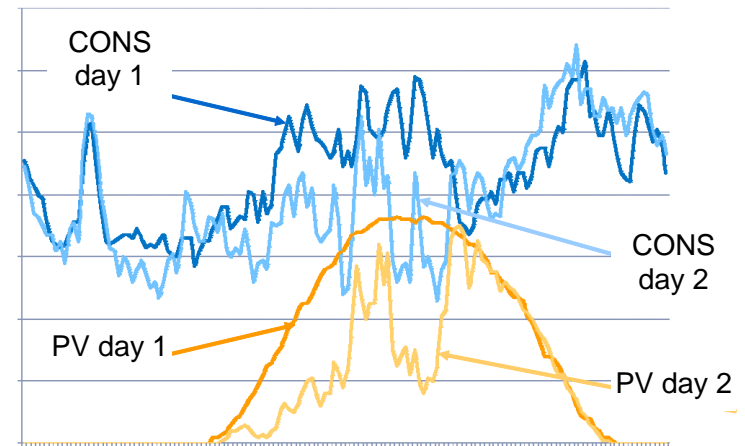


373 permanent consumers

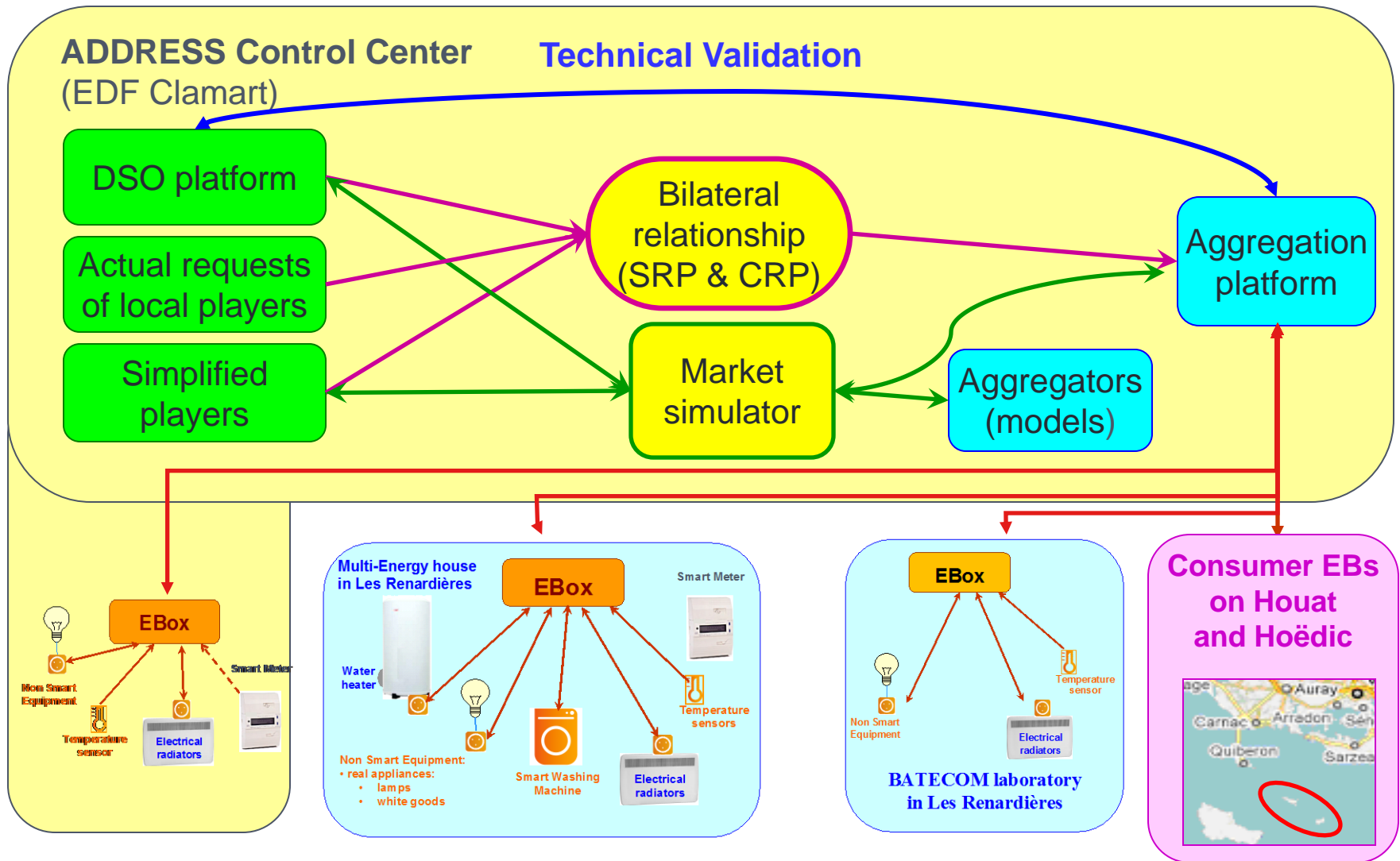
More than 7% active consumers

PV plant 100 kWp
Very high penetration at certain periods

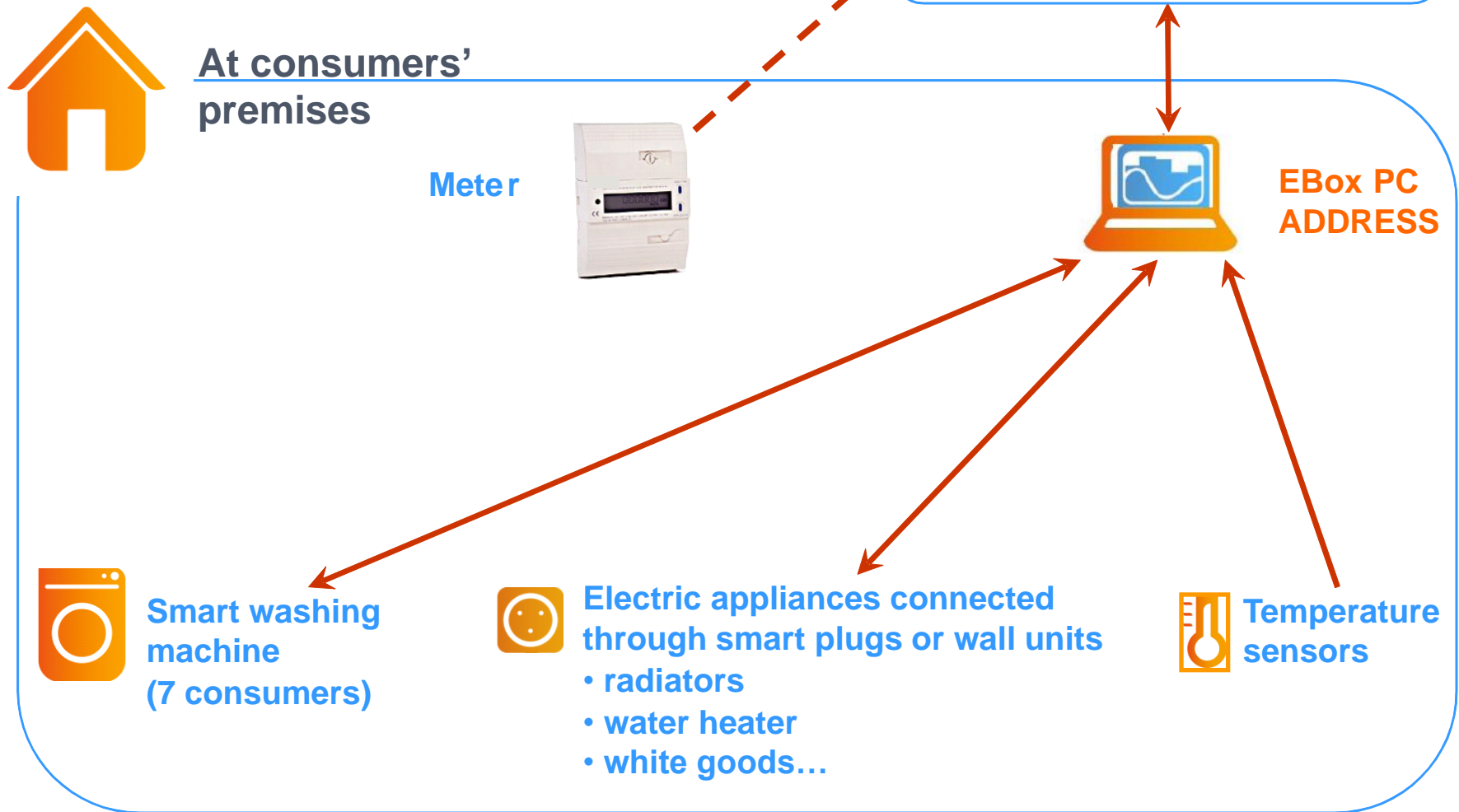
Underwater cables to continent
One MV feeder, 8 MV/LV substations



The ADDRESS control center in EDF...



At the consumers' premises



At the consumers' premises



**ADDRESS
Control Center
(EDF Clamart)**



**At consumers'
premises**

Meter



**EBox PC
ADDRESS**



**Smart washing
machine
(7 consumers)**



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- water heater
- white goods...

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At the consumers' premises



**ADDRESS
Control Center
(EDF Clamart)**



**At consumers'
premises**



Smart plugs and wall units



**EBox PC
ADDRESS**



**Smart washing
machine
(7 consumers)**



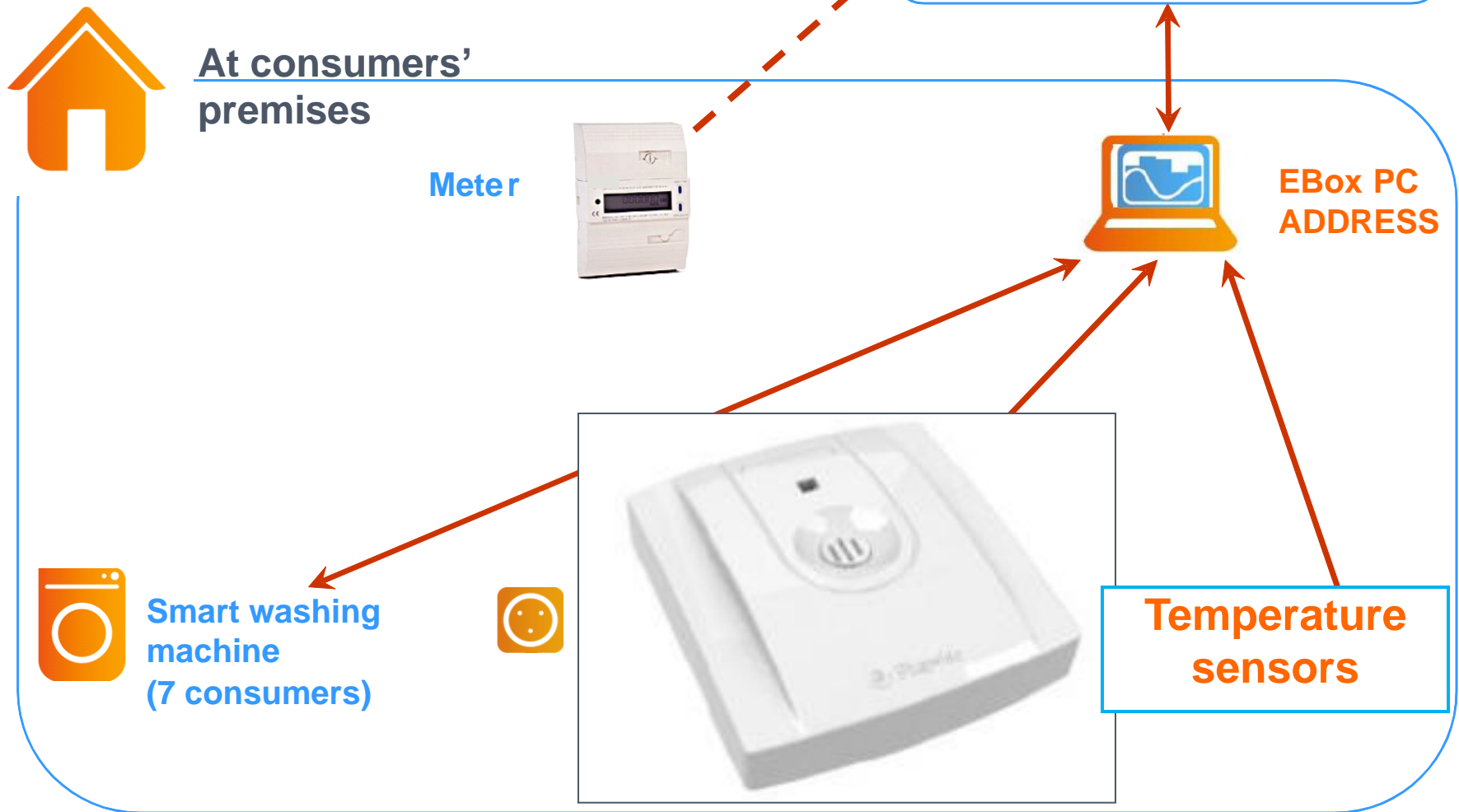
**Electric appliances connected
through smart plugs or wall units**

- radiators
- water heater
- white goods...



**Temperature
sensors**

At the consumers' premises



At the consumers' premises



**ADDRESS
Control Center
(EDF Clamart)**



**Smart washing
machine at
7 consumers**



**Electric appliances connected
through smart plugs or wall units**

- radiators
- water heater
- white goods...



**EBox PC
ADDRESS**



**Temperature
sensors**

The tests carried out:

1.- Technical feasibility

- Assess technical performance of the algorithms and strategies developed for
 - The aggregation platform,
 - The DSO (e.g for the technical validation of AD actions),
 - The Ebox and the control of the appliances
 - The exchanges of signals/data between aggregation platform, EBox and appliances
- A lot of communication issues both
 - between EBox and ADDRESS control center
 - Inside the house between EBox and appliances

The tests carried out:

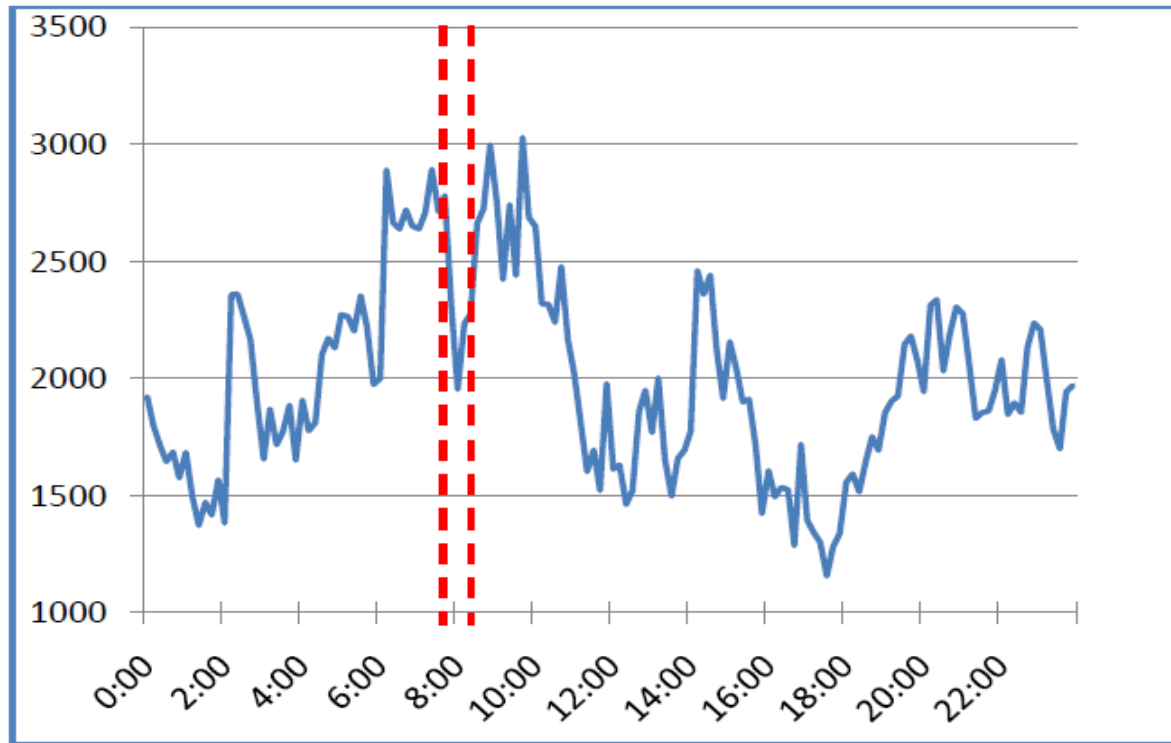
2.- Provision of services by AD

- Based on
 - Actual requests
 - Simulation of possible needs or problems
- Services
 - For DSO or TSO: voltage control, active power reserve, overload or network congestion relief, limitation of peak load on the grid.
 - For deregulated players - BRP, retailer or PV producer, etc.: peak load reduction, combination with PV production in order to shift consumption to periods when the PV plant is producing.
- Requests were sent to the consumers' EBox and the consumers' response was assessed.

The tests carried out:

2.- Provision of services by AD: example

- **Example of peak load reduction:** request to reduce consumption between 7h45 to 8h15 on March 14th during the morning peak load period.



→ Average reduction of more than 700 W per consumer

The tests carried out:

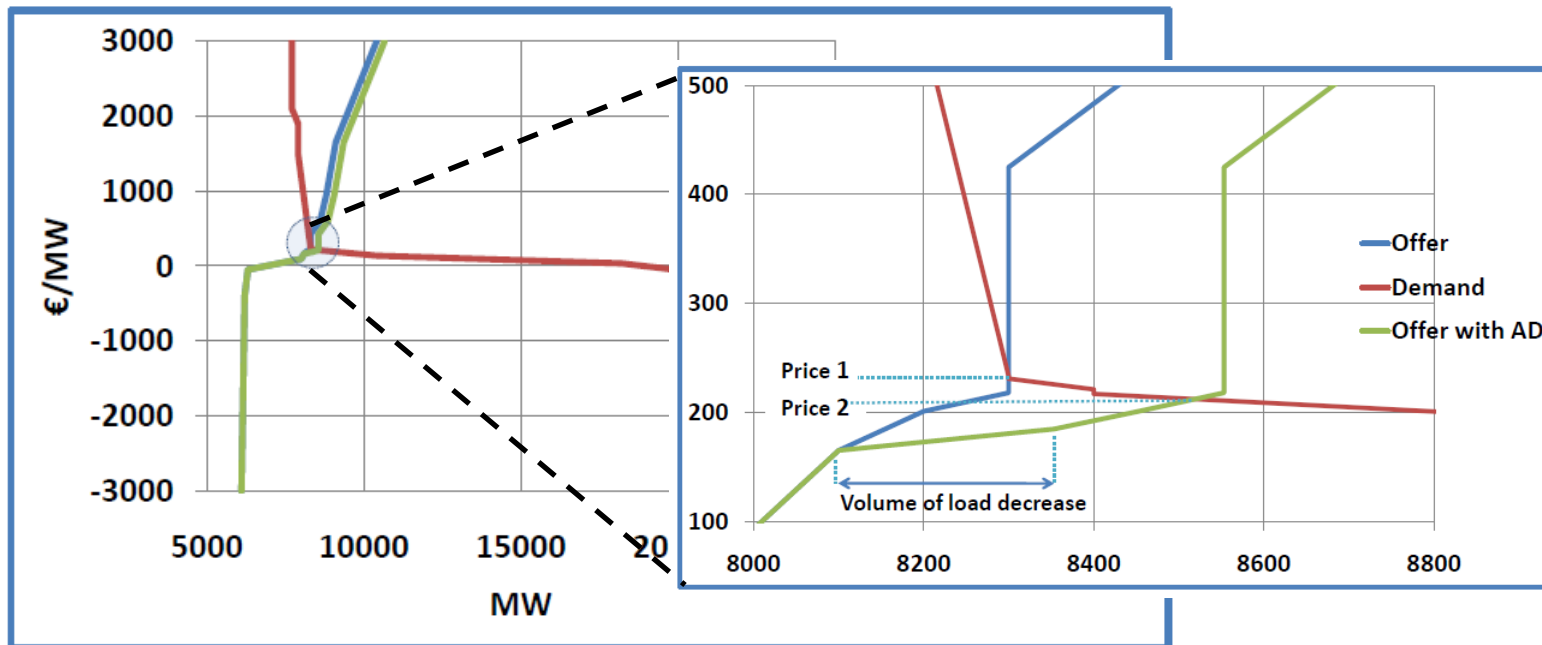
3.- Simulated market interaction

- Market simulator and simplified modeling of players
- Different scenarios tested
 - Actual past market situations on the French Energy market.
 - Real offer and demand bids reproduced
 - Potential impact of AD offers made by aggregation entities
 - Realistic hypotheses regarding their consumers portfolio, the associated consumption flexibility and the market rules.

The tests carried out:

3.- Simulated market interaction: example

- Offer for a 250 MW consumption decrease on wholesale market.
- All the volume of the offer is accepted by the market
- Market price decreases from 232 €/MW to 212 €/MW



The tests carried out:

4.- Consumers' engagement

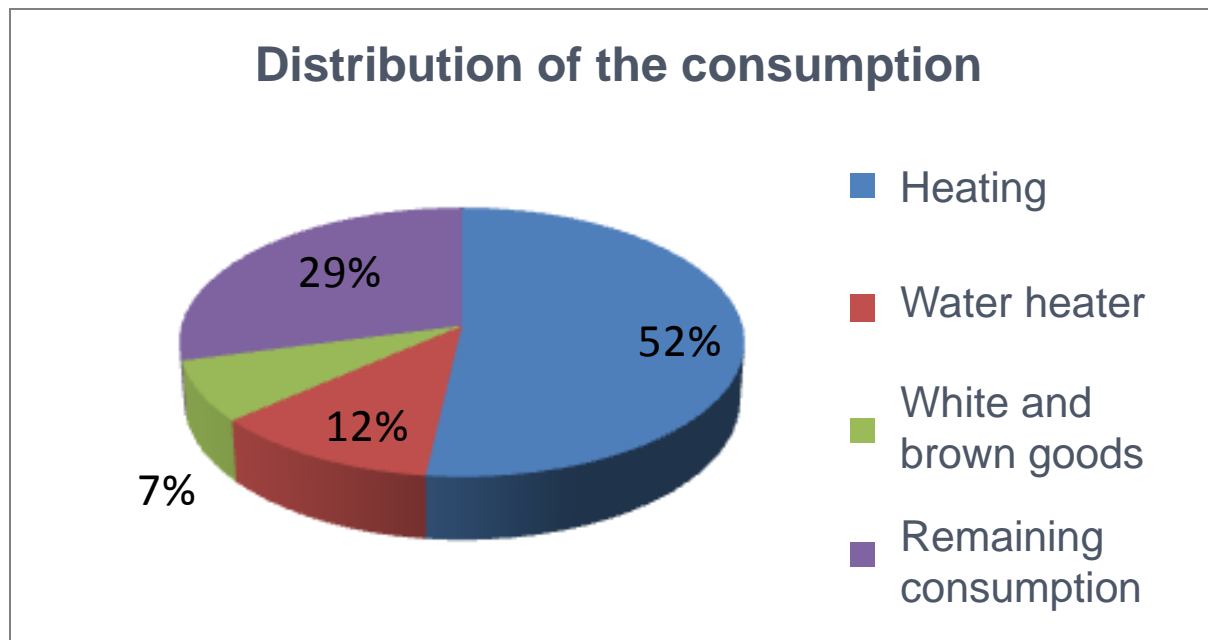
- Assess consumers'
 - commitment in field tests
 - acceptability with respect to AD and project concepts
 - ➔ See later

Benefits for the participants...

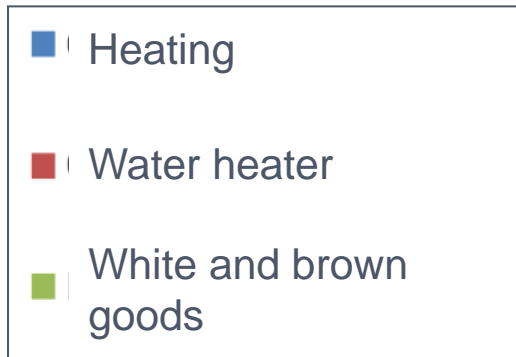
- Remuneration in the form of vouchers:
 - **A fixed amount** for participation to the field tests ;
 - **A variable amount** corresponding to the actual response of the consumers to the AD requests,
 - namely each time the EBox modifies the consumption of at least 1 piece of equipment during the AD request

Benefits for the participants...

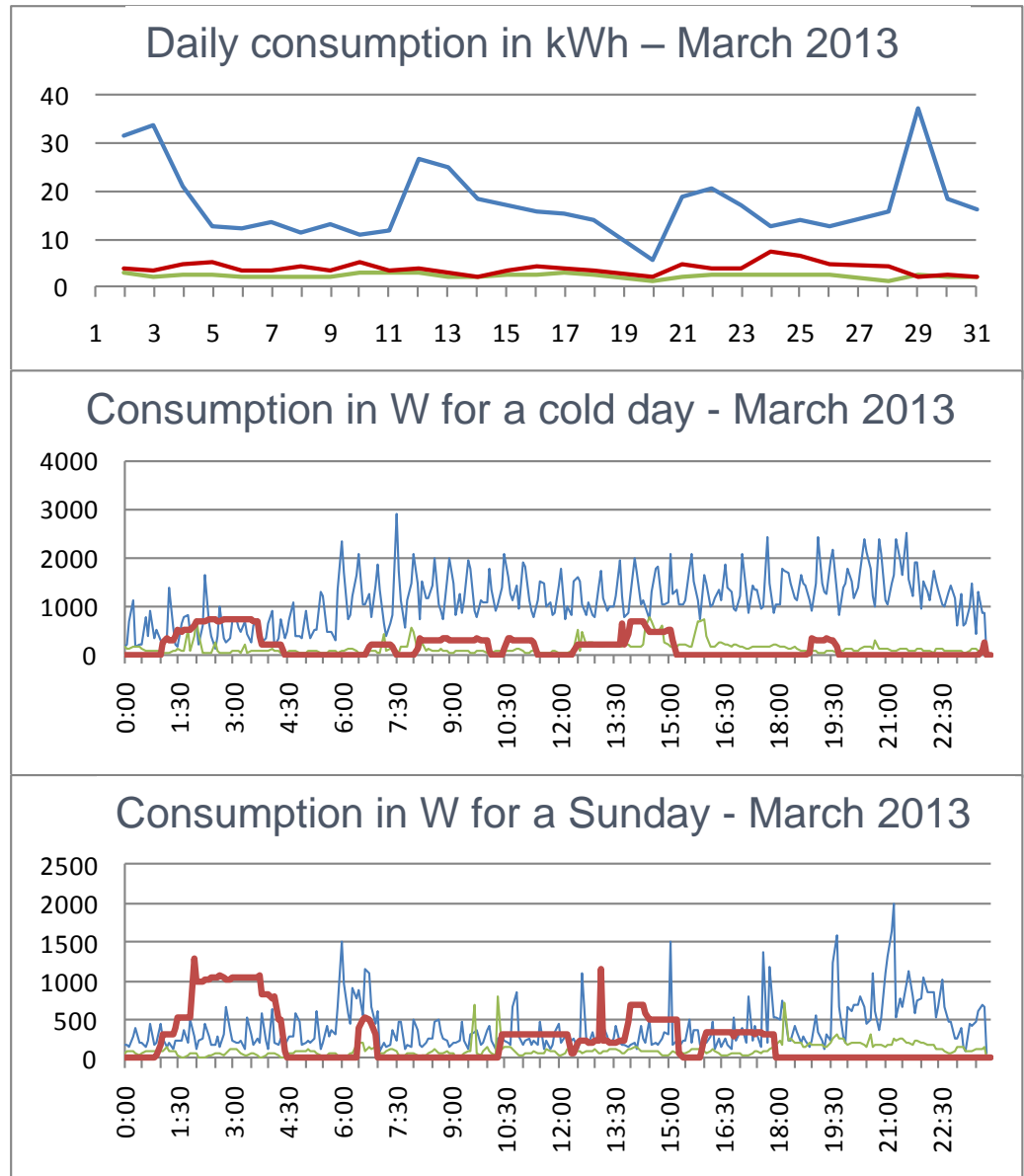
- Individual periodic report
 - Information on their participation, the results of the tests and the consumption of their appliances



In more detail...



➔ **Allow consumers to have a better knowledge of their consumption**



Conclusions

- Very complicated field tests
 - A lot of issues and difficulties were met
 - ... and solved for a large part
- Improvements are needed before a possible deployment in particular in terms of communication and robustness of the equipment
- The whole ADDRESS chain has been validated
 - Provision of services by AD is technically feasible
- A high motivation of the participants



Thank you

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