Using broadcasting infrastructures to control the flexibility of electricity consumption in real time: The case of the « FLEXIMAX » project

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France

New technical solutions to address the needs for making electricity networks more flexible AND an innovative sociological approach aiming at better appropriation of electricity supplier offers based on these technical solutions by households, and to remove obstacles to the adoption of these solutions by the general public.

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An ongoing collaborative research project

- A four-year 6.5 M€ R&D project cofounded by the French government
- The first period (2023-2024) has been dedicated to technical R&D work
- The second period (2025-2026) will be devoted to the operations of a demonstrator for:
  - Validating the technical solutions of the project in all types of electricity networks, from dense urban to rural,
  - Carrying out sociological studies aiming at maximizing the acceptability of future commercial services based on the project's solutions in a rotating sample of real customers of the project's electricity supplier partner.

A project bringing together the best available skills on each matter

RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

FRANCE 2030

Co-financer

ADEME
AGENCE DE LA TRANSITION ÉCOLOGIQUE

Supervisor

External personalities, experts and companies supporting the project

Advisory board

Coordinator

ARMINES
CES Laboratory

Academic
Modeling & simulation

ARMINES
CMA Laboratory

Academic
Applied mathematics

degetel

Large enterprise
Project design & mgt + software provider

ERGYLINK

SME
Electronics & software provider

ipbc International Panel on Behavior Change

Academic
Sociology of energy

LINK IO

SME
Expert of Bluetooth protocol stack

octopus energy

Large enterprise
Electricity supplier

WORLDCAST SYSTEMS

SME
Radio broadcast system provider

What is this project about?

The context

This project is part of the move towards a carbon neutrality objective in 2050,
in the framework of up to 100% renewable energy scenario.

What is this project about?

The objectives

- Making possible the massive increase in electricity consumption induced by the transition to a carbon-free economy, including the large move to the electric vehicle.
- Making the power grid both more flexible and more resilient.
- Reducing the need for reinforcement of the electrical network infrastructure and the need for electrochemical storage through **automated** and **behavioral** demand control.

How this is done?

Increasing flexibility of consumptions

By complementing the traditional planned production-consumption balancing

with a **dynamic balancing in real-time**

based on a **low latency control of the consumption**

of **relevant aggregates** of power loads

according to unforeseen fluctuations in production,

or to any type of incident occurring in the grid.

How does this system work?

An innovative use of a proven and ubiquitous “data pipe"

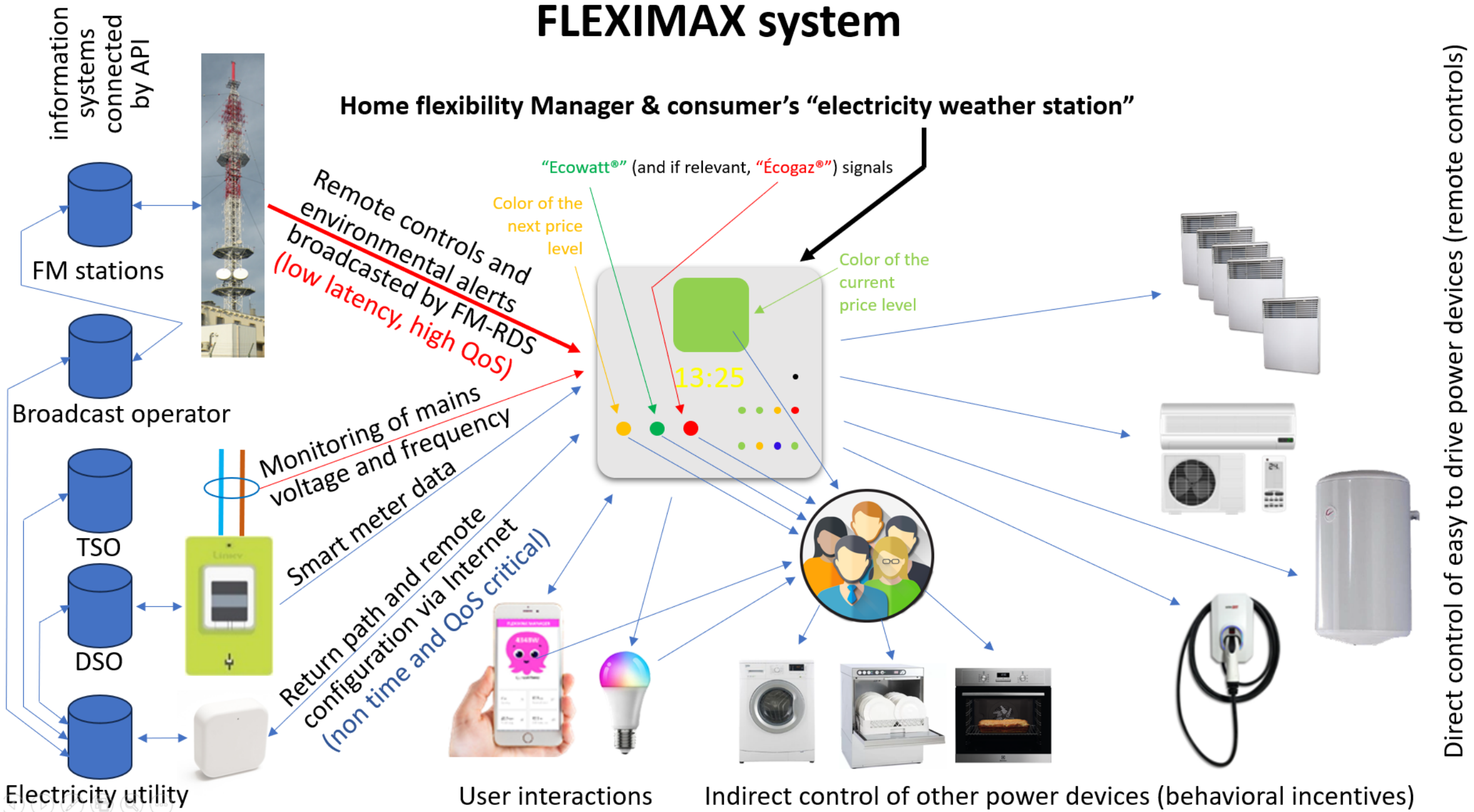
- Using FM-RDS broadcasting to control massive amounts of distributed electrical loads, 24 hours a day, 365 days a year, reliably, safely and economically, both in terms of CAPEX and OPEX because there is no new infrastructure to build,
- Everywhere, nationwide, even in rural areas of the country with no white zones thanks to the coverage of FM broadcasting,

Concretely, how it works?

The technical key specificities

- A flexible and efficient communication system based on an hybrid approach combining a rugged real-time FM-RDS downstream channel and a bidirectional standard telecom connectivity to Internet,
- A new multicast addressing method that natively does the work of load aggregation “by design”,
- A multi-criteria addressing allowing "zooming" according to the needs, from thousands to millions of simultaneous recipients to control aggregates of thousands of KW to hundreds of MW.

FLEXIMAX system



Sociology

- Why the need for sociology?

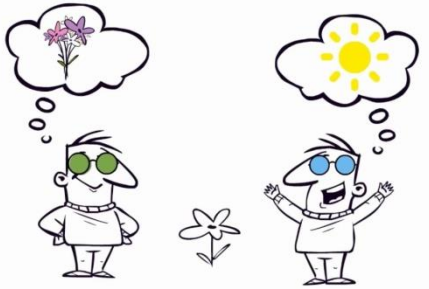
- Because energy consummers are HUMAN consumers, with complex interactions with energy, different capacities to act, and
- different perceptions of energy and of…
- their capacities and …
- Their interest and…
- motivations to act!

Basically:

1. The brain is lazy, so…
2. It creates personal and social filters, which translates into:
3. Different individual-level socioenergy profiles who…
4. enter into complex interactions with energy.

SOCIAL REPRESENTATIONS:

or how the brain imposes its order on reality



A social representation is an organizing filter guiding us in what we perceive as important/relevant/interesting… or not!
It offers meaning to our perceptions and practices

Social representations play a more important role in behavior than information even when it is false:

Climate change?

Protect our biodiversity!

ENERGY BEHAVIORS vs MANAGEMENT vs EFFICIENCY

Energy efficiency refers to technology. Ex: an efficient heating system allows you to obtain an equal result with less energy.

Energy management refers to energy consumption patterns without changing behavior: modification of production time slots…

Sobriety refers to behavioral changes: keep air conditioning at 26° in offices and meeting rooms during heatwaves.

The 7 socioenergy profiles

1. Ecophiles fighting against CC and for biodiversity
2. Thrifties : gain money, reduce bill
3. Energyphiles reducing kWh for kWh's sake! And worry about grid stability and access to energy for all
4. Resistant: refusing any effort
5. Indifferent do not feel concerned by transition issues
6. Technophiles reducing through new techs, not interested by energy.
7. Powerless would like to do better but does not know how

IMPLICATIONS FOR OCTOPUS, FLEXIMAX AND ENERGY MANAGEMENT

- Improving the energy culture of Octopus' customers
- Improving the sociological culture of Octopus' teams so as to improve its communication and services dedicatd to energy management and customers' energy consumption
- better understand, sociologically, the interactions between customers and energy management through new technologies
- better understand, sociologically, the interactions between customers' socioenergy profiles and dynamic pricing offers

In order to globally…

- Improve the ***collective efforts*** at better managing energy consumption and reducing it!

Thank you for your attention!
ご清聴ありがとうございました！

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For sociological aspects

Bios

Jerome Gilbert began his career in electronic engineering and computer science at Philips Telecom where he joined the direction of product strategy and advanced projects.

Jérôme then held management positions in R&D and Innovation in several startups and large companies.

He is currently Director of Innovation and Intellectual Property at Degetel where he is responsible for a strong position in the field of energy sector through the conception, launch and lead of several successful large interdisciplinary collaborative R&D projects.

Stephane La Branche is the first sociologist to have worked on climate in France. He has completed over 40 research projects, has analyzed and contributed to several French national and territorial climate and energy transition as well as numerous energy operators' strategies ; contributor to two IPCC reports.

Stéphane is now the scientific coordinator of the International Panel of Experts on Behavioral Change (IpBC).