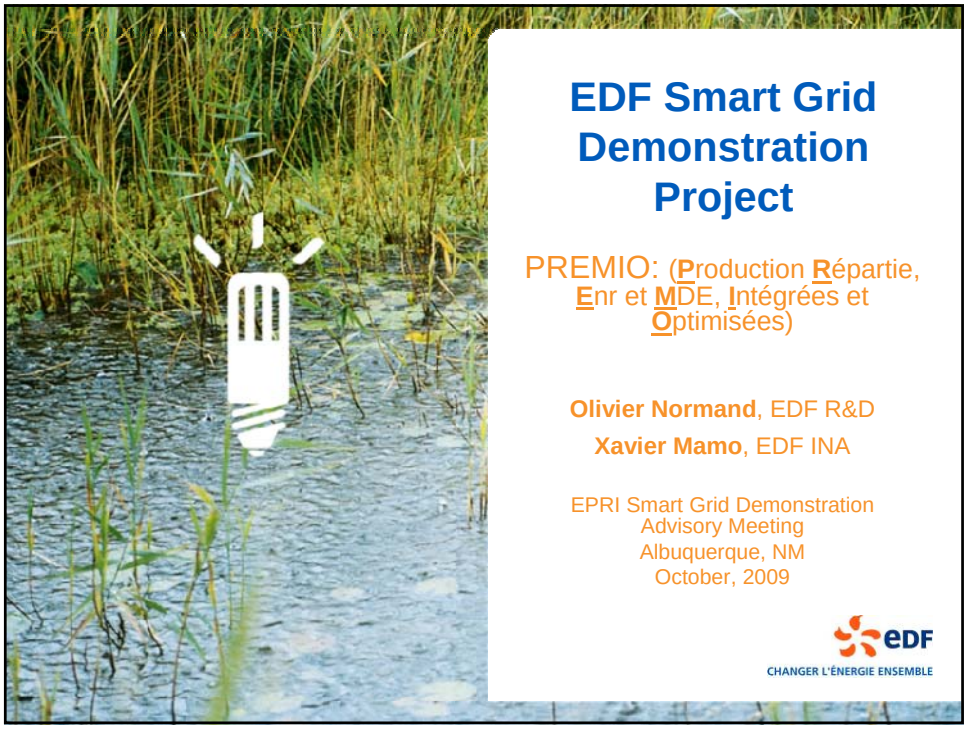


EDF Smart Grid Demonstration Project

PREMIO: (**P**roduction **R**épartie, **E**nr et **M**DE, **I**ntégrées et **O**ptimisées)

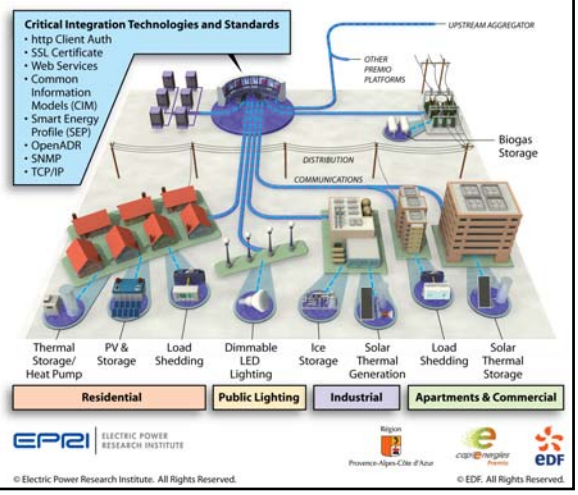
Olivier Normand, EDF R&D
Xavier Mamo, EDF INA

EPRI Smart Grid Demonstration Advisory Meeting
Albuquerque, NM
October, 2009

EDF
CHANGER L'ÉNERGIE ENSEMBLE

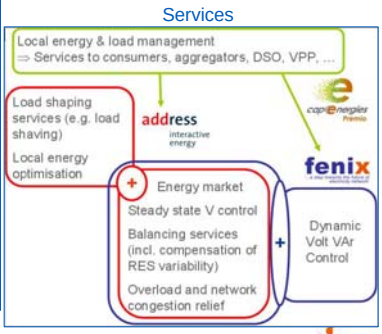
EDF Smart Grid Demonstration project overview

- **To demonstrate an innovative, open, and repeatable architecture to optimize the integration of distributed energy resources in order to provide load relief, local network support and reduce CO2 emissions in the South East of France**
  - **Extremely constrained local system**
  - **9 families of experiments**
  - **Architecture leveraging IP based standards**
  - **Day Ahead & Intra-day (10 min) Pricing/event notification**



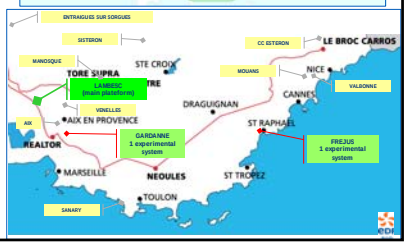
EDF Smart Grid Demonstration project overview

- **Provides solid connection to European Smart Grid R&D**
  - **PREMIO: (Production Répartie, Enr et MDE, Intégrées et Optimisées)**
  - **ADDRESS: (Active Distribution network with full integration of Demand and distributed energy RESourceS)**
  - **FENIX: (Flexible Electricity Network to Integrate the eXpected "energy evolution")**



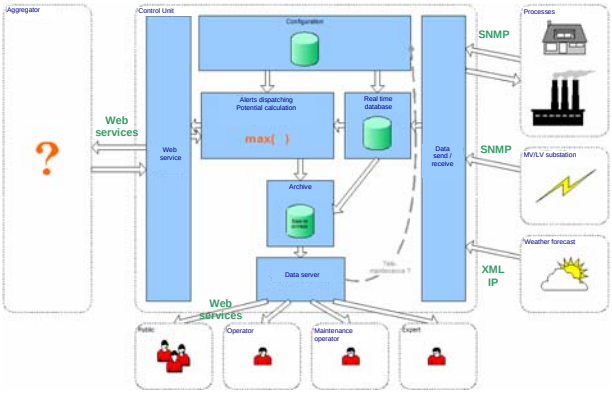
Changes to existing Architecture

- **PREMIO is a tool at the end of the supply chain enabling the integration of distributed energy resources, aggregated by an energy third party or service company in the power system**
  - **Not "one upstream aggregator" oriented**
  - **Covers various configurations of actors, originating from the residential and small commercial sectors**
  - **Considers various scenarios for future business cases, validated by the DSO and TSO**
- **Implementation in different locations**
  - **Lambesc (main platform)**
  - **Gardanne and Frejus hosting one experiment each**
  - **12 municipalities identified for future replication**



Interface implications to legacy systems

- **Communication architecture**
  - SNMP
  - IP
  - SSL Data Encryption
- **Functional requirements developed in UML**



- **Definition of standard interfaces for DR messages and compatibility with other existing standards to enable interoperability**

Considerations for emerging/changing requirements

- **Demand Response modeling**
  - Need for a standard data exchange model between system and equipments
  - Need to take into account and challenge existing standards
  - Specific focus on the modeling of the DR potential
- **Enhance interoperability between system and equipments**
  - Need modules to enable information transfer to industrial protocols
  - Use of industrial computers versus programmable controllers
- **Adapt the duration of load shaving events**
  - Specification of the durations according to applications' needs
  - Need for a link between need for load shaving and technologies

Improved Benefits from Architecture Changes

- **Demand Response modeling**
  - Stable basis for data exchange between system and equipments
  - Easily replicable
  - Quick integration in the available equipments
- **Enhance interoperability between system and equipments**
  - Allow more flexibility to integrate new equipments
  - Raise the distributed intelligence level for better interactions
- **Adapt the duration of load shaving events**
  - Implement the most efficient technology for a given application

Overall Project Lessons Learned

- **Lessons learned**
  - Need to adopt a common semantic for the definition of actors, functions and data exchanges in the model. UML modeling is very adapted for defining the integration and information exchanges between the actors
  - On the field, protocols and standards are still a KEY issue in the experimentation of various technologies and on the equipments commercially available (even among those supposed to be widely deployed)
  - Flexibility among different solutions is needed
- **Suggested improvements**
  - Not to impose a given protocol/standard too quickly and keep on favoring the interface and interoperability between various solutions
  - Cyber security tests can be useful in order to determine the survivability of the technologies and the impact on the electrical system in the case of ICT failures or potential cyber attacks

Thank You! Q&A