SmartNet

The SmartNet Project

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WHY SmartNet?

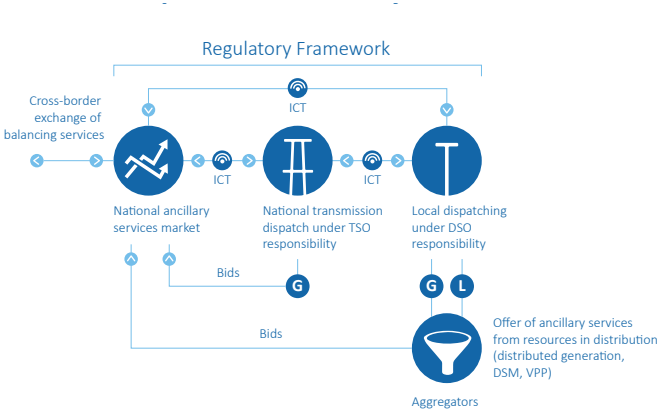
As an effect of the increasing amount of generation produced by Renewable Energy Sources (RES) with variable generation pattern and of the big changes affecting distribution (deployment of distributed generation, local storage and flexible loads), future distribution networks will inject a growing amount of energy into the transmission system. Variable generation located in distribution could be operated together with local storage and active demand in order to provide local services for the distribution grid (voltage regulation, congestion management) as well as services for the entire system through the connection point to the transmission grids.

Till now, distribution networks have been managed with a fit-and-forget philosophy. In the future, strict real-time coordination will be needed between the different actors that are involved in the provision of ancillary services. Optimizing the interface between TSOs and DSOs will prove a crucial factor to ensure the achievement of an overall efficiency target.

The project in brief

Duration	3 Years
Budget	€ 12.657.928,00
Funding Project	Horizon 2020 - The EU Framework Programme for Research and Innovation
Reference Call	LCE-6-2015, Research and Innovation Actions

Relationship between main system actors



The project SmartNet aims at providing an answer to some important open questions:

- Which ancillary services could be provided for distribution to the whole system (via transmission)?
- How to optimise the TSO-DSO interface: which monitoring and control signals could be exchanged?
- How could the architectures of the real time markets be revised?
- Which regulatory implications could the above issues have?

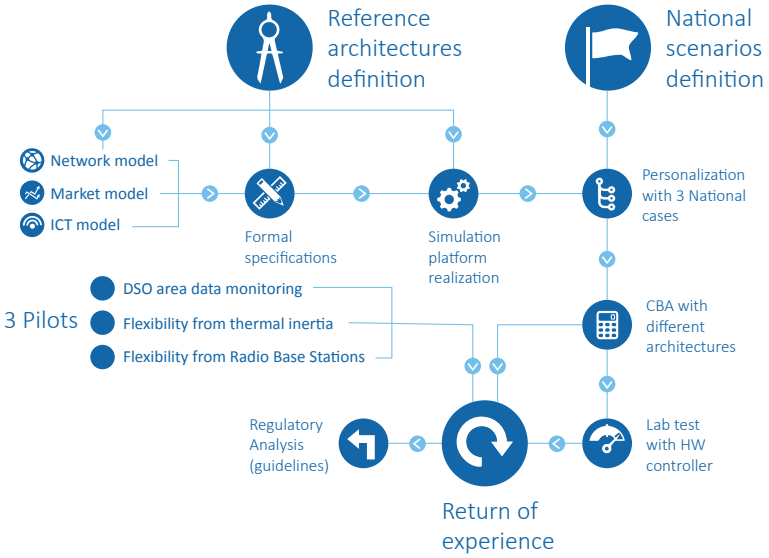
HOW will we conduct our research?

In three years, SmartNet aims at comparing different architectures for optimized interaction between TSOs and DSOs in managing the purchase of ancillary services (reserve and balancing, voltage regulation, congestion management) from subjects located in the distribution segment.

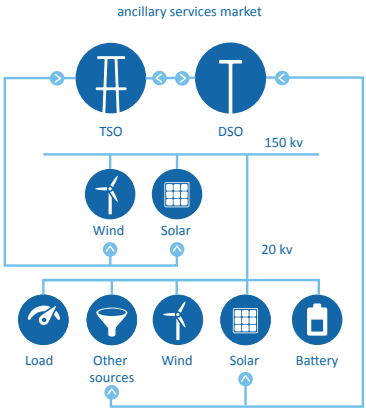
An ad hoc simulation platform will be built up over three layers (physical network, market and ICT) in order to simulate three national cases (Italy, Denmark, Spain); this simulation platform will then be implemented in a full replica lab, where the performance of real controller devices can be tested.

Three physical pilots will demonstrate modalities for exchanging monitoring and control signals between transmission and distribution networks and flexibility services that can be offered by entities connected to distribution, by exploiting thermal inertia of indoor swimming pools and distributed storage facilities of radio-base stations used for telecommunication.

Overall project layout

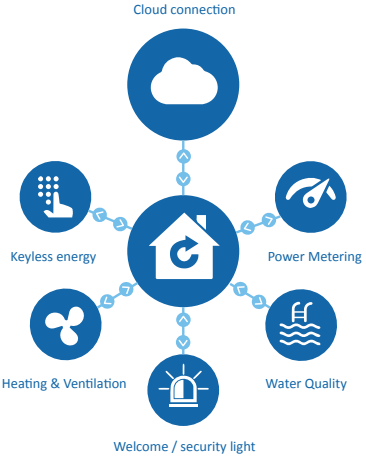


The three national pilot projects



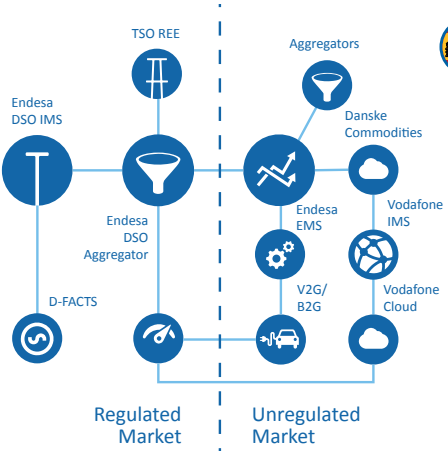
DSO area data monitoring

- Development of an aggregation system and implementation in field of a device in order to exchange all the data with the TSO.
- Development of an architecture and implementation in field of a system for the voltage regulation.
- Development of an architecture and implementation in field of a system for the power-frequency regulation



Flexibility from thermal inertia

- Aggregation of a sample of 16 summer houses.
- Implementation in field of ICT technology to exchange data between TSO, DSO, aggregator and smart houses.
- Development of an architecture and implementation in field of a system for the voltage regulation.
- Development of an architecture and implementation in field of a system for the provision of balancing power.
- Development of an architecture and implementation in field of a system for the provision of congestion management.



Flexibility from Radio Base Station

- Aggregation of a 10-20 radio base stations to build up about 50 kW of flexible demand.
- Virtual provision of frequency control service by the DSO to the TSO.
- Implementation of the mechanism for DSO-TSO coordination related to the technical validation of flexibility services at the distribution level.
- Development of flexible simulation tools for complementing the 50 kW available in the pilot reach the minimum 5 kW required by the TSO.

Main stakeholders' vision on TSO-DSO interaction needs

European Commission: "The Commission will prepare an ambitious legislative proposal to redesign the electricity market and linking wholesale and retail. This will increase security of supply and ensure that the electricity market will be better adapted to the energy transition which will bring in a multitude of new producers, in particular of renewable energy sources, as well as enable full participation of consumers in the market notably through demand response … enabling the roll-out of new technologies smart grids and demand response for an efficient energy transition". (From: "A framework strategy for a resilient Energy Union with a forward-looking climate change policy", part of the Energy Union Package)

ACER: "The remit of DSOs is perhaps changing faster than any other single actor in the energy sector. Some networks are beginning to require more active management as significant volumes of small-scale generation connect to distribution grids. The TSO-DSO interface therefore requires careful management, as does the need for efficient information exchange, coordinated congestion management and integrated planning (coordination requirements between TSOs and DSOs introduced, for example, by the Demand Connection Code provide a valuable starting point). NRAs and ACER will work with DSOs and TSOs to assist them in more clearly defining their respective roles and responsibilities so that DSOs may manage their evolving networks in a transparent and reliable way, whilst at the same time supplying system services to TSOs" (From: "European energy regulation. A bridge to 2025")

ENTSO-E: Indicates, among other, the following three policy actions: TSOs and DSOs need to provide consumers access to participate in all markets; TSOs should work with DSOs and regulators in determining requirements around observability and active power management of distributed generation (DG) and demand-side response (DSR); Many aspects of TSO-DSO interaction will be addressed by the Network Codes; The implementation, maintenance and amendment of Network Codes are a priority for TSO-DSO collaboration in the coming years. (From:" Towards smarter grids: Developing TSO and DSO roles and interactions for the benefit of Consumers")

CEDEC, EDSO4SmartGrids, ENTSO-E, Eurelectric, Geode: To solve their respective challenges in a cost- and resource efficient way, both TSOs and DSOs will rely upon access to a common set of supply and demand side resources. Ensuring coordinated access between TSOs and DSOs to this limited pool of assets is essential for enabling TSOs and DSOs to fulfil their missions in a manner that minimises societal cost and maximises sustainability and security of supply of our power system. (From: "General Guidelines For Reinforcing The Cooperation Between TSOs and DSOs")

The consortium

Project coordinator:

RSE - Ricerca sul Sistema Energetico (Italy)

R&D partners

- Research Organizations: RSE, AIT, SINTEF, Tecnalia, VITO, VTT
- Universities: DTU, EUI/FSR, Uni-Strathclyde, KU Leuven

Industrial partners

- TSO: Energinet.dk, TERNA
- DSO: ENDESA, NYFORS, SELNET
- Manufacturers: SELTA, SIEMENS Italia
- Software developers: Eurisco, N-SIDE
- Telecom: VODAFONE
- Trader: Danske Commodities
- Vacation rental: NOVASOL

Advisory Board:
ACER, AEEGSI, CEER, CISCO, Clervergy, Cybergrid, Danskenergi, EDP Distribuição, EDSO4SmartGrid, EERA JP SmartGrids, ELES, ENEL Distribuzione, ENEL Hydro and DG Research, ENTSO-E, EPRI, EURELECTRIC, EWEA, GE GRID Solutions, GME, IBERDROLA, ISGAN Annex VI, EC-JRC, Norwegian SmartGrids centre, NTUA Athens, OFGEM, RTE, R&D Nester/REN, T&D Europe, Telecom Italia, Université catholique de Louvain

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