FINAL PROJECT FACT SHEET

EUROPEAN UNION CO-FUNDED PROJECT

under the funding programme

Horizon 2020

LCE-02-2016 - DEMONSTRATION OF SMART GRID, STORAGE AND SYSTEM INTEGRATION TECHNOLOGIES WITH INCREASING SHARE OF RENEWABLES: DISTRIBUTION SYSTEM

Project acronym:

inteGRIDy

integrated Smart GRID Cross-Functional Solutions for Optimized Synergetic Energy Distribution, Utilization & Storage Technologies

Author:

Andrea Rossi

done in Madrid on:

Tuesday, November 22, 2016

Grant agreement reference: H2020-LCE-2016-SGS / 731268 / "inteGRIDy"

Project duration: 01.01.2017 ÷ 31.12.2020

Project total cost: 15,840,275.00€
EU contribution: 12,329,013.00€

Coordinating entity: ATOS
Albarracín 25, 28037, Madrid - Spain
Coordinator: Andrea Rossi
Tel.: +34912149011 email: andrea.rossi@atos.net

Project web site: http://www.integridy.eu

1. SUMMARY

inteGRIDy is a project which is right about to start (01/2017) and aims at integrating cutting-edge technologies, solutions and mechanisms in a scalable Cross-Functional Platform of replicable solutions. This platform connects existing energy networks to diverse stakeholders, with enhanced observability of both generation and consumption profiles. inteGRIDy pursues facilitating the optimal and dynamic operation of the Distribution Grid, fostering the stability of the electricity grid and coordination of distributed energy resources, Virtual Power Plants and innovative collaborative storage schemes within a continuously increased share of renewable energy. Innovations are built upon:

- Integration of existing smart-metering/automation systems, with IoT infrastructure, enabling interoperability through standard APIs and efficient data collection and monitoring of grid assets.
- Novel modelling and profiling mechanisms allowing the creation of network topology and Demand Response models, together with battery cycling and charging profiles.
- Predictive algorithms enabling dynamic scenario-based simulation and multi-level forecasting for managing real-time demand and supply of energy and optimised decision making.
- Powerful and efficient visual analytics and end-user applications, using novel human machine interaction techniques.
- A security access control framework, built upon the standardization, regulatory environment for privacy and data protection.
- Innovative business models providing important tools to the energy market for dynamically involving Demand Response strategies and allowing new energy market entrants.

inteGRIDy envisions the realisation and demonstration of a solution covering the aforementioned innovations under a variety of environmental, market and societal conditions at 10 pilot and demonstration sites throughout EU.

The project celebrated its kick-off meeting on January 11th and 12th 2017, hosted by Atos, as coordinator, and using GNF premises in Barcelona. The location was selected as Barcelona is the location of a Large Scale Pilot in inteGRIDy. Requirement identification, regulatory framework study and Business model creation activities were launched. inteGRIDy framework building process and Pilot presentations were also covered by the meeting agenda. inteGRIDy partners were represented through an audience of nearly 60 participants.

2. PROJECT SCOPE

The main goals of the inteGRIDy project will target innovation towards the following primary objectives:

1. Facilitate the decarbonisation of the electricity grid and the integration of large shares of distributed renewable generation, deploying innovative DR, storage, EV management and SG technologies
2. Integrate innovative smart grid technologies/concepts with a scalable and replicable Cross-functional Modular Platform, enabling optimal and dynamic operation of the distribution system's assets.
3. Use modelling and profiling extraction techniques for network topology representation, innovative DR mechanisms and Storage System characterization, supporting automated scenario-based decision making.
4. Use predictive algorithms and scenario-based simulation for innovative Operation Analysis Framework of the DG enabling avoidance of RES curtailment and enhancing self-consumption and net metering.
5. Demonstrate an integrated Decision Making and Optimisation Framework featuring a grid balancing and stability engine, optimization-based energy synergies to ensure energy security
6. Deliver integrated Visual Analytics tools, with innovative HMIs and Services for stakeholders and end-users, allowing monitoring and control of distribution network in real-time context.
7. Implement and Deliver added value end-user applications for all stakeholder and new business models involved in the smart grid value chain, enabling, also, their participation in energy markets
8. Contribution to the transformation of the energy market situation in Europe in order to comply with the ongoing energy related activities for standardization and regulatory frameworks
9. inteGRIDy system deployment, integration and validation in real-life large-scale demonstration pilot use cases

The main outcome of the project would be its 10 envisaged pilots, in which assessment for the viability of technical solutions and the real-life adaptations needed to implement them and interconnect them with existing infrastructure will be provided. Among the technical innovations themselves, the main outcome is represented by

the Cross-Functional Modular platform proposal, as it is the core of the project, integrating and coordinating all other innovations and already existing technologies. inteGRIDy overall progress will be continuously monitored, measured and verified based on specific quantitative and qualitative indicators relevant to each of above mentioned objectives.

3. PROJECT TECHNICAL DESCRIPTION & IMPLEMENTATION

inteGRIDy approach envisions an active re-adaptation of the provided functions/capabilities of the smart-grid distribution domain whereas its developments will affect the interconnection between the involved stakeholders. More specifically the impact will be to: a) the operations by reconfigurable topology control and supervision, b) the market by new services, c) the customer by enhanced engagement through DR mechanisms, d) the transmission by novel forecasting scenarios for the MV/LV areas, and e) part of the production by considering innovative storage utilization cross connecting thermal, energy and hydrogen storage along with integration of user from the EV transport targeting the optimum use of RES.

inteGRIDy tools and mechanisms have a wide area impact, both geographically, but also in terms of technology areas covered. A special role belongs to the RES systems (sources of energy) and the Users (sinks of energy), as the primary information flow generated by them will be analysed but also be used as the primary trigger for the automated-DR. The ultimate goal of inteGRIDy is to offer an integrated solution, which will accommodate the operations of the distribution grid, response from the customers, as well as DR mechanism to engage the involved end-users.

inteGRIDy is a 48 months project. The work is divided into four phases, covering the following topics: (Phase 1) Definition of Domain, Standardisation, Regulations & Business Models, (Phase 2) inteGRIDy Framework & System Integration, (Phase 3) Small & Large Scale Pilot Use Cases Demonstration & Evaluation and (Phase 4) Project Management, Dissemination & Exploitation. The inteGRIDy Structure adheres to the project vision, thus making sure that the scientific and adopted technical methodology will sufficiently result in specific tangible achievements with respect to the corresponding scientific, technical and real-life pilot objectives.

4. RESULTS ACHIEVED

The overarching methodology of inteGRIDy project seeks to integrate tools, methods and technologies from computer science and electrical engineering with control engineering (automation and control of distributed storage sources) and chemical engineering (assessment of optimum behaviour and cycling of batteries, heat storage and hydrogen-enabled systems). Such an interdisciplinary approach to addressing smart distribution grid, storage and system integration technologies with increasing share of RES is innovative and ground-breaking. inteGRIDy will follow a pilot-driven approach as its overall goal concentrates on the fulfilment of actual need and requirements. A set of innovative methods/mechanism integration will be targeted by inteGRIDy activities that will results to exploitable products with a high commercialization potential.

5. IMPACT

1.1. Replicability

The concept of the cross-functional standardized interface API layer has been introduced to enable replicable and expandable products, solutions, services and field level information/data exchange. This component will allow the proposed tools to be replicated on new LV/MV distribution networks and, the architecture can also be scaled to comprehend more grids. The Internet of the Grid paradigm introduced in the inteGRIDy project offers the required scalability potential for mass-scale application of innovative demand response schemes. The cloud-based demand response optimization tools will be able to host evolving numbers of end-consumers/nodes and interact with them both for data collection and demand control purposes. Finally, the compatibility of demand response technologies with widely accepted smart home/ building communication (Zigbee, EnOcean) and demand response (OpenADR) standards, guarantees the high replicability potential of the envisaged Human-Centric Demand Response Automation solutions introduced in inteGRIDy.

1.2. Socio-Economics

Savings from lower electricity distribution and retail prices, resulting from the efficiencies obtained from a smart grid by the distribution and retail companies are expected to be a profit for the customers offering them more choices including time-varying rates, prepayment programs, and customer energy management systems (Xcel Energy Smart Grid study found that Integrated Volt/VAr Control IVVC used on a continuous basis helped reduce

customer electricity use by 2.7 percent). Such customers' benefits magnify if one considers that less proactive measures are required in the case of an emergency situation (e.g. storms, earthquakes).

1.3. Environment

inteGRIDy contributes to the uptake of alternative energy sources, except for fossil ones, especially for local communities, where the available energy mixture is quite limited (encounters the problem of fuels poverty for certain EU regions). A main objective is to simplify and support the integration of renewables in existing power systems, avoiding and/or limiting expensive and inefficient investments on new grid infrastructures. In particular, the effective RES and load forecasting allows to increase the hosting capacity of distribution networks, but facilitates also the management of the transmission network, making easier to schedule in advance the conventional generation required to compensate RES fluctuations. inteGRIDy will bring on the market software and hardware solutions that will enable a smooth integration of renewables, most of which should evolve toward real microgrids managed by software tools that enable the collaboration between the microgrid and energy distribution grids.

1.4. Market transformation

The project will release an integrated platform of the enhanced version of already existing tools together with proper models and methodologies for smart cooperation between energy users and the Grid. These results will significantly contribute to the market of services that a new generation of energy users will be able to provide to the operators of the energy distribution networks. The technological solutions the project will bring into the market will enable win-win cooperation among energy stakeholders in the frame of a continuously evolving regulatory framework that, even though with different speeds in different countries, is currently open new internal markets of energy and energy-related services. These technological innovations introduced in the project will allow the involved SMEs to act as enablers for the application of innovative demand response schemes, ensuring the smooth and acceptable introduction of demand as a high-value actor in the energy markets.

1.5. Policy

Several partners of inteGRIDy play an active role in many National and EU initiatives in the field of smart grid. As they are aware of the ongoing EU policy developments, inteGRIDy can contribute to become a credible and solid pilot project, where the existing policies and the related regulatory frameworks will be further investigated in order to propose the required adaptations and solutions in the form of a complaint cross-functional framework. The project will promote the deployment of novel strategies to manage energy storage systems with the purpose to perform, in addition to self-consumption (that can be considered a first, basic, grid service, aimed essentially to reduce energy losses on network and to defer investments on new grid infrastructures), further ancillary services, to be supplied to the power system through the dispatching services market.

1.6. Other impacts on the call

One of the major impacts of inteGRIDy will be the interconnection between the partner territories with the aim of exchanging knowledge and best practise on smart grid architecture including hybrid storage facilities and EV charging stations. A closer cooperation between the 5 involved DSOs, the organisation of coordination meetings and their exchange of information with the Member States will consent a good contribution in the policy development for the interconnection among the EU energy networks.

inteGRIDy will allow the DSOs to manage the configuration of its grid according to the actual needs of the load and generation connected to the power system. Moreover, Demand Response and Virtual Energy Storage will act as enablers for the provision of high value balancing and ancillary services to the distribution grid, by offering scalable flexibility amounts in rapid response times and in this way allowing for the frequency and voltage regulation both at primary and secondary/tertiary regulation levels.

inteGRIDy enables energy storage systems to sell ancillary services, in the view of a more reliable and cost-efficient planning and operation of distribution and, in perspective, of transmission systems In the envisaged architecture, the charge/discharge of energy storage systems will be managed remotely according to the outcomes of the energy market and the technical constraints of the distribution network.

The impact that inteGRIDy will have on avoiding curtailment is significant: the flexibility offered by such integrated approach can support the stable and reliable operation of the grid through the provision of a variety of balancing and ancillary services, leveraging significant benefits for all involved stakeholders. Through the infrastructure deployed in the project, the DSO can then manage the charge/discharge of energy storage systems. This allows the coordination of energy withdrawals from the grid with the local RES production:

Synergies between the grid and transport is a major aspect of inteGRIDy as the EV charging point solution will help to decarbonise.