OPENING UP FOR A MORE COMPETITIVE ENERGY MARKET WITH NEW ENERGY SERVICES BY MAKING "REAL TIME" METERING DATA ACCESSIBLE TO MARKET PLAYERS

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ABSTRACT

The development of competition and entry of new players in the Europe's electricity retail market would be facilitated by the removal of existing barriers and the emergence of new services. Low cost access to the real time data in an open way will be a key element to foster the deployment of new services. Major Distribution System Operators (DSOs) are working together with market players and other stakeholders within the Horizon 2020 project FLEXICIENCY to develop a technical model to concretize the vision of data exchange based on meter data accessibility provided by DSOs close to real time. A common language will be openly set up in the project to address standardization and service accessibility for any actor willing to provide services and for that needing to exchange information. Standardized interfaces will be developed to integrate platforms of different players, becoming plug and play at EU level and allowing replicability of novel energy services. A virtual ICT environment will catalyze the interactions between relevant stakeholders and encourage a cross-country and cross-player access to innovative energy service based on metering data. This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 646482.

INTRODUCTION

Smarter grids are gaining the ability for electricity producers and consumers to effectively change their electricity usage and the way they can contribute to the system optimization.

The Energy Efficiency Directive of 2012 in particular considers demand response to be an important instrument to take action on consumption and billing information and thus provides a mechanism to reduce or shift consumption, resulting in energy savings in both final consumption and, through the more optimal use of networks and generation assets, in energy generation, transmission and distribution [1].

More recently, in 2013, the European Commission launched a consultation on the functioning of retail energy markets, while analyzing current and future scenarios and eventually assisting consumers to become real actors in the energy market [2]. New technologies and political determination are opening up new opportunities and perspectives and many consumers will assume a completely new role. Accordingly, the market needs to open up and adapt to new production and consumption patterns, and to a different role and expectations of the consumer. Information from smart meters in combination with market information can enable customers to take actions for their participation to the electricity system management, while opening up a wide range of advanced services in the energy markets. For this to happen, customers must be provided with higher quality and quantity of information as well as appropriate ICT tools and smart energy services.

In particular, when and where smart meters are rolled out, consumers must be in a position to benefit from the possibility of accessing new or enhanced services and be given greater control of their energy use. Moreover, as from deregulation procedures in Europe, third parties and either new or existing market stakeholders should be able to access data to eventually provide new services and develop new business models in the future.

Nevertheless, there is no unique standard format for the processing of electricity consumption data and metering data are today primarily made available for settlement by the DSO and the retailer connected to the customer. In general, in fact, there is no or limited forwarding of data and information to other third parties since there are few infrastructures or platforms available that could cost-effectively facilitate this information exchange. Additionally, data is available in low resolution and with considerable delays, often up to 30 days.

In the growth of more competitive and smarter scenarios, DSOs will increasingly play a key role by neutrally facilitating and stimulating the development of an open market in smart electricity services. Accessibility of close to real time metering data in a standardized way to any interested player (i.e. retailers but also new or existing service providers) has such potential. Moreover, the use of open standards and protocols represents a much improved approach for services to avoid the risk for a vendor lock-in and to limit costs. This has been identified as one of the improvement area of the Green Button initiative in the US [3], which addressed the issue to provide electricity customers with easy access to their energy usage data via a "Green Button" on electric utilities' website.

In the project FLEXICIENCY, with start date on February 2015, major DSOs having deployed smart metering infrastructures are working together with market players and other stakeholders on a technical model to concretize this vision for data exchange based on meter data accessibility guaranteed close to real time by DSOs. Low cost access to the data in an open way would be addressed to foster the deployment of new services not in place or exploited in most of EU countries, overcoming existing barriers. The development of an EU Market Place, together with open standard interfaces providing

access to data to any player, will catalyze the interactions between relevant stakeholders and encourage a cross-country and cross-player access to innovative energy services at EU level. The overall architecture and envisaged services will be described in this paper, together with the expected impact from implementation.

OBJETIVE AND BRIEF DESCRIPTION OF THE FLEXICIENCY PROJECT

The overarching goal of the FLEXICIENCY project is to demonstrate that the deployment of novel services in the electricity retail markets can be accelerated thanks to an open European Market Place for standardized interactions among electricity stakeholders, opening up the energy market at EU level. Novel energy services will be provided in real world within a framework where metering data, made available by DSOs in "real time", can be exchanged by energy service players to design new local control and flexibility aggregation of loads to contribute to demand response approaches. For this to happen, a common language for data exchange will be openly set up to address standardization and service accessibility and the necessary requirements and the expected use cases for advanced services will be defined in the project. Four major DSOs (ENEL Distribuzione - Italy, Endesa Distribucion - Spain, ERDF - France, and Vattenfall Distribution - Sweden) will run a set of four complementary demonstrations with real customers, covering new services. A fifth demonstration will be run by Verbund, as a new comer in the Austrian electricity retail market, where smart metering has not been rolled out yet, thus covering different conditions and allowing to draw insights on existing barriers towards energy efficiency service provisions. In addition, Vattenfall Germany will participate as a third party to validate the envisaged project architecture in a different regulatory context where metering activities are not under the responsibility of regulated players. Applicability and replicability of the project solutions will be thus duly addressed under diverse regulatory contexts.

As customers will be recruited and involved at different levels in the demonstrations, the project will properly take into account the relevant privacy and data protection issues in compliance with EU and national rules and adequate measures will be accordingly put in place. In particular, personal data of the participants actively involved in demonstrators' activities beyond existing contractual agreements will be collected implementing informed consent procedures and consent will be freely given with sufficient information on the requested involvement in the demonstration.

OVERALL PROJECT ARCHITECTURE

The overall project architecture has been envisaged to be applicable to different regional and market contexts, and four building blocks, illustrated in Figure 1, can be identified and are described in the following sections.

DSO Platforms

Relevant meter data will be made available by DSOs in a non-discriminatory way close to real time to all the interested players, under customer consent, through advanced interoperable platforms that will be enhanced in the project building on open standards. Pushing forwards innovation in Europe, the DSO platforms that will be run in the project feature new capabilities beside those currently available and in particular: *(i)* metering data provision, both consumptions and generation data, as in case of prosumers, made available at a given requested frequency, also close to real time, to any interested stakeholder willing to provide services; *(ii)* data storage (both historical, close to real time and/or forecasted data); *(iii)* advanced functionalities, aimed at facilitating service provision in the retail market such as for example data analytic and forecasting; *(iv)* technical validation of requested services, when impacting on the network, by interfacing with the DSO's legacy systems. Accordingly, DSOs platforms (as in Figure 1) include different modules such as Metering Module/Smart Grid Portal (where for example metering data and EV recharging poles status are provided) and the Active Demand Technical Validation (carried out on the basis of DMS/SCADA systems). For those countries where metering is operated by other players those modules could be managed by different actors (however, the Active Demand Technical Validation would be carried out by the DSO). Electricity retailers, ESCOs and aggregators are primary users of such data, to eventually provide novel services running on their service platforms.

Service platforms

Service platforms (from different types of market players) are interested in having access to real time metering data, provided that they are accessible in a standardized way through open APIs, and with interfaces compatible with the variety of IT systems, which are in use today. Interested players can be: energy retailers, which are developing as ESCOs new electricity retail models, which favour energy efficiency, and allow to compensate a reduced turnover by volume effects; aggregators, which are developing with industrial or large facility loads programmes able to use the flexibility of their customers; TSOs, which are in charge of validating areas where active demand response can be implemented safely for the electric system; TSOs and DSOs, for which cross-border balancing mechanisms based on the new network codes delivered at EU level generate new opportunities; other companies (including DSOs) offering for example data analytics services, which can use data streams describing electricity consumption to serve customer segmentation needs to design new retail business models at EU level, or to serve forecasting needs to better anticipate seasonal or consumption effects.

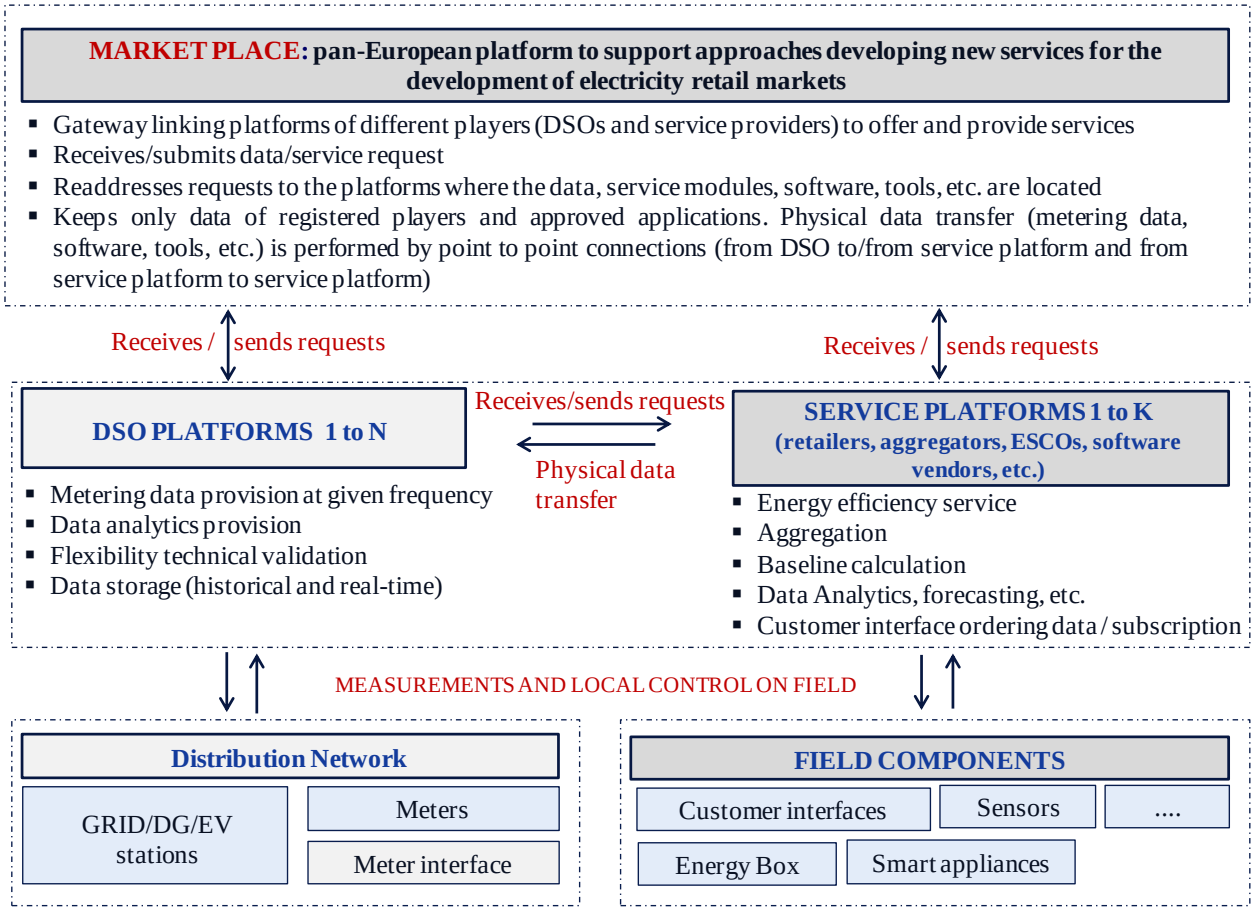

Figure 1: overall architecture of the project.

Platforms of retail companies operating in different regional contexts will be involved in the project, both with (as for Italy, Spain, France, Sweden) and without (as for Austria) smart metering infrastructures, respectively with and without DSOs on board in the respective countries. Platforms of other service providers, such as for instance software vendors, will be in the scope of the project to demonstrate a concept of an integrated market for services.

Field components

Field components will be installed for both measurement and control at field level, acting as local interfaces and controllers at customer premises to deliver services.
The adoption of interoperable solutions will be addressed in the project leveraging on existing standards and open communication protocols.

EU Market Place

A virtual ICT environment will be developed to catalyze the interactions between all the relevant stakeholders at EU level. Such virtual environment will allow interactions between all stakeholders of the electricity retail markets and will communicate in a standardized and open way with the existing and new DSO and service platforms. In the case of market players operating in different network areas, the Market Place would act as a gateway for service requests, simplifying B2B relationships between parties. Any player might either offer or provide services to all other players in the market, especially players willing to operate in several countries and to provide services either to existing or new customers. This could be the case for example of an ESCO or a retailer willing to provide energy services in countries and/or areas operated by diverse DSOs and thus needing to access DSOs' metering data close to real time.
As in Figure 1, the Market Place will be a pan-European meeting point between retail market players and DSOs: service providers will be able to interact and exchange data, services, software, methodologies, etc., and provide services to their customers. DSOs will be able to interact with all service providers and make commercially available metering data (and other data processing services such as forecast, profiling, etc.) to any interested (existing or new) player at EU level.
Physical data transfer will be performed point to point, i.e. no physical data transfer or storage will occur through the Market Place. This will foster the birth and growth of new electricity retail economic models throughout EU28, which will in turn increase in the future the overall electricity system flexibility, while maximizing energy efficiency across Europe.

EXPECTED SERVICES

On the basis of the project overall technical model, new services will be provided to customers in five different demonstrators within the project. The replicability of the solutions will be demonstrated, reflecting a common European framework for service provisions. Key future smart grid functionalities can be summarized under the following categories.

Advanced energy monitoring

Advanced energy monitoring services entail the detailed energy consumptions patterns and production information collected through smart metering infrastructures with high frequency and possibly close to real time.
Metering data will be made duly available to customers, thus enhancing their energy consumption awareness, and also to third parties (such as retailers, ESCOs and aggregators) willing to provide and promote new energy services to their new or existing customers. It has been recognized by the European Commission that data from smart meters on electricity consumption, electricity feed-in on the medium and low voltage levels as well as other relevant measurements are essential to massively deploy new functionalities and services beyond single demonstration areas [4].

Local energy control

Local energy control services encompass tools and algorithms to provide local energy control and modulation, together with value added services to the customers (for example a customer may activate energy generation and consumption coordinated management capabilities, as in the case of prosumers, thus maximizing their self-production; load modulation and control may allow optimal management of home appliances, following defined energy efficiency objectives, either at level of individual or larger group of customers, or through dynamic pricing schemes). They represent a fundamental step preparing for larger exploitation of flexibility services at aggregated and system level, as enabling the active management of electricity loads and generation connected to the distribution network.

Flexibility

Flexibility services entail the exploitation of the flexibility provided by a group of aggregated customers, distributed systems of loads (such as electric vehicle charging infrastructures), distributed generators (such as in case of prosumers), to eventually enable the provision of services to the market and the participation of new actors, such as distributed generation, to the energy market.
The different use cases will be validated in real-life environments, building on existing energy and telecommunication infrastructures, as well as through simulations, accounting for the existing regulatory and market constraints.

EXPECTED IMPACT

Five demonstrations will be implemented with duly time of operation, providing in practice in a real customer environment unique insights and solutions to burst the implementation and exploitation of energy efficiency and demand response on a large scale. In particular, the project will stimulate the creation of new services towards end-consumers allowing for the development of active demand.
New applications will be enabled by making available close to real time metering data in a non discriminatory way to third parties, while nowadays, there is no or limited forwarding of data since there are few infrastructures or platforms available that could cost-effectively facilitate this information exchange. Therefore, there is indeed a positive economic impact in creating new opportunities through the project, both for new players, such as aggregators, to enter the electricity market, and also for existing players, such as retailers, ESCOs, etc, to provide advanced and innovative services in the market.
Eventually, this would empower the customer that would benefit from the creation of new services in an open and more competitive market and to evolve his role from passive to more active player.
A clear framework defining the relationships between DSOs, service providers and consumers to support new market players will be addressed in the project while accounting for applicability in different regional contexts and regulatory frameworks.
Recommendations for standardization of data formats, appropriate regulatory framework for active demand and participation of distributed resources into DSOs operations will be provided to policy makers, thus contributing to a competitive market with new energy services.
Building on existing scenarios and regulatory frameworks and cost-effective use of existing systems and infrastructures will ensure and accelerate market up-take of the proposed solution.
As result, the development of competition and entry of new players encouraged by the emergence of new services would be facilitated while removing relevant barriers in Europe's electricity retail markets.

MISCELLANEOUS

Acknowledgments

The whole FLEXICIENCY Consortium Members are hereby acknowledged for their contribution and participation in the project. The FLEXICIENCY partners are in particular: Enel Distribuzione S.p.A. (project coordinator), Endesa Distribution S.L., ERDF, Vattenfall Eldistribution AB, EDSO for smart grids, Enel Energia S.p.A., Endesa SA, Vattenfall AB, Verbund AG, Agencia Municipal de la Energia de Malaga, SAP SE, Cybergrid GMBH, Siemens S.p.A., Joule Assets Europe AB OY,

VaasaETT Ltd AB OY, Fundacion CIRCE Centro de Investigacion de Recursos y Consumos Energeticos, University Of Ljubljana, Kiwi Power Ltd.

Disclaimer

This paper reflects the FLEXICIENCY consortium view and the European Commission (or its delegated Agency INEA) is not responsible for any use that may be made of the information it contains.

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