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Smart *Mediterraneo*

Best practices, innovation and pilot projects in smart grid development in the Mediterranean region

23-24 June 2016, Bari. Italy

Spisto A., Prettico G., Flego G.

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Title
Smart *Mediterraneo*. Best practices, innovation and pilot projects in smart grid development in the Mediterranean region - 23-24 June 2016

Abstract

The event highlighted the importance of a multi-disciplinary approach to the research and knowledge development; well-structured and lean procedures as a prerequisite to access the European funds; the post-development phase of the project, when the funding period is over and the technology is in place for delivering products and services.

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Foreword

The Joint Research Centre Institute for Energy and Transport of European Commission organised a workshop on best practices, innovation, and pilot projects in smart grid development in the Mediterranean region. This workshop "Smart *Mediterraneo*" was organised in the framework of the Smart Specialisation Platform for Energy (S3PEnergy) and aimed at building synergies among the regions of the Mediterranean area to exchange experiences and best practice in the field of smart grids.

Regional authorities, companies, universities and research centres met and exchanged knowledge on Smart Specialisation, energy and cohesion policy, novel funding opportunities and challenges and opportunities coming from the new regulation of the retail market. This workshop served as the occasion for interactions between local and international stakeholders with the aim to reinforce links between their projects, needs and expertise along with the perspectives of Smart Specialisations including activities in smart grids technologies.

The smart grids sector faces several challenges and obstacles such as need of more targeted interregional cooperation and higher engagement of the private sector. Future scenarios, initiatives and interventions in this field should capitalise on existent evidence and results facilitated by the research and analysis carried out across Europe, by actors in both the private and the public sector.

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EC Directorate C JRC Organising Committee: Marcelo Masera (JRC-PETTEN), Gianluca Fulli (JRC-ISPRA), Amanda Spisto (JRC-PETTEN), Gerda Gowens(JRC-PETTEN), Dima Petrova (JRC-PETTEN).

Local Organising Committee (in alphabetic order): Adriana Agrimi (Regione Puglia), Domenico Bufi (Enel SpA), Paolo Casalino (Bruxelles Office of Puglia Region), Mariagrazia Dotoli (Politecnico di Bari), Carlo Gadaleta Caldarola (ARTI Puglia), Rosa Giannini (Regione Puglia), Ugo Stecchi (ARTI Puglia), Mario Savino (Politecnico di Bari).

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Partnerships and sponsor

The workshop was partially sponsored by Enel SpA.

Agenda of the workshop[1]

First day - 23 June 2016

13:30 Registration & coffee

14:00 Opening

Welcome by Michele Emiliano

President of PUGLIA REGION

Loredana Capone

Regional Minister for Economic Development, Apulia Region

SESSION 1 Energy and Cohesion Policy, Novel Funding Opportunities

Presentation 1

EU's Smart Specialization Platform for Energy

Manuel Palazuelos. *Project Leader European Commission DG JRC.*

Institute for Prospective Technological Studies (IPTS) Smart Specialization Platform on Energy

Presentation 2

Cohesion policy support for smart grids

Manuel Palazuelos, *Project Leader European Commission DG JRC.*

Institute for Prospective Technological Studies (IPTS) Smart Specialization Platform on Energy

Presentation 3

Industrial policy for smart grids: learning from lighthouse projects and the way forward for deployment

Gordon Buhagiar, *Policy Officer - Advanced Engineering and Manufacturing* Systems.

European Commission DG Growth

Presentation 4

Challenges and actions for smart grid deployment in the EU Internal Energy Market Constantina Filiou, *Principal Administrator - Smart Grids.*

Internal Market Ill: Retail markets; coal & oil. European Commission DG EN R

Presentation 5

The Apulian background - sustainable energy and smart grids. Adriana Agrimi, Head of Research and Innovation Section - Apulia Region

Carlo Gadaleta Caldarola, *Economist and project Manager. ART/ Regional Agency* for *Technology and Innovation -Apulia Region.*

Discussion

Moderator: *prof. Eugenio Di Sciascia, Dean of Politecnico di Bari*

16:00 Coffee break and networking

[1] The power point presentation can be download form the SP3 platform, in the section dedicated to the events. (http://s3platform.jrc.ec.europa.eu/s3-platform).

16:30 **SESSION 2** Dissemination of innovation and barriers and challenges to new investments. Lessons from implementation cases

Presentation 1

Field experiences of innovation development to industrial implementation

Rinaldi Raphael, *EU/Transnational Subsidized Programs - Global Infrastructures & Networks, Enel SpA*

Presentation 2

Energy Efficiency Innovation Projects

Antonio Sacchetti *CEO Tera srl*

Presentation 3

Innovative H2 Solutions to Move Towards Clean & Smart Territories

Diana De Rosmini, *McPhy*

Discussion:

Moderator: Mariagrazia Dotoli, *Associate Professor of Control System engineering - Politecnico di Bari*

17:30 **SESSION 3** Best practices from pilot projects in smart grid development.

Presentation 1

Case 1 - Turkey. Wind Energy in Turkey and Cost Benefit Analysis of Wind Turbines in Smart Grid Systems.

Ilhami Colak, *Prof. Dr. Vice Rector and Dean of Engineering and Architecture Faculty at Istanbul Gelisim University*

Presentation 2

Case2 - Croatia.

Ivona Stritof, *HEP - Republic of Croatia*

Presentation 3

Case 3 - Italy. An urban control centre for smart city energy governance.

Mario Savino and Mariagrazia Dotoli, *Associate Prof. Politecnico di Bari*

Presentation 4

Case 6 - Greece. TILOS - Technology Innovation for the Local Scale, Optimum Integration of Battery Energy Storage

Panagiotis Ktenidis, *Senior Consultant for TILOS project*

Discussion

Moderator: Domenico Laforgia, *Director of APULIA REGION Department of Economic Development, Education, Training and Employment*

19:00 Networking

20:00 Social dinner

Saturday - 24 June 2016

08:30 Registration & coffee

09:00 **SESSION 4** Best practices from pilot projects in smart grid development.

Presentation I

Case 4 – Cyprus. SmartPV for PV integration and Demand Side Management: First results from Cyprus.

Venizelos Efthymiou, *Chairman* of *FOSS the Research Centre* for *Sustainable Energy* of *the University of Cyprus.*

Presentation 2

Case 5 - Malta, Croatia and Greece. SUNSHINE smart-energy platform: IT to support energy awareness and consumption reduction.

Raffaele De Amicis (VC)

Presentation 3

Case 6 – Italy. INGRID Project

Massimo Bertoncini, *INGRID project coordinator.*

Presentation 4

Case 7 – Serbia. EPIC-HUB - Energy Positive Neighbourhoods Infrastructure Middleware based on Energy-Hub Concept

Nikola Tomasevic, *R&D scientist Institute Mihajlo Pupin. Serbia (VC)*

Discussion

Moderator: Stefano Valentini, *Energy* & *Environment Regional Technology Platform Coordinator. ASTER* S.Cons.*p.*A

10:30 Coffee break and networking

11:00 **SESSION 5** Smart Grid Project Outlook 2016 - A preview

Gianluca Fulli, Deputy head of unit Energy Security, Systems and Market. European Commission Directorate C. JRC for Energy, Transport and Climate

11:30 **WRAP-UP SESSION AND CONCLUSIONS OF THE WORKSHOP**

Participants: Angelo L'Abbate (RSE SpA). Alessandro Rubino (Senior Editor, Nature Publishing Group editor), Fabio Tambone (MEDREG General Coordinator and Head of External International Relations, Autoritá per l'energia elettrica, il gas e i sistemi idrici).

Q1: Which framework for trans regional and transnational cooperation in the smart grids development?

Q2: Successful experiences, main obstacles and lesson learnt from smart grid technologies development.

Moderator: *Paolo Casalino. Head* of *the Brussels Office* of *Puglia Region*

13:00 Lunch break at the Camera di Commercio di Bari

14:00 Visit to site of interest. SHOWROOM Smart City RES NOVAE, Bari.

Abstract

The Joint Research Centre Directorate C for Energy, Transport and climate of the European Commission organised the workshop "Smart Mediterraneo" on best practices, innovation and pilot projects in smart grid development in the Mediterranean region. This event was organised in the framework of the Smart Specialisation Platform for Energy (S3PEnergy) and aimed at building synergies among the regions of the Mediterranean area to exchange experiences and best practices in the field of smart grids. This initiative falls into the broader policy arena of the regional and urban development policy of the European Union that aims at supporting sustainable economic growth, job creation, competitiveness and the improvement of citizens' quality of life.

During the last decades, in the main, the EU regional development policy aimed to be sector-neutral. The Research and Innovation Smart Specialisation Strategy RIS3 proposes a new vision of the EU regional innovation policy based on the need to select and prioritise fields and areas where cluster of activities should be developed, under a public-private partnership umbrella and through an endogenous entrepreneurial push. The novelty of the RIS3 compared to the previous framework is represented by the switch from a top-down to a bottom-up approach, where the (regional) governments make strategic (and informed!) choices and formulate a smart specialisation strategy to support the emergence of systems of innovation in specific domains. The information flows to the public authority from the entrepreneurial actors of the innovation process.

The workshop has been an occasion of exchange on the difficulties encountered during all stages of the development of the projects; particular focus was given to success stories and lessons learned. These insights can lay down foundations to build upon for future projects aiming at scalability or replicability exercises. The common denominator of the projects presented in the workshop is the fact that all propose new technologies and innovative ICT solutions for smart grids development. Moreover, all the projects include a demonstrator, which is the concrete result of the research, innovation and development effort of the project. The event saw also the participation of the representatives of some European and regional authorities that are in different respects involved in the research and innovation process in the field of energy and smart grids. DG REGIO (presentation 2 given on behalf of DG REGIO) gave an overview of the cohesion policy support for smart grids; DG JRC – Seville presented the Smart Specialisation Platform for Energy; DG Growth gave an overview of the European industrial policy for smart grids development; DG ENER addressed the challenges and actions for smart grids deployment in the EU Internal Energy Market. Finally DG JRC - Petten presented the preliminary findings of the updated outlook on smart grids projects inventory in Europe.

The Apulia region was another main actor during the event. Representatives of the local authority – the local administration of the Apulia Region and the Brussels office of the Apulia Region – the academia – in particular the Politecnico di Bari and the University of Bari – the local regional Agency for Technology and Innovation - ARTI Puglia - have presented their experience in the smart specialisation strategy and in the field of smart grid technologies.

A dedicated session hosted the experiences of nationally- and internationally-operating companies presenting their business, s.a. McPhy Energy Italia S.r.l., specialised in hydrogen technology; Enel SpA, which realised (in cooperation with the Apulia Region and the Politecnico di Bari) the Showroom Smart City RES

NOVAE of the city of Bari; and the local small-medium enterprise Tera Srl, which has already been involved for many years in the research and development of smart grid solutions for the energy sector. The workshop's wrap-up session also saw the participation of speakers coming from the Italian Authority for Energy, Gas and Water Resources (AEEGSI), an Italian-based research institute in the field of energy, Ricerca sul Sistema Energetico (RSE SpA), and the Nature Publishing group editor.

Three main findings arise from the discussion held during the two-days of the workshop. The first one is the importance of a multi-disciplinary approach to the research and knowledge development in the first phases of the project, and to the further aggregation of capabilities during the entire process of project development. The collateral capabilities may also come from outside the geographical territory where the innovation is experimented. The presence of an already established network of potential professional suppliers of skilled labour force, modern technology and infrastructure are the key elements for a successful outcome of the innovative project.

The second element is a well-structured and lean procedure to access the European funds available through local authorities is a fundamental prerequisite for the efficient start of an innovation project. Local authorities provide guidance for the formulation and implementation of the strategy on the territory. The strategy emerges through cooperation with the main actors of the innovation process and in tight collaboration with the suppliers of "collateral capabilities" that facilitate the success of the project. Where projects have a demonstrator site, delays and interruptions during site acquisition and preparation may undermine the outcome of the project.

Finally, the debate also addressed some crucial aspects of the post-development phase of the project, when the funding period of the project is over and the technology is in place for delivering products and services. These are the phases where the project can concretely demonstrate its innovation potential; the presence of a local entrepreneurial environment - ready to capture the value added from innovation - and an easy access to the infrastructures that facilitate the utilisation or commercialisation of the innovation determine the project's and innovation policy's success and effectiveness. As was highlighted in one project presentation, "the main challenge of smart grids development is the difficulty in connecting technologies and creating communication channels with the energy system".

Despite an improved 2014-2020 innovation policy agenda, concrete challenges are still envisaged in the development of the smart specialisation strategy framework in "providing a common political rationale for a socio-economically and territorially diverse set of regions and nations facing different place-based challenges and different innovation modes [..]" (Capello et al. 2016).

Directorate C for Energy, Transport and Climate (ETC) is currently involved in the organisation of workshops following up the experience in Bari and in the frameworks of the Smart Specialisation initiative (see "Next events" section). The workshops to come will be again focused on smart grid energy projects and on the learned lessons (including drivers and barriers) that each hosting region has identified. Its most recent deliverables in this field are published in the dedicated JRC website available at: http://ses.jrc.ec.europa.eu/.

1. Introduction

Regional and urban development policy is a core priority of the European Union which aims at supporting sustainable economic growth, job creation, competitiveness and improvement of the citizens' quality of life.

During the last decades, in the main, the EU regional development policy aimed to be sector-neutral (Foray 2016). According to this logic, and with some exceptions, resources were mostly allocated without any preferential intervention on selected field of development; they were rather allocated "horizontally" with the aim of acting on a generic framework, common to any company and innovation actors across sectors and fields. Clearly, this approach entails a number of advantages – mainly the improvement of the general conditions, while fixing general problems and minimising the risks of distortions. However, some downsides were also present. Those policies failed, on the one hand, in filling the knowledge gap between the "top regions" and the "transitions and less advanced regions". This is to be attributed mainly to the presence of isolated innovation capabilities – e.g. start-ups with great potential – within a fragmented industrial system that lacked the necessary complementary capabilities for the innovation to thrive – e.g. suppliers, qualified works, external expertise, etc.

On the other hand, even in those cases where a certain improvement in the knowledge gap did take place, the failure was often in its translation into real economic convergence, mainly because of the absence of cross-sector knowledge spill-overs from complementary capabilities, e.g. industrial associations, large companies, universities and public research organisations. In such cases, regional policies appeared to be unable to support the emergence of "micro-systems of innovation", made by a network of companies, research institutes, specialised services and other actors with complementary capabilities, where the integration of knowledge drives the structural change and the development of new business models.

When this process of transformation does not happen spontaneously it can be facilitated by a smart specialisation strategy called Research and Innovation Smart Specialisation strategy (RIS3). This new vision of the EU regional innovation policy is based on the need to select and prioritise fields and areas where clusters of activities should be developed (non-neutral approach)[2], within an integrated public-private partnership framework, and through an endogenous entrepreneurial push. The novelty of this approach lies not so much in the prioritisation of certain domains or areas[3] as in the switch from a top-down to a bottom-up approach, where the (regional) governments make strategic (and informed!) choices and formulate a smart specialisation strategy to support the emergence of systems of innovation in specific domains. The information flows to the public authority from the entrepreneurial actors of the innovation process, encompassing all actors directly and indirectly involved in the innovative process who hold knowledge about the technological and market potentials of new domains and activities. The dynamic interaction between the (local) governments and the entrepreneurial sector would lead to the "discovery" of the R&D and innovation domains into which a region should move to construct its future: its aim is to ease the difficulties in acquiring relevant information that constrained

[2] The sector-neutral approach is opposed to a non-neutral one.

[3] Prioritisation is an intrinsic feature of any policy dealing with a finite financial endowment. In the past, prioritisation was carried out through a top-down approach, with the government as the *ex ante* omniscient planner.

the public sector's traditional top-down identification and promotion of areas of potential comparative advantage.

In addition to RIS3, and in support of the challenges highlighted above, the Stairway to Exellence (s2E)[4] project aims to support EU13 Member States[5] and regions in closing the innovation gap and to stimulate the early and successful implementation of national and regional smart specialisation strategy.

The Research and Innovation Smart Specialisation strategy is part of Europe 2020, the EU's growth strategy for a smart, sustainable, and inclusive economy. The main pillars of the RIS3 are:

- Knowledge-based development;
- Region's strengths and competitive advantages;
- Technological and practice-based innovation and experimentation;
- Stockholders inclusion in the innovation process.

In order to reach these goals and address the diverse development needs in all EU regions, € 351.8 billion – almost a third of the total EU budget – has been set aside for Cohesion Policy for 2014-2020[6]. Regional Policy is delivered through three main funds: the European Regional Development Fund (ERDF), whose resources are allocated according to priorities and depending on the type of region – more developed, in transition, less developed –; the Cohesion Fund (CF), only concerning a subset of the Member States[7]; and the European Social Fund (ESF), which is earmarked for human capital investment in Member States. All these are part of the European Structural and Investment Fund (ESIF)[8]. One of the main focuses of the regional policy is on energy and low carbon economy.

Some studies review the early experiences of smart specialisation implementation in EU cohesion policy (McCann et al. 2016) and have identified the EU sectorial and thematic priorities that Member States and regions have chosen in their policy setting. Under the EU priority "Digital Agenda" many Member States[9] have chosen "Clean environment and efficient energy network" (where smart grids are explicitly listed as an example within this sub-category), "intelligent inter-model & sustainable urban areas (where smart cities are referred to) and the category "Sustainable innovations" with the subcategories "Smart green and integrated transport systems", "Sustainable energy and renewables and "Resource Efficiency" (Eye@RIS3 database[10]).

Against this backdrop, the workshop "Smart Mediterraneo" has been organised by the Directorate C for Energy, Transport and Climate of the European Commission under the initiative of Directorate REGIO and the support of Directorate B for Growth and Innovation, which is in charge of the management of the Smart Specialisation Platform (S3P)[11]. The objective of the event was to

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[4] https://ec.europa.eu/jrc/en/research-topic/stairway-excellence-s2e

[5] The thirteen MS who join the EU in 2004, Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia.

[6] http://ec.europa.eu/regional_policy/en/policy/what/investment-policy/

[7] The Member States that can access the fund are those (Bulgaria, Croatia, Cyprus, the Czech Republic, Estonia, Greece, Hungary, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia and Slovenia) whose Gross National Income (GNI) per inhabitant is less than 90 % of the EU average. It aims to reduce economic and social disparities and promote sustainable development.

[8] Part of the ESIF are also the European Agricultural Fund for Rural Development (EAFRD) and the European Maritime and Fisheries Fund (EMFF),

[9] In the "EyeonRIS3 data base" the Member States that have chosen these categories and sub-categories are: AT, BE, BG, CY, CZ, DE, DK, EL, ES, FI, FR, HU, IE, IT, LT, LV.

[10] http://s3platform.jrc.ec.europa.eu/eye-ris3

[11] http://s3platform.jrc.ec.europa.eu/

share and learn from the experiences that Mediterranean regions have on projects in the field of smart grid energy technologies.

All the projects[12] presented during the workshop have received financial support through European funding during the period between 2012 and 2015. They are either finalised or are in the process of being finalised by 2019.

The common denominator of the projects presented in the workshop is the strong focus on new technologies and innovative ICT solutions for smart grids development. Moreover, all the projects include a demonstrator, which is the concrete result of the project's research, innovation and development effort.

The workshop was also an occasion to exchange views on the difficulties encountered during all stages of the development of the project.

The event also saw the participation of the representatives of some European and regional authorities that are in different respects involved in the research and innovation process in the field of energy and smart grids. DG REGIO gave an overview of the cohesion policy support for smart grids (presentation 2, delivered on behalf of DG REGIO); DG JRC – Seville presented the Smart Specialisation Platform for Energy; DG Growth outlined the EU industrial policy for smart grids development; DG ENER addressed the challenges and actions for smart grids deployment in the EU Internal Energy Market. Finally, DG JRC - Petten presented the preliminary findings of the updated outlook on the smart grids projects inventory in Europe.

The Apulia region was another main actor during the event. Representatives of the local authority – the local administration and the Brussels office of the Apulia Region -, academia – in particular the Politecnico di Bari and the university of Bari –, the local regional Agency for Technology and Innovation - ARTI Puglia -, and the private sector - Tera srl - have presented their experience with the smart specialisation strategy and in the field of smart grid technologies.

A dedicated session hosted the experiences of nationally- and internationally-operating companies which presented their business, like McPhy Energy Italia S.r.l., specialised in hydrogen technology; Enel SpA, which realised (in cooperation with the Apulia Region and the Politecnico di Bari) the Showroom Smart City RES NOVAE of the city of Bari; and local small-medium enterprise Tera Srl, which has been involved for many years in the research and development of smart grid solutions for the energy sector.

The workshop's wrap-up session also saw the participation of speakers from the Italian Authority for Energy and Gas and Water Resources (AEEGSI), an Italian-based research institute in the field of energy, Ricerca sul Sistema Energetico (RSE SpA), and the Nature Publishing group editor.

[12] The JRC smart grids projects outlook 2016 (*forthcoming*) includes information on about 1000 smart grids projects across Europe (*http://ses.jrc.ec.europa.eu/*).

2. Session 1. Energy and Cohesion Policy, Novel Funding Opportunities

Moderator: prof. Eugenio Di Sciascia, Dean at Politecnico di Bari.

2.1 First presentation. EU's Smart Specialisation Platform for Energy

Speaker: Manuel Palazuelos, Project Leader European Commission DG JRC. Institute for Prospective Technological Studies (IPTS) Smart Specialisation Platform on Energy.

E-mail: Manuel.PALAZUELOS-MARTINEZ@ec.europa.eu

The power point presentation can be downloaded form the SP3 platform, in the section dedicated to the events. (http://s3platform.jrc.ec.europa.eu/s3-platform).

Title

Smart Specialisation Platform on Energy

Abstract:

The Smart Specialisation Strategy (S3) is a new regional and national innovation strategy to develop through innovation. The core of strategy is what has been called the "entrepreneurial process of discovery" where the different stakeholders included in the quadruple helix (government, industry, academia and civil participants) cooperate to identify a common idea and develop it as a strategy for the future. The regional bodies are required to be facilitators of the strategy, and are asked to coordinate the inputs received by all the potential stakeholders. In terms of funds, the smart specialisation strategy represents a ex-ante conditionality for receiving support through European Structural Funds related to innovation.

Keywords:

S3P, strategy, innovation, stakeholders participation

Introduction

The Smart Specialisation Strategy (S3) is a new regional and national innovation strategy to promote innovation-driven development, also defined as an integrated place-based economic transformation agenda through innovation. It aims at overcoming barriers and problems identified in prior regional and national strategies taken in the past. For instance, the scattered support used in the past (that is, funding many activities with small amounts) was replaced by an approach focused on concentrating the allowed resources on a more restricted set of potential innovation areas. These areas can be chosen by identifying, within the regional economic fabric, potential sources of comparative advantage also in terms of skills and knowledge. The core of the strategy is what has been called the "entrepreneurial process of discovery", wherein the different stakeholders included in the quadruple helix (government, industry, academia

and civil participants) cooperate to identify a common idea and to develop it as a strategy for the future. At first glance, the strategy may look simple; on several past occasions, however, overlooking the involvement of relevant stakeholders led to disappointing results at the regional level. Nowadays, the regional bodies are required to be facilitators of the strategy and are asked to coordinate the inputs received by all the potential stakeholders. In terms of funds, the smart specialisation strategy represents an *ex-ante* conditionality for receiving support through European Structural Funds related to innovation. Practically this means that regions, which aim at recovering public money to spend on innovation projects, need to receive an approval by the EC on their smart specialisation strategy document in which such projects have been detailed. But what is the state-of-play of the S3P so far? Basically European regions and countries have drafted their S3s and half of these proposals at the moment have been approved by the EC. In certain cases some minor changes have been proposed by the EC to address potential weaknesses of the presented strategies. The following step is then represented by the implementation of the strategy. In the implementation phase several decisions need to be taken: for instance, if several potential areas have been identified in the strategy planning, a more concrete area needs to be selected at this level.

The S3 platform (S3P) works based on a membership process where regions and countries decide to adhere freely to the platform. They have no obligations but in contrast they can have access to all the activities shown within the platform. So far about 85% of the EU territory is represented in the platform (Figure 1).

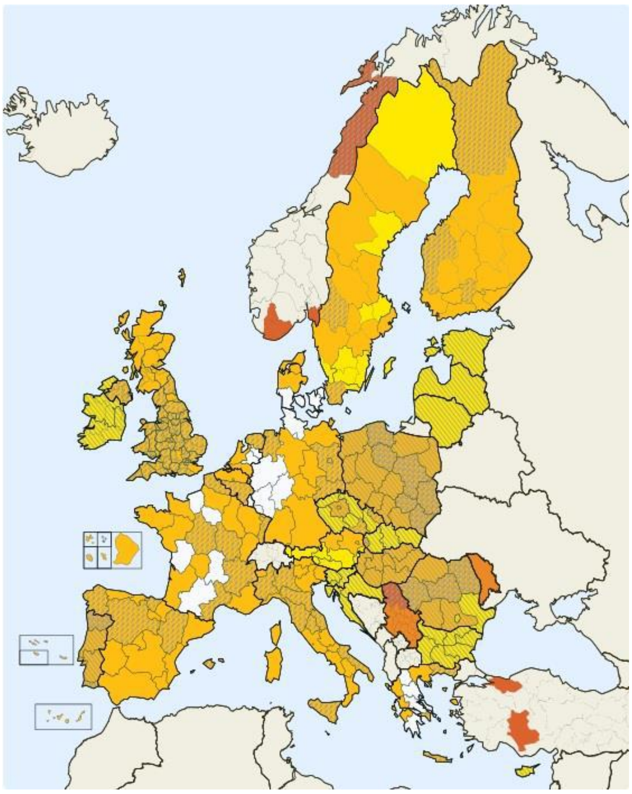

Figure 1 Participation to the S3 Platform at EU level since 2011

In numbers this corresponds to 168 EU regions plus 18 countries. Some non-EU countries feature as members, too: despite the fact that they cannot receive European Structural Funds, these countries (e.g. Norway) consider the S3 an interesting exercise to be performed and have done this freely.

The main work done by the JRC on the S3P can be summarised in seven points:

1. Methodological guidance: support was asked from universities to devise closely how to draft a smart specialisation strategy;
2. Trans-national learning: peer review mechanisms and organised thematic workshops to learn from one another;
3. Organisation of country and macro-regional events;
4. Participation to the RIS3 (Research and Innovation Strategies for Smart Specialisation) assessment and support to DG REGIO desks;
5. Fostering of inter-regional collaborations;
6. Developing of interactive tools and an update website;
7. Research Agenda with reports and studies on the field.

Why a Smart Specialisation Platform on Energy?

From the platform we can collect some interesting information. Two thirds of all regions in S3P have chosen an energy priority in their strategies (Figure 2).

Figure 2 Map of the European region with Energy as a priority in its strategy

The dark and light shades of green indicate those areas (regions and countries) that have selected in their strategy at least one activity related to an energy priority.

As previously mentioned, the S3P supports effectively tapping Cohesion Policy funds for Energy, by assisting countries and regions to set up strategies to accelerate the development of a technology-based low-carbon economy. This requires multidisciplinary competences in energy, innovation and regional policies. To this end, a joint effort was put in place by three different Directorates General of the European Commission: DG REGIO, DG ENERGY and DG JRC[13].

To achieve the goals mentioned above, the project has been divided in four main work packages (Figure 3):

[13] Within the JRC two institutes are mainly involved: the Institute for Prospective Technological Studies (IPTS) and the Institute for Energy and Transport (IET). In the IPTS the active units are: S3 Platform, Knowledge for Growth and Economics of Climate Change, Energy and Transport. For the IET they are: Energy Conversion & Storage Technologies, Energy Technology Policy Outlook, Renewables & Energy Efficiency and Energy Security, Systems and Market Unit.

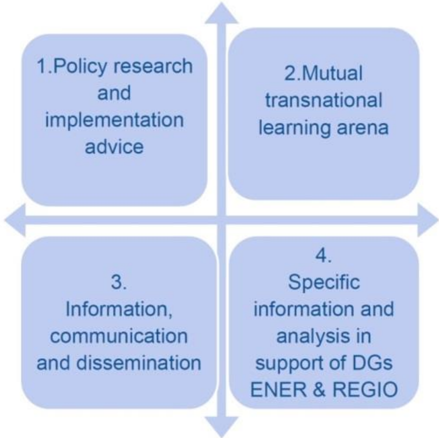

Figure 3 Work packages

A list of the events organised by the S3P team and collaborators is given in Figure 4.

Date	Title	City (Country)
27 May 2015	High level launching event of the S3P Platform	Brussels (BE)
May 2015	Fuel Cells & Hydrogen(co-organised JU-Rhone-Alpes)	Lyon (FR)
13–15 Oct.	Blue Growth and Marine Energy (with Canarias)	Las Palmas (ES)
27–30 Oct.	Support to the Danube Strategy+EUSDR	Ulm (DE)
3 Nov.2015	Sustainable Energy Efficiency Construction (with Andalucia)	Seville (ES)
9 March 2016	Regions and energy union, co-organised with ERRIN (European Regions Research and Innovation Network) - Report	Brussels (BE)
April 2016	Smart Specialisation (energy priorities), (*back to back with S2E* with SI)	Ljubiliana (SI)
1-2 June 2016	***High Level Event*:** Thematic Session on Energy, Brussels, (co-organised JU-RA)	Brussels (BE)
16 June 2016	*Energy Week*: Smart Specialisation in Energy, how Europe's regions are implementing their priorities	Brussels (BE)
23-24 June 2016	Smart Grids and Smart Specialisation. Smart Mediterraneo - IET	Bari (IT)
4-5 July 2016	How to build Smart Energy Regions: Regional perspectives on energy transition (with Baden-Württemberg)	Karlsruhe (DE)
10-13 October 16'	*Open Days*: European Week of Regions and Cities 2016	Brussels (BE)

Figure 4 Events organised by the S3P team and collaborators

On 1st and 2nd June 2016, the representative of all regions involved in S3P had the chance to meet in Brussels at the presence of five commissioners. On that occasion, several groups were naturally identified as a function of the priorities of interest. For each group, a region/country leader was chosen. Table 1 provides a short summary of these initiatives.

Topic of the table	'Lead' region (s)	Other interested regions/cities
1. **Energy Efficiency in buildings**	Andalusia (SP)	Paca (FR) Valencia (SP) Campania (IT) Trento (Province) (IT) Praga (City) (CZ)
2. **Water**	Flanders (BE)	ERRIN (in principle)
3. **Smart Mobility**	?	1 region? (UK) Catalonia (SP) Bavaria (DE) Flanders (BE) 2 regions (RO)
4. **Advance Manufacturing for energy applications in harsh environments**	Basque Country (SP)	13 regions (?) of the Vanguard Initiative Pomorskie (PO)
5. **Heating and cooling**	Castilla y León (SP)	Central Macedonia (GR) ERRIN
6. **Bioenergy**	Lapland (FI)	East & North Finland (7 regions?) (FI) East Norway (8 regions?) (NO) Extremadura (SP) Westerns Macedonia (GR)
7. **Smart Grids**	Paca (FR)	Provence – Alpes (Côte d'Azur) (FR) Northern Netherlands (Groningen) (NE) Pomorskie (PO) – Energa S.A. Lower Saxony (DE)

Table 1. Summary of initiatives

2.2 Second presentation. Cohesion policy support for smart grids

Speaker: Manuel Palazuelos, Project Leader European Commission DG JRC. Institute for Prospective Technological Studies (IPTS) Smart Specialisation Platform on Energy.

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The power point presentation can be downloaded from the SP3 platform, in the section dedicated to the events. (http://s3platform.jrc.ec.europa.eu/s3-platform).

Title

Cohesion Policy Funding in Energy

Abstract:

European Regional Development Fund (ERDF), European Social Fund (ESF) and Cohesion Fund (CF) amount to a total of €352 billion over 2014-2020. The key goal of these funds is to help reduce disparities between Europe's regions, by strengthening economic, social and territorial cohesion. More generally, these funds also contribute to the Europe 2020 Strategy for smart, sustainable and inclusive growth. Almost 120 Billion are allocated to the smart growth area where smart grids activities are mainly expected to fall.

Keywords:

S3P, funds, social and territorial cohesion.

Cohesion Policy funds can be divided in three main categories: European Regional Development Fund (ERDF), European Social Fund (ESF) and Cohesion Fund (CF). They amount to a total of €352 billion over 2014-2020. At a European

level regions can be divided also into three main categories: more developed regions, transition regions and less developed regions. This categorisation is mainly based on the level of GDP per capita (Figure 5).

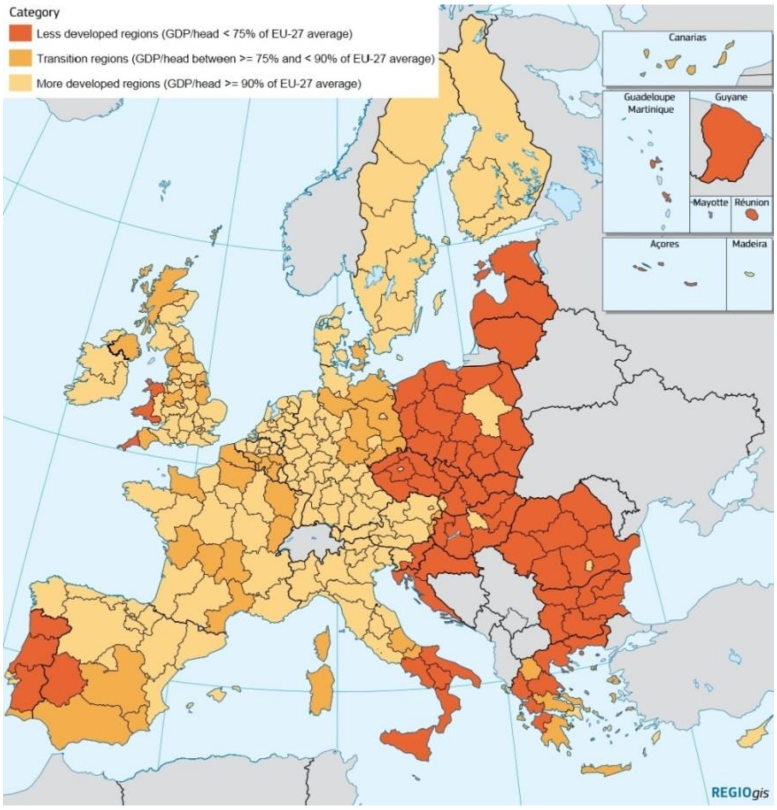

Figure 5 Categorisation of European regions

The key goal of these funds is to help reduce disparities between Europe's regions, by strengthening economic, social and territorial cohesion. More generally, these funds also contribute to the Europe 2020 Strategy for smart, sustainable and inclusive growth. These three areas comprehend eleven thematic objectives, as shown in Figure 6.

Figure 6 Main objectives of the European funds (ERDF, ESF, CF)

Figure 7 summarises the allocation of the different funds in each of the eleven thematic objectives (in billions of euros).

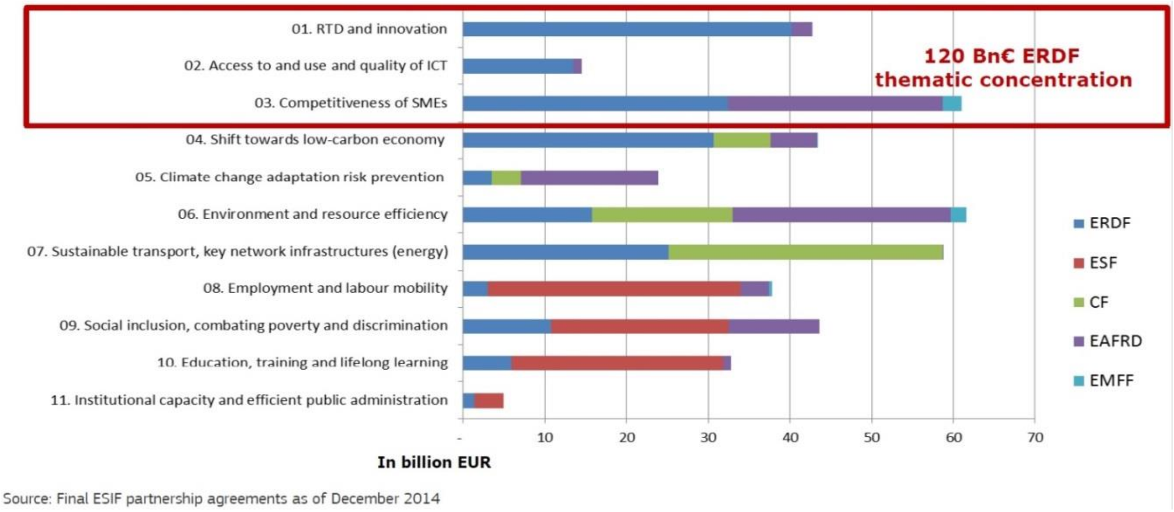

Figure 7 Allocation of the different funds in each of the eleven thematic objectives

Almost 120 Billion are allocated to the smart growth area, the category where smart grids activities are mainly expected to fall. The new EC funding for the 2014-2020 period features an important novelty: a thematic concentration mechanism. This requires regions to spend a certain percentage of their funds on the subjects indicated by the EC. Figure 8 shows an example for two kinds of regions:

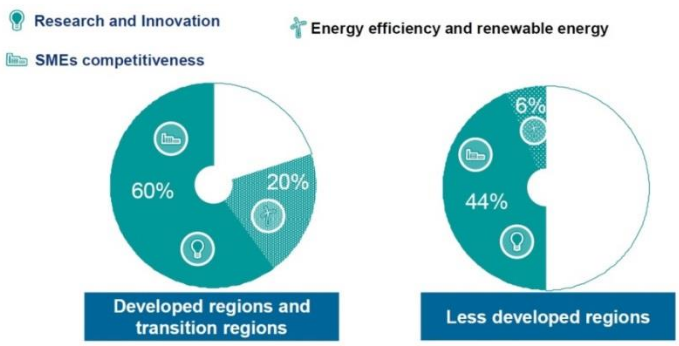

Figure 8 Example of types of regions

Comparing the 2007-2013 and 2014-2020 periods suggests that the overall amount of funds (ERDF +CF) is on the rise. In Figure 9, three key areas are compared: energy efficiency, renewable energy, and smart energy infrastructure.

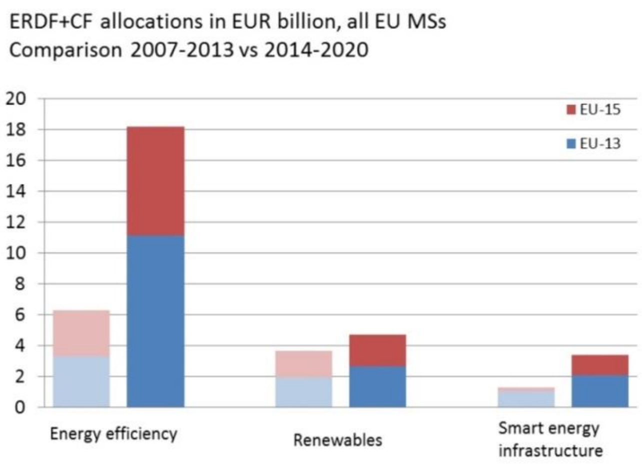

Figure 9 ERDF and CF allocation in EUR billion, all EU MSs

A comparison can be drawn at the country level between the two periods' allocations for thematic objective 4: shifting toward a low carbon economy (Figure 10).

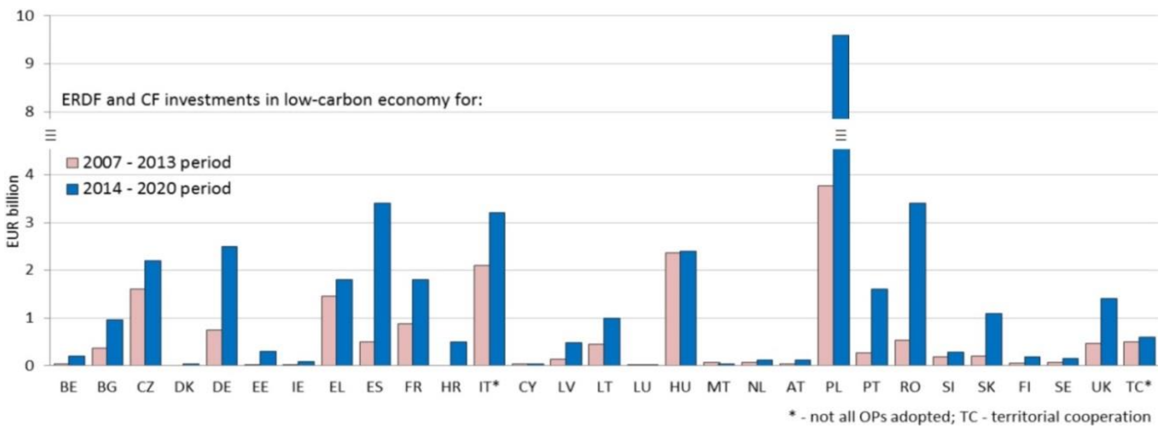

Figure 10 Comparison between the two periods allocation (country level detail)

To get hints on how the countries are investing their funds, this thematic objective can be detailed into finer activities (Figure 11).

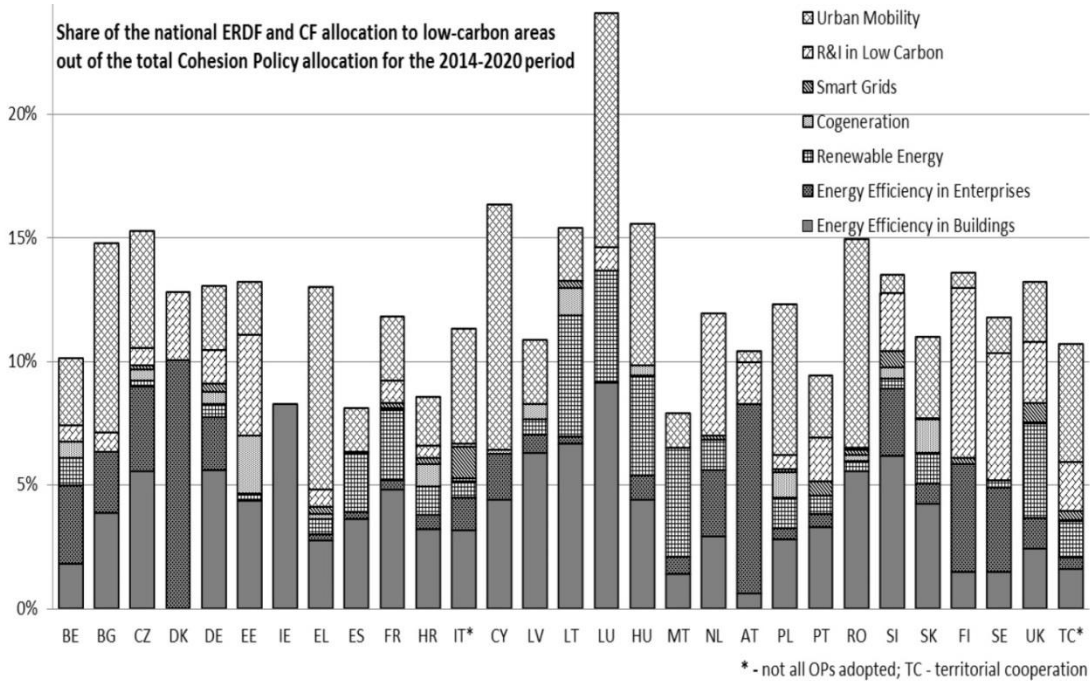

Figure 11 Comparison between the two periods' allocation (detail by country and activities)

Figure 11 highlights that the largest investments per country are devoted to urban mobility and energy efficiency in buildings. Furthermore, countries are very diverse. With respect to energy infrastructure, three main sources of funds can be listed: Connecting Europe Facility, Cohesion Policy and the European Fund for Strategic Investments. The first amounts to € 4.7 billion for investments in TEN-E infrastructure of highest European added value. The second is unlocking € 2 billion for smart energy infrastructure (electricity and gas transmission) in six Member States. Finally the third aims at mobilising private financing for strategic investments in renewable energy, energy efficiency and energy infrastructure sectors.

The two thematic objectives related to Smart Energy Infrastructure are the fourth, already mentioned, and the seventh (sustainable transport and removing bottlenecks in key network infrastructure). The former aims at developing and implementing smart distribution systems at low and medium voltage levels but also focusing on 'real life' demonstration/validation projects. The latter aims at improving energy efficiency and security of supply (through the development of smarter energy distribution, storage, and transmission systems, and through the integration of distributed generation from renewable sources).

Concerning smart grids a total of € 1.1 billion is allocated for smart distribution grids that are believed to connect 3.3 million additional energy users. Investments in this sector have been promoted by fifteen Member States (CZ, DE, ES, FI, FR, GR, HR, IT, LT, NL, PL, PT, RO, SI, UK).

Some useful references are given in the following:

List of Programs and Managing authorities

http://ec.europa.eu/regional_policy/en/atlas/programmes/

http://ec.europa.eu/regional_policy/en/atlas/managing-authorities/

New open data platform

https://cohesiondata.ec.europa.eu

http://ec.europa.eu/regional_policy/en/policy/evaluations/data-for-research/

Project examples

https://ec.europa.eu/budget/euprojects/

http://ec.europa.eu/regional_policy/EN/projects/

Discussion

Question addressed to Mr. Palazuelos on the ex-ante conditionality in the Smart Specialisation Strategy: are there any assessment mechanisms for ex-post?

Mr. Palazuelos replies that the question on ex-post assessment is very important since it encompasses one of the major concerns related to funding. From past experiences, it is clear that a follow up was missing and no information was available on the changes that were introduced through the project implementation in the regional context of interest. What has been done on this respect is to embed the ex-post in the ex-ante conditionality. Indeed, one of the conditions in the strategy is that regions that participate need to have a solid evaluation process. Several regions did not receive the EC green light to move to the implementation phase of the project especially because of their weaknesses in term of monitoring methods. What it is expected, in fact, is a long term strategy from regions in the smart specialisation which can go ahead once the incentives (or just reimbursements) are not there anymore.

2.3 Third presentation. Industrial policy for smart grids: learning from lighthouse projects and paving the way for deployment

Speaker: Gordon Buhagiar, Policy Officer - Advanced Engineering and Manufacturing Systems. European Commission DG GROWTH

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The power point presentation can be downloaded from the SP3 platform, in the section dedicated to the events. (http://s3platform.jrc.ec.europa.eu/s3-platform).

Title

Learning from Lighthouse projects and paving the way for deployment

Abstract:

This presentation is on how smart grids can benefit the EU engineering sector in terms of growth and jobs. The work was carried out by the so called Expert Group 5 within DG ENER's Task Force for Smart Grids and together with industry stakeholders (energy generation and power companies). Part of the outcome of the work will be published in the Study on Smart Grids Lighthouse Projects and Study on Smart Grids barriers to deployment and opportunities.

Keywords:

Industrial competitiveness and development, investments, design policies.

How should we approach Smart Grids from the perspective of improving the competitiveness of the EU engineering industries? This was the first question the Advanced Engineering and Manufacturing Systems Unit of DG GROWTH posed to itself when it started working on this dossier. More specifically, how can smart grids benefit the EU engineering sector in terms of growth and jobs? To answer these questions, in 2012 the unit set up a working group called Expert Group 5 (within DG ENER's Task Force for Smart Grids) focusing and brainstorming together with industry stakeholders (energy generation and power companies) on ideas on how to take this forward in terms of industrial policies. The feedback obtained can be summarised as follows: *i)* speed up deployment (the technology is there but for some reason things are not happening as fast as they ought to be), *ii)* attract investment (linked to the deployment issue but also on how to attract more investment to the Smart Grid sector), *iii)* Design policies on how to target these two specific areas. This should go through the following three steps:

1. Identify what seems to be working and what not, i.e. the 'Goods' and 'Bads';

2. Use the Goods to encourage further investment in these areas;

3. Identify what policy is necessary to encourage more of the ‘Goods’ and less of the ‘Bads’.

To handle point 1), it was fundamental to identify the state-of-play. Funding was provided through COSME (the EU programme for the Competitiveness of Enterprises and SMEs) for a number of studies on Smart Grids. The two areas identified together with stakeholders were: Study on Smart Grids Lighthouse Projects and Study on Smart Grids barriers to deployment and opportunities. The outcomes of these two studies may be used to improve industrial policy in this area. The first study on SG Lighthouses projects is based on an analysis of one hundred Smart grid low-voltage Lighthouse projects currently in operation in the EU (chosen from the JRC database). The primary aim of this study is to understand what makes these projects attractive to investors, moved by the more general goal of stimulating investment in Smart Grids in the EU.

Four criteria were chosen for the project selection in the first “Study on Smart Grids Lighthouse Projects”:

1. Uniqueness of the project, as defined in the lighthouse projects context;
2. Potential for creating new or transforming existing markets;
3. Synergies with other utilities, telecoms and municipalities;
4. Nature of social, economic and/or environmental benefits to end consumers.

The second study, Study on Smart Grids barriers to deployment and opportunities, aims at identifying obstacles to the deployment (economic, legal, socio-cultural) to also identify opportunities in SG - besides the area of Smart Metering - where demand response may be improved and to help steer investment towards these areas. The Steering Committee is composed by members of the JRC, DG ENER, DG GROWTH and EASME. The task of the Committee is to provide expertise on different aspects of Smart Grids, but also to ensure that the contractors of the two studies deliver, and deliver well.

Some initial findings have already been identified in the early stages of the first study, but are still subject to changes in the final report which is due in December 2016. They are listed below.

There is a high potential for smart grid technologies and applications all around the globe. There is large market potential, as alternatives are needed for power system planning and operation and there is a disruptive impact of smart grid technologies on the power system: new business models are needed. Additionally, a higher level of active prosumer engagement is deemed necessary.

Exploiting synergies with the ICT industry is another key issue. Energy grids can learn from best practices in internet networks for harnessing cybersecurity. Increased cooperation between the roll-out of broadband networks and smart grids will induce cost savings.

With respect to challenges and opportunities, other findings have been highlighted by the first study. In a nutshell, smart grid activities outside Europe put non-EU regions as a potential for export. A high level of activity is observed outside mature markets, and competitiveness of non-EU countries in ICT markets is considered to be a threat at the moment.

The current fragmented regulatory framework (due to differences in national legislation) is a further hurdle preventing European companies from benefitting from economies of scale. This is a challenge for policy makers, who should focus on harmonising the regulatory framework at a European scale. In contrast, non-EU countries are taking initiatives permitting incumbent actors to upscale.

After the studies are completed, the final reports will be published and made available online. Follow-up measures need to be taken, such as e.g. a conference to present and discuss the results. Consultation with industry stakeholders for their input will be required.

Both studies will feed into DG GROWTH's industrial policy making mechanism, and findings will be converted into concrete measures to improve the competitiveness of the EU engineering industries. As mentioned industry stakeholders will be involved in the process.

For more information on the Commission's work in smart grids:

http://ec.europa.eu/energy/en/topics/markets-and-consumers/smart-grids-and-meters/

2.4 Forth presentation. Challenges and actions for smart grid deployment in the EU Internal Energy Market

Speaker: Constantina Filiou, Directorate-General for Energy - European Commission

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The power point presentation can be downloaded from the SP3 platform, in the section dedicated to the events. (http://s3platform.jrc.ec.europa.eu/s3-platform).

Title

Challenges & Actions for Smart Grid Deployment in the EU Internal Energy Market

Abstract:

Smart, innovative grids are key elements in the energy transformation for delivering the 2030 framework and realising the Energy Union, both in terms of infrastructure and market. Recognising this, the Commission, through its policy initiatives and under specific actions, works to address challenges in order to accelerate smart grid deployment. Its attention is concentrated on:

(i) supporting the development and use of technical standards and interoperable smart energy grid solutions;

(ii) ensuring consumers' data protection and cybersecurity in a smart grid environment;

(iii) guaranteeing an open competitive retail market in the interest of the consumers; and

(iv) supporting the uptake of smart metering systems and smart grid technologies with a particular emphasis on overall system benefits, delivery of innovative services, and consumer empowerment.

Keywords:

internal energy market; smart grid policies; smart grid deployment; smart metering

Website:

http://ec.europa.eu/energy/en

http://ec.europa.eu/energy/en/topics/markets-and-consumers/smart-grids-

Filiou presented the EU policies and the legislative framework for smart grid deployment that enables initiatives and financing opportunities on smart grid projects.

The context

According to the EU 2030 targets and our COP21 clean energy commitments, at least 27% of our final energy consumption, including 50% of electricity, shall come from renewables by 2030. This growing share of renewable energy, as well as of decentralised sources and new loads such as storage and electric vehicle charging, will have to be integrated into our grids, and will largely affect, the distribution grid. This situation brings challenges to the electricity system operation, such as more volatility and higher risk for congestion (Figure 12). To address them, innovative solutions are required at both infrastructure and market level, which can give the needed flexibility while ensuring that the system remains fit to meet security of supply standards. Smart grids are part of the solution and can help turn these challenges into opportunities.

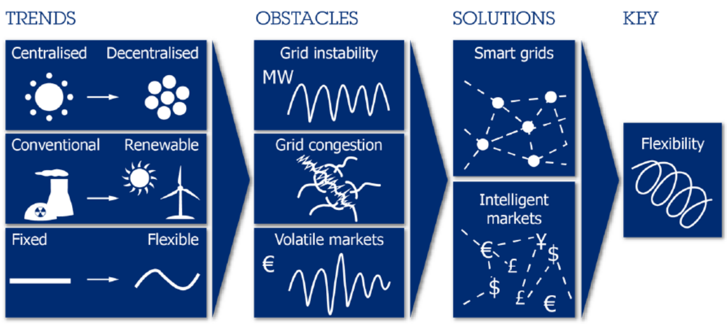


Figure 12 The context

This is in line with our Energy Union strategy and its five pillars (Figure 13) which advocate secure and sustainable energy at affordable prices for all - householders and industry.

To deliver the Energy Union vision all pieces of the puzzle must fall well into place, namely incentives, investments, technology, and consumer engagement.

The European Commission presented its thoughts on these very issues in the 2015 Summer Package. The Package contains a number of proposals and ideas on, amongst others, the new market design initiative and the delivery of a 'new deal' for energy consumers for which smart grids are key and enabling elements.

Figure 13 Pillars of the Energy Union

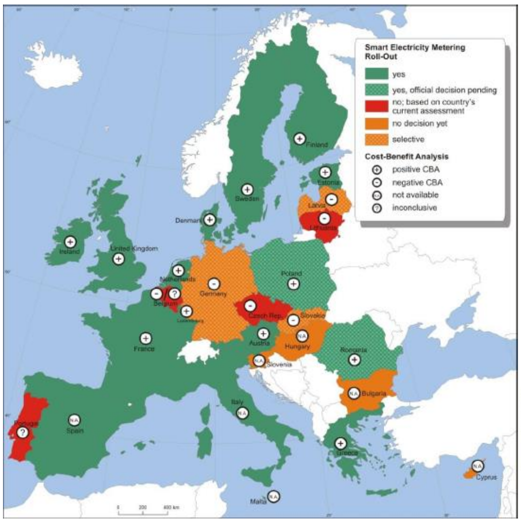
As a follow-up, the Commission is currently working on a legislative proposal, to be adopted at the end of 2016, which will help this vision into fruition, and will *inter alia* include provisions of relevance to smart grids. These will complement existing measures[14], based on which actions are currently taken for the deployment of smart grids and smart metering in the service of the energy system and its stakeholders.

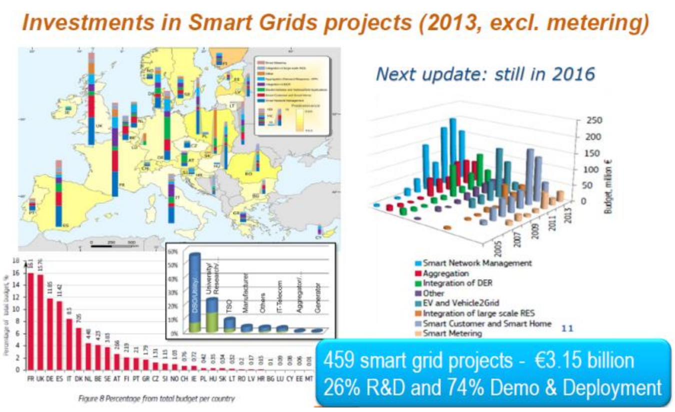
The electricity and gas directives set the legal basis for the roll-out of the smart metering (Electricity Directive 2009/72/EC; Gas Directive 2009/73/EC) and explicitly mention the obligation of a cost benefit analysis for assessing the technical feasibility and economic viability of the implementation. Furthermore, the energy efficiency directive (2012/27/EC) is complementing these provisions and also contains an article on demand response. The Energy Infrastructure Regulation (EU) 347/2013 includes smart grids as one of the priority areas for delivering trans-European projects of common interest (PCIs). Currently, there are three smart grid PCIs in the corresponding list. Also in the Alternative Fuels Directive AFID and COM(2013)18 there is an article referring directly to electro-mobility charging, a use case for smart grids. The Commission produced two recommendations (Recommendation 2012/148/EU on Preparations for Smart

[14] Legislative acts and policy documents related to smart grids that are currently in place: Electricity Directive 2009/72/EC; Gas Directive 2009/73/EC; Energy Efficiency Directive 2012/27/EC; Energy Infrastructure Regulation (EU) 347/2013; Electro-mobility Alternative Fuels Directive AFID; COM(2013)18; Recommendation 2012/148/EU on smart metering; Recommendation 2014/724/EU Data Privacy Impact Assessment; COM(2011)202 on Smart Grids; COM(2012)663 on the Internal Energy Market; COM(2013)7243 on IEM and public intervention; SWD(2013)442 on Demand Side Flexibility; COM(2014) 356 Smart Metering & accompanying SWDs; COM(2015) 339 on delivering a 'new deal' for energy consumers.

Metering and Recommendation 2014/724/EU on Data Privacy Impact Assessment) to assist Member States in their choices when rolling-out smart grids and smart metering infrastructure. This supporting policy documentation followed the original Communication (COM(2011)202 on Smart Grids; and was also complemented by other communications such as the COM(2012)663 on the Internal Energy Market (IEM) and the ; COM(2013)7243 on IEM and public intervention, and the supporting SWD(2013)442 on Demand Side Flexibility, as well as the Commission Report on progress with smart metering in the EU Member States as presented under COM(2014) 356 Smart Metering & accompanying SWDs. The most recent policy documentation in the field is the communication COM(2015) 339 on delivering a 'new deal' for energy consumers.

In the field we see that that there are investments taking place, supported by this legislative framework; i.e. the smart metering infrastructure has grown in the last years slowly but steadily, with Italy as one of the pioneers starting now the roll out the second generation of smart meters. This will be finished by the end of 2019; more countries are following suit (Figure 14- a & b).





(a) (b)

Figure 14 Deployment of smart metering in the EU – ref COM(2014) 356 (a); Investments in smart grids (2013, excl. metering) – ref JRC Smart Grids Project Outlook (b)

Smart metering is being deployed in the EU at different speeds in different countries. The total commitment of Member States with respect to the roll out of smart metering at large scale by 2020 consist in seventeen doing large scale projects, and two implementing smart metering on specific segment of consumers with particularly high consumption levels, and amounts to 35 billion Euros just for electricity, involving in total 195 million smart meters, and close to 72% of EU consumers.

Based on the JRC 2014 inventory, investments in smart grids amount so far to a total of 3.15 billion Euros. The needed investments for smartening up and

modernising the EU distribution grid infrastructure is much higher though and amounts to close to 60 billion Euros by 2020, and 300 billion by 2030, for covering the integration of higher shares of renewables.

To accelerate the deployment of smart grids, the European Commission, in close consultation with stakeholders and its group of experts under the European Smart Grids Task Force (Figure 15)[15], has been working over the last years on the following key challenges (COM (2011) 202) :

1. Standards and interoperability
2. Data privacy, data protection and cyber-security
3. Regulatory issues
4. Industrial policy and infrastructure

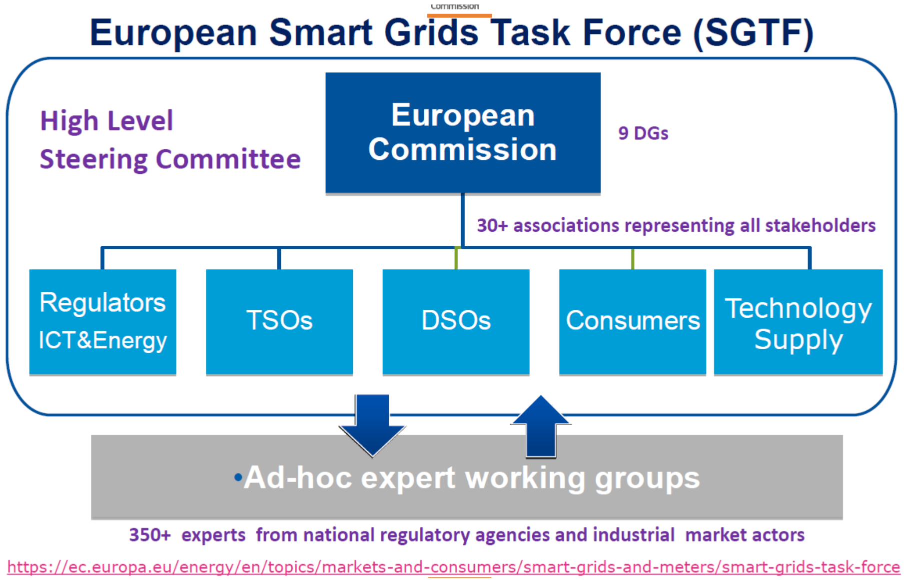


Figure 15 The European Smart Grids Task Force

Standards, covering both technology and communication issues (i.e. protocols for exchange of information) are available for smart grids and smart meters, and confirmed by industry as complete. They were delivered under the Commission mandates M/441 (on smart meters) and M/490 (on smart grids) issued to the European Standardisation Organisations (Figure 16). It is important that these standards are systematically used.

[15] The Smart Grids Task Force was set up by the European Commission in 2009 to advise on issues related to smart grid deployment and development. It consists of five Expert Groups who focus on specific areas. http://ec.europa.eu/energy/en/topics/markets-and-consumers/smart-grids-and-meters/smart-grids-task-force

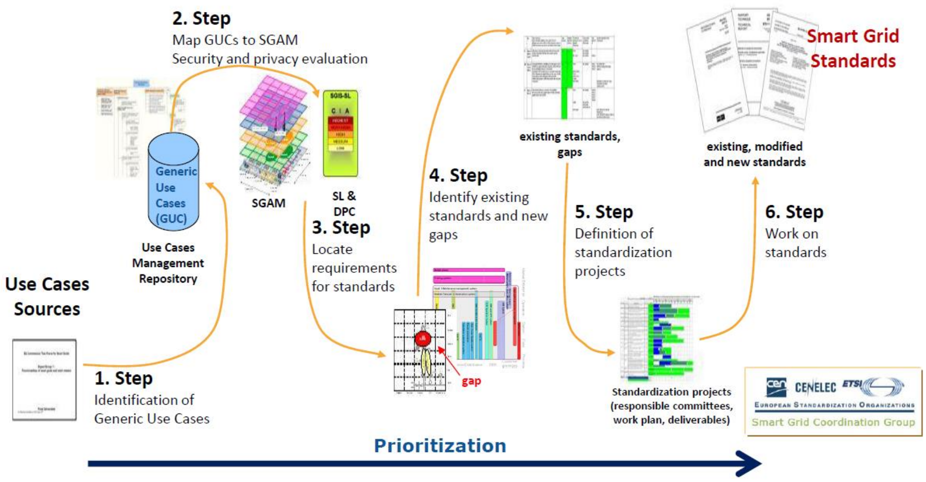


Figure 16 Standards and interoperability. Smart grids standardisation process completed.

What is still missing, though, is standards for smart homes and smart appliances, together with the connectivity and seamless interaction within the home (Figure 17).

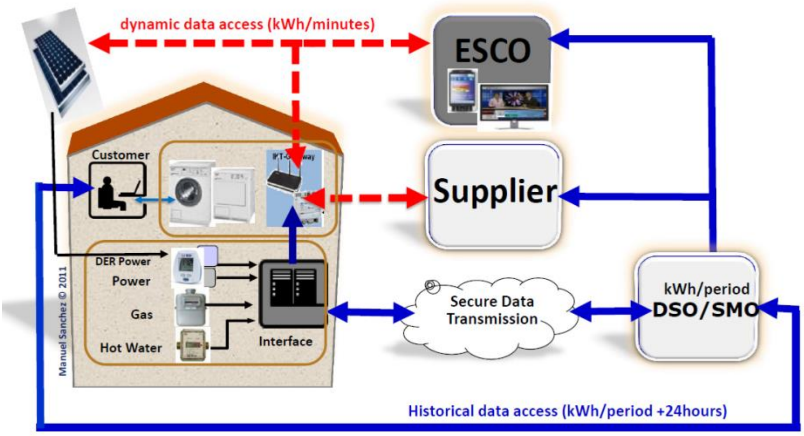


Figure 17 Standards and interoperability. Open model for consumption data flow. An example.

Connectivity and seamless flow of data within the home, and also between the metering infrastructure and the services platform, requires real time delivery of data and information (dynamic data flows) to consumers (directly to their in-home management systems, or to online visualisation platforms, smart phones, etc.) or to a third party they may designate. This will enable them to make an educated choice on their energy consumption and/or participate in demand side response schemes. Automation is key in this process, as is the laying out of standardised interfaces and their interoperability for delivering the required information.

Privacy, data protection, and cyber-security are the second challenge that was identified (in COM(2011) 202) for accelerating the deployment of smart grids. At European level consumer personal data, and therefore also that involved in the context of smart metering and smart grids, is protected by the EU's directive on

the processing of personal data. The Directive sets rules on who can have access to personal data, and under what circumstances. The Commission has also put together guidance on data protection and privacy for data controllers and potential investors in smart grids. This is in the form of the Data Protection Impact Assessment (DPIA) Template for Smart Grid and Smart Metering Systems. The DPIA Template is an evaluation and a decision-making tool which helps entities planning or executing smart grid investments to identify and anticipate risks to data protection, privacy and security. It offers guidance to help ensure the fundamental rights to protection of personal data and to privacy in the deployment of smart metering and smart grid applications and systems. The use of the DPIA Template is supported by the Commission Recommendation 2014/724/EU, and is meant to assist the industry comply, in the most cost-efficient manner, with the new legal obligations of the General Data Protection Regulation. A two-year test phase of this Template, as foreseen by the Recommendation, is currently ongoing, and will be completed this year. A growing number of DSOs are involved in this process, covering more than 30% of EU electricity consumers: their feedback will help fine-tune the tool's efficiency and improve its user-friendliness.

Regulatory and market issues are also being addressed within the Smart Grids Task Force. Its earlier work on business model for handling data in smart grid environment was followed up by a recent investigation and the drafting of regulatory recommendations for the deployment of flexibility[16]. Related issues are also the subject of dedicated workshops during 2016, covering demand response and self-consumption, smart homes and building, incentives for innovation, as well as storage and its cost-effective integration in the energy network.

With respect to the smart grids-specific industrial policy and infrastructure, the Task Force has also dedicated expert groups that look into these issues. It is under this umbrella that the JRC has undertaken, and is currently updating, its inventory of smart grid projects. The infrastructure expert group of the Smart Grids Task Force has developed a methodology for assessing smart grid projects of common interest (PCI) which was used for the first two calls of the trans-European energy infrastructure regulation put in place to help create an integrated EU energy market. The PCIs are considered essential projects for completing the European internal energy market. PCIs could potentially qualify for access to financial support totalling €5.35 billion from the Connecting Europe Facility from 2014-2020. The current second Union list includes three smart grid PCIs. A third call, for which the aforementioned assessment methodology is being refined, is currently ongoing.
Smart grids are key for delivering our climate and energy objectives. The Commission is therefore encouraging project promoters to stay mobilised and use every financing opportunity available to deploy smart grids, and help enhance the overall system benefits, deliver innovative services and empower consumers, on the way to a secure, sustainable and affordable energy for all.

[16] Deliverable of the smart Grids Task Force can be found at the following link: https://ec.europa.eu/energy/en/topics/markets-and-consumers/smart-grids-and-meters/smart-grids-task-force.

2.5 Fifth presentation. The Apulian background - sustainable energy and smart grids

Speakers:

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The power point presentation can be downloaded from the SP3 platform, in the section dedicated to the events. (http://s3platform.jrc.ec.europa.eu/s3-platform).

Title

The Apulian background – sustainable energy and smart grids

Abstract:

The Apulia region is a net exporter of electricity, with a surplus of +91% in 2014. From year 2000 to 2014, RES production in Apulia rose by a factor of 29 while in Italy the growth factor was 2. In 2014, about half of the regional electricity needs was covered by RES. This new scenario has a high impact on the performance of the regional power grids.

ARTI is involved in one project concerning smart grids: the Ingrid Project. This is a European R&D project co-funded by the 7thFP; it combines the recent advances in Smart Grids and hydrogen-based energy storage to match energy supply and demand, and optimise the electricity generated by intermittent RES while ensuring security and stability of the distribution network.

Keywords:

Smart grids, Apulia, ARTI, Puglia, INGRID, RES, GRID

Project details

Project Name: Ingrid - High-capacity hydrogen-based green-energy storage solutions for grid balancing

Website of the pilot project: www.ingridproject.eu/

Web Portal: www.ingridproject.eu/

Call ID: 296012

Reference: massimo.bertoncini@eng.it

Started: July 2012

Duration: 52 Months

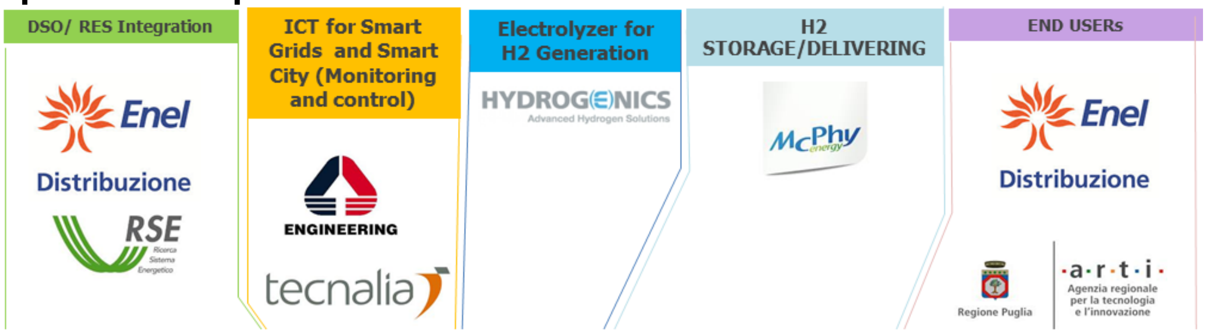
Partners: Engineering, Enel Distribuzione, ARTI – Agenzia Regionale per la Tecnologia e l'Innovazione della Regione Puglia, McPhy, Hydrogenics, BFP, Tecnalia, RSE SpA.

Coordinating institution: Engineering (Italy)

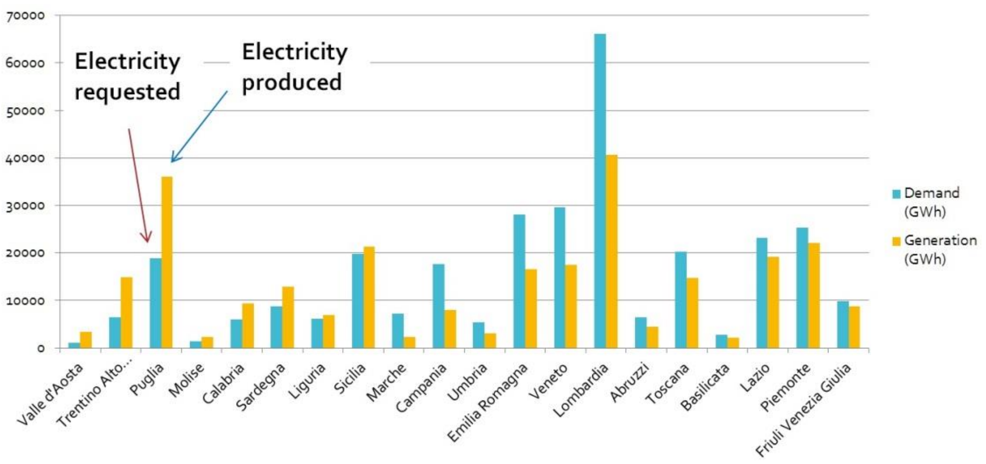
Coordinator: Massimo Bertoncini

Budget: €24 million

Sponsors and partners:



The presentation focuses on two main points: the Apulian energy state of the art and a regional project on Smart Grids called Ingrid. Apulia region is the second electricity producer (after Lombardia) in Italy (Figure 18) and the first exporter since nearly half of the electric energy produced *in situ* is exported (91.4% surplus). This fact has a high impact on the performances of the transmission and distribution grids due also to the fact that a considerable part of the electricity produced comes from renewable intermittent sources (photovoltaics panels and windfarms).



Source: ARTI elaboration on Terna 2014

Figure 18 Energy production and demand at regional level in Italy

Apulia produces 28% of the entire Italian wind production and 16% of the PV one (first region for PV installed capacity). In 2014, the share of RES on the

electricity produced amounted to more than 25%. Although in 2000 the Apulia region's RES production was considerably far from the Italian average, data from 2014 show that, in about ten years, such level of installation was achieved and surpassed: 56.1% of regional electricity demand was covered by RES production (compared with the 41.5% of the national level).

In 2008-2013, Apulia's end users invested 450 million € on energy efficiency thanks to tax deduction incentives. In 2015, it was the second Italian Region for Energy Efficiency Certificates issued, and the fifth Region for energy efficiency operators (301 licensed ESCOs).

As mentioned, then, the Apulia region is a big exporter of electricity in Southern Italy; this has an important impact on the transmission grid especially, in terms of congestions.

Figure 19 shows the congestion-prone areas at different voltage levels in some regions of the south of Italy. The city of Brindisi - where conventional plants are located and electricity is sent to the north (Bari) and to the south (Salento region) – is experiencing these problems severely.

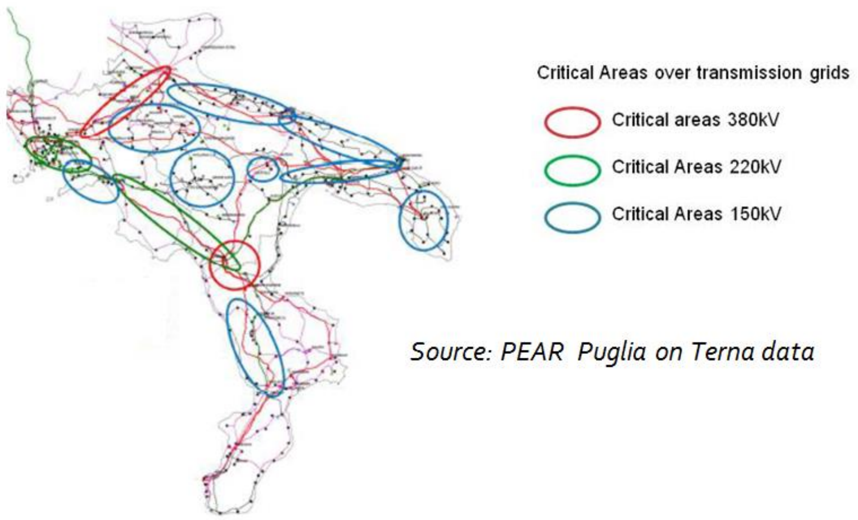


Figure 19 Congestion at different voltage levels in some regions of the south of Italy

Congestion problems are also common at the interconnection with Campania region. A different type of problem experienced in the region is the presence of large areas where reverse flows exist. Reverse flows indicate the fact that electricity is flowing from the distribution grid (lower voltage levels) to the transmission (higher voltage levels). The areas interested by these issues are those where a higher concentration of renewable sources is installed (the Foggia and Salento area).

The Italian Burden Sharing sets, for each Region, a specific objective in terms of ratio between RES production and gross final energy consumption. For the Apulia region, this target corresponds to 14.2 %. The estimated value to be

reached for 2016 is 11.9%, which is not very far from the 2020 target (Figure 20).

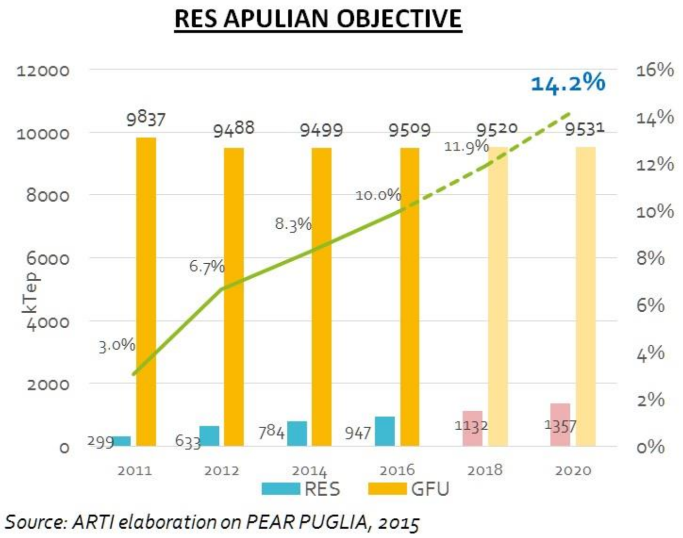


Figure 20 Apulia's objective for RES production/gross final energy consumption

In the Regional Operation Programme (ROP) there are many resources that can be used to act on the sustainable energy and on the quality of life. In particular more than 100 M€ will be used to reduce energy consumption and to integrate RES in the public buildings. But there are a further 15 M€ targeted at increasing the share of energy demand covered by distributed energy systems through the development of smart grids.

Among the several projects on which ARTI is collaborating, there are the AlterEnergy project, focused on sustainable communities, and the Ingrid project, which will be detailed in the following.

The Ingrid project is an R&D project founded by the FP7 programme with a total budget of 24 M€. It combines the cutting edge in ICT technologies with hydrogen-based energy storage. The challenge is to optimise the electricity generated by intermittent RES while ensuring security and stability of the distribution network, but also to demonstrate under which regulatory and market conditions hydrogen storage can be feasible.

The situation is the following: RES produce electricity which through the grid is sent to an electrolyser. The hydrogen produced at this stage is then stored into a solid state hydrogen storage unit. At this stage there are three main options: *i)* the storage unit is transported through trucks to the destination; *ii)* hydrogen is converted once back into electricity by fuel cells and injected in the grid when needed (e.g. for charging EVs); *iii)* the hydrogen is injected into the gas pipelines (power to gas technology).

ARTI has realised a web tool to virtually visualise the functioning of the INGRID demonstrator[17]. The INGRID's systemic approach aims at providing solutions in several fields as hydrogen, electrical mobility, as well as - virtually - heat, especially in a region as Apulia which relies on import of gas for heating. The INGRID project contemplates the construction of a demonstration plant, located in the Troia Municipality, in the province of Foggia. The power reverse flow in Troia is the highest among the regional primary substations (62%) (Figure 21). This effect is mainly due to the fact that the small village of Troia cannot absorb the wind turbines' huge production.

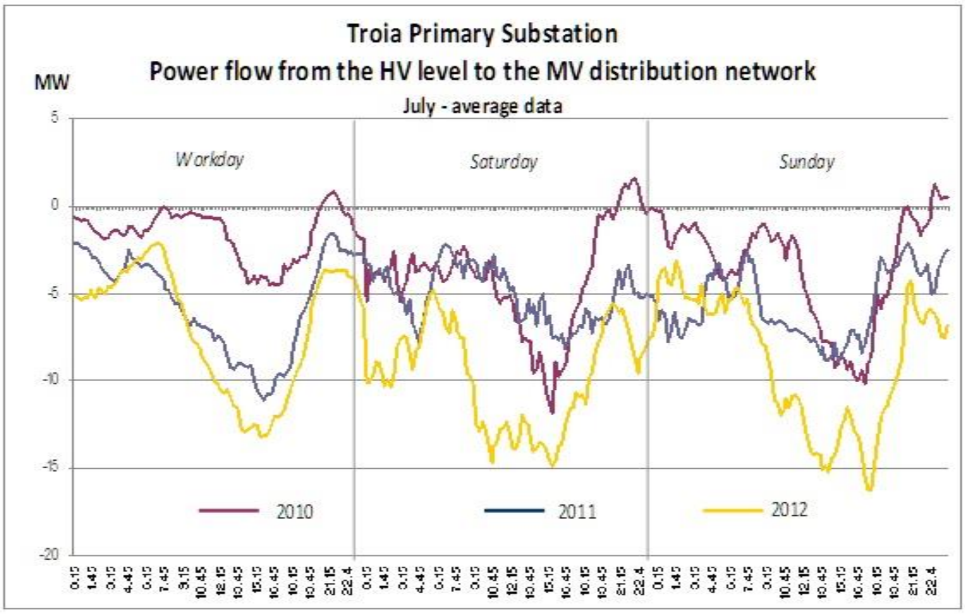


Figure 21 Detail of the INGRID project

The civil work started in April 2016 and the project will close the demonstration phase in spring 2017. In sum: until less than 10 years ago, RES were considered by several experts a market niche, and an expensive way to produce energy. In 2015, however, the World RES capacity surpassed 600 GW, six times the value foreseen by IEA in 2000: the actual potential of RES, then, was highly underestimated. In Apulia, the PV installed capacity has reached 2.490 MW, 16 times the objective of the PEAR of 2007 (150 MW for 2016): this result can hardly be underestimated.

The world is changing, and Apulia is keeping up. Smart grids play a key role in this transformation. Let us conclude with a quote for president Barack Obama: '*A nation that can't control its energy sources can't control its future*'.

Q&A session 1

Alessandro Rubino (Nature Energy Editor) stated that the list of applicable legislation for smart metering and smart grids is rather lengthy, which can be

[17] http://www.virtualereale.com/vr.html

seen as positive or negative depending on the perspective. Furthermore, he asked about the level of implementation of this legislation and of available standards in Europe (especially in countries which are more active on smart grids), and about which kind of regulatory 'recipe' could be exported outside Europe.

Constantina Filiou clarified that the currently available legal framework is not smart grids-specific, but includes some provisions related to smart grids. Only two Recommendations, one Communication, and one Report by the Commission specifically target Smart grids and smart metering.

Concerning the level of implementation in EU Member States, Mrs Filiou noted that the respective legislative provisions are enforceable in all Member States and constitute part of their legal order. Taking the example of smart metering and looking at what is happening in the field, there are variable degrees of commitment and intentions for deployment in the different Member States. According to the Electricity and Gas Directive, the roll-out may be subject to an economic assessment of the long-term costs and benefits to the market and the individual consumer. Following, in most cases, such an assessment, Member States have decided if they desire a large-scale deployment; understandably, the degree of commitment to smart metering deployment varies from Member State to Member State. Furthermore, 'first movers' are already considering the next phase; one of pioneers, Italy, will soon be deploying the second generation of smart meters, while others have not even started yet. Looking at Member States' cost-benefit analyses, and given that there are no detailed instructions in the legislation for conducting such an assessment, but only guiding principles in a Recommendation, Mrs Filiou explained that there is divergence in the key assumptions made, and in roll-out parameters used, that affect the outcome of the exercise. Furthermore, some cost-benefit analyses are less elaborated or less inclusive than others, and may not account for certain benefits, for example those related to consumers. It is nonetheless acknowledged that no 'one size fits all' approach is applicable, as starting conditions differ from Member State to Member State, and do influence the roll-out scenarios considered.

The Electricity and Gas Directive also calls on Member States to deploy smart meters for the active participation of consumers, and to ensure the interoperability of these systems within their territory; furthermore, it has due regard to the use of appropriate standards and best practices. Given that neither the concept of 'active consumers' and of 'interoperability' were not defined in the legislation, nor how they could potentially be reached, nor were the respective standards available at the moment of its entry into force, these elements were not sufficiently covered in the field. There is therefore room for improvement and scope for assisting the Member States in rolling out systems that can deliver, in the interest of the consumers and the whole of the energy system, and in line with the intention of the co-legislators. These are activities that the Commission is currently considering as follow-ups, under the umbrella of the market design initiative which is meant, *inter alia*, to deliver a 'new deal' for consumers. This could be a good 'recipe' to export also outside Europe.

The audience addressed Mr. Palazuelos to ask whether, besides the Smart Specialisation Strategy which is an *ex-ante* condition - as stated by Mr. Palazuelos -, there are any assessment mechanisms for *ex-post* phase. This is important given that the implementation is one of the main items on the OECD agenda for Energy, and it is often where things go wrong. Mr. Buhagiar and Mrs.

Filiou concurred to say that investments are not there to the desired extent: another member of the audience addressed them to ask why this is the case, and what should be done to adjust that. A third question regarded consumers: what type of intervention, at what level, has a chance to be effective in supporting their active engagement in the retail market.

Manuel Palazuelos replied that the issue of *ex-post* assessment is crucial, since it encompasses one of the major concerns related to funding. From past experiences it is clear that a follow-up was missing, and no information was available on the changes that were introduced through the project implementation in the regional context of interest. What has been done in this respect has been to embed the *ex-post* in the *ex-ante* conditionality: in fact, one of the conditions in the strategy is that regions that participate need to have a solid evaluation process. Several regions did not receive the EC green light to move to the implementation phase of the project specifically because of their weaknesses in term of monitoring methods. What is expected of regions is in fact a long term smart specialisation strategy, one that may go ahead once the incentives (or just reimbursements) are not there anymore.

Constantina Filiou replied that 'Incentives' is a keyword in her answers too. Regarding investments, a stable regulatory framework that incentivises the roll-out of smart grid solutions needs to be in place to accelerate progress. Smart grids deployment is already happening but not necessarily at the speed or extent we would have liked. To change this, we need to address a number of elements as already mentioned, ranging from technical standards and interoperability to market issues fostering innovation, fair competition and a level playing field. In practice, a stable regulatory framework that guarantees continuity and appropriate incentives for rolling out smart energy grid infrastructure is key for attracting investors. At the moment, the regulatory frameworks in several countries do not appear to give adequate incentives for instance to Distribution System Operators to smarten up their grids; as a consequence, they opt instead for traditional investments (e.g. copper installation). The Commission is currently reflecting on this issue, and will be tabling related legislative provisions under the new market design initiative.

With respect to consumers, the Commission is also looking into how to best provide, under the new market design, the right conditions to enable and incentivise the consumers' active participation in the energy markets. This is the follow-up to its July 2015 communication, tabling ideas on delivering a 'new deal' for energy consumers. A key requirement for supporting the consumers' active engagement is access to the right tools (such as smart metering) that may enable them, in a secure and safe environment, to get accurate and timely information on their energy consumption or generation. This would allow them to manage it better and (should they choose so) participate in demand response schemes and reap the ensuing benefits. This means that an enabling legislative framework should be in place to facilitate such an engagement of consumers, giving them the right incentives for doing so, and leaving it to them to decide on the extent of their involvement.

3. Session 2. Dissemination of innovation and eleven barriers and challenges to eleven new investments. Lessons from implementation cases

Moderator: Mariagrazia Dotoli, Associate Professor of Control System engineering, Politecnico di Bari.

3.1 First presentation. Field experiences of innovation development to industrial implementation

Speaker: Rinaldi Raphael, EU/Transnational Subsidised Programs - Global Infrastructures & Networks, Enel SpA

This presentation was cancelled because of the speaker's inability to attend the event.

3.2 Second presentation. Energy Efficiency Innovation Projects

Speaker: Antonio Sacchetti, co-founder and CEO at Tera Srl

E-mail: antonio.sacchetti@terasrl.it

The power point presentation can be downloaded from the SP3 platform, in the section dedicated to the events. (http://s3platform.jrc.ec.europa.eu/s3-platform).

Title

Energy Efficiency Innovation Projects

Abstract:

The speech dealt with energy efficiency and innovation projects, with special regard to some experiences of TERA in the field of energy efficiency of buildings, which is one of the aspects of the Smart Grids programme. The key part of the presentation described the company's project that won "SME-Instrument Phase 1" call on "Low Carbon Systems" in 2014 and subsequently, with some improvements, allowed TERA to get the Seal of Excellence during SME-I Phase 2 in 2016. SME-Instruments is an interesting programme by the European Commission, as it is the first time that the EC directly and single-handedly finances SMEs. The TERA achievement in the SME-I programme has been possible thanks to the long standing experience of TERA team in R&D ICT projects in the energy efficiency field (one of the most important activities in this framework has been the RES NOVAE project implemented in the city of Bari). Furthermore, it was made possible by the strong market-oriented approach of the company in each R&D project where it has been involved.

Keywords:

Energy efficiency, smart home, buildings energy management system

Pilot project presented

Project Name: BEETA

Website of the pilot project: www.beeta.it

Description

This project, named Beeta, is focused on the end point of the grid, i.e. the final users. In order to have energy efficiency in the buildings, but also in enterprises, it is crucial to employ sensors and activators working in accordance with well-defined criteria. The pillar of this project is technology (smart gateway to be installed at home) but also user-specific information able to engage users over time with the final goals to improve the users' habits as regards energy aspects. The solution interact with users digitally and physically and it allows to release detailed info like: consumption profiling (or production profiling in case of PV plant), classification (absolute or relative), alerts for overloads, peak shaving information, appliance and device faults/derating, specific suggestions for behavioural. Another important feature of Beeta is the integration with FIWARE, the EU cloud platform able to overcome the lock-in issue in the cloud technologies. The system has been tested in the RES NOVAE project. In the framework of such a project the data gathered from field devices have been sent to a service hub where algorithms (developed by Politecnico of Bari, ENEA, ENEL, IBM, and other companies) were running in order to elaborate output for improving energy usage into the public buildings located in the City of Bari and used for the pilot phase.

The project

Antonio Sacchetti is the co-founder and director TERA srl, a SME from Apulia active in the field of Smart Energy, with numerous achievements and funding obtained for R&D projects. He is an electronic engineering graduate from the Politecnico of Bari and has obtained several awards and patents. An entrepreneur since 2007, he started six start-ups and forty innovative projects at national and European level. TERA, in particular, received the EU Seal of Excellence for project proposals "not financed but evidently deserving financing".

His presentation dealt with energy efficiency and innovation projects, with special regard to some experiences in the field of energy efficiency, which is one of the aspects of the Smart Grids programme. He introduced his company, TERA: a knowledge-intensive company, not a capital-intensive one, where the key resource is the work team (designers, R&D engineers - hardware and software -, administrative, marketing and sales people). It is represented in several organisations in the Apulia region, and the team members possess five to twenty years of experience in different fields. The company recently won an important prize in FIWARE (Future Internet WARE), a joint initiative of the European

Commission and some big business players: the so-called Future Internet is one of the topics integrated in the EU energy efficiency strategy.

The company has recently engaged in several dissemination activities, and received some acknowledgement from these. It reached the final tournament at the South Summit competition in Spain and the Best Practice for Innovation prize in Italy, and was included in *100 Italian energy stories*, a publication mentioned by ENEL and by the Symbola foundation at the recent COP21 meeting at the European Parliament. Furthermore, it was selected for the Grid Innovation Investment forum in Stuttgart and for the FIWARE business matchmaking event in Karlsruhe, and finally it was in Paris for a final phase of competition meeting between big companies and SMEs.

The activities performed are based on a broad know-how including ICT, embedded electronics, wireless sensor networks, and some specific competences in the field of energy efficiency (like thermography and others). So, the company is active in several application fields, but has recently concentrated on ICT for the energy efficiency of buildings in residential and small industry applications. The current strategy was based on the exploitation of the results of some previous R&D projects, the key ones being two national and one European project. They were most recently involved in the RES NOVA project with the Politecnico of Bari, which is implemented in a real demonstration site (some of the results were made visible at the workshop in the ENEL showroom).

The key part of the presentation described the project that won the 2014 EU "SME-Instrument Phase 1" call on "Low Carbon Systems". This achievement gave the company a crucial confirmation of the goodness of its business model, which is essential in the case at hand. Indeed, scientific and technical excellence cannot be sufficient for a commercial enterprise: focus on the final market uptake of the involved innovation is also a vital part of the endeavour. Furthermore, as already recalled, the second phase of the project was recently awarded the EU Seal of Excellence: an interesting programme by the European Commission, as it is the first time that the EC directly and single-handedly finances SMEs. This programme, derived from a US programme of the previous decade, is strongly focussed on bringing concrete change to society through innovation.

At the moment, the company's main project is a Smart Gateway named BEETA. This project concentrates on the end point of the grid, i.e. the final users, which is where its greatest importance lies. In order to have energy efficiency in the buildings, but also in enterprises, it is crucial to employ sensors and activators working in accordance with some predefined criteria.

As can be noticed, the project mainly concerns the final energy use, and involves monitoring first and then activation: a smart gateway is relevant in order to benefit automatic activation, but also from the modification of the final consumer's behaviour. A smart gateway, therefore, needs to collect information from different sensors with different protocols, and be interoperable with

different utilities or energy providers and distributors. This is the great challenge, as was already pointed out in previous presentations. Other TERA projects in the field of energy efficiency include a hydraulic power transmission control system and a small-scale demonstration pilot to accumulate PV energy in electrochemical batteries and through the production of hydrogen: a sort of small-scale version of something the Apulia region is doing with other partners in bigger projects.

Therefore, smart gateways may find employment at home (whereby design also needs attention) or in industry. This implies several communication protocols, remote upgrading, and cloud enabled: the latter is also an important feature on which the company benefits from the EC programme FIWARE not only financially, but also as regards what was properly the mission of this programme, i.e. techno-economic features of the Future Internet: in particular, how to avoid being locked in to some provider of cloud services. This is a great problem in the EC: by the day, services are going to be more and more cloud-based: there is room for debate on the advantages and risks of this, but it is a direction that it is not possible to avoid. Hence, it is vital that the kind of gateways we will see in our houses in the future will be interoperable with sensors and activators, but also capable of storing the data on a cloud structure that ensures data privacy and security, but also allows for the possibility to switch suppliers.

The pillar of this project is technology, to be sure; but also user-specific information, the capacity to provide users with insights, since one of the final goals is to *change* the users' habits. Over time, user engagement will be the final challenge. It is easy to imagine, in fact, that one may start using the new technology for energy efficiency of the buildings, and then abandon it: the real problem is how to engage the user in the long term. To this end, he needs to be endowed with actually useful and correctly provided information. The smart gateway allows to release detailed consumption/production profiling, classification (absolute or relative), alerts for overloads, peak shaving information; appliance and device faults/derating, specific suggestions for behavioural changes (i.e. set points), and also tariff profiles information. The latter, in particular, may not be well received by distributors, and suppliers, but is nonetheless important.

The company came to elaborate the BEETA project based on relevant previous experiences. One of the most important is the energy box implemented for the RES NOVAE project in Bari, involving management of several kinds of sensors and activators as per the following picture (Figure 22).

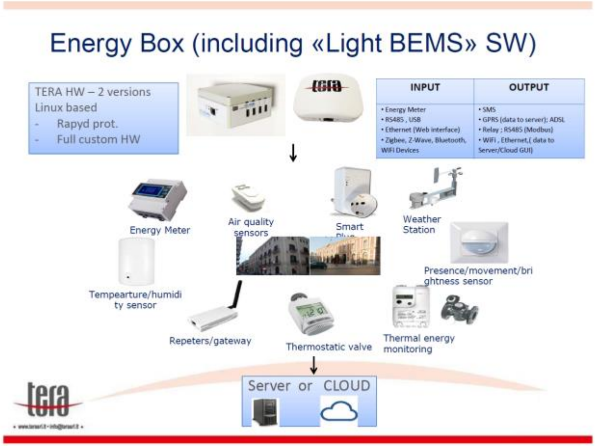


Figure 22 Energy box implemented for the RES NOVAE project in Bari

In this project, the data are sent to some service hub where algorithms (developed by Politecnico of Bari, ENEA, ENEL, IBM, and other companies) are elaborating the final system decisions. This regards specifically public buildings, as shown in the following pictures (Figure 23 and Figure 24): hence sensors of different kinds, activators in different rooms and environments.

Figure 23 Energy box (large scale facilities)

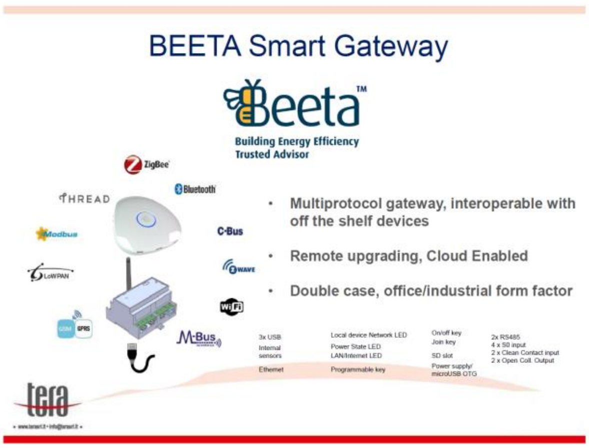


Figure 24 BEETA smart gateway

Other examples of the involved functionalities are electrical power energy monitors, photovoltaic power production monitoring, thermal power, the functionality of the smart thermostat; in the future also energy storage monitoring. A further topic is Demand Response, which is still underdeveloped in Europe. In the US they are already working commercially on this, so the possibility to have Demand Response (DR) is already *active*; it is anyway good to have this target for Europe, as it would enable peak shaving and active load balancing. As can be seen, the functionalities in terms of energy efficiency in the final usage of the building are strictly connected to the general topics of Smart Grids (Figure 25).

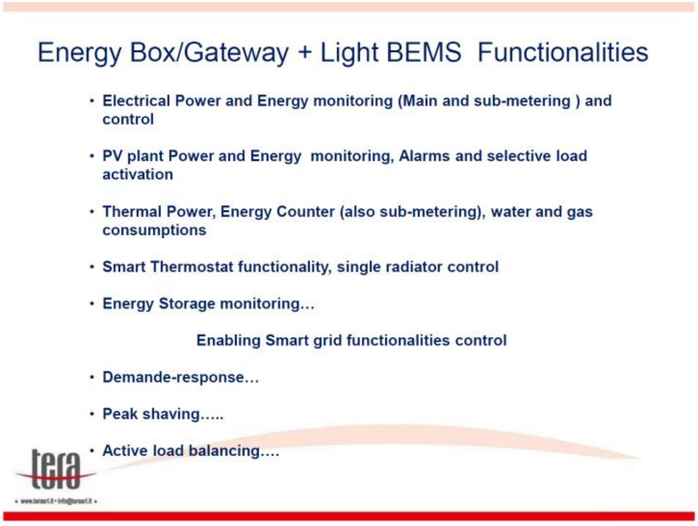


Figure 25 BEETA smart gateway & Light BEMS functionalities

Several kinds of algorithms are available within these projects: the following (Figure 26) is just a very simple example to control the air conditioning system, which allows it to be not only affected by the temperature but also by the presence of people inside the room.

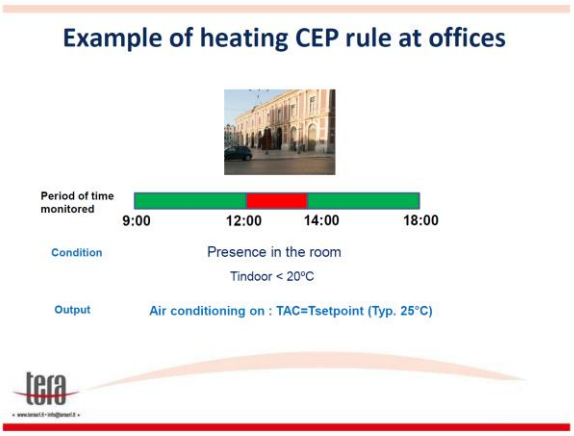


Figure 26 Example of heating CEP rule at the office

A project already which is already up-and-running is related to the specific topic of PV monitoring: however, this is representative of the company's experience in general energy efficiency, and not only in PV. It is worth spending a few words about this pilot. The original part built by the company is the central box (Figure 27).

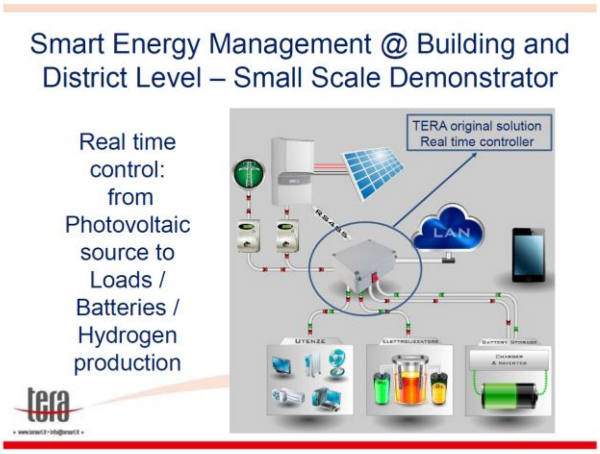


Figure 27 Smart Energy Management at boiling and district level

From this example, one may easily imagine the benefits from the intelligent management of the energy coming from a complex situation with a grid (hence, not off-grid but on-grid), PV plants, loads, electro-chemical batteries, storage, along with hydrogen production which may be stored inside boxes but can even be directly injected into the [gas] grid (like in the example shown in a previous presentation): so, Power-to-Gas implies competence on, and interaction with, another system i.e. the conversion of hydrogen into methane. As can be seen, then, a variety of options are available: in other words, "Smart Grids" is not only an expression to be used for commonness: there really are a lot of possible solutions. In this pilot project, the dashboard and the management system to set the threshold were also implemented, so that if PV production exceeds loads by one first threshold, for example, one may decide to store the excess in batteries; by another threshold, to activate electrolysers and produce hydrogen. The last short example of real project about energy efficiency does not regard Smart Grids, but may nonetheless testify the company's engagement within the broader context of energy efficiency: it consists in modernising the usage of the classical engine through a control system that will balance energy use by modulated hydraulic pumps, so to avoid pollution and allow 30% consumption reduction also in applications not strictly connected to the buildings (Figure 28).

Figure 28 HPT controller

The bottom line is that, in the field of smart energy (Smart Grids), it is possible even for SMEs to come up with innovative projects and – vitally for a commercial enterprise – gain positive market uptake of their products or services. Once again, this aspect is fundamental for an enterprise like TERA Srl: even when its projects involve R&D collaborations with third parties like universities, before starting a research project a company has to have clear in mind what the possible market impacts are.

What TERA has reached by now, however, is not an end point but a starting point. One has to keep an eye on the future of this specific field: from previous presentations, for instance, it was evident just how complex the relevant regulatory issues are. But complexity is really a defining feature of the world of Smart Grids, since the various actors (distributors, consumers, etc.) have starkly different points of view. As a consequence, careful attention should always be paid to the direction one may want to go (e.g. entering niche or larger markets); and, most importantly, to the overarching question of why the final user should pay something for you.

3.3 Third presentation. Innovative H2 Solutions to Move Towards Clean & Smart Territories

Speaker: Diana De Rosmini (Mc Phy)

The summary of the presentation is not available. Power point presentation can be download form the SP3 platform, in the section dedicated to the events. (http://s3platform.jrc.ec.europa.eu/s3-platform).

4. Session 3. Best practices from pilot projects in smart grid development (Part I)

Moderator: Domenico Laforgia, director of Department of Economic Development, Education, Training and Employment, Apulia Region.

4.1 Case I Turkey. Wind Energy in Turkey and Cost Benefit Analysis of Wind Turbines in Smart Grid Systems

Speaker: İlhami Çolak, Prof. Dr. Vice Rector and Dean of Engineering and Architecture Faculty at Istanbul Gelişim University

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http://w3.gazi.edu.tr/~icolak/english.htm

The power point presentation can be downloaded from the SP3 platform, in the section dedicated to the events. (http://s3platform.jrc.ec.europa.eu/s3-platform).

Title:

Wind Energy in Turkey and Cost Benefit Analysis of Wind Turbines in Smart Grid Systems

Abstract:

Smart grids have been very popular and own a grooving market in the World recently for the numerous benefits that they provide. Among those the possibilities of integrate renewable energy, and in particular of wind energy, by smart grid technologies are well known by the energy community. Turkey has the highest wind energy capacity in the Europe. This study examines the cost-benefit analysis of the wind turbines in Turkey and different types of wind turbines used. The study is extended to the consideration of the efficient operating life of turbines and annual average operating capacity factors. The study concludes with some outcomes about cost benefit analysis of future wind turbines in the smart grid systems.

Keywords:

Wind turbines, cost benefit analysis, smart grid, wind energy in Turkey.

The project

The global warming issue has led to discover the importance of renewable energy. National and international policies intensively support renewable energy. The unit cost of energy is higher for renewable plants than for conventional plants; however, governments provide incentive & cost based tariffs to support renewables. Cost-benefit analyses give us an idea about the acceptability of any renewable energy plant.

The topic of the presentation is wind energy in Turkey, and the cost-benefit analysis of wind turbines and Smart Grids applications. This will cover the development of wind energy in Turkey, some facts about wind energy

applications (capacity, wind turbine brands, wind turbine components, cost benefit analysis of turbines like comparison of different wind turbine models, efficient operating lifetime, capacity factors), and the adaptation to Smart Grids.

Total installed capacity in Turkey is now 73,147.6 MW (end of the year 2015). That includes hard coal (9,023 MW), imported coal (6,064 MW), natural gas (21,222 MW), fossil resources (4,326 MW), and hydro (25,877 MW). Wind energy is only 4,498 MW. Furthermore, we have geothermal (623.9 MW) and solar energy (585 MW under operation) (Figure 29). Source-based electricity production rates by the end of year 2015 are given in the pie chart below.

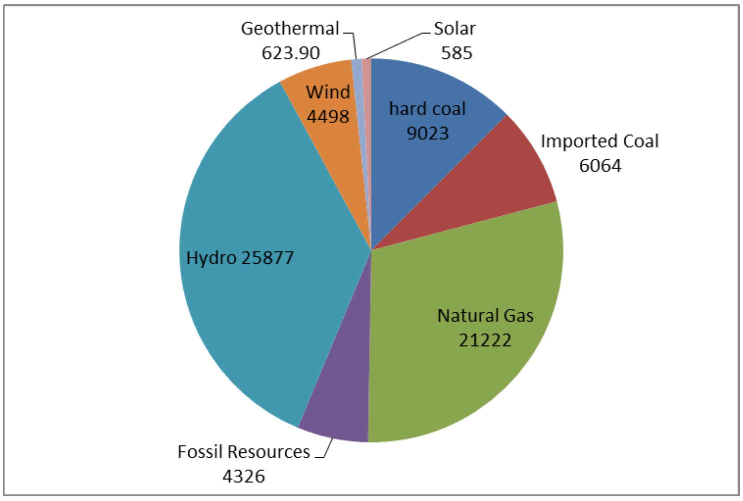


Figure 29 Capacity mix in Turkey. Source: Turkish Ministry of Energy&Natural Sources.

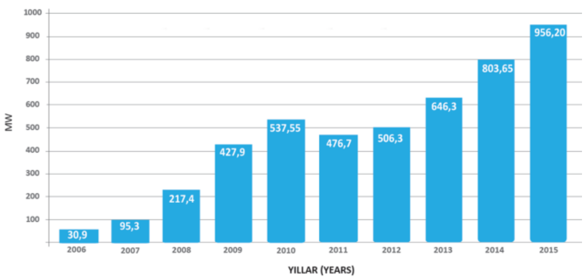
The biggest sources are hydro power and natural gas, the third is coal: renewables are very small compared to the other sources. Turkey installed wind power capacity represents only 6% of the total capacity, at just above 4.7 GW. The capacity under construction is still 1.9 GW, waiting to join operation. Turkey is increasingly turning to Renewable Energy Sources to improve its energy security, and it seeks to generate 30% of its electricity from renewable energy (including wind, solar and hydro power) by 2023. Turkey's best wind resources are located in the provinces of Çanakkale, İzmir, Balıkesir, Hatay and Manisa. As of the end of 2013, the Aegean region had the highest installed wind capacity with a total of 1,600 MW, followed by the Marmara region with 1,517 MW and the Mediterranean region with 543 MW.

One of the objectives set out in the 2009 Electric Energy Market and Supply Security Strategy Paper for Wind Energy is to reach a total installed capacity of 20 GW by 2023. The Turkish Wind Energy Association has been publishing the Turkish Wind Power Plant Atlas of Turkey twice every year. The updated atlas - i.e., the 2015 end-of-year version - is given in the following figure: as you can see, all the wind energy generation capacity is in the western part of Turkey (Figure 30). As for support of wind energy, Turkey's Renewable Energy Law (No. 5346, dated 18th May 2005) was amended in December 2010 and the notification was issued on 8th January 2011. After the amendment of the law, the feed-in tariff was set at USD 7.3 cent/kWh (EUR 5.4 cent) for wind power for a period of ten years, and will apply to power plants coming into operation before 1st January 2016. In 2014, an 11.65% increase in wind production enabled Turkey to pay $850 million less for natural gas (Turkey uses almost half of its natural gas imports for power generation).

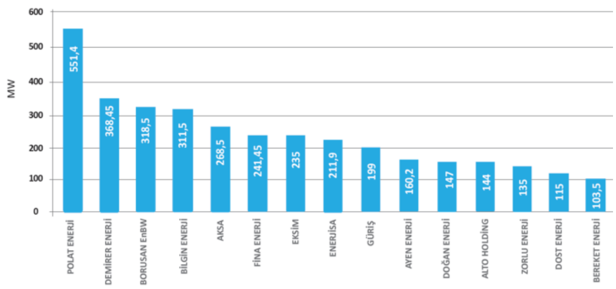
Figure 30 **Localisation of the wind energy generation capacity in Turkey**

With respect to the outlook for 2015 and beyond, the Turkish Wind Energy Association expected the market to reach an installed capacity of 5,000 MW by the end of 2015, a target that was met. Turkey's national Transmission System Operator expects annual installations to reach 1,000 MW per year from 2014 onwards. Currently, Turkey has one of the biggest on-shore wind markets in Europe with an eleven GW pipeline of wind power projects; this figure could be as high as twenty GW in the next ten years. The wind power plants under operation in several regions are shown in the slides 12 and 13 of the power point presentation, and there are more projects in the pipeline.

In fact, the annual installations for Wind Power Projects (WPPs) in Turkey (Figure 31) are growing dramatically: in 2015 their value was almost 1,000 MW. The increase can be seen per year, and the big jumps come between 2013 and 2015, with an increase ratio around 27% and 25% resp.



(a)



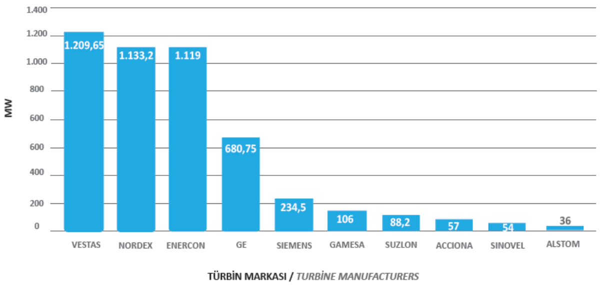
(b)

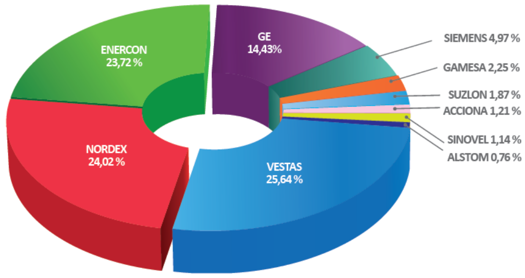
Source: Turkish Wind Energy Association, Wind Energy Statistics Report, January 2016

Figure 31 **Annual Installations for WPPs in Turkey(MW) (a). Investors According to operational wind power plants(%) (b).**

Investors per installed capacity for operational wind power plants in MW (**Error! Reference source not found.**) are given in slide 16. As you may notice, there are several different companies: the first one is Polat Enerji with 551.4 MW.

Investors according to operational wind power plants (MW) still see the latter as the biggest company in the first column of the graph below.





(a) (b)

Figure 32 Turbine Manufacturers by Installed Capacity for Operational WPPs (MW) (a). Turbine Manufacturers by Operational WPPs (%) (b).

Source: Turkish Wind Energy Association, Turkey Wind Energy Statistics Report, January 2016.

Among the turbine manufacturers, Vestas, Nordex, Enercon and General Electric are the first four, while Siemens is coming as the fifth one (Figure 32 by MW and **Error! Reference source not found.** by %).

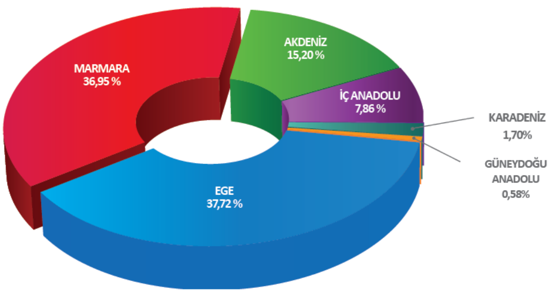
The wind energy power installed capacity per region ((a)

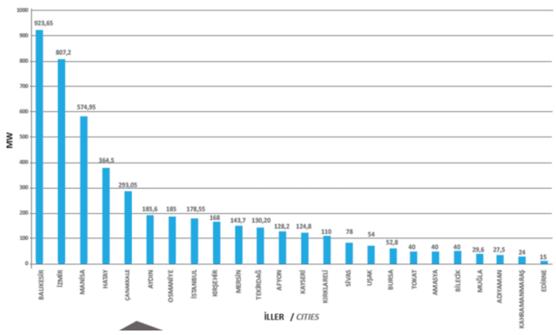
(b)

Source: Turkish Wind Energy Association, Wind Energy Statistics Report, January 2016

Figure 33) is reported as follows: the set features the Aegean region, Marmara, the Mediterranean, Anatolian and Black Sea regions and the southern part of Anatolia. The Aegean region comes in first, with the Marmara region ranking second.

The cities according to installed capacity for operational WPPs in MW are given here below (**Error! Reference source not found.**). The first city is Balıkesir, İzmir is the second, Manisa the third, then Hatay, and others.





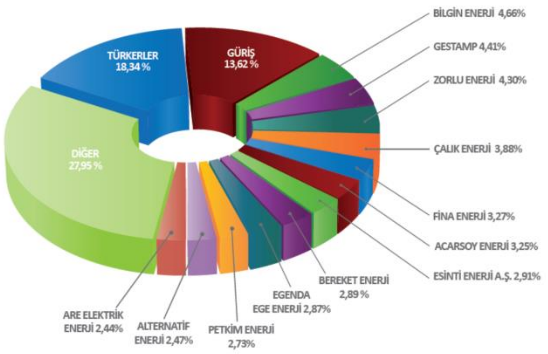
(a) (b)

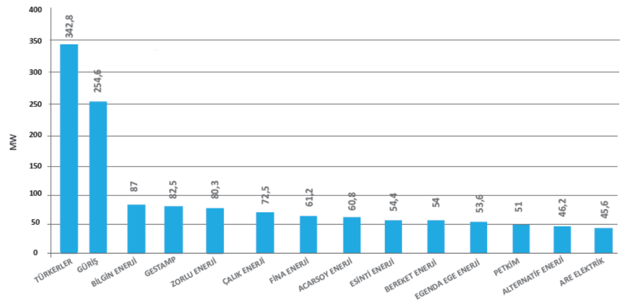
Source: Turkish Wind Energy Association, Wind Energy Statistics Report, January 2016

Figure 33 Regions According to the Installed Capacity of Operational WPPs (%) (a). The cities according to installed capacity for operational WPPs in MW (b)

Slide 24 of the power point presentation presents the wind power plants which are under construction, but not in operation at the moment: it is visible that several plants of both big and small size are under construction.

Among the biggest investors in terms of % of capacity of WPPs under construction (Figure 34) Türkerler has the highest ratio, among the other companies alongside. Among the investors ranked according to capacity of WPPs under construction by MW Türkerler is again the first one (**Error! Reference source not found.**).

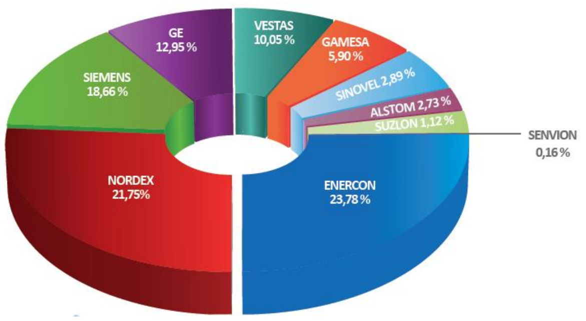


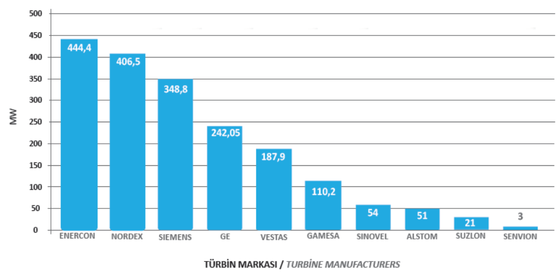


(a) (b)

Figure 34 Investors According to capacity for WPPs Under Construction (%) (a). Same data (MW) (b).

Turbine manufacturers according to the percentage of WPPs capacity under construction are given in the next pie chart, and again Enercon and Nordex are the first two big companies (Figure 35 and **Error! Reference source not found.**).



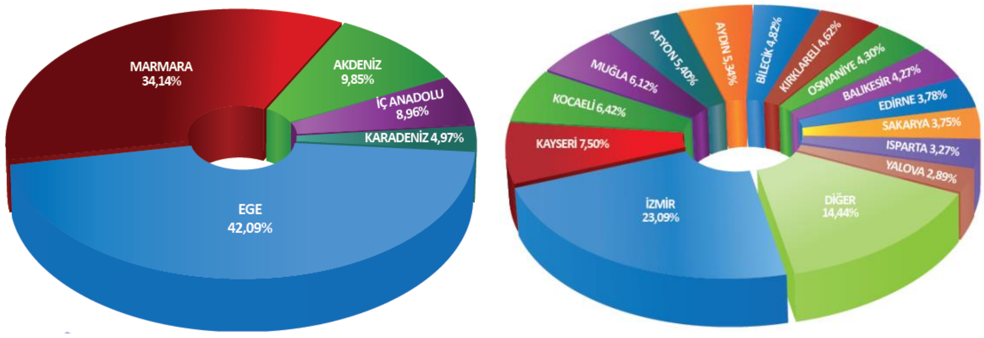


(a) (b)

Source: Turkish Wind Energy Association, Wind Energy Statistics Report, January 2016

Figure 35 Turbine Manufacturers According to capacity for WPPs Under Construction (%) (a). Turbine Manufacturers According to capacity for WPPs Under Construction (MW) (b).

Among the regions by percentage of installed capacity for WPPs under construction (Figure 36) the Aegean region contains almost half (42%) of Turkey's wind capacity. instead, presents cities according to capacity for WPPs under construction (%): İzmir accounts for 23%.



(a) (b)

Source: Turkish Wind Energy Association, Wind Energy Statistics Report, January 2016

Figure 36 Regions According to the Installed Capacity for WPPs Under Construction(%) (a). Cities According to Capacity for WPPs Under Construction(%) (b).

One may proceed to the classification of wind turbines currently used in Turkey. The most frequently installed brands are Siemens, Enercon, Nordex, and Vestas. The most frequently installed wind turbine products of the Enercon series in Turkey have been classified in the next figure, and a comparison has been set out. The turbines mainly differ in their rated power (kW), rotor diameter (m), rotational speed (rpm), and capacity factor (%). In slide 35 one may find the most frequently used products of Enercon in Turkey. Power ranges from a minimum of 900 KW (E-44) to a maximum of 3 MW (E-82).

The most used product of SIEMENS series in Turkey is the SWT-101. Here, powers are ranging from 2.3 MW up to more than 3.2 MW.

The list below (**Error! Reference source not found.**) displays the SIEMENS Wind Projects in Turkey: it shows the number of wind turbine generators, the total capacity, the scope, and the status: most of them are now in operation, but others are executed, or sold to another company.

Project Name	Turbine Type	Number of WTG	Total Capacity	Scope	Status
Mahmudiye	SWT-2.3-101	13	29.9MW	WTG+E-BoP Supply	In operation
Dagpazari	SWT-3.0-101	13	39.0MW	WTG+E-BoP Supply	In operation
Dinar	SWT-2.3-108	22	50.6MW	WTG+E-BoP Supply	In operation
Dinar-2	SWT-2.3-108	12	27.6MW	WTG+E-BoP Supply	In operation
Balabanli	SWT-2.3-108	22	50.6MW	WTG+E-BoP Supply	In operation
Dinar-3	SWT-2.3-108	16	36.8MW	WTG+E-BoP Supply	In operation
Zeliha	SWT-3.0-113	8	24.0MW	WTG+E-BoP Supply	Sold/In execution
Kanije	SWT-3.2-113	20	64.0MW	WTG+E-BoP Supply	Sold/In execution
Fatma	SWT-3.0&3.2-113	25	77.4MW	WTG+E-BoP Supply	Sold/In execution
Kinik	SWT-3.2-108	17	54.4MW	WTG+E-BoP Supply	Sold/In execution
Bereketli	SWT-3.2-113	10	32.0MW	WTG	Sold/In execution

Table 2 SIEMENS Wind Projects in Turkey

A further company used in Turkey for wind turbines is Nordex. There are three models of it: N90, N100, and N117. Their power is ranging from 2.5 MW to 3.3 MW.

The project specifications of Nordex are: installed capacity (42.5 MW), allotted to seventeen wind turbines. The site is about 18 km south of Pergamon, where the wind speed ranges from 8.5 to 9.5 m/s. Further details are presented in slide number 40 of the power point presentation.

Vestas is another company whose products are employed in Turkey. The most used products are V90, V100, and V112, whose power is ranging from 2 MW to 3.3 MW.

The CBA for wind turbines has been carried out taking into account the the social cost benefit analysis and the financial cost benefit analysis. There are mainly three ways of evaluating CBA: Benefit/Cost ratio, Net Present Value (NPV), and Internal rate of return (IRR).

The aspects affecting the analysis of renewable energy technologies can be summarised in: location of the plant, type of renewable energy, technology status, government involvement, availability of technical staff, economic considerations, overall objective of installation, climate conditions, risk of natural disaster.

As for the basic cost of wind energy, approximately 75% of the total cost of energy for a turbine is related to upfront costs such as the cost of the turbine itself, foundation, of the electrical equipment, and of the connection to the grid. Cost outflows are represented by capital cost of plant, annual maintenance cost, unwanted and extra investment, while inflows include the benefit of selling energy, the social benefit of supplying electricity to rural areas, the benefits from carbon credit, the commitment to ward green development, and the high rate of return to supporting renewable energy. The cost of the system is composed of land lease cost, turbine installation cost, electrical network upgrading cost, cost of additional reserve requirement, component life maintaining cost, and operating cost. The benefit of the system flows from the capacity benefit, carbon

credit, fuel saving, social empowerment and, with proper design, multifunction land utilisation.

The following table (**Error! Reference source not found.**) shows one example of the cost of one turbine, and it is the example of a pilot project which is around more than 71 million euros. As shown by the cost distribution, a big [piece of the] pie goes for the turbine.

	INVESTMENT (€1,000/MW)	SHARE OF TOTAL COST %
Turbine (ex works)	928	75.6
Grid connection	109	8.9
Foundation	80	6.5
Land rent	48	3.9
Electric installation	18	1.5
Consultancy	15	1.2
Financial costs	15	1.2
Road construction	11	0.9
Control systems	4	0.3
TOTAL	**1,227**	**100**

Note: Calculated by the author based on selected data for European wind turbine installations

Table 3 Typical 2 MW Wind Turbine Costs

The outcomes of the 55 MW wind Project can be summarised as follows:

- the operation time 3000 hours per year,
- the lifetime of the turbine is 30 years,
- The power plant generates 155 million kWh of electricity per year and it meets the annual need of 77.500 people.
- Also it reduces 98.500 tons of emission each year

The wind turbines are compared according to: produced power, lifetime, operation and maintenance, capital cost, interest rate, full hours, capacity factor, etc. The benefits of wind turbines are displayed below (Figure 37)

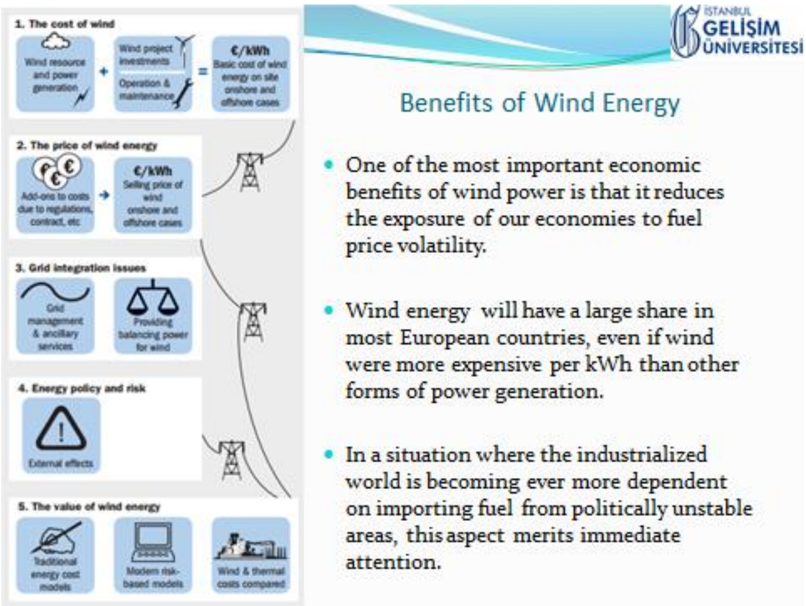


Figure 37 Benefits of wind energy.

The advantages of wind power are the following: after installation, the only cost is maintenance; wind is renewable, it is available everywhere to some extent, it entails no pollution and a simple design; the supply of wind energy cannot be controlled by anyone, and wind farms make it profitable. The disadvantages are that it is expensive to set up, it requires custom products, that wind speed varies a lot, and that the environmental impact from manufacturing turbines can require large areas of land. A very well-known aspect, therefore, is that we have to connect this renewable energy source with the communication system to make it smarter. What is then the benefit of making it smart? The cost-benefit analysis of Smart Grid systems will satisfy the energy need in Turkey by providing energy more efficiently and in an environmentally-friendly manner. Without knowledge of the costs and benefits of renewables, it is difficult to draw a roadmap for the country's renewable energy technologies. The benefits of Smart Meters consist in CO_2 reduction and fuel savings. The costs are due to installing the Smart Meters, the integration of renewables, to updating the infrastructure, and educating the public.

A few references on the presentation:

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2. ENERCON Wind energy converters, Product Overview
3. Wind energy resource assessment of İzmit in the West Black Sea Coastal Region of Turkey, Serhat Kucukali, Renewable and Sustainable Energy Reviews 30 (2014)
4. Renewable Energy Technologıes: Cost Analysis Series,Irene,2012
5. Çolak, M. S. Ayaz, M. Bilgili, and K. Boran, "Cost benefit analysis of wind turbines in smart grid systems," 2014 16th Int. Power Electron. Motion Control Conf. Expo., pp. 1295–1299, Sep. 2014.
6. The Economics of Wind Energy, EWEA 2012
7. ENERCON, VESTAS, SIEMENS, NORDEX wind turbine datasheets
8. EWEA Annual Statistics, 2015
9. Turkish Wind Power Atlas 2015
10. Turkish Ministry of Energy&Natural Sources Report 2015

Discussion

A question from the audience is on the very ambitious target of 20 GW of wind installed capacity by 2023. Will the target be really reached, and what does it mean for the future of Turkey? Will the country experience high load increase, or maybe export a lot of its wind energy to other countries. This involves high-level decisions towards a more integrated energy sector in Turkey.

Professor İlhami Çolak answers referring to the total installed capacity of Turkey that is now more than 74 GW, but half of it is coming from gas, which is already imported from Russia, Iran, and other countries. Turkey is trying to reduce this amount and turn to wind energy, given the high potential for it in Turkey. The target is that at least 20% of total energy production should come from wind, but total RES generation will be more than 20,000 [MW] by the year 2023. The goal then is to reduce the use of gas for electricity generation because 54% of the electricity (or maybe even more) is produced by gas-fired stations. Turkey represents the biggest wind energy potential in Europe which amounts to more than 11 GW.

4.2 Case 2 Croatia. MicroGRId Positioning

Speaker: Ivona Štritof. Director of the EU and Regulatory Affairs Department of Hrvatska Elektroprivreda (HEP Group)

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The power point presentation can be download form the SP3 platform, in the section dedicated to the events. (http://s3platform.jrc.ec.europa.eu/s3-platform).

Title

Project "microGRId Positioning"

Abstract:

The focus of the presentation was the Project "microGRId Positioning". However, the overall electricity market situation in Croatia was presented, primarily HEP as the incumbent vertically integrated company, with its subsidiaries performing different energy activities. Furthermore, the context of Smart grid efforts, including CBA for smart meters and the information on current smart grid projects was elaborated. After presenting the rationale behind the uGRIP project and its key impacts, discussion on future steps and prerequisites (the aspects of market rules and network regulation, institutional collaboration on the EU level etc.) required for the pilot and demonstration projects in Croatia was given.

Keywords:

HEP, incentive network regulation, institutional collaboration, uGRIP project, smart grid

Project presented

Project Name: uGRIP (microGRId Positioning)

Website of the pilot project:

https://www.era-learn.eu/ and https://www.era-learn.eu/network-information/networks/era-net-smartgridplus/era-net-smart-grids-plus-joint-call-for-proposals/microgrid-positioning

Description

uGRIP (microGRId Positioning) is a 1.11 mil€ ERANET Smart GRIDS+ project coordinated by the Faculty of Electrical Engineering and Computing, University of Zagreb (FER). Partners on the project are German OFFIS and Danish DTU. FER receives a 40% funding for this project by the Environmental Protection and Energy Efficiency Fund. Due to this fact, HEP and KONČAR-KET (a SCADA producer), support the project, therefore it is to believe that the positive spill-over effects will spur the smart grid efforts in Croatia.

The main focus of the project is to strengthen the role of microgrids in active distribution networks. Besides analysing all the microgrid elements and providing optimal operation policies, the project aims to design a distribution-level market for microgrids. This market might be energy market, reserves market or voltage regulation market. On top of this, all the simulations will be verified in an actual Smart Grid Lab at FER. Below list of Sponsors.

The project is supported by funding from the European Union's Horizon2020 under grant agreement No 64603.

The project

HEP is a company with tradition in generating, transmission and distribution electricity for over 120 years. The first hydroelectric power plant was erected one year after the Niagara hydroelectric power plant. Today, half of the installed capacity in HEP's portfolio is in renewables.

Only last year Croatia produced more than 50% of its electricity from renewables. At the moment, Croatia's power system is dealing with all the problems typical of large renewables capacity made of high shares of wind as well as vast amount of distributed energy resources. Additionally, HEP is covering the whole chain of activities (Figure 38), and has capability to develop new business models.

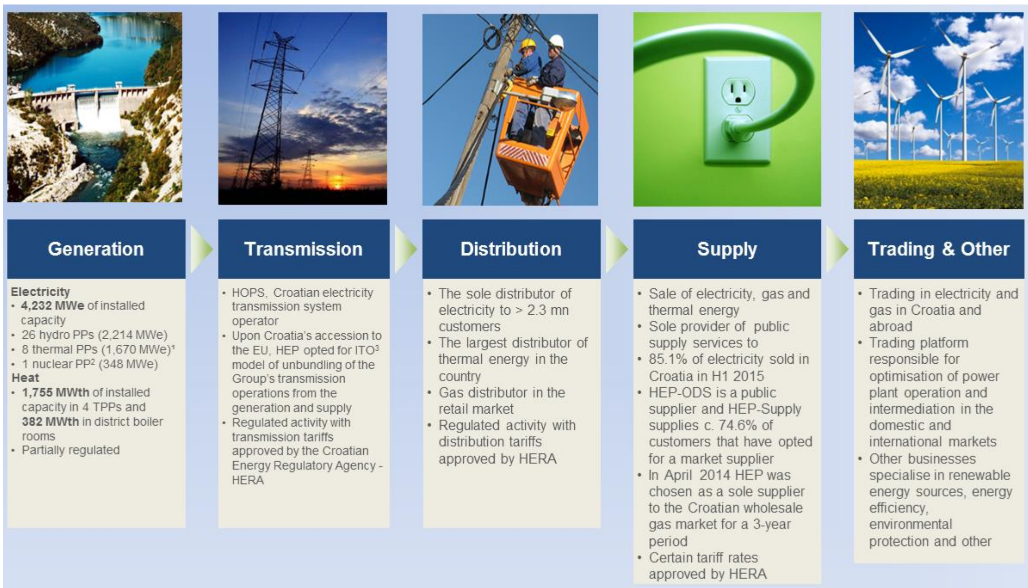

Figure 38 HEP at a glance

Already today HEP's landscape includes electric vehicle chargers that consume energy self-produced through numerous distributed energy resources. What needs to be decided today is how to direct the future, in particular, how to deal with the active consumer to make it a prosumer, a term coming from the fact that the consumer is not anymore only a consumer but a producer, too, and also the one responsible for the storage of energy.

Let us now focus on general framework for the Smart Grid platform in Croatia. A Cost-Benefit Analysis is currently underway for Smart Meters, a precondition for Smart Grid concept in reality. Although the deadline was actually in 2012, still the process is ongoing. The rationale for Cost-Benefit Analysis is obvious, since the average consumption of Croatian households is below 4000 kWh per year. Therefore, based on the results of this CBA, the policy and regulatory framework will be set. However, in this area only a couple of projects are on-going and/or recently completed. Most of the projects deal with micro-grid problems or with electric vehicle chargers. Also, there are three projects on the PCI list. One is the Synchro-Grid project, a common endeavour between the Croatian Transmission System Operator (HOPS, and Croatian Distribution System Operator together with counterpartners in Slovenia.

Another project is microGRID project. This is quite a new project, and it will last until 2019. It is one of the most recent Smart Grids research projects in Croatia. It is funded by the ERANET Smart Grid platform. However, out of 1.11 mil€, roughly 0.77 mil€ will be funded through ERANET. Germany and Denmark, countries that are partners in this project, receive 100% funding, while Croatia only has 40%. Due to this fact, HEP (as a company and producer of SCADA KONČAR) is supporting this project. HEP do believe that this project might have spill-over effects and is actually going to be one the projects with the highest visibility in Croatia so far. Hopefully, its result will feature a three-layer approach: technology, market, and making the customer more aware of the Smart Grid story.

Most readers are probably familiar with the ERANET Smart Grids + platform: however, considering the map below (Figure 39), most of the Mediterranean countries are actually not part of it. Ms Štritof is one of the national local experts

on this platform who will exchange opinions with other local experts concerning market and regulatory issues. Overall there are five different working groups, dealing with different segments: standardisation, architecture of the system, consumer involvement, and so forth. This platform is funded by the Horizon 2020 grant agreement. Anyway, the objectives of micro-grids currently include storage (as one of the elements of the micro-grid) and making consumers more price-responsive.

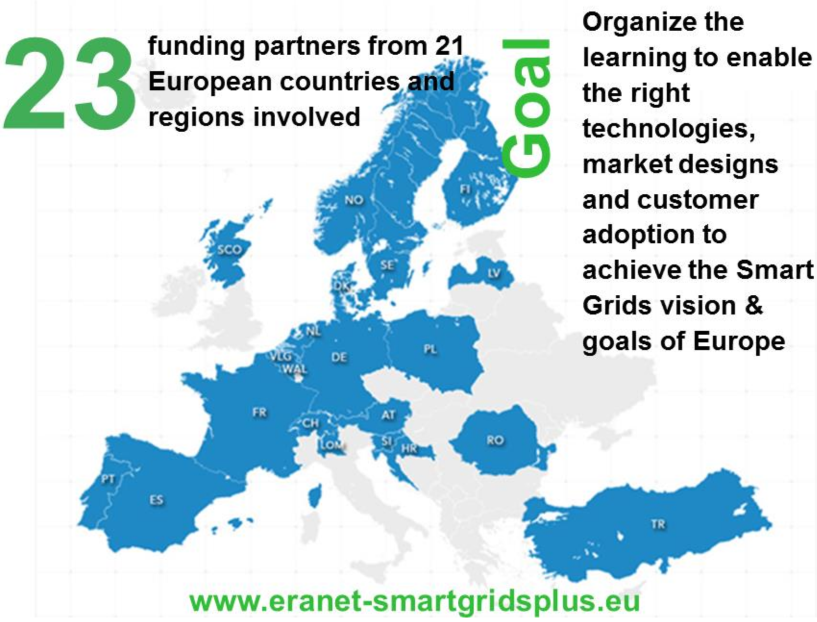

Figure 39 From Local Trials towards a European Knowledge Community

Additional value added of this particular project is participation of Danish and German partners. Comparing the current state of play in Croatia with those more developed countries, one may hope for some positive impact coming from such partners: one of the biggest impacts for Croatia will be to develop and repower the faculty lab. There are already different components of the micro-grid; however, they will be repowered with a storage component and with flexible consumer parts. Overall, the project is divided into six different work packages: Croatia leads the work package "project management" and "distribution system modelling". Denmark is in charge of "micro-grid operation modelling" and "market design", while the German partner is in charge of "communication and control infrastructure". KONČAR as a company is in charge of leading the demonstration and providing the equipment for repowering the lab.

Furthermore, the local market concept is expected to be developed within this project. An implication of the so-called "new deal for consumers" is linking retail and wholesale markets. Hopefully, this project will result in something useful also for the legislative and regulatory framework, for the market design and market players, including prosumers. The lab will be used as a micro-grid, and as the distribution network for different simulation and modelling activities (Figure 40).

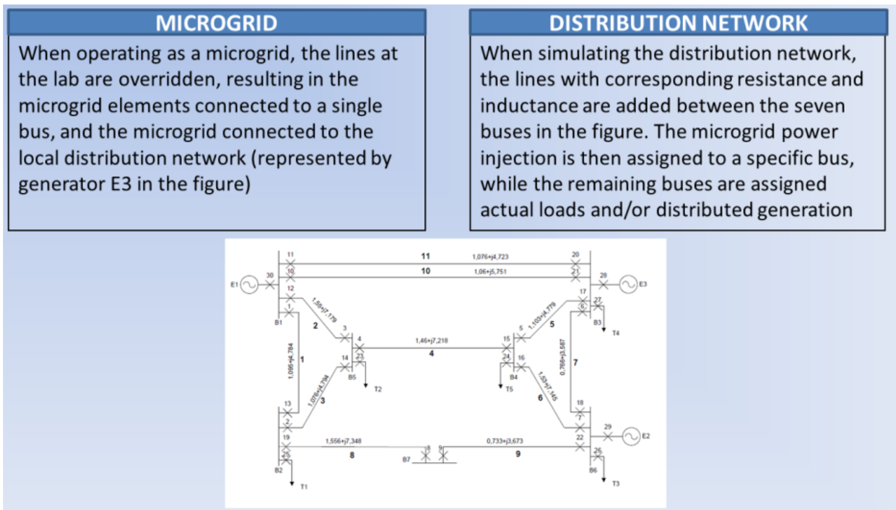

Figure 40 Two folded role of the FER-UNIZG lab

Several impacts may be envisaged for this project. Actually, the idea of the ERANET Smart Grids + platform is to avoid replicating projects, but rather have trans-national projects to gain better visibility of the results and to actually make them work in the real world. For sure, in Croatia more Smart Grids demonstration projects are needed: strategic documents in this regard are still lacking. Smaller Slovenia already has a Smart Grids roadmap strategy, of course with more funds allocated for Smart Grids projects. The EU regulators insist on mandatory dissemination of the lessons learnt, as can be noticed in one of the reports of CEER (Council of European Energy Regulators) about lessons learnt and how to incorporate demonstration projects into the methodology for setting the tariffs. A rethink of the network regulation is surely needed, to make it more incentive-oriented toward innovation. Furthermore, the consumer should certainly be made more active as a prosumer, and should be recognised as one of the actors in the energy transition.

Today, HEP as a utility is more than just electricity: rather, it is dealing with new business models, and will hopefully survive these challenges lying in front of it.

Discussion

A question from the audience addresses a project that was mentioned during the presentation, the Synchro-Grid project that is a PCI in collaboration with Slovenian partners, involving not only DSOs but also TSOs. This project could then represent a very interesting example for other European countries not only of cross-border cooperation, but also of transmission-distribution cooperation. A couple of years ago, there was a project named GREENME between Italy and France. This project was also on the PCI list and had a similar situation w.r.t. transmission and distribution. Somehow, then, Synchro-Grid is the most recent such project in the PCI list. Can this be an important example to be further considered as a reference for other countries in Europe?

The speaker answer that the Synchro-Grid project is supposed to be a PCI project, and the leading partner is ELES, the Slovenian TSO. The project is carried out together with the Croatian TSO, which is however in a slightly specific situation w.r.t. the rest of the HEP group due to the ITO model certificate. The speaker is not personally involved in this project. The distribution company on the Croatian side and the Slovenian distribution operator are also involved, but their percentage participation in the project budget is really negligible. This

project was discussed at the meeting on storage a couple of months ago in Rome.

4.3 Case 3 Italy. An urban control centre for smart city energy governance

Speakers: Mario Savino, Full professor, Politecnico di Bari and Mariagrazia Dotoli, Associate professor, Politecnico di Bari

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The power point presentation can be download form the SP3 platform, in the section dedicated to the events. (http://s3platform.jrc.ec.europa.eu/s3-platform).

Title

Best practices from the Italian case: the RES NOVAE project

Abstract:

This project involved two municipalities in the south of Italy (Bari and Cosenza), and it aimed at contributing to best employment of the new information and communication technologies, so to make life easier for the residents and visitors. Information and communication technology was applied to this project, with the involvement of all the most important groups of the Politecnico and partners from the industry, academia and other institutes and universities. The target of the project was to bolster RES integration, streamlining flow and energy consumption; also, to promote energy efficiency and the development of new products and services for citizens. Several smart sensors were set up, not only to control air pollution and carbon dioxide, but also to improve the energy efficiency inside two buildings. Another point is awareness of energy consumption, so to create (and make available to the public administration) modern national control systems with innovative features and management of energy resources.

Keywords:

Smart city, renewable integration, awareness of energy consumption

Pilot project presented

Project Name: *RES NOVAE*

Website of the pilot project: https://www.enel.it/it-it/eventi-news/Pagine/A-Bari-va-in-scena-lo-show-delle-smart-city.aspx

Description

The project

Prof. Mario Savino presented the first part (the introduction, the research motivation and objective), while the second one (i.e., the Urban Control Centre itself) was exposed by colleague prof. Dotoli, responsible for the related workgroup within the project.

The Politecnico of Bari accepted to be a partner of this project, i.e. helping overcome the global economic crisis through engineers, technicians, and scientists' competences especially in the context of Europe. Europe can be an effective union only if Europeans also cooperate in the field of science. One of the most important parts of the economic crisis is the energy crisis, and the challenge ahead is to convince Europe's representatives and governments to comply with the Kyoto protocol. Scientists can reach this goal.

The issue at hand during the workshop is the Smart Grid and Smart City. Work in this project took place in the context of the internet of things, a topic of ever growing relevance: 60% of the growth is forecast in the next ten years, as a vast number of companies and enterprises are programming to work in the field, and all the sensors set up in the project are wireless sensors able to go on car and on smart buildings.

This project involved two municipalities in the south of Italy (Bari and Cosenza), and it aimed at contributing to best employment of the new information and communication technologies, so to make life easier for the residents and visitors.

Why is it necessary to work in the field of the smart city? It is mandatory to work in this field in the future energy networks, as cities are becoming too big and too crowded, and the process seems to have no floor. Half of the world's population already resides in the cities, and that proportion is expected to grow. The World Health Organisation predicts that 60% of the world's population will live in cities by 2030 and 70% by 2050, and considering immigration these figures are probably too low. Furthermore, today energy infrastructures are approaching their expected lifetime. Over 60% of demand is concentrated in cities, and about 75% of European population lives in urban areas, accounting for 80% of energy consumption and global warming gas emissions. In short: the numbers make abundantly clear that this is the most important problem in Europe for the next years.

Information and communication technology was applied to this project, with the involvement of all the most important groups of the Politecnico. The partners that allowed solving simple and complex problems included big companies such as ENEL, IBM, General Electric, Small and Medium Enterprises, as well as university and research centres. IBM is also working closely with many cities in the world, giving useful recommendations on how to make cities more efficient.

The core of the project is the urban control centre (UCC), but it is not the only goal: another point was the smart grid competence centre, i.e. a research center where the new operating scenarios of low-voltage network will be monitored, studied and analyzed. The smart grid literature features many studies on High and Medium Voltage networks, but urban electricity networks generally powered at Low Voltage. Another problem is that energy flows are not any more unidirectional, but bidirectional. In this project, a smart grid competence centre is considered that is able to monitor, study, and analyse the new operating scenarios in the field of the Low Voltage networks that are typical of cities. This competence centre is open to visit near the show room, in the facilities of ENEL in Bari. In brief, the target of the project was to bolster RES integration, streamlining flow and energy consumption; also, to promote energy efficiency and the development of new products and services for citizens. Several smart sensors were set up, not only to control air pollution and carbon dioxide, but also to improve the energy efficiency inside two buildings. Another point is awareness of energy consumption, so to create (and make available to the public administration) modern national control systems with innovative features and management of energy resources. The link with municipalities is very important, because the urban control centre must control all the problems in the cities: participation in the development path of the smart city, reduction of carbon dioxide emissions, and activation of new scientific and technological competences through training courses.

Prof. Mariagrazia Dotoli gave a very cursory presentation on the Urban Control Centre, as the audience had the opportunity to learn about the basic features of the urban control centre by visiting it during the conference.

The Urban Control Centre is a decision support system that helps the public administration of a smart city take decisions on energy efficiency. It is being developed and prototyped by the Politecnico di Bari together with IBM Rome Solutions Lab, and is basically a platform for both monitoring and managing the urban dynamics. So these are really the two key points: first, you can use the UCC as an indicator dashboard, so to have a measure of the state of the smart city through some key performance indicators; second, you can use it as a decision making tool, to take strategic decisions as an energy manager of the smart city.

The main improvement of this project is that some other decision support systems for energy management are indeed present in the related literature and in other projects, but they’re mainly devoted to specific case studies or to some particular urban sector, typically buildings. What the project attempted is an application of the “system of systems” idea: a smart city is a complex connection of several different interrelated elements. The basic principle is to consider in an integrated way different urban systems, f.i. public buildings, private buildings, the city lighting system, etc. The UCC features several data reporting and exporting tools, available for navigation through several dashboards. Concerning the strategic support - which is the part in which the Politecnico di Bari was

mainly active -, the main idea is to consider different decision panels and adopt a hierarchical decision control approach to organise joint actions among decision panels in acting according to their own goals and producing the overall systems goal. The resolution technique is based on bi-level programming, an optimisation technique that allows to decompose a complex decision process into simpler decision sub-processes. The typical application consists helping the central decision maker (which is typically the energy manager) optimise the financial resources allocation to the low-level decision panels, such as the private building panel, the public building panel, the lighting panel, and so on.

In order to solve this very complex problem, it is decomposed in different problems (upper-level decision problem and several lower-level problems). These have to be coordinated, of course, to take decisions in a coordinated way: this was done by employing a game-theoretical approach, this application of game theory to such decision-making problem led to several publications (available upon request). These strategic tools are applied to the municipality of Bari (Figure 41).

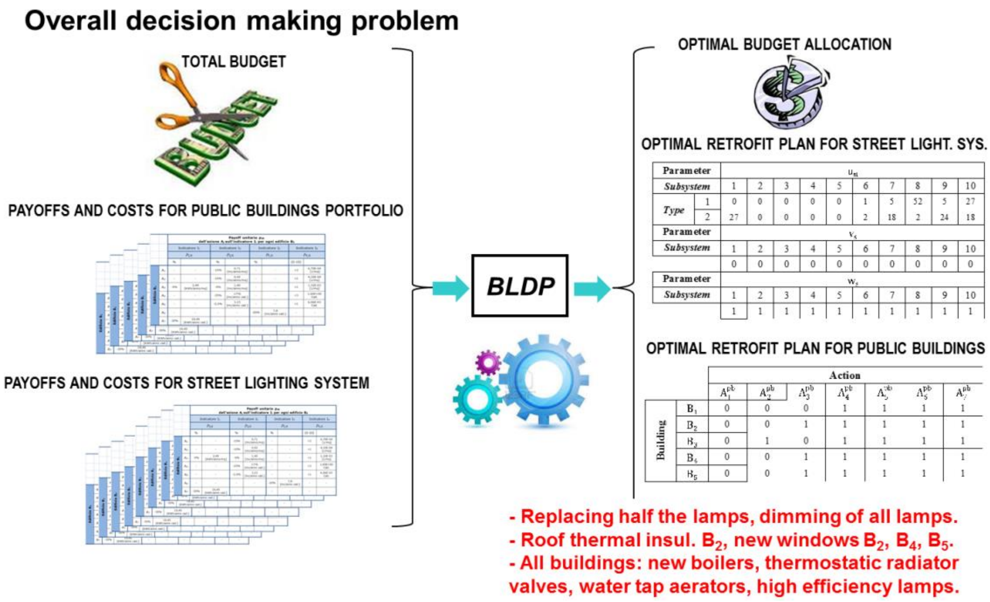

Figure 41 The case study

The UCC considers the total budget owned by the energy manager. In this case study, it considers the payoffs and costs for all urban elements that one may want to renovate, s.a. the public buildings, the street lighting system, and gives as an output the optimal budget allocation split by the different panels: the optimal retrofit plan for the street lighting system, the one for the public buildings, etc. The decisions that it produces, for instance, are to replace some lamps, dim all the lamps, apply roof thermal insulation to a particular building, substitute some windows, install new boilers in the buildings, or thermostatic radiator valves, and so on and so forth.

In sum, the urban control centre is a decision support system for the Smart City management that allows the public administration and citizens to govern the Smart City energy; it uses a hierarchical multi-criteria decision process and provides the city energy manager decision panels with business intelligence tools for strategic decision making and planning of urban sectors.

Discussion

A question from the audience was on the degree of transferability of those systems to a different city with different structure and different facilities. Is your system something general, or a custom application?

Prof. Mario Savino replies stating that the system is very simple and can definitely be transferred. One of the ideas beyond it was to transfer the system into the region, so to enable control of all public transportation. Another more difficult idea is that of controlling the region's health-care system. There is in the planning the improvement of the system of control, especially data mining, to enable managing an extremely high number of data. The problem here is to define the data that physicians must consider as useful to formulate a diagnosis. This is the next step to put in practice, provided the Politecnico access the necessary funding and support.

4.4 Case 4 Greece. TILOS - Technology Innovation for the Local Scale, Optimum Integration of Battery Energy Storage

Speaker: Panagiotis Ktenidis, Senior Consultant for TILOS project at SEALAB, Piraeus University of Applied Sciences (PUAS), Greece

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The power point presentation can be download form the SP3 platform, in the section dedicated to the events. (http://s3platform.jrc.ec.europa.eu/s3-platform).

Title

Technology Innovation for the Local Scale, Optimum Integration of Battery Energy Storage (TILOS)

Abstract:

TILOS aims to demonstrate the optimal integration of local scale energy storage in a fully-operated, smart island microgrid that will also communicate with a main electricity grid. The main objective of the project will be the development and operation of a prototype battery storage system, based on NaNiCl2 batteries, provided with an optimum, real-environment smart grid control system and coping with the challenge of supporting multiple tasks, ranging from microgrid energy management, maximisation of RES penetration and grid stability, to export of guaranteed energy amounts and provision of ancillary services to the main grid. The battery system will support both stand-alone and grid-connected operation, while proving its interoperability with the rest of microgrid components, including demand side management (DSM) aspects and distributed, residential heat storage in the form of domestic hot water.

At the same time, TILOS project addresses the high-priority area of island regions. In doing so, apart from Tilos island, TILOS also engages the islands of Pellworm, La Graciosa and Corsica, aiming to create an island platform that will enable transfer of technological experience by making use of the smart grid system of Pellworm on the one hand, and by offering new case studies for the development of similar projects on the other. Elaboration of new case studies will

be enabled by the development of an advanced microgrid simulating tool, i.e. the Extended Microgrid Simulator, offering the potential for the detailed examination of different battery technologies and microgrid configurations (stand-alone, grid connected and power market-dependent systems). Furthermore, by also addressing social issues, through public engagement, and by developing novel business models and policy instruments, TILOS puts emphasis on the market diffusion of the developed battery storage system and the integrated energy solution implemented on the island of Tilos.

Keywords:

Smart Island Microgrid; Local scale battery storage; Community Public Engagement

Pilot project presented

Project Name: TILOS

Website of the pilot project: www.tiloshorizon.eu

Description

Project Title & ID: TILOS – 646529. Technology Innovation for the Local Scale, Optimum Integration of Battery Energy Storage

Research Call: Topic: Local / small-scale storage-LCE-08-2014

Total Score: 14/15 (Excellence 4.5; Impact 5.0; Quality & Efficiency 4.5)

Project Budget: EU Funding: ~11M€ - Total Grant: ~15ME

Project Duration: Duration of 4 years - Start Date: 1/2/2015

Project consortium

The project

The project on technology innovation for the local-scale optimum integration of battery energy storages is based on the idea that one can exploit the new technology through information about Smart Grids, small-scale storages, and assembling the expertise it generates from all over Europe.

The project deals with the topic of local small scale storage, for the whole project takes place in a small island, Tilos in the Aegean Sea, close to the borders with Turkey. It was a very good submission, with a kernel of about five years of preparation. The hope is to submit a local project with quite more extensive targets: energy storage, with hydrogen, and other "green" ideas that may allow a small-scale island to enjoy all these facilities in a self-sustained fashion. The project got EU funding, and the promoters also managed to raise private funding to support it, clearly adding further value.

The project started in 2015. The island is small (about 500 inhabitants) and close to a number of other neighbour islands all powered by a small grid. The geography is presented in the map below: Kos is the upper and bigger island, where the main diesel stations are located; then there are Nisyros, Tilos, and some smaller islands connected by a sub-sea cable (Figure 42).

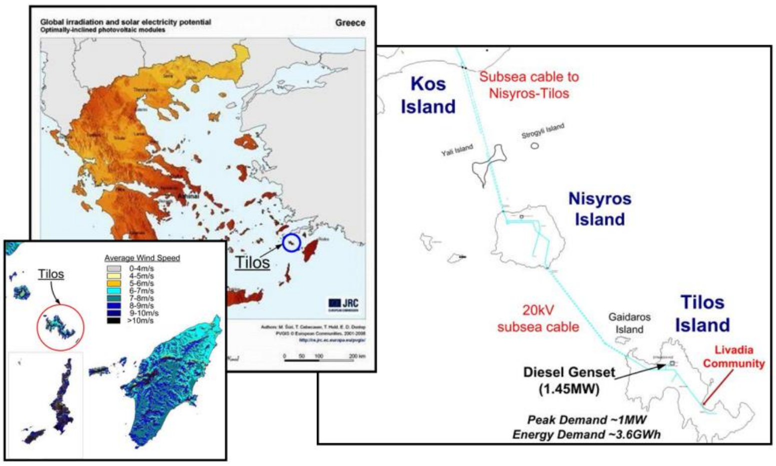

Figure 42 Tilos Island

These islands enjoy good solar radiation and moderate wind exposure (average speed of about ~7 m/s). The load measurements (Figure 43) distinguish between the data relative to the entire island and the Livadia area, one of the two villages that is intended to install the Smart Meters and all the equipment needed to enable self-sustainment.

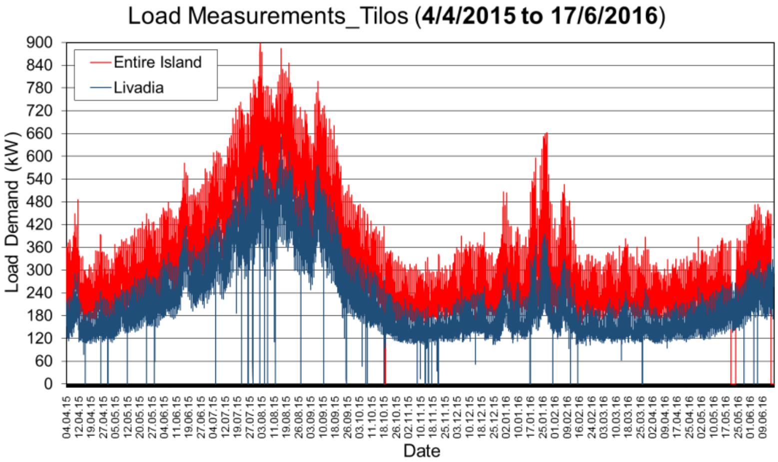

Figure 43 Tilos island – Load demand

The main objective of the Tilos (Figure 44) project is to develop the prototype battery system: small-scale storage supported by zebra-type batteries. The idea is to exploit wind and PV power through micro-grid energy management to allow for the maximisation of RES penetration, so to avoid losing a lot of renewable energy for failing to support its integration due to grid stability and other problems: a very common problem with renewables, as very well known. The idea is to operate a management system in order to check other services that this small grid can support, s.a. ancillary services. In the figure the main features of the project are shown: these are storage (not only batteries but also thermal storage), the micro-grid, and also diesel. In this way it will be possible to exploit a two-way electricity and energy feeding (permission for this, which usually takes a long time, was instead already obtained). A proper hybrid power station will also be in operation.

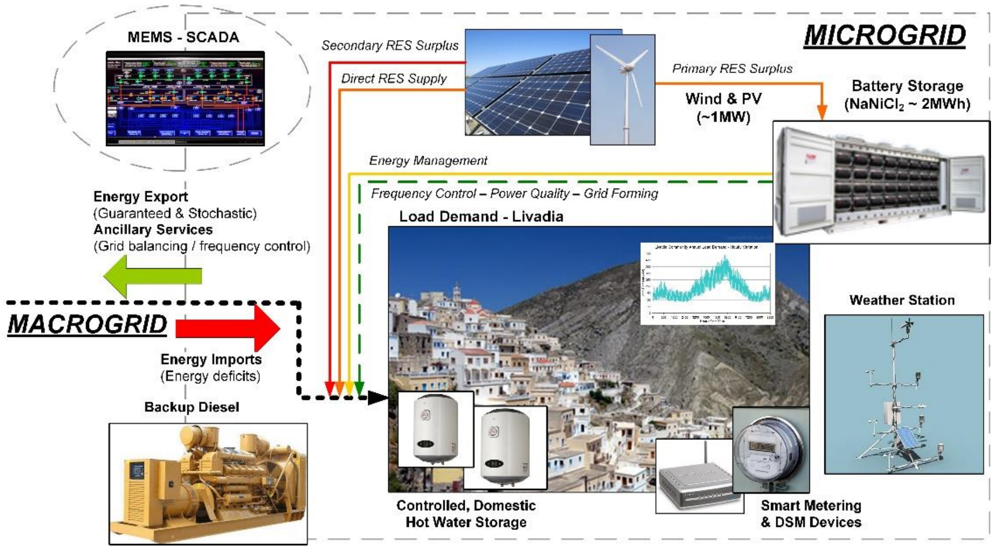

Figure 44 Tilos' main objectives

The main parts of this installation are a 800 kW wind turbine, PV power of 160kW, and storage through a FIAMM battery (2 containers of 1,4MWh/400kW each). This is a very reliable and well-tested product, which is here also going to be put to the test under the very severe conditions present on the island. FIAMM

is a very well-known and promising Italian firm producing storage equipment based on the zebra technology.

There are three modes of operation that are going to be tested in the project (Figure 45): one is the stand-alone mode, the second one features increased energy autonomy, and the third one involves energy exchange with the host grid of Kos.

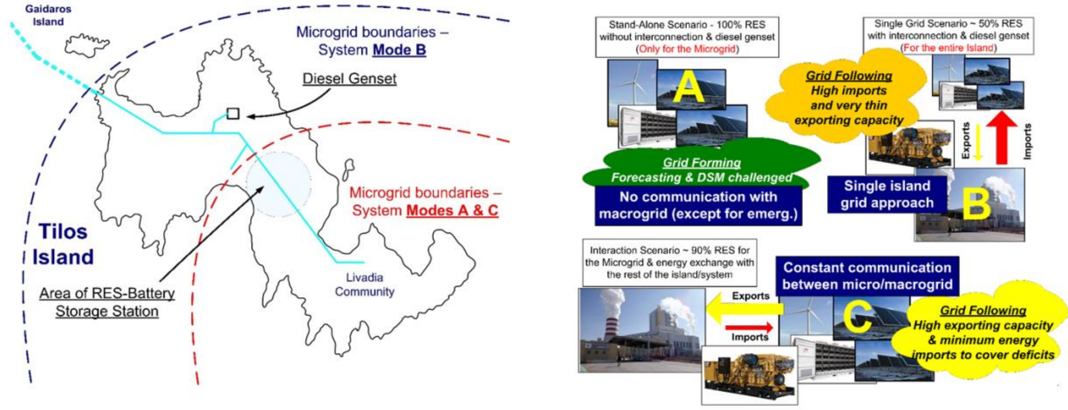

Figure 45 The three different test modes

One may notice that interaction with the rest of the system is intensive, and the reason why this is possible - and the main added value of doing so – is that the local DSO is a partner of this project. In fact, this kind of activities requires the local DSO, as the one subject that may handle the distribution network so to guarantee continuing energy security and safety: this is a real-time and real-life experiment, so it is crucial for the people not to lose their confidence in the power system's operation. This is very important, furthermore, due to the composite nature of this project and its ability to transfer technological knowledge and - more generally - exchange of information between different partners.

The project features collaboration with Pellworm, another island in Germany, which also pursues this kind of renewable energy exploitation. Its situation is different, as it is connected to the mainland and its population is bigger; however, it is a valuable source of experience. Further collaborations are with several partners across Europe, including also Younicos, a very well-known German company that supports management of battery systems, and is also expanding to the US. This allows to broaden the activities and exploit the knowledge produced by all these research projects in Europe. Finally, another partner is the Spanish island of Graciosa, also with batteries and RES. The plan is to pool this experience: importantly, Corsica, Tilos and Graciosa are islands that are broadly in the Mediterranean area, which obviously makes them all the more relevant.

The project's typical structure is shown in the Figure 46.

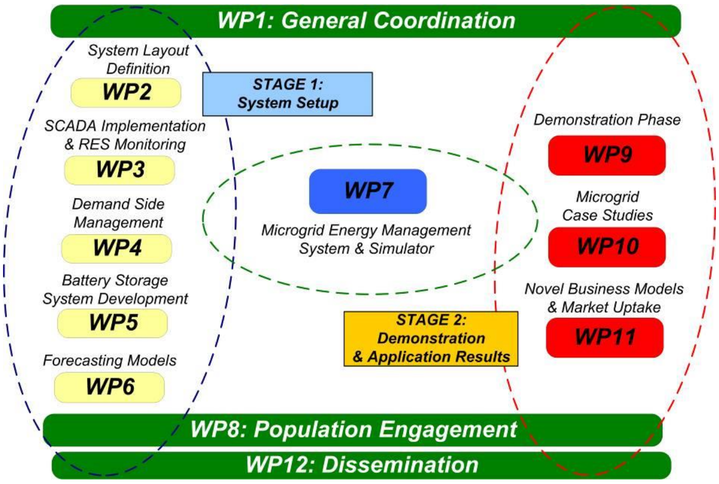

Figure 46 Project structure

While the other elements are quite technical (business models, case studies, and so on), it is important to stress the work packages 8 and 12 on population engagement and dissemination, resp. Population engagement is key, in particular, as the local people are following and impacting on the project in a very eager way. The mayor of the island supports it, promoters have had several meetings with the people there, and it is a very strong asset that the Greek section of the well-known global organisation of WWF is a partner of the project, taking care of all the environmental issues on the island: this is a sensitive topic, as it has to comply with numerous wildlife preservation constraints. Summarising, then, there are industrial partners, academics, and the DSO, as well as the Greek department of the WWF. As can be gleaned from the map below, then, one may say the project is spread all over Europe, with partners from the UK, Sweden, Germany (Younicos, Eurosol and Aachen University), Italy (FIAMM), France (CEA-INES and University of Corsica), Spain (ITC) and Greece (Piraeus University with the EPC Eunice, WWF Greece and the local DSO HEDNO).

In order to share knowledge from the activity, the promoters set up a "Bridge" initiative, consisting in:

1. Work groups;
2. Data management groups;
3. Business and regulation;
4. Customer engagement group.

Here one may find collected all this very valuable and experience-based information, so to give back to the Commission, the officers, and all the people handling the policy, very useful data on the issues faced in the project. For instance, a topic already tackled is what definition of storage should be adopted. In fact, if people were to make clear what they mean, you may see that everybody has a different opinion about what storage is and what storage has to do: therefore, it is very important to acquire a common terminology.

The logo of the project is this small boat, expressing the idea that all Europeans could be on the same boat, trying to progress towards a common vision, as well as that the TILOS solution, once proved on Tilos, will then travel to all European islands, transferring the technological know-how for the replication of the TILOS system.

Discussion

A member of the audience agrees with the speaker on naming the population engagement as a very critical aspect in this situation. The question refers to what degree is the flexibility of demand for energy balancing on the island incorporated in the solutions? In particular is there any Demand Side Management (DSM) flexibility.

Panagiotis Ktenidis (SEALAB, PUAS) answers that DSM is going to be taken into account through an additional module on the system, in order to gain this kind of flexibility. The storage system is going to operate taking the benefit of the DSM. This will be obtained by operating Smart Meters, as agreed with the DSO. There will always be a problem with data: one needs to get people to agree that their demand be handled on difficult times. There are interruptions on the island: not so big, but rather frequent especially in the period of summer, when peak loads are concentrated. This is definitely something that will have to be taken care of. A lot of more details on the project can be found on the website.

5. Session 4. Best practices from pilot projects in smart grid development (Part II).

Moderator: Stefano Valentini (ASTER S. Cons. p.A)

Stefano Valentini is the energy platform coordinator of the region Emilia Romagna. He works in Aster, the regional consortium for innovation and technology transfer among the regional government and all research centres in the region (4 universities - Bologna, Parma, Ferrara, Modena and Reggio-Emilia, technical university of Milano with premises in Emilia Romagna region - CNR national council of research and ENEA).

A short presentation of the activity of Aster is given by S. Valentini. Aster is in charge of the implementation of the regional operative programme 2014 -2020 (ROP), in particular regarding industrial research. ASTER is also in charge of the elaboration and implementation of the smart specialisation strategy. The High Technology Network of Emilia-Romagna, coordinated by Aster, includes 82 research laboratories specialised on applied research working with companies. Aster has an important role also in the Regional Energy Plan (REP) by participating at the elaboration of the plan for the period from 2014 to 2025. The REP is now on path for the legislative approval, in the plan we stressed the importance of smart grids. In the REP it emerged that in Emilia Romagna region there is little room for a further big exploitation of renewable energies until 2030, therefore the main actions shall be concentrated in energy efficiency measures, where the role of smart grid is essential. Aster settled up a focus group/working group specialised on smart grids, with the scope of giving suggestions, best practices, pilot initiatives to the policy level in order to facilitate the implementation of new regulation and to engage the stakeholders, citizens and other relevant operators.

The moderator recalls the key words of the previous session of the workshop (first day) that were: decentralised energy production system, smart metering, storage system, prosumers, but also new opportunities, business models, deployment of technologies, financing schemes. The new energy production paradigm opens the door to the transition phase from a centralised production system to a decentralised one. This transition will have important impacts on our local companies, local territories, employment and in economic growth. A more active role from stakeholders is essential to address and steer this transition into the right direction. Pilot initiatives and best practices are important in this context also to motivate people and operators, which are naturally reluctant to changes, as for instance in the past experience in Italy with PV and now with biogas and green gas where we have administrative burdens and regulatory issues. The role of the scientific and technical community is to show that the transition is possible and that the environment and the economy will benefit from it, and moreover demonstrate that these solutions are economically feasible. Workshops like the one organised by the JRC in Bari are of great importance as they give the opportunity to learn from success story, to exchange expertise and experiences and inspire people.

5.1 Case 5 Cyprus. SmartPV for PV integration and Demand Side Management: First results from Cyprus

Speaker: Venizelos Efthymiou, Chairman of FOSS the Research Centre for Sustainable Energy of the University of Cyprus

E-mail: venizelo@ucy.ac.cy

The power point presentation can be download form the SP3 platform, in the section dedicated to the events. (http://s3platform.jrc.ec.europa.eu/s3-platform).

Title

SmartPV for PV integration and Demand Side Management: First results from Cyprus

Abstract:

SmartPV investigates pilot net metering schemes for cost-effective PV implementation and higher grid penetration in Cyprus of distributed generation with the target of achieving a WIN WIN scenario for both consumers and energy utilities.

The presentation will address a price-based DSM tool that has been developed and implemented in order to arrive at effective Time of Use (ToU) tariffs with improved DSM results based on real data from households in Cyprus. Smart meters (SMs) have been installed at 300 households equipped with grid-connected PV systems, in order to acquire consumption and production profile details of typical Cypriot prosumers.

The comparative results of the average daily consumption profile for a typical domestic consumer as obtained from the Electricity Authority of Cyprus (EAC) and PV production profiles are analysed to provide evidence for effective DSM policies capable of improving self-consumption practices for the benefit of the system and the connected users.

Keywords:

Photovoltaics, demand side management, demand response, grid-connected, smart meters.

Pilot project presented

Project Name: Smart net metering for promotion and cost-efficient grid-integration of PV technology in Cyprus

Website of the pilot project: www.foss.ucy.ac.cy; www.smartpvproject.eu

Description

The projects develops and implements smart net metering for promotion and cost-efficient grid-integration of PV technology in Cyprus

LIFE+ Environmental Policy and Governance

Implementation: Cyprus

Duration: 1/7/2013 – 31/12/2017

Budget: 1,219,838 Euro (% EE: 50%)

Coordinator: Photovoltaic Technology laboratory, University of Cyprus

Sponsors:

The project

Nations that cannot control resources cannot control their future. Europe is making a lot of effort on energy issues by putting high in the agenda energy related issues through the Energy Union. The aim of this workshop is to add knowledge from pilot project experiences and share results.

The same objectives are addressed by the project SmartPV in Cyprus. This is a LIFE+ project that is aiming at helping the solar penetration in Cyprus with a targeted date for completion the end of 2017. It is coordinated by the Photovoltaic Technology Centre of the University of Cyprus. Partners in the project include the DSO of Cyprus, the Regulator, the Department of Environment of the government of Cyprus and e Deloitte. The aim of the project is to develop solutions for fully supporting the next phase of development of photovoltaics in Cyprus.

Figure 47 Photovoltaic Technology Centre is active within FOSS

FOSS (Photovoltaic Technology Centre is active within FOSS – Figure 47) the Research Centre for Sustainable Energy of the university specialises in analysis, characterisations and testing of PV modules covering work on grid integration, smart grid solutions and related market approaches. The work of the centre with state of the art facilities provides world recognised work with support on the implementation of the new energy policies (Figure 48).

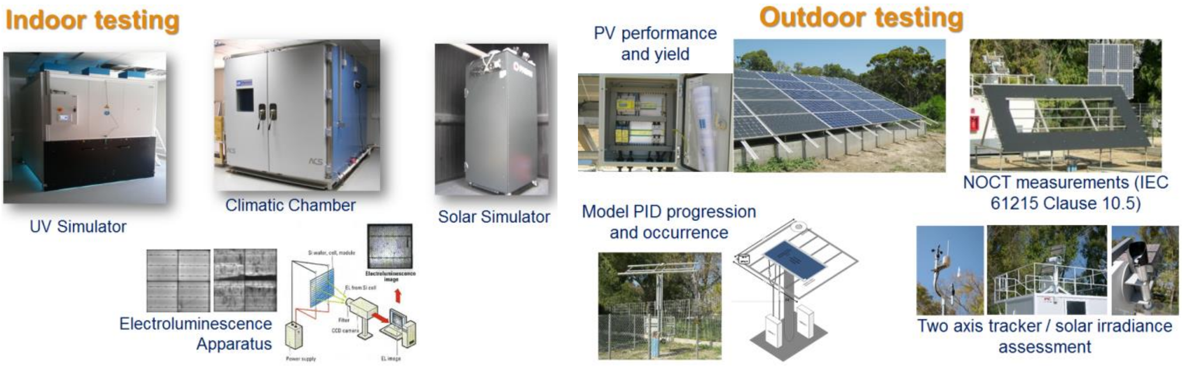

Figure 48 Facilities of FOSS at the University of Cyprus

The SmartPV project has set out objectives based on the evidence that solar energy will play an important role in the years ahead in Cyprus, thanks to the favourable geographical location of the island. The motivation to develop the SmartPV project relies on three main challenges that the energy system encounters when high shares of renewable energy penetrates the grid:

1. High PV penetration may lead to stability and reliability problems;
2. Demand Side Management (DSM) can reduce energy consumption and can help convert unsustainable energy practices into cost effective and sustainable energy use;
3. DSM can mitigate RES operational issues and contribute to effective management of congestion problems.

DSM is a solution that can be used in Cyprus to foster the role of the prosumers, integrate solar power and help in reaching the energy goals set by the policy (Figure 49). The aim of the project is to identify the cost-reflective tariff to be applied in order to make sure that the burdens of this transformation are not passed on to those users that do not have their own PV system.

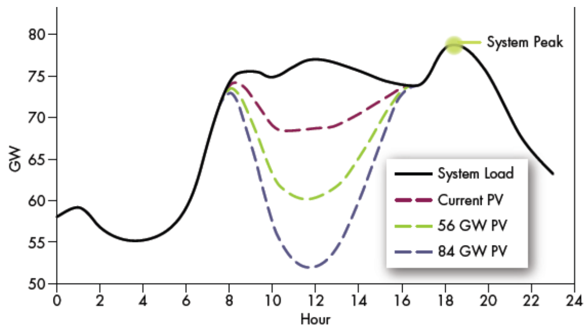

Figure 49 The potential of DSM in managing the constantly changing load profile

The project aims also to educate the prosumers to make the best use of their energy resources in meeting their needs in the most efficient way. A sample of prosumers and consumers is part of the project and participate actively.

The objectives of the project can be summarised in 5 main required developments:

1. A cost-optimum dynamic tariff tool for optimal PV grid integration
2. A fairer billing system leading to a WIN-WIN scenario for all the stakeholders
3. Cost reflective tariffs that enable demand side management (DSM)
4. A Framework for informing and educating customers for transition from passive to active consumers
5. The elaboration of new policies that will increase PV penetration and induce smart grids

The project uses nearly on line data taken from the DSO for the development and testing of the tools. The data base (

Table 4) contains around 300 consumers connected to the communication network. Generation and consumption data is collected from about 100 prosumers through smart meters.

Area	Participants (targeted)	Participants (installation completed)	Participants (1st contact completed)
Lefkosia-Kyrenia-Morphou	124	116	101
Larnaca-Ammochostos	74	71	67
Lemesos	54	51	43
Paphos	48	46	46
TOTAL	**300**	**284**	**257**

Table 4 Participants to the Smart PV project.

These users are distributed in cities and rural areas, coastal areas as well as in mountain areas so to give a good reflection of the functioning and features of the power system (Figure 50).

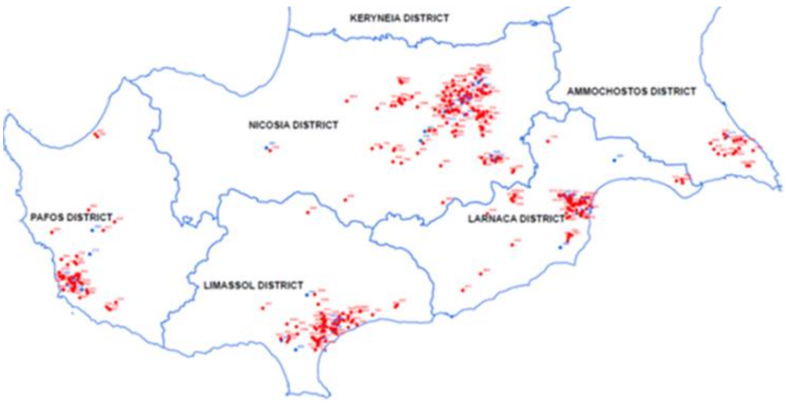

Figure 50 Spatial spread of prosumers shown on the Map of Cyprus.

The availability of this type of data helps the analyses of the full system and the development of the optimal tariff to be adopted while also formulating best practices.

The analysis then turns to the role and features of Demand Side Management, in order to assess its benefits by studying each single prosumer's load and match their needs with the requirements and burdens of the system. By studying the consumption needs and production behaviours of the users of the grid – both consumers and prosumers –, along with the challenges raised by the increasing share of PV production, the project aims to maximise the benefits to the system. The involvement of the DSO and the regulator in this project allows for a coordinated utilisation of the flexible tools provided by the project for the revision of the current tariff scheme, so that the distribution tariff will reflect the actual costs of the system.

The tariff shall reflect the costs of renewable integration, by changing accordingly to address the level of penetration of solar generation. The tariff set at the current PV penetration, which is at 10% of total production, shall be modified when the share rises to 40%. DSM provides the tools to find the optimal tariffs that maximise the system benefit.

Time of use (ToU) tariff is a price-based tool that incentivises efficient behaviour, while imposing the minimum burdens on the system. The ToU tariff has been developed through a two-step approach: a) the statistical analysis is used to identify the inflection points, which are the points in time at which there is a change in the use of energy. Based on the inflection points of the load duration curve, and on the probability density function of each load segment, the ToU block periods are derived;

Optimisation of the error (Eq. 1): by using the statistical results for ToU as initial conditions, the ToU blocks are varied and subtracted from the load curve (P_k) until the root mean square error (RMSE) is minimised:

$$\mathrm{RMSE} = \sqrt{\frac{1}{n}\sum_{k=1}^{n}(\mathrm{ToUb}_k - P_k)^2}$$

Equation 1

Three periods in a year for energy consumption have been evaluated: summer peak, when the consumption of energy is higher, also due to tourism; winter, when another peak is registered from historical data; and a third period called "middle" which includes spring and autumn periods, when the energy consumption behaviour looks alike. The analysis of the consumption behaviour allowed the definition of 9 price levels for the use of energy, 3 for each consumption period of the year and 3 for the three periods of the day – peak, shoulder, off-peak.

Using the two-step analysis outlined above, the tariffs were derived in order to maintain neutral cost effects in the case where the prosumers' energy behaviour remains unchanged (Table 5).

Block	Price (€cents/kWh)	Periods		
		Winter (Dec - Mar)	Summer (Jun - Sep)	Middle (Apr, May, Oct, Nov)
Peak	18.85	16:00 – 21:59	09:00 – 18:59	08:00 – 20:59
Shoulder	14.85	06:00 – 15:59 22:00 – 23:59	07:00 – 08:59 19:00 – 00:59	06:00 – 07:59 21:00 – 23:59
Off-peak	10.85	00:00 – 05:59	01:00 – 06:59	00:00 – 05:59

Table 5 Results of price levels for each day/year period.

The difference between the peak and shoulder price and the shoulder and off-peak price is in both cases of about 27%. The idea is to find a tariff that safeguards to the energy supplier the same revenues provided that the prosumers do not change their habits. The ToU tariff is set in such a way that, when implemented, it yields the same revenue to the supplier.

The above methodology was used as evidence to the regulator for accepting the results and implement the tariff for the 300 prosumers participating in the project.

The project also developed an in-house display /web application made available to the participating prosumers, to give them the possibility to monitor historical and current data on import/export; consumption; PV production; comparisons and other information material (Figure 51).

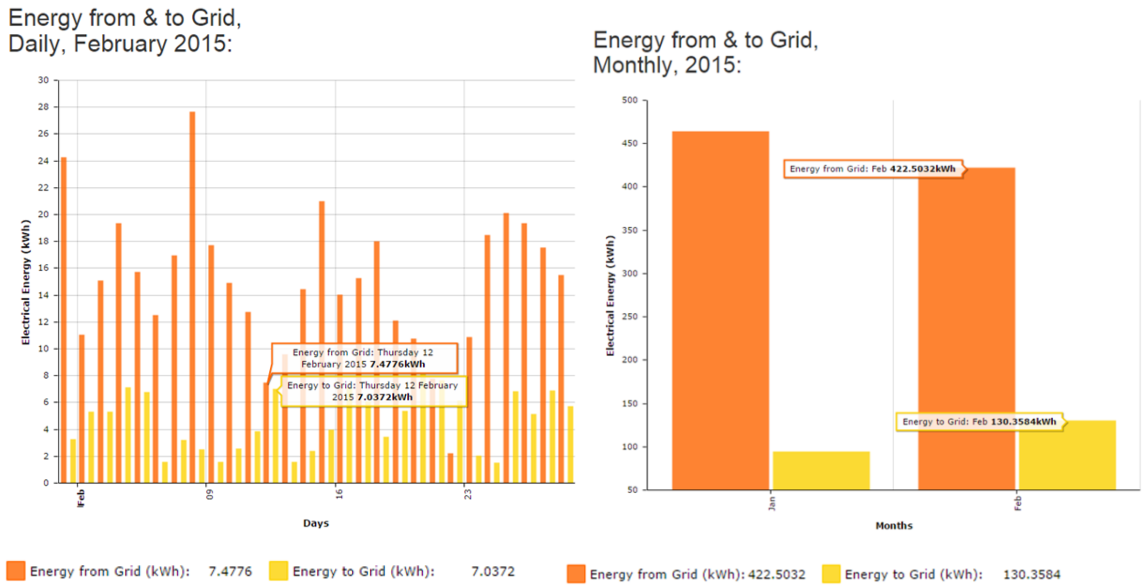

Figure 51. An example of the capabilities of the In-House Display (IHD) – web-application

Discussion

A member of the audience asked whether the project targets solely the load shifting potential of Demand Side Management or also the load reduction potential of Demand Response, the two things being complementary but not the same.

The speaker Venizelos Efthymiou clarified that the aim of this project is not implementing DR measures, because that would require a fully developed and functional smart grid system. There is another project in Cyprus, called NERG300 project, that will address DR, since it is a multi-micro grid project that will use the results of the SmartPV project, and build on them. In the SmartPV project, the aim is educating users to manage their energy needs, so that they may shift their consumption, understand their energy use, and achieve high levels of efficiency.

A second question from the audience was whether the three prices shown in the presentation – peak, shoulder and off-peak –, which look quite high, also include the distribution costs.

The speaker Venizelos Efthymiou explains that the prices shown in the slides are the current total price that includes network costs, energy, all costs to the end-consumers, except VAT. The energy price in Cyprus is high, because it is a system dominated by conventional fossil fuel production plants. The share of renewable generation is at the moment 8,5% and half of this has been supported through feed-in tariffs therefore the system has not enjoyed the benefits of low costs of renewable energy production. The solar production in Cyprus is now at a cost of 5€c or less, and this would lead to a change in the energy mix of the island.

A third question from the audience was about communication protocols, and in particular whether the project faced some mandatory issues, and what choices were implemented.

The speaker Venizelos Efthymiou answered saying that in this project it was only used GPRS technologies including machine to machine communication to implement the metering activity, so not exactly a smart grid technology. The intention is to move to a micro grid solution that will involve the adoption of smart grids operations and total AMI solutions with the possible adaption of Power Line Carrier (PLC) solutions on low and medium voltage network as already implemented in many countries in Europe. Joint with the fact that Cyprus electricity system is equipped with fibres on all transmission lines, this can offer the possibility of broad band connectivity throughout the Island.

5.2 Case 6 Malta, Croatia and Greece. SUNSHINE smart-energy platform: IT to support energy awareness and consumption reduction

Speaker: Raffaele De Amicis, SUNSHINE project.

The summary of the presentation is not available. The Power point presentation can be downloaded from the SP3 platform, in the section dedicated to the events. (http://s3platform.jrc.ec.europa.eu/s3-platform).

5.3 Case 7 Italy. INGRID Project

Speaker: Massimo Bertoncini, INGRID Project coordinator

The summary of the presentation is not available. The Power point presentation can be downloaded from the SP3 platform, in the section dedicated to the events. (http://s3platform.jrc.ec.europa.eu/s3-platform).

5.4 Case 8 Serbia. EPIC-HUB - Energy Positive Neighbourhoods Infrastructure Middleware based on Energy-Hub Concept

Speaker: Nikola Tomašević, PhD. R&D scientist at Institute Mihajlo Pupin – Belgrade, Serbia

E-mail: nikola.tomasevic@pupin.rs

The power point presentation can be downloaded from the SP3 platform, in the section dedicated to the events. (http://s3platform.jrc.ec.europa.eu/s3-platform).

Title

EPIC-HUB. Energy Positive Neighbourhoods Infrastructure Middleware based on Energy-Hub Concept

Abstract:

The goal of EPIC-HUB was to develop a new methodology, an extended architecture and services able to provide improved Energy Performances to Neighbourhoods (NBH). By combining powerful Energy-Hub-based Energy Optimisation capabilities with seamless integration of pre-existing and new ICT systems, EPIC-HUB contributes to achieve the global objective of the Energy-positive NBH. EPIC-HUB covers all the aspects directly or indirectly connected to efficient Energy-based Management, Control and Decision-Support at NBH-level, and defines a Fully-Interoperable Middleware solution able to provide integration and a structured vision of the overall infrastructure, friendly usable by all the involved stakeholders (e.g. the energy managers). The adaptability of the EPIC-HUB approach was demonstrated by the implementation of different pilots with

highly motivated communities, among which Nikola Tesla Airport (Serbia) hosted very challenging demonstration site and respective NBH use-case.

Keywords:

energy efficient airports, energy positive neighbourhoods, energy hub

Pilot project presented

Project Name: Energy Positive Neighbourhoods Infrastructure Middleware based on Energy-Hub Concept (EPIC-HUB)

Website of the pilot project: www.epichub.eu

Description

Full name: Energy Positive Neighbourhoods Infrastructure Middleware based on Energy-Hub Concept.

Type of funding scheme: FP7 (Collaborative Project (CP)– Small or medium-scale focused research project (STREP))

Work programme topic addressed: EEB-ICT-2011.6.5 ICT for energy-positive neighbourhoods

Total budget: 6.7 MEuros/Total funding 4.2 MEuros

Project lifetime: 42 months (from 01/10/2012 until 30/03/2016)

Project Consortium: 11 partners; 6 Industry / 2 SME / 3 Research from 6 countries;

(Italy (4), Switzerland, Serbia, Spain (3), Czech Republic, Israel)

Project partners:

The project

The project was acquired within a FP7 work program on ICT for Energy Positive Neighbourhoods with a budget of 6.7 million Euros. The objective of the project was to develop a new methodology, an extended architecture and services able to provide improved Energy Performances to Neighbourhoods (NBH), i.e. not only at the facility level but also at the neighbourhood level. EPIC-HUB solution was leveraged upon the energy hub (EH) concept for energy optimisation introduced by ETH from Switzerland, and upon fully interoperable middleware layer providing seamless integration of pre-existing and new ICT systems. The EPIC-HUB was demonstrated through three pilot projects: port of Genoa (Terminal San Giorgio), Nikola Tesla airport in Belgrade and the exhibition centre in Bilbao.

Energy Hub concept

EPIC-HUB fully exploits the EH concept, which was envisioned to represent the target facility infrastructure as comprising of different conversion blocks/modules for converting the energy from one type to another (Figure 52). EH takes various energy carriers at the supply side and optimise their usage to satisfy the demand side of target infrastructure, also taking into account possible energy storage devices serving as energy buffers.

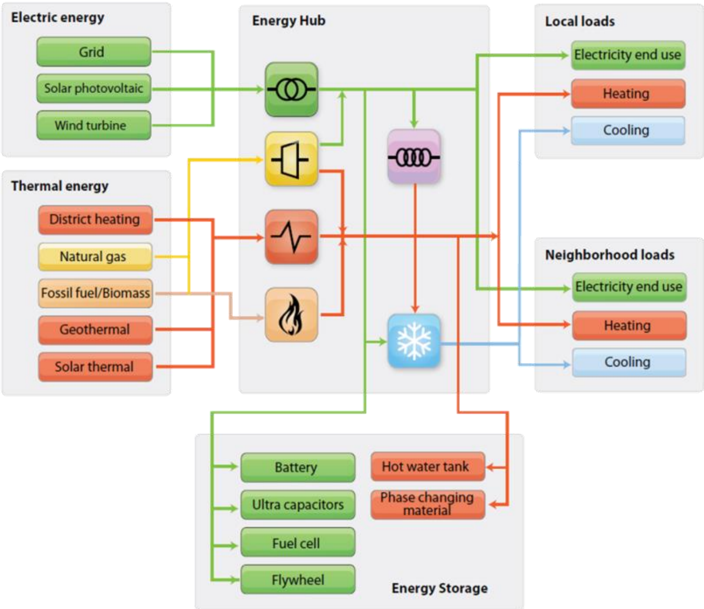

Figure 52 The energy hub representation of target facility infrastructure.

The EH concept was used as an optimisation tool to determine the optimal energy dispatching factors and to optimise the energy flows starting from the energy supply side while respecting the demand side requirements. Moreover, apart from the operation optimisation (conducted in real time), the EH concept was used in the planning phase as well to determine an optimal infrastructure of target facility.

EPIC-HUB system architecture

The architecture of the proposed EPIC-HUB solution was inspired by a typical three-tier distributed architecture (Figure 53). At the lowest layer, i.e. the field level, the energy data monitoring takes place, where the data acquisition was conducted in a plug-and-play manner (through designated plug-ins). Acquired energy data are sent to the energy gateway and then forwarded to the business level, which is the middle layer of the proposed architecture. Here, at the business level, the middleware infrastructure was implemented in a form of the enterprise service bus which was responsible for orchestrating and integrating several business logic modules, such as, for instance, modules for forecasting the demand, for energy assets management, etc. These data would then be forwarded to the application level (the highest layer of the system), which was responsible for hosting the optimisation modules, planning tool and modules for visualisation of the optimisation results and acquired data.

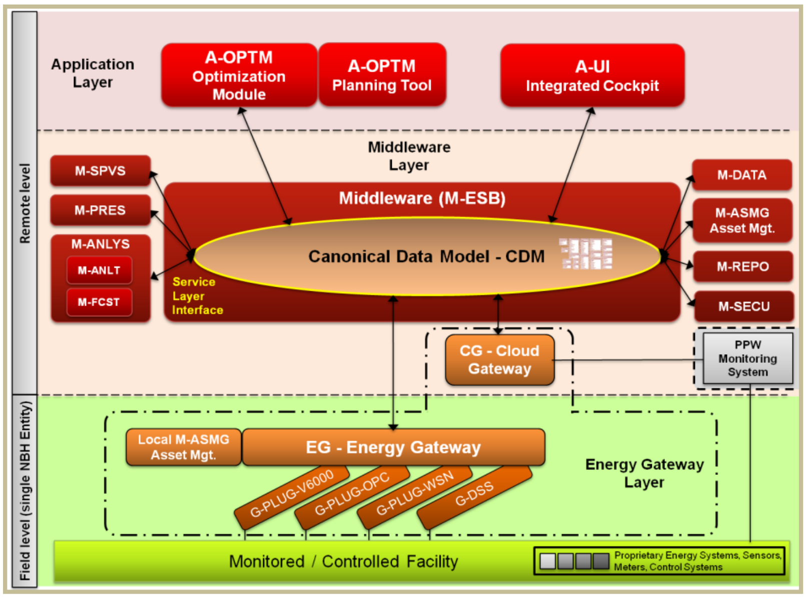

Figure 53 The architecture of the EPIC-HUB solution.

Nikola Tesla airport (Pilot site)

The EPIC-HUB project was demonstrated at three project pilots, whereby one of them was the international Nikola Tesla Airport (NTA) in Belgrade, Serbia. Airports are generally complex and critical infrastructures and represent huge energy consumers, comparable to smaller cities. In case of NTA, the key figures related to the airport energy assets show that there is a surplus of generated thermal energy that could be exported to the neighbouring entities. In fact, the heating requirements of the airport are about 18 MW, while its total thermal energy production capacity (through heating plant of the airport) is almost 48 MW (Table 6).

Aircraft Movements	No. passengers	Cargo (kg)	Mail (kg)
58,507	4,776,164	13,066,939	1,771,816

Total indoor area (T1, T2, Gates): 47,000 m2

Yearly energy consumption: 33 GWh (both electrical and thermal energy)

Energy assets:

4 boilers - heating capacity 47.9 MW (18MW NTA demand -> NBH)

7 chillers - cooling capacity 2.3 MW

20 rooftop units - Qc 222 kW/ Qh 255 kW (auxiliary system!)

Table 6 Key figures of Nikola Tesla airport (2015)

Demonstration target area

For the demonstration of the EPIC-HUB solution, corresponding target areas of NTA were identified with multi-energy supply options which are suitable for deployment of the multi-carrier EH optimisation concept. More precisely, gates A2 and A3 were chosen for demonstration of the EH optimisation concept. These gates are equipped with rooftop units that can operate in two modes, i.e. either

consuming hot water produced by the heating plant of the airport, or solely the electricity from the power grid. In that way, these systems provided enough diversity to optimise which energy carrier will be used to satisfy the heating demand. Additionally, gates A4 and A5 were used to provide a baseline data (without EPIC-HUB solution applied).

Deployment plan

To acquire the energy date for verification purposes, corresponding installation activities were carried out, for instance, the installation of wireless power meters (by Panoramic Power), fuel oil metering equipment, calorimeters, etc. The deployment plan started with the infrastructure analysis and identification of the missing energy monitoring points and equipment (for both electrical and thermal energy) that should be installed to support the demonstration of the EPIC-HUB solution.

Neighbourhood level optimisation

Furthermore, additional analysis was carried out to assess the energy assets of the airport NBH entities, together with the existing distribution infrastructure that could support possible exchange of thermal energy surplus generated by the airport and implementation of EH concept. For this purpose, the Aviation museum, the Serbian air traffic control agency (SMATSA) and the "Jat tehnika" maintenance company operating at the airport were taken into account.

EPIC-HUB Cockpit

For visualisation of acquired data, the EPIC-HUB Cockpit was developed serving as EPIC-HUB Integrated user interface. It provides for a centralised, holistic monitoring of the energy data and delivers a detailed information about deployed monitoring points and energy assets within the target infrastructure. It is also aimed to give an overview of the current, past and forecasted energy profiles and optimisation results that the EPIC HUB solution came up with.

EPIC-HUB results

The outputs of the EPIC-HUB can be summarised in:

1. Energy supply-demand operation optimisation. Controlling the type of supplied energy carrier (electricity or hot water via roof-top supply carrier switch);
2. DSM measure. Optimal load profile suggested to the airport energy manager (energy carrier tariffs and contracted power peaks);
3. Planning optimisation. Optimal solution for introducing new energy assets based on EH approach (e.g. a CHP plant or PVPP);
4. Optimisation at NBH level. Optimisation of the energy flows among NTA and its NBH entities.

Finally, achieved EPIC-HUB results were the following:

1. Through the dynamic selection of thermal energy sources, the project achieved an estimated savings of 16.5% (only HVAC at NTA target area was considered);
2. The proposed solution has high replication potential, for instance estimated savings for all T1+T2 gates are about 20 kEur/year (for heating only);

3. Considering NBH energy assets, the project showed the possibility of introducing a number of optimisation solutions at the neighbourhood level. For instance, introduction of relatively "high" capacity CHP would reduce energy imports by about 18%.

Questions:

A member of the audience asked a question related to the modelling point of view, particularly on the electricity heating and cooling and on the gas technologies that are modelled in the same platform to be optimised. It can happen that the results (flows, prices) seems to be not realistic, because integrated models for costs and markets are not available yet.

The speaker, Nikola Tomašević, clarified that the EPIC-HUB project was demonstrated upon the real energy data and pricing schemes. For instance, in case of NTA in Belgrade, dynamic tariffing was applied for electrical energy pricing, while fixed price was considered for fuel-oil mazut used by airport's heating plant for production of hot water. However, looking from the modelling perspective, modelling realistically such complex infrastructures such as an airport, also including various energy assets on site, requires too much computational power and complex nonlinear models of energy converters and assets. Therefore, in order to cope with such a complex task in real time (for instance for operation optimisation), certain linear simplifications of the EH building blocks (representing the energy converters and consumption devices) had to be adopted.

6. Smart Grid Project Outlook 2016 - A preview

Speaker: Gianluca Fulli. Deputy head of Energy Security, Distribution and Markets unit. European Commission Joint Research Centre – Directorate C Energy, Transport and Climate

Email address: Gianluca.FULLI@ec.europa.eu

The power point presentation can be downloaded from the SP3 platform, in the section dedicated to the events. (http://s3platform.jrc.ec.europa.eu/s3-platform).

Title

Observing the Smart Grid transition. Insights from the JRC Outlook 2016: Preliminary Results

Abstract:

Please provide a short abstract of your speech (max 1000 characters, including spaces)

JRC is strengthening its role of independent data-broker by collecting and analysing data in the field of smart grids. One of the outputs related to this activity is the smart grids projects outlook. The upcoming edition assesses the level of development of projects; identifies the business models to understand the conditions for investments remuneration and the benefits for the society; identifies solutions for the market integration of technologies, like targeted market instruments in support of services' remuneration.

Keywords:

Smart grids outlook, investments, funding sources.

Website: http://ses.jrc.ec.europa.eu/survey-collection-european-smart-grid-projects

The project

The presentation given by Gianluca Fulli regarded the current status of smart grid projects in Europe. The JRC is the scientific body of the European Commission whose mandate is to support the policy making through science. In the energy field, the JRC performs independent research and analyses on the systemic and technological features that play a role in the energy transition. JRC is strengthening its role of independent data-broker by collecting and analysing data in the field of smart grids and releasing reports on: (1) smart grid projects (in the form of periodical outlooks with updates and details on the projects tested and developed in Europe)[18]; (2) smart grids laboratories, which provides a basis for the JRC's experimental activities aimed to understand the interplay – interoperability – of the components of the energy system, e.i. technologies,

[18] Covrig CF, Ardelean M, Vasiljevska J, Mengolini A, Fulli G, Amoiralis E, Jiménez MS, Filiou C. Smart grid projects outlook 2014. Joint Research Centre of the European Commission: Petten, The Netherlands. 2014.

consumers, infrastructure[19]; (3) and distribution systems observatory[20], that contains data and analysis of the technical, topological and market features of the largest distribution grid operators in Europe and a number of indicators and representative network models that can support researchers in the analysis and simulation activities on realistic distribution grids.

Smart grid project outlook

The smart grid landscape is changing and the need to understand the level of maturity of the technologies and the obstacles to their full deployment is becoming a priority. The new outlook (Figure 54) contributes to: assess the level of development of projects; identify the business models to understand the conditions for investments to be remunerated and the benefits for the society as a whole; identify solutions for the market integration of technologies, like targeted market instruments in support of services' remuneration, i.e. demand response scheme in the US.

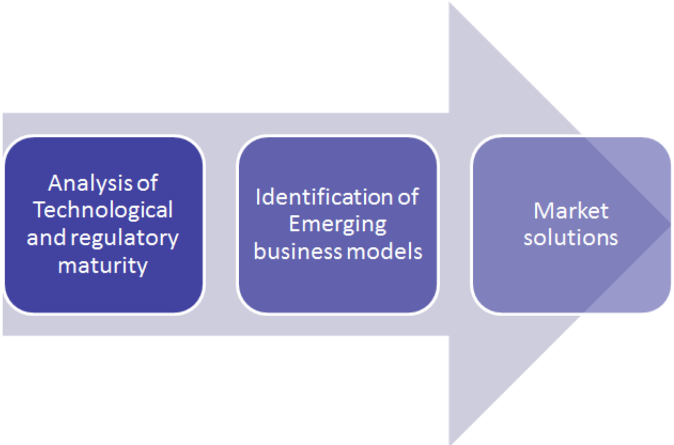

Figure 54 Main focuses of the 2016 Smart grids project outlook

The new edition of the JRC outlook covers around a thousand projects in 51 countries in Europe, for a total investment of 5.1 billion euro; it includes a review of 3000 organisations playing a role in this field, i.e. universities, research institutes, utilities, and other actors like municipalities, housing associations - the latter active especially in the field of demand response – and 640 implementation sites mainly in Germany, France and the UK (Spain and Italy are following suit) (Figure 55).

[19] Blanco MP, Prettico G, Andreadou N, Guardiola MO, Fulli G, Covrig CF. SMART GRIDS LABORATORIES INVENTORY 2015. Joint Research Centre of the European Commission: Petten, The Netherlands. 2015.

[20] Prettigo G, Gangale F, Mengolini A, Lucas A, Fulli G, Distribution systems operators observatory, Joint Research Centre of the European Commission: Petten, The Netherlands. 2016.

Figure 55 Smart grid outlook 2016 – quick takes

While Germany, France and UK record the highest absolute values of investments, Denmark and Slovenia are the leading investors if the euro *per capita* figures are taken into account. Distribution system operators are the leader investors in terms of budget allocated, while universities and research centres are those involved in the biggest number of projects (Figure 56). New actors, which are not necessarily directly linked to the energy business, have recently started entering into the smart grid field. This is the case of municipalities and housing associations which started participating in projects to understand the role of demand response to help balancing the system. This is the sign of a new trend which sees the engagement of final consumers and cross-border cooperation among different actors to share experiences and find synergies.

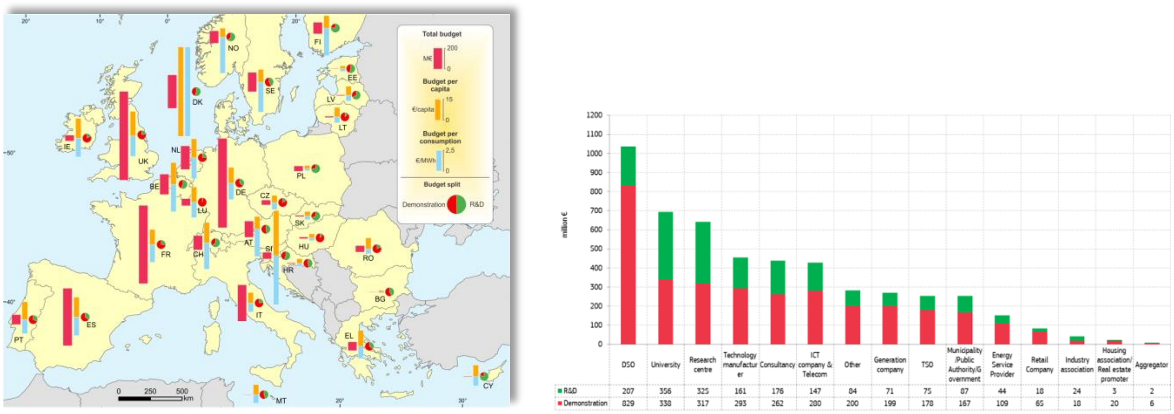

Figure 56 Investments in smart grid projects by country and by investor category.

The ranking of the projects by innovation stage of development (Figure 56) shows R&D projects being more numerous (58% of the projects included in the 2016 outlook) while demonstration projects are larger in terms of million euro invested (65% of the total budget invested) but limited in quantities.

(a) (b)

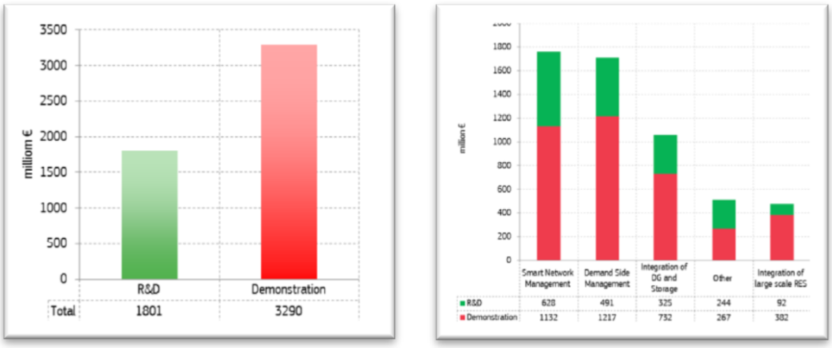

Figure 57 Investments by (a) projects' stage of development (R&D vs demonstration), (b) application.

The variety of smart grids applications across Europe is a sign of the diversity of interests and circumstances of each European Member State, national industry strategies, specificities of the different regulatory frameworks (Figure 58). The 2016 outlook categorises the smart grids applications into 4 main families: smart network management, featured by ICT solutions; demand side management, that includes the role of consumers together with big industrial energy users; projects for the integration of distribution grids and storage; project for the integration of large scale renewable technologies; other applications.

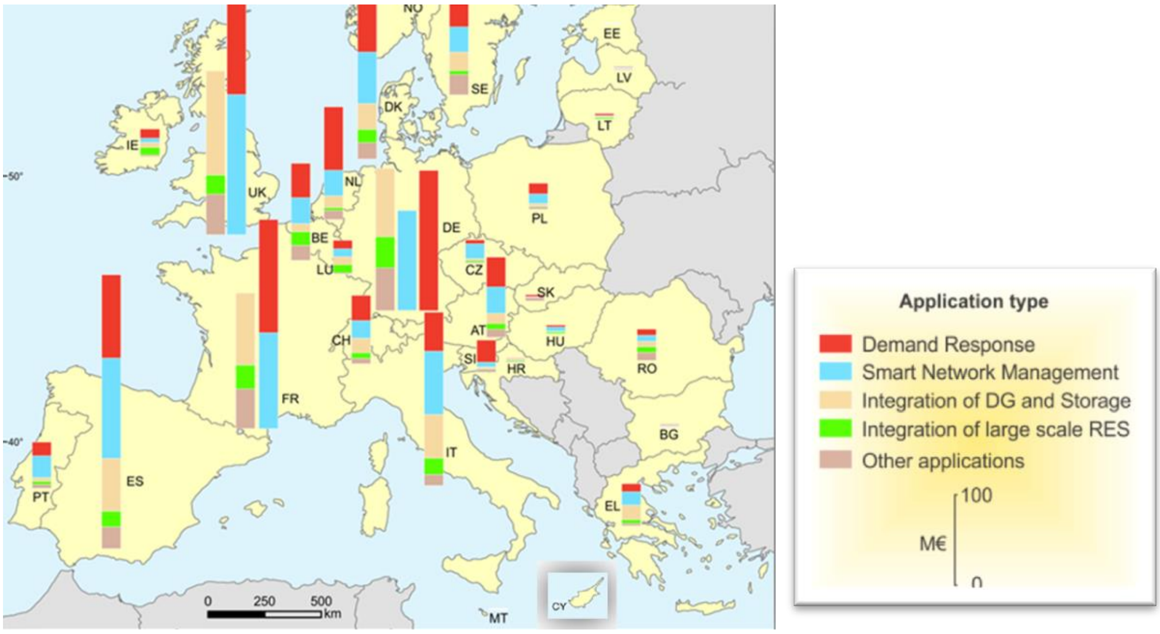

Figure 58 Projects' applications across Member States

A critical issue is in the source of financing of the projects (Figure 59). Private resources are the main sources of financing for a total of 45% of the overall investment, whereas the European Commission funding amounts to 25%. Other sources of funding come from novel regulatory mechanisms created in support of innovation (i.e. the Low Carbon fund in UK), whereby new budget lines have been used to support smart grids projects and demonstrators.

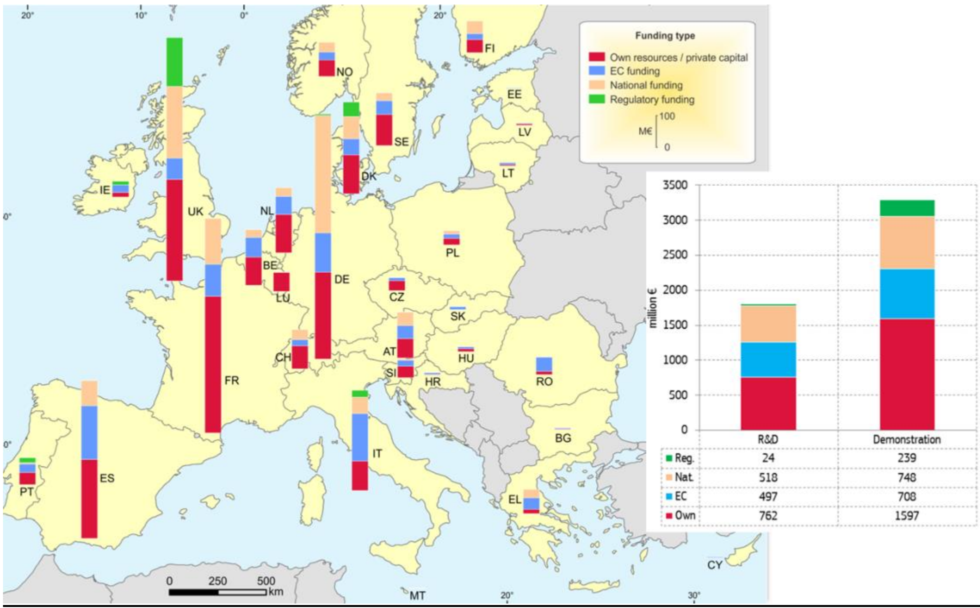

Figure 59 Source of financing of smart grids projects (regional, national, European Commission, Own sources).

The concluding key messages of the presentations can be summarised as follows:

- ✓ Europe is among the world leaders in smart grid investments, together with some emerging or developed Asian countries; big economies like the north American ones are following suit and may take the lead in the next years;
- ✓ An increasing degree of cross-border interaction and synergies among new and new actors has emerged among the results of the analysis reported in the 2016 outlook;
- ✓ Public funding still plays a central role in supporting the smart grid R&D and demonstration activities;
- ✓ More than deploying the silver-bullet technology, a key to smart grid solutions uptake is finding the way to make different systems and technologies integrated and interoperable;
- ✓ Investigating and testing the systemic integration of different solutions under real-life conditions, and their interaction with end-users, is becoming imperative to move from research to deployment; the end-consumer needs to be properly involved through a proper regulatory framework;
- ✓ Knowledge sharing and dissemination of best practices is strategic to accelerate smart grids deployment.

Final note: those interested in including their own project in the smart grid project outlook, can consult the JRC data base at the link http://ses.jrc.ec.europa.eu/survey-collection-european-smart-grid-projects

7. Wrap-up session and conclusions of the workshop

Moderator: Paolo Casalino, Head of Brussels office at Apulia Region, working on the smart specialisation for Apulia Region, in support of the Department of industrial research and innovation represented by Adriana Agrimi. He represented the Apulia region at the meeting in Brussels on the EU sustainable energy week on the 13-17 June 2016, and gave a speech on the regional priorities on energy.

7.1 Innovative grid-impacting technologies for pan-European system analyses: key GridTech results on Demand Response application - A preview

Angelo L'Abbate. Senior Research Engineer, Transmission Planning and Operation Group. Energy Systems Development Department RSE SpA

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The power point presentation can be downloaded from the SP3 platform, in the section dedicated to the events. (http://s3platform.jrc.ec.europa.eu/s3-platform).

Title

Innovative grid-impacting technologies for pan-European system analyses: key GridTech results on Demand Response application

Abstract:

The presentation, after providing an overview of the European GridTech project, focuses on the role and effects that innovative grid-impacting technologies may have on the evolution of the pan-European system over the years. Particular attention is paid to Demand Response (DR) technologies and their impact in complex pan-European system studies. For this purpose, different outcomes of the GridTech pan-European study applying a zonal analysis are taken into account, with reference to 2020, 2030 and 2050 scenarios. Some key results of the application of DR modeling for the GridTech pan-European studies are also evaluated and compared towards a quantitative techno-economic assessment of DR in 2020, 2030 and 2050 scenarios.

Keywords:

Demand Response, grid-impacting technologies, pan-European system evolution, scenarios build-up

Pilot project presented

Project Name: IEE GridTech project

Website of the pilot project: http://www.gridtech.eu

Contract number: IEE/11/017/SI2.616364

Duration: May 2012 - April 2015

Sponsors:

The project

GridTech is a project co-funded by the European Commission under the Intelligent Energy Europe (IEE) Program: its full title is *Impact Assessment of New Technologies to Foster RES-Electricity Integration into the European Transmission System*. RSE SpA has been deeply involved in GridTech. The JRC has been also actively participating in the project together with industry partners, including the Italian transmission system operator Terna SpA among others, while the project has been coordinated by the Energy Economics Group of TU Wien University. The project has aimed to provide analyses, modelling and applications in a number of studies on the Pan-European system and on 7 regional target countries to assess the techno-economic impact of new technologies that can help TSOs to integrate renewable energy sources (RES) at lowest possible costs to the system.

The objectives of the project can be summarised as in the following in order to:

1. assess the non-technical barriers for transmission expansion and market compatible renewable electricity integration in Europe;
2. develop a robust cost-benefit analysis methodology on investments in most suitable new technologies fostering large-scale renewable electricity integration into the European transmission grid;
3. apply and verify the cost-benefit analysis methodology for investments in the transmission grid, on national and European level;
4. achieve a common understanding among key actors and target groups on best practice criteria for the implementation of new technologies fostering large-scale renewable electricity and storage integration;
5. deliver tailor-made recommendations and action plans, taking into account the legal, regulatory, and market framework.

The focus of the project has been on the most promising and innovative technologies that may (directly or indirectly) impact on the transmission system, like: i) electricity generation technologies (EGT), with a focus on variable RES; ii) transmission grid technologies (TGT), with particular attention paid to flexible devices including HVDC; iii) energy storage technologies (EST), with emphasis on bulk storage options; iv) electricity demand technologies (EDT), including Demand Response (DR), Demand Side Management (DSM) and electric vehicles (Figure 60).

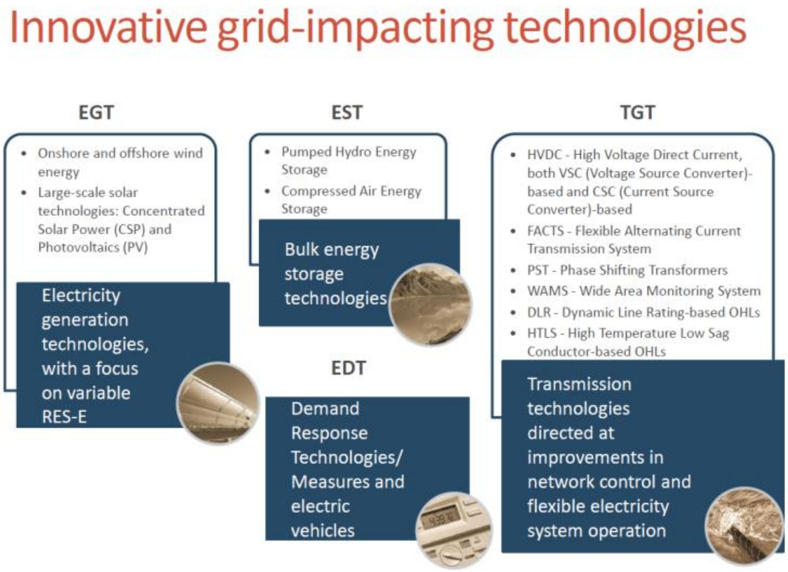


Figure 60 Mix of innovative technologies included in GridTech modelling.

The presentation focuses on Demand Response technologies adopted by large customers, on their aggregated load shifting effect over the year and on the techno-economic impact of these technologies on the system.

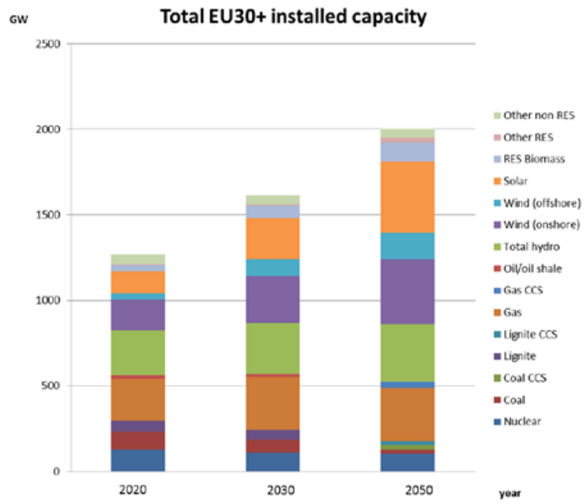
The project had started before the Energy Union concept was developed; it takes into account the long term scenarios, starting from 2020 up to 2030 and 2050 and assesses - under increasing levels of renewable generation - i) *which*, ii) *where*, iii) *when*, and iv) *to which extent* innovative technologies could effectively contribute to the further development of the European transmission system: this has to be considered while boosting the creation of a competitive and sustainable pan-European electricity market. This project includes studies covering models for EU30+ system as well as with focus on 7 European countries (AT, BG, DE, ES, IE, IT, NL) with a detailed grid/zonal analysis. The EU30+ system is based on a copper-plate type model, by means of MTSIM (Medium Term SIMulator) tool developed in-house by RSE SpA over the years. MTSIM is a medium-term zonal simulator of a generic day-ahead market (DAM), which is able to independently take into account inter-zonal HVAC (through the PTDF matrix) and HVDC transmission grid. The key feature of MTSIM is that it optimises the power dispatch while singling the installation of additional interconnection capacity between the market zones, as well as the insertion of new storage and DR technologies. The output of the simulations includes dispatch costs, inter-zonal flows, load shedding values, renewable generation curtailment levels and CO_2 emissions. The focus of the presentation is on DR defined as the capability of a certain load to modify its own absorption profile by shifting the consumption in time, while preserving the total demand value in a specific time interval, e.g. 24 hours - and its benefits in terms of reduced renewable generation curtailment and total dispatch cost decrease in the system over the years. The DR considered concerns industrial customers across Europe.

This project studies the evolution of a very large system, so far the widest in terms of geographical coverage for this type of analyses, in line with the approach of the Energy Union, including EU28, the Western Balkan countries,

the EFTA nations and Turkey, all of them fully endogenously modelled. MTSIM also includes injections from former Soviet Union countries (Russia, Belarus, Moldova and Ukraine), Middle East and North Africa. In the long term (post-2030), additional zones (5 to 7) have been also included to account for the offshore grid islands. Focus of this presentation is however on the onshore pan-European system (up to 2050).

Figure 61 summaries the main assumptions of the model (base case).

2.a – assumed energy mixat 2020, 2030, 2050



2.b – details

EU30+	2020 (GW)	2030 (GW)	2050 (GW)
Nuclear	126.9	108.6	102.1
Hard coal	105.5	76.5*	53.0*
Lignite	65.6	56.6	19.8*
Gas	245.1	311.2*	349.9*
Oil / oil shale	20.4	16.6	0
Other non RES	57.3	53.0	50.8
Total Hydro	260.7	297.0	335.1
Wind (onshore)	179.9	276.8	380.8
Wind (offshore)	37.9	96.9	154.3
Solar	126.7	243.2	416.8
RES Biomass	38.8	69.6	113.7
Other RES	2.5	8.5	26.9

*: including CCS

Figure 61 Main assumptions of the EU30+ model

The modelling tool has simulated different scenarios for each time horizon - 2020, 2030 and 2050. For the analysis of DR impact at each target year, a comparison has been carried out, considering a case without DR implemented in the system (base case, S0) with respect to a case where DR technologies have been included (S3)(**Error! Reference source not found.**).

DR scenarios	Time horizons		
Without DR	2020 S0	2030 S0	2050 S0 (1 and 2)*
With DR	2020 S3	2030 S3	2050 S3 (1 and 2)*

* At 2050 the analyses of the pan-European system have been conducted for the case with PTDF (2050-1) and for the case without PTDF (2050-2).

Table 7 Simulation scenarios for Demand Response technologies

Results of the simulation for the 2020 base case scenario (S0), which corresponds to the scenario in which no DR is introduced in the system, show that:

- The merit order curve sees coal-based power generation as cheaper than gas-based generation (the CO_2 price is assumed to amount to 10 €/tCO_2);
- Curtailment of renewable sources is rather significant , especially in isolated regions, like Ireland and Iceland;
- Electricity prices in some countries like in Malta, Turkey and Cyprus are rather high.

The simulation of 2030 base case scenario, for a CO_2 price assumed to amount to 35 €/tCO_2, results in an increase of electricity prices and increment of RES generation curtailment (due to the higher RES penetration) with respect to 2020. This extended trend concerns also the 2050 base case scenario for a CO_2 price assumed to amount to 100 €/tCO_2: this CO_2 price however changes the merit order, making gas-based generation more convenient than coal-based generation.

The inclusion of DR technologies, aggregated for large industrial customers, changes the outcomes of the simulation leading to a decrease of renewable generation curtailment, a reduction of total dispatch costs, while the impact on zonal costs depends on the country-specific renewable penetration and energy mix. Moreover, while DR does not generally impact much on load shedding and energy not supplied, the effect of DR on CO_2 emissions can be very significant. The results show that, in presence of a coal-based generation more competitive than gas-based generation (like at 2020 and 2030), by shifting the load towards lower marginal costs DR can lead to an increase of CO_2 emissions. This situation is reversed with gas-based generation more convenient than coal-based generation (Table 8).

Benefits from DR	**2020**	**2030**	**2050-1**	**2050-2**
Total dispatch cost reduction	425 M€	1423 M€	24530 M€	25636 M€
RES curtailment reduction	127 GWh	1458 GWh	6719 GWh	6445 GWh
CO_2 emissions reduction	-869 ktCO_2	-8384 ktCO_2	6694 ktCO_2	6563 ktCO_2
Load shedding reduction	0 ktCO_2	0 ktCO_2	4327 GWh	4555 GWh

Table 8 Summary of DR impact results by time horizon and scenario.

Main conclusions on the role of Demand Response in the pan-European electricity system can be summarised as in the following:

- Large investments and system extensions are needed to foster huge RES integration: there are several technological options available today and in the future, while there are not solutions good for all cases/regions (much depends on local situation)
- From a society perspective, the use of DR might be very effective -> price signals to industry and customers are needed
- Storage vs. DR -> DR may be favoured over storage as it is generally cheaper and more efficient
- Flexibility, controllability and socio-environmental impact will be more and more crucial aspects to be further investigated
- Further analyses towards a full quantitative techno-economic DR assessment, taking into account DR benefits and costs, as well as comparisons with other innovative technologies, have been carried out within GridTech.

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7.2 Technology , Regulation and Consumers behaviours

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The power point presentation can be downloaded from the SP3 platform, in the section dedicated to the events. (http://s3platform.jrc.ec.europa.eu/s3-platform).

Title

Technology , Regulation and Consumers behaviour

Abstract:

Innovation is an essential element of economic performance, as well as a central component of the wellbeing of modern societies. However innovation can also cause reduction of privacy, security threat and give room to exploitation and abuse of market power. Thus technological and societal innovation is likely to create winners and losers.

For these reasons innovative practice and technologies cannot be passively adopted but need to be adequately regulated in order to promote the positive effects that innovation is able to bring to our societies while limiting, at the same time, its adverse impact. In this context we cannot assume that established policies for encouraging innovation are adequate to the new conditions.

It is therefore vital that a self-reinforcing process is set in motion where regulation is able to allow innovation and where innovative regulatory models are designed to allow the positive effect of technical and societal innovation to emerge over time.

Keywords:

Innovation, consumer centric regulation, energy transition,

Technology, Regulation and Consumers behaviour

The topic of the presentation is on smart communities and on how regulation, technology and consumers come together to promote innovation (Figure 62).

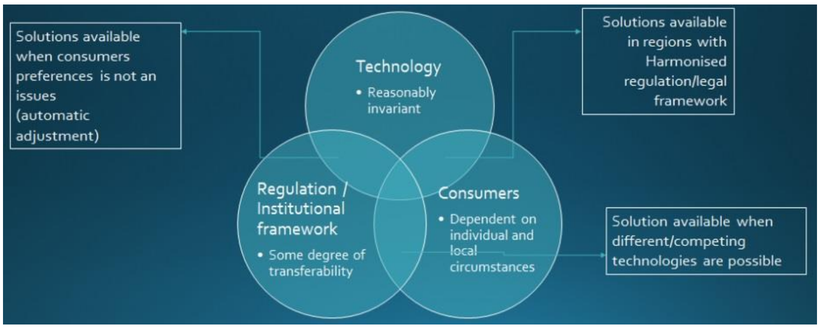

Figure 62 Smart communities main ingredients

In the process of moving towards smart grids systems the role of the demand side shall be reconsidered. Typically when studying the power market the main assumptions made on the demand and the supply side follow the traditional scheme of perfect competitive whole sale and retail markets. In this context consumers' protection and empowerment was and is nowadays one of the main targets of the regulator and the design of the energy market. In the complex framework of smart grid systems the role of the consumers may change, together with an increasing complexity in defining consumers, consumers' needs, etc.

A bilateral flow of information going from the market to the consumers and vice versa from the consumers to the market by the transparent expression of their preferences can be used in many ways, i.e. the perfect profiling of the consumers. This calls for a radical reshape of the regulation and new potential links between regulation and technology. In order to make the consumer side more dynamic on the market it will be possible in the future to allow consumers to seek for the best deal according to their specific consumption profile. Telecom and energy regulator will need to work together to make the effective exchange of flows of information possible.

7.3 Regulation and investments in the Mediterranean Region

Fabio Tambone. Head of external international relations of the Italian Authority for Energy, gas and water, also MEDREG General Coordinator. MEDREG, Mediterranean Energy Regulators

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The power point presentation can be downloaded from the SP3 platform, in the section dedicated to the events. (http://s3platform.jrc.ec.europa.eu/s3-platform).

Title

Regulation and investments in the Mediterranean Region

Abstract:

MedReg is an organisation bringing together 25 regulators in the Mediterranean regions from 21 countries. The objective of MedReg is to promote a stable and harmonised regulatory framework; markets and systems integration; infrastructure investments; consumer protection; enhanced energy cooperation. Among the cooperation activities that MedReg has initiated, there is the joint work with Med-TSO (the Transmission System Operators of the Mediterranean basin) performed under the umbrella of the Union for the Mediterranean (UfM) on the development of an energy market in the Mediterranean area (Regional Electricity Market (REM) Platform).

Contact person: info@medreg-regulators.org

Keywords:

Mediterranean regions, TSOs, cooperation.

Pilot project presented

Project Name: MedReg, Mediterranean Energy Regulator

Website of the pilot project: www.medreg-regulators.org

Regulation and investments in the Mediterranean Region

MedReg is an organisation bringing together 25 regulators in the Mediterranean regions (Figure 63) from 21 countries. The objective of MedReg is to promote a stable and harmonised regulatory framework; markets and systems integration; infrastructure investments; consumer protection; enhanced energy cooperation.

Figure 63 Members of MedReg

The Presidency is composed by the Egyptian energy regulator being the president of the organisation and the Italian regulator is a permanent Vice-president, being Italy the founding and hosting member of MedReg, together with Portugal and Albania (Figure 64)

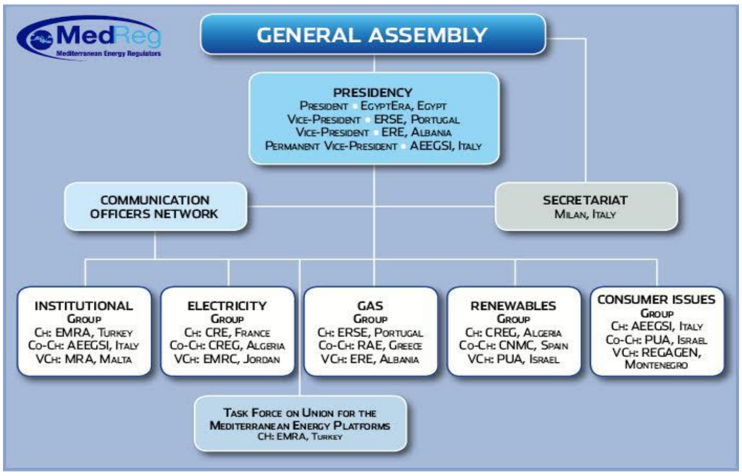

Figure 64 MEDREG organisation

The Mediterranean area is a region full of opportunities from the point of view of the development of renewable energy resources. The costs of the development of these technologies are transferred on to energy tariffs which are regulated by national energy authorities. Consumers and stakeholders' engagement is important in the process of promoting and boosting new energy development like renewable energy and smart grid. The challenge also regards data collection from TSOs and operators. MEDREG is supported by a large number of stakeholders which is made of partners from international institutions; financial sector; and other national and international industrial associations (Figure 65).

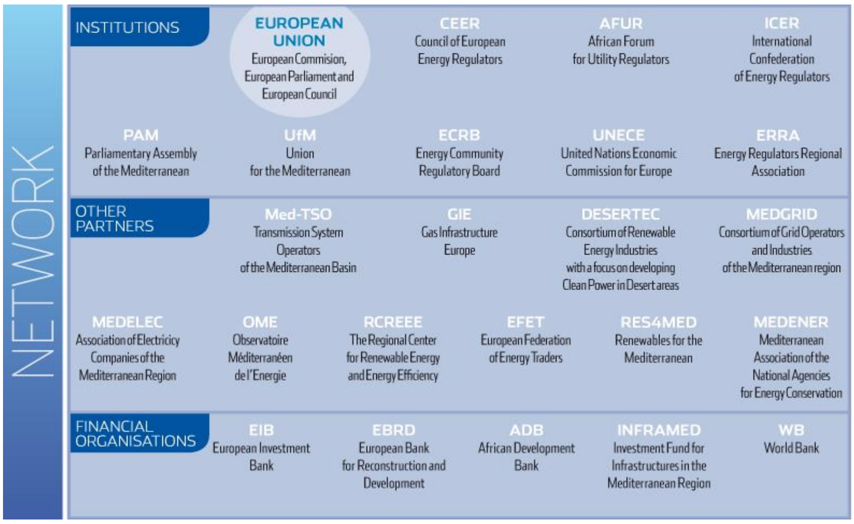

Figure 65 MedReg network

Among the cooperation activities that MedReg has initiated, there is the joint work with Med-TSO (the Transmission System Operators of the Mediterranean basin) performed under the umbrella of the Union for the Mediterranean (UfM) on the development of an energy market in the Mediterranean area (Regional Electricity Market (REM) Platform), that has the following objectives (Figure 66):

1. Evaluate and motivate the adoption of regional and sub-regional approaches, aiming at an overall integration, while respecting countries' diversity
2. Develop, share and discuss possible scenarios on Mediterranean power exchange in the short, medium and long term

3. Perform a cost-benefit analysis of cross-border projects in the Mediterranean region, and propose to the Euro-Mediterranean countries a list of potential candidates to be labelled as projects of common interest to obtain faster permitting procedures and easier funding

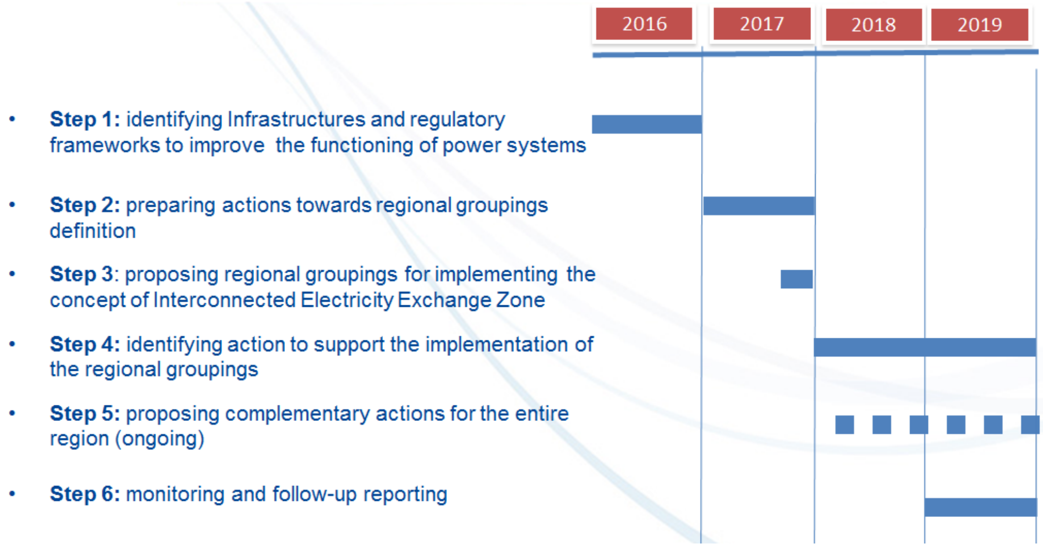

Figure 66 The 6-steps plan and timeline of the Mediterranean Regional Electricity Market (REM) project

Together and before boosting the development of new investments in the energy system, MedReg and Med-TSO cooperation aims at evaluating that existing investments guarantee efficiency. An example of what shall be the focus of an attentive analysis is the monitor of the existing infrastructures.

MedReg has recently finalised a consultation on the need of new investments in the Mediterranean region. The main barriers to the reformation of the energy system in the Mediterranean area are represented by countries with political instability, countries where reforms of the energy system have been delayed, and in other countries where the process of reformation of the system is happening yet without adequate market governance.

The main challenge around the development of smart grid is represented by the difficulty of connecting technologies and create communication channels with the energy system. An example of such difficulties was in the operation of electricity power exchanges across Europe, which did not communicate with the same technologies. This recently changes and allowed electricity markets to interact.

In this context market design plays a major role. Here the participation of diverse stakeholders – regulators, operators and consumers - is to be advocated in the process of the reform of the power markets towards the creation of a common European market.

The work of MedReg working groups on electricity and one on renewable energy is to understand how renewable energy can be integrated in electricity systems. In this context smart grids need to be part of this process through information, research, regulation and investments.

MedReg's financial advisory panel interfaces with many international financial institutions and governments like the Egyptian energy regulator that we assist in the regulatory reform of the gas sector.

7.4 Wrap-up session and discussion

The round table is composed by Paolo Casalino (Head of the Brussels Office of Puglia Region), Angelo L'Abbate (RSE SpA), Alessandro Rubino (Nature Energy Publishing) and Antonio Sacchetti (Tera Srl).

7.4.1 Antonio Sacchetti – Tera Srl

Main topics that emerged during this workshop and some conclusions.

Demonstration and pilot project are very relevant to empower the background in terms of information needed to take final decision about actions and related benefits in the field of energy efficiency. Many projects presented at the workshop Smart *Mediterraneo* were in the field of smart renewable generation, smart use of energy with DSM, storage and involved multiple stakeholders. The value chain of the energy sector is traditionally made of producers, transmission operators, distribution operators and final users. Between energy distributors and final users there are actors which are proving growing importance: the vendors, operators without physical infrastructure and a big plethora of service companies working in energy efficiency and energy management applications.

New and more ambitious targets of CO2 emission reduction will impose higher costs also to the energy sector. This will progressively increase the unit cost of power to the final users. This will reward companies for their effort to improve efficiency and adopt new generation technologies in terms of what can be called as “smart grids” (in terms of ICT, devices, plants, systems).

Users' engagement is key element for the success of smart grids technologies. The annual energy costs savings due to smarter energy management for an average household has been estimated to be from around 200 to 500 Euros ca. In some sectors the energy management costs saving – which includes not only energy consumption reduction but also the implementation of smart tariffs and dynamic energy pricing of this type – may be higher. Nevertheless these cost-saving estimations *per se* do not look big enough to justify the “massive” change in the consumers' habits that is advocated in the current discussion around deployment of smart technologies. Thus, programs to stimulate user’s engagement, starting from their awareness and going towards the adoption of concrete actions, both in behaviors and investments, are needed.

7.4.2 Angelo L'Abbate – RSE SpA

The European Energy Union is an encompassing framework that shall be the playing field for collaboration also on smart grids. The discussion on smart grids evolution and issues in Europe should include in the loop transmission system operators, in addition to distribution system operators and customers. In this sense, the big and small customers shall be involved into a more systemic approach; all of them represent different interests that need to be highlighted and taken into account. The build-up of a Energy Union in Europe shall push not only to a transnational but also to a transregional horizontal and vertical coordination at distribution and transmission level, fostering closer cooperation between neighboring countries and beyond. R&D and Innovation has a key role in this process, together with the increasing penetration of energy efficiency and renewable energy sources technologies. Regulation plays a crucial role in the promotion of innovation along the full energy value chain, with both ex ante and

ex post measures aimed at monitoring and improving innovative processes during the years.

7.4.3 Alessandro Rubino – Nature Energy Publishing

Considering the three dimensions of the development process of smart communities (Regulation, technology and Consumers), there is a need to find out the solutions compatible with these three dimensions. Compatibility of systems - "Lego system" - is of the utmost importance: as in with Lego the bricks are of different dimensions but their combination is compatible and effective.

It is well known that innovation is an essential element of economic performance, as well as a central component of the wellbeing of modern societies. In particular innovation is typically associated with environmental sustainability and equity. However innovation can also cause reduction of privacy, security threat and give room to exploitation and abuse of market power. Technological and societal innovation is likely to create winners and losers. For these reasons innovative practice and technologies cannot be passively adopted but need to be adequately regulated in order to promote the positive effects that innovation is able to bring to our societies while limiting, at the same time, its adverse impact.

Innovation is required to become, and to remain competitive and dynamic in a fast evolving environment that is increasingly globalised and where technical progress is relentless while its direction is unpredictable. In this context we cannot assume that established policies for encouraging innovation are adequate to the new conditions. Nor can we assume that the ways in which technical progress is evolving will allow further innovative process to take place. It is therefore vital that a self-reinforcing process is set in motion where regulation is able to allow innovation and where innovative regulatory models are designed to allow the positive effect of technical and societal innovation to emerge over time, spurring a race to the top competition.

Regulatory obstacles to the implementation of smart grids technologies are evident. Dynamic regulation is the ability to adapt to different circumstances that could emerge over time. This comes with a cost. Stable regulatory framework conflicts with constant innovation. The trade-off here is the degree of protection of the system versus openness to innovation. It is definitely a political decision to set out the boundaries to this trade-off and allow for stability or more dynamic innovation at a time and under specific circumstances.

7.5 The floor is open to discussion with the audience and the invited speakers

Angelo L'Abbate (RSE SpA)

The IEE GridTech project, as previously presented, has taken into account a variety of tools, transmission technologies options for interconnectors together with storage and demand side devices and measures: as said, demand response will not be the only solution, but to address those issues related to a boosting renewable energy penetration in Europe the answer is in the optimal combination of technologies and tools and the exploitation of their related benefits.

In agreement with what presented by Mr. Tambone, it is true that we need solutions at the horizontal and vertical level, including HVDC together with larger interconnectors, for enabling a boosting renewable energy penetration and

market integration. In the IEE GridTech project we focused only on DR from large industrial players but we also saw an important role of storage, especially in the solution of local issues in presence of transmission capacity gaps (in isolated countries or regions). The utilisation of scenarios analysis for understanding what would be the European electric energy system in the coming decades has its advantages and disadvantages. The ability of considering a diversified portfolio of tools and measures is key in the understanding of results and elaboration solution. Although we are not yet there with a unified European energy market, we have functioning (or under development) regional markets. Markets for ancillary services will be also created. The integration of gas and electricity markets together with the optimal use of interconnectors and advanced technologies towards the realisation of RES and efficiency targets through the implementation of stable (but also flexible) regulatory frameworks in addition to other measures will contribute to the evolution towards the European Energy Union. We do not have the answers to all issues yet but we can find them: for this, we shall need a global vision in Europe to foster the process of national energy policies coordination towards collaboration among countries.

Javier Gomez – JRC

In the Smart Specialisation for Energy we have recently improved the registry of the community. Those who want to be part of the community can register to the web portal: S3PEnergy community registration. The ideas is to exchange with the community on two objectives: the first is to inform the community about what it is happening in the regions on smart grids topics and other; the second is to receive feed-backs from the experts on how they advance on the project development and on their experience.

7.6 Closure of works

Paolo Casalino

On behalf of Apulia Region I would like to thank the JRC IET and the other JRCs involved in the organisation of this event. This event has been organised under the framework of activities of the Smart Specialisation Platform on Energy. Apulia Region is strongly committed to implement the external dimension of Smart Puglia 2020, the regional smart specialisation strategy and to actively work in the S3 thematic platforms on industrial modernisation, agri-food and energy. Today's event is the first step of a process, which will include other moments: a Workshop on financial synergies between ERDF and other funding programmes on 11/7/2016 in Bari organised with the JRC of Seville. A third event in September 2016 will be on the cooperation of regions, clusters and universities in the implementation of the smart specialisation, where the new call for expression of interest launched by DG Growth on the Strategic cluster partnerships for smart specialisation investment will be presented.

8. Visit to site of interest: SHOWROOM Smart City RES NOVAE, Bari (Italy)

enel Distribuzione — RES NOVAE — Reti Edifici Strade Nuovi Obiettivi Virtuosi per l'Ambiente e l'Energia — Comune di Bari

The Showroom Smart City RES NOVAE is a demonstration/information center aimed at involving citizens in the road to Smart City (Figure 67).
Citizens and students can face interactive paths with the scope to easily show what is a Smart City, which are the main benefits, how to actively contribute to its development and deployment, and furthermore have a look to the main results of the RES NOVAE project. The showroom is a space full of prototypes, monitors showing interactive games, self-explicable videos, on-line applications and a conference room where study in deep smart topics. The Showroom is itself a smart place in which several sensors are installed (air quality, temperature, smart plugs, smart meter), whose data are gathered together and showed trough an App developed during project activities.
In the Showroom is placed the "Urban Control Center" (UCC) as well, a city dashboard developed by IBM that shows trough a Touch Screen the energy map of the City of Bari, gathering, analyzing and monitoring several data such as environmental, energetic or mobility.
The main objective of the Showroom is to give the possibility to take a virtual tour in the smart part of the City, giving awareness to citizens on smart topics and triggering good behavior to better use energy and environmental resources.

Figure 67 Showroom RES NOVAE, Bari.

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8. Conclusions

For several stakeholders in the field, the workshop "Smart Mediterraneo", hold by the JRC in Bari on 23rd and 24th June 2016, represented a successful occasion to exchange experiences on smart grid project development under the EU research & development and innovation policy. The event saw the participation of around eighty attendees from the private, public and research sector and allowed for a constructive interaction among local entrepreneurs and public authorities. The main findings arising from the discussions during the two-day workshop mainly regarded two aspects.

A well-structured and lean procedure to access the European funds available through local authorities is a fundamental prerequisite for the efficient start of an innovation project. Local authorities become the lighthouse for the formulation and implementation of the strategy on the territory. The strategy is discovered together with the main actors of the innovation process and in tight collaboration with the suppliers of "collateral capabilities" that facilitate the success of the project. Delays and interruptions in site acquisition and preparation phases, in case of projects with a site demonstrator, may undermine the outcome of the project.

The second element is the importance of a multi-disciplinary approach to the research and knowledge development in the first phases of the project and the further aggregation of capabilities during the entire process of project development. The collateral capabilities may come also from the outside of the geographical territory where the innovation is experimented. The presence of an already established network of potential professional suppliers of skilled labour force, modern technology and infrastructure are the key elements for a successful outcome of the innovative project.

The debate also addressed some crucial aspects of the post-development phase of the project, when the funding period of the project is over and the technology for delivering products and services is already in place. In this phase, the project can concretely demonstrate its innovation potential. The presence of a local entrepreneurial environment - ready to capture the value added from innovation - and an easy access to the infrastructures - facilitating the utilisation or commercialisation of the innovation – determine the success and effectiveness of the project and of the innovation policy. As was highlighted in one project presentation, "the main challenge around the development of smart grid is represented by the difficulty of connecting technologies and create communication channels with the energy system".

Despite an improved 2014-2020 innovation policy agenda has been put in place, when compared with previous periods, concrete challenges are still envisaged in the development of the smart specialisation strategy framework, especially in "providing a common political rationale for a socio-economically and territorially diverse set of regions and nations facing different place-based challenges and different innovation modes, and hence, quite legitimately, different general policy agendas" (Capello et al. 2016). This study lists five main categories of challenge:

- Lack of local preconditions for innovation;
- Innovation and technological lock-in and lack of capacity to diversify domains of development around historical specialisation patterns;
- Difficulties in policy prioritisation;

- ➢ Difficulties in repositioning of "peripheral regions" in international value chains, due to the lack of interest of local Multinational Enterprises (ME) in engaging with local government and its strategies, due also to the risk of company relocation strategies that are out of control of the regional government;
- ➢ Risk for weak Small and Medium sized Enterprises (SME) to remain out of the prioritisation process of the local government, which may, as a consequence, remain by and large publicly driven.

JRC, through the organisation of dedicated workshops across different EU Regions[21], helps the local stakeholder in acknowledging and overcoming these challenges. Workshops gather both regional policy makers and local project promoters, providing first-hand inputs:

- Promote growth and innovation with more efficient regional policies and tools (organisation of funding schemes, etc.)
- *Acknowledge innovative projects and experiences already present in the region*
- *Learn from the experience of other regions, made available by JRC experts in innovation and on technical aspects of innovative projects (e.g. Smart Grids).*

The positive feedback received by the audience of the workshop underlined that such events bring significant added value and consolidate the relationship among regional actors and EU actors, contributing also to bridge a communication gap between the two governance levels.

[21] See Annex 6 to know about the upcoming workshops in other regions of the EU.

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List of abbreviations and definitions

AEEGSI Autorità per l'energia elettrica, il gas e i servizi idrici (Authority for electricity, gas and water service)

ARTI Puglia Agenzia per la Ricerca Tecnologica e Innovazione

AT Austria

BE Belgium

BG Bulgaria

CBA Cost Benefit Analysis

CEER Council of European Energy Regulators

CF Cohesion Fund

COP21 Conference of the Parties number 21

COSME (EU program for the) Competitiveness of Enterprises and Small and Medium-sized Enterprises (SMEs)

CY Cyrus

CZ Check Republic

DE Germany

DG ENER Directorate General for Energy

DG GROWTH Directorate General for Growth

DG JRC Directorate General Joint Research Centre

DG REGIO Directorate-General for Regional and Urban Policy

DK Denmark

DR Demand Response

DSM Demand Side Management

DSO Distribution System Operator

EAC Electricity Authority of Cyprus

EH energy hub

EL Greece

ENEA Energia Nucleare ed Energie Alternative ("Atomic Energy and Alternative Energy")

ERDF European Regional Development Fund

ES Spain

ESCOs

ESF European Social Fund

ESIF European Structural and Investment Fund

EU European Union

FI Finland

FIWARE Future Internet WARE

FR France

GR Greece

GW Giga Watt

HU Hungary

ICT Information & Communication Technology

IE Ireland

IPTS Institute for Prospective Technological Studies

IT Italy

JRC Joint Research Centre

LT Lithuania

LV Latvia

NL The Netherlands

NPV Net Present Value

NTA Nikola Tesla Airport

PCI Projects of Common Interest

PL Poland

PLC Power Line Carrier

PT Portugal

PV photovoltaic

RES Renewable Energy Sources

RO Rumania

ROP Regional Operation Programme

RSE SpA Ricerca del Sistema Energetico

RSI3 Research and Innovation Smart Specialisation Strategy

s2E Stairway to Excellence

S3(s) Smart Specialisation Strategy(ies)

S3P Smart Specialisation Platform

S3PE Smart Specialisation Platform for Energy

SI Slovenia

ToU Time of Use

TSO Transmission System Operators

UCC urban control centre

UK United Kingdom

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Annex 1. Power point presentations

Power point presentations of all speakers can be found on the web site of the Smart Specialisation for Energy at the following link

http://s3platform.jrc.ec.europa.eu/-/s3p-energy-smart-mediterraneo-best-practices-innovation-and-pilot-projects-in-smart-grid-development-in-the-mediterranean-region?inheritRedirect=true

Annex 2. S3PEnergy Community register

For those who are interested in being part of the S3PEnergy Community register, it is possible to register and be updated on the events and initiatives of the community by inserting personal data on the registry managed by JRC S3PEnergy community registration

(http://s3platform.jrc.ec.europa.eu/registrationsform/event46/event_form.cfm)

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Picture. Some of the participants to the workshop (24/06/2016 Camera di Commercio di Bari)

Annex 4. Partners and sponsors

Annex 5. Smart *Mediterraneo* on the web

Arti Puglia

http://www.arti.puglia.it/europaplus/smart-mediterraneo-buone-pratiche-innovazione-e-progetti-pilota-nello-sviluppo-delle-smart-grid-nellarea-del-mediterraneo

Politecnico di Bari

https://www.poliba.it/it/ateneo/eventi/convegno-jrc-energia

Universitá di Bari

http://www.uniba.it/elenco-siti-tematici/unidea-unimpresa/eventi-notizie/evento-workshop-201csmart-mediterraneo201d

Sistema Puglia

http://www.sistema.puglia.it/?id=46889

L'Obiettivo

http://lobiettivonline.it/s3p-energy-smart-mediterraneo/

Tiscali News

http://notizie.tiscali.it/permalink/Smart-Mediterraneo-si-costruiscono-sinergie-per-le-reti-intelligenti/

Comune di Massafra

http://www.comunedimassafra.it/sportello-impresa-e-lavoro/2339-sistemapuglia-del-21-giugno-2016.html

INGRID project web site

http://www.ingridproject.eu/index.php?option=com_content&view=article&id=81:ingrid-project-at-smart-mediterraneo-best-practices-innovation-and-pilot-projects-in-smart-grid-development-in-the-mediterranean-region-workshop-planned-in-bari-italy-on-june-23-24-2016&catid=10:news&Itemid=206

TILOS Project

http://www.tiloshorizon.eu/tilos-participating-s3penergy-workshop/

Omnia Salus

http://www.omniasalus.org/Cosa-facciamo/SERVIZI-DOMICILIARI/ArtMID/516/ArticleID/9850/S3P-Energy-Smart-Mediterraneo-Bari-23-24-giugno-2016---Camera-di-Commercio-Eventi

Tera Srl – news / eventi

http://www.terasrl.it/it/2016/06/17/tera-e-le-tecnologie-smart-grid/

Linux news

http://www.tuttosulinux.com/cerca-prodotto/newsitem/118684/Cronaca-Smart-Mediterraneo-a-Bari-si-costruiscono-sinergie-per-le-reti-intelligenti.html

Annex 6. Next events

Next events organised by the Joint Research Centre – Directorates C (Energy, Transport and Climate) are:

Smart Baltic. Riga, 14-15 November 2016

S3P ENERGY WORKSHOP - SMART BALTIC

SMART GRID CHALLENGES AND OPPORTUNITIES IN THE BALTIC REGION

Contact: JRC-PTT-S3P-SMARTGRIDS@ec.europa.eu - Joint Research Centre, European Commission – Directorate C Energy, Transport and Climate

The workshop aims at facilitating a constructive exchange about the implementation of the Smart Specialisation (S3) priorities related to Smart Grids in the Baltic region. The event will address specific examples of how S3 regions are preparing the ground for smart grid deployment, including intraregional cooperation as a key aspect to support S3 implementation and the effective uptake of the Cohesion Policy Funds for Smart Grids. The workshop offers an opportunity for the industry, research & innovation sectors, regional authorities and other stakeholders to exchange good practices and innovative concepts supporting S3 and energy policy in the Baltic region.

The event is organised by the Joint Research Centre – Directorates C (Energy, Transport and Climate) in close collaboration with the Latvian Ministry of Economic Affairs and the Riga Technical University.

Agenda

DAY 1	
13:30 – 14:00	Registration & coffee
14:00 – 14:20	Welcoming speech: Smart grid development: a perspective from Latvia and the Baltic Sea region **Olga Bogdanova**, Director of the Energy Market and Infrastructure Department, Latvian Ministry of Economic Affairs
Session 1 - Cohesion Policy, S3P and Smart Grids	
14:20 – 14:45	General aspects and current work of S3PEnergy **Javier Gomez**, European Commission, DG JRC – Sevilla
14:45 – 15:10	Smart Grid investments in Europe: lessons learned and current developments **Flavia Gangale**, European Commission, DG JRC - Petten
15:10 – 15:40	Coffee break
Session 2 - S3 Smart Grids priorities and regional cooperation	
15.40-16.05	Smart Grid related specialisation areas in Latvia, investment programs and instruments **Olga Bogdanova**, Director of the Energy Market and Infrastructure Department, Latvian Ministry of Economic Affairs
16.05-16.30	Smart Grid related specialisation areas in Estonia, investment

16.30-16.55	programs and instruments **Laura Arengu**, Smart Specialisation expert, Estonian Ministry of Economic Affairs and Communications
16.55-17.20	European Integrated Research Programme on Smart Grids **Irina Oleinikova**, Director, Institute of Physical Energetics , Latvia
17.20-18.00	Ongoing transnational Smart Grid projects **Oskars Krievs/ Diana Zalostiba**, Riga Technical University Discussion: Possible areas for regional cooperation
19:00	Social dinner

***

DAY 2	
Session 3 – Smart Grid implementation in the Baltic region: lessons learned and future opportunities	
09:00 – 09:20	Smart grid data in the client side experience. Future data applications **John Šipkovs** ISO Ltd, Energodata project, Latvia
09.20-9.40	Estfeed data sharing platform as facilitator of demand-side related services
09.40-10.10	**Kalle Kukk**, Strategy Manager, Elering, Estonia Smart grid development in Lithuania **Arturas Klementavicius**, Lithuanian Energy Institute – Lithuania
10.10-10.30	Smart metering projects and new analytics in grid operations **Heikki Kolk**, senior specialist at the Network technology department of Elektrilevi OÜ, Estonia
10.30-11.00	Discussion: lessons learned and future opportunities
11:00 – 11:30	Coffee break
Session 4 - Strengthening cooperation in the Baltic region	
11.30-11.50	Smart city of Riga **Inete Ielite,** Riga Seap Management Board Member, **TBC**
11.50-12.10	Transnational digital collaboration in the Baltic region **Torben Aaberg**, Head of Public & Digital Affairs, Baltic Development Forum
12.10 – 12.30	Smart Grid Projects of Common Interest **Sebastian Gras**, DG ENER
12.30 – 13.00	Discussion: Intraregional cooperation on smart grids, the way forward
13:00	Lunch and networking

VISIT to the research laboratories of the Riga Technical University

Smart Biscay - Bilbao 2017

Smart grids challenges and opportunities in the Bay of Biscay. The Agenda is forthcoming on SP3 platform http://s3platform.jrc.ec.europa.eu/events)

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