



ETIP SNET

EUROPEAN  
TECHNOLOGY AND  
INNOVATION  
PLATFORM

SMART  
NETWORKS FOR  
ENERGY  
TRANSITION



## D3.3 Minutes of the regional workshops 2018

# **D3.3 Minutes of the regional workshops 2018**

*Confidential (Intensys4EU consortium and Commission services)*

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# 1. INTRODUCTION

## 1.1 OBJECTIVES OF THE REGIONAL WORKSHOPS

The Regional Workshops aim at:

- Presenting national and regional RD&I projects of significant added value addressing energy system integration issues, in line with the thematic priorities of the ETIP SNET Working Groups;
- Identifying unsolved RD&I topics and monitoring the implementation of RD&I activities at national and regional levels in Europe;
- Ensuring consistency between national and European views;
- Stimulating knowledge-sharing between stakeholders and among Member States and associated countries, so as to foster the efficient implementation of RD&I projects all over Europe.

## 1.2 ORGANISATION OF THE REGIONAL WORKSHOPS

### 1.2.1 REGIONAL APPROACH

Based on the experience gained during the Grid+Storage workshops organised in 2016 (see <http://www.gridplusstorage.eu/workshops>), and on the will to stimulate exchanges between stakeholders within different countries, it was proposed to adjust the scope of the different regions and to divide Europe into four parts, as illustrated below.

- Region 1: PT, ES, FR, UK, EI
- Region 2: DK, SE, FI, NO, LT, LV, EE
- Region 3: IT, SL, KR, MT, HU, RO, BG, GR, CY
- Region 4: BE, NL, LU, DE, PL, CH, AT, CZ, SK, HU



The workshops were organised for 2018 according to the schedule presented in the table below.

Table 1 – Planning for the 4 regional first knowledge sharing workshops

Workshop nr.	Member States	Location	Date
1	Italy, Slovenia, Malta, Hungary, Romania, Bulgaria, Croatia, Greece and Cyprus	Zagreb (Croatia)	19-20 September 2018
2	Denmark, Sweden, Norway, Finland, Latvia, Lithuania and Estonia	Helsinki (Finland)	3-4 October 2018
3	Belgium, Netherlands, Luxembourg, Poland, Austria,	Brussels (Belgium)	11-12 October 2018

	Germany, Switzerland, Czech Republic and Slovakia		
4	Spain, France, Portugal, Ireland and the UK	Madrid (Spain)	22-23 November 2018

## 1.2.2 PROGRAMME OF THE KNOWLEDGE SHARING WORKSHOPS

The 4 workshops are held over two days according to the agenda below (adjusted depending on logistical constraints and number of projects presented):

Slot duration	Speaker	Purpose
5 min	Workshop host representative	Welcome words
15 min	<b>ETIP SNET Chair/co-chair</b>	Introduction to R&I activities in the scope of the ETIP SNET; presentation of the ETIP SNET Vision 2050, purpose of the workshop and agenda
<b>Project session 1 (group of projects addressing topics within the scope of ETIP SNET WG1)</b>		
15 min	<b>ETIP WG1 representative</b>	High-level vision (overarching goals and constraints) for the European energy system and respectively of the contribution of various technologies to this system – in relation with the concerned WG(s). Topics to be discussed during the roundtables.
30 min per project	Projects' representatives	<p>Presentation of the findings of the project. Focus on:</p> <ul style="list-style-type: none"> <li>• The project overarching objectives, the consortium;</li> <li>• Project Key exploitable results: Added value, quantifiable benefits (improvement of the management of the grid, decrease of CO2 emissions, etc...) and final beneficiary;</li> <li>• The main lessons learned and barriers to innovation / exploitation of the results;</li> <li>• Needs for future R&amp;I activities coming out of the project (if any !);</li> <li>• Deployment prospects of the most promising solutions.</li> <li>• Identify needs for further testing (platforms, demos, etc...) and an emphasis on interoperability is welcome</li> <li>• Information about the use/need of an inter-regional cooperation.</li> </ul> <p>Each presentation is followed by Q&amp;A.</p>
30 min	Roundtable (animated by <b>ETIP SNET support team</b> )	Presence of all speakers in the session + <b>ETIP WG1 representative</b> + <b>WG5</b> representative

<b>Project session 2 (group of projects addressing topics within the scope of ETIP SNET WG2)</b>		
Similar structure than first session		
<b>Project session 3 (group of projects addressing topics within the scope of ETIP SNET WG3)</b>		
Similar structure than first session		
<b>Project session 4 (group of projects addressing topics within the scope of ETIP SNET WG4)</b>		
Similar structure than first session		
<b>Concluding session</b>		
45 min	<b>WG5 representative</b>	Consolidation of recommendations in terms of “Innovation implementation in the business environment”
45 min	<b>ETIP SNET support team</b>	Wrap-up of the recommendations from the projects presented and of the conclusions from the roundtables
10 min	<b>ETIP SNET support team / Host</b>	Closing words, invitation to participate in upcoming consultation processes

### 1.3 STRUCTURE OF THIS REPORT

For each of the regional workshops, this report gathers the following information:

- List of projects presented, including the link to the slides displayed at the workshop;
- Participants in the different roundtables and statistical analysis of the attendees per country and organisation of origin;
- Main questions raised during the projects’ Q&A sessions;
- Recommendations for innovation implementation in the business environment;
- Summary of the main recommendations from the projects and conclusions from the roundtables.



## 2. REGIONAL WORKSHOP 1 (BULGARIA, CROATIA, CYPRUS, GREECE, HUNGARY, ITALY, MALTA, ROMANIA AND SLOVENIA)

The first workshop was held in Zagreb (Croatia) on the 19-20 September 2018. The workshop agenda is available on the [ETIP-SNET website](#).

### 2.1 PROJECTS AND PARTICIPANTS IN THE WORKSHOP

#### 2.1.1 R&I PROJECTS PRESENTED

Thirteen R&I projects were presented during the first workshop, as displayed in the table below:

Table 2 – Projects presented at the workshop 1

Project	Country	Purpose	Speaker	Link to presentation
<b>Session 1: Projects addressing topics within the scope of ETIP SNET's Working Group 1 (WG1): "Reliable, economic and efficient smart grid system"</b>				
The NEDO Project	Slovenia	The Slovenian electric Transmission system operator ELES and the Japanese research agency NEDO (through company Hitachi) are financing an overall smartgrids project in Slovenia covering a wide scope of smart grids and smart communities' topics. Part of the project dealing with demand response is already running 9 months of demonstration during which a Demand Response Control System was designed and 830 household and small commercial consumers were included to participate in active demand response activities aiming at reducing energy (power) consumption during peak consumption periods. One hundred (100) households are equipped with direct load control units and HEMS, which perform demand reduction automatically, while the rest receive SMS and email notifications. So far, the results are very promising providing approximately 30% peak power reduction at participating users.	<b>Gregor OMAHEN</b>	<a href="#">Link</a>
The LivinGrid Project	Italy	The aim of the project is to develop new models for the enhancement of the system observability, as well as for the optimal management, in emergency conditions, of the National Transmission Network (NTN), of the disconnection and reconnection of portions within the network, and of the related DER. The project will contribute to overcome the traditional "load shedding" concept, and the distributed generation curtailment. The project benefits from the outputs of other projects: the ISERNIA project and the Puglia Active Network Project.	<b>Gareth BISSELL</b>	<a href="#">Link</a>

Projects for Smartening the Greek Islands	Greece	The projects are realized in the Non-Interconnected Island Systems (NIIS) in Greece. The aim is to increase RES penetration in energy systems of the non-interconnected islands, reducing the operational cost and ensuring an uninterrupted electricity supply to their inhabitants. The projects deal with the development of advanced Energy Management Systems having as main goal the establishment of the needed infrastructure for 32 ES of NII, covering the emerging needs of all participants in the NII's market. The also deal with generation planning tools able to maximise RES installations. An ambitious project is the preparation of 3 pilot Smart Islands projects that will achieve over 60% annual RES penetration by installing Hybrid stations with Smart Management systems. This is a major challenge for Non-Interconnected Islands that need to maintain voltage and frequency stability faced solely by RES.	<b>Nikos HATZIARGYRIOU</b>	<a href="#">Link</a>
<b>Session 2: Projects addressing topics within the scope of ETIP SNET's Working Group 2 (WG2): "Storage technologies and sector interfaces"</b>				
Husahagi Wind Power Plant and Battery Energy Storage System	Faroe Islands	The energy storage system installed at the Husahagi Wind Power Plant on the Faroe islands is enhancing grid stability by smoothing ramp rates and allowing a very high wind penetration to be present in the electrical grid reaching levels of even higher than 80% for hours at multiple times during the course of the year. Additionally, it reduces the noise in system frequency and can provide ancillary grid services such as frequency control in the future. The power of the Wind Power Plant is 11.7 MW with 2.3MW / 0.7MWh of Li-On Battery Storage installed in a weak grid on the Faroe Islands. The project presents a very high attractive return of investment.	<b>Georgios ARGYRIS</b>	<a href="#">Link</a>
The EVBASS Project	Croatia	The first part of the project is focused on analysis of current scientific and commercial state-of-the-art, as well as legislative so as to develop a viable business model of the BSS business case considering the optimization of the BSS operation (day-ahead scheduling and real-time operation) and control and communication of the BSS. The second part of the project will assess the impacts that BSS and a group of BSSs have on power systems considering points of view of Distribution and Transmission System Operators. The final stage of the project will be the deployment of a testbed that consists of a central computer, a large number of EV battery stacks, and all the accompanying control and communications infrastructure. This will provide the opportunity to test the developed algorithms in a realistic environment and to verify the results.	<b>Hrvoje PANDZIC</b>	<a href="#">Link</a>
The StoRES Project	Cyprus, Greece, Slovenia, Italy	StoRES foresees the development of an optimal policy for the effective integration of photovoltaics (PV) and energy storage systems (ESS) via testing smart solutions in 5 MED islands and rural areas. The challenge is to achieve high PV penetration in their energy mix through solving all market/technical/grid/tariff issues without compromising grid stability or security of supply.	<b>Venizelos EFTHYMIU</b>	<a href="#">Link</a>

The SUCCESS Project	Croatia	The project aims at answering the following questions: <i>Who and why will install and own storage? What size and where? What services will these units provide?</i> The project focuses on the aspects of storage role in distribution networks. In particular the role of storage in all segments of the distribution network life cycle (from planning stage to real-time operation). It discusses the role of the aggregator and recognizes challenges the aggregator faces and preconditions missing (such as insufficiently liberalized retail markets) to enable the operation of the aggregator. It considers market and regulatory EU environment, with special focus on Croatia so as to enable larger RES integration.	<b>Tomislav CAPUDER</b>	<a href="#">Link</a>
<b>Session 3: Projects addressing topics within the scope of ETIP SNET's Working Group 3 (WG3): "Flexible generation"</b>				
the uGRIP Project	Croatia	This project aims to develop a full-scale microgrid that consists of distributed generators, both renewable and controllable, storage units and flexible loads. A real-life microgrid may perform arbitrage, provide flexibility thus increasing the utilization of RES, take part in corrective actions, provide voltage support, and defer investments in power lines and (distributed) generation. A structure of the local, distribution-level market is defined and demonstrated within the project. The complex interactions between the microgrid, distribution network, transmission network, wholesale electricity market and local distribution level market has been investigated and a viable operation mechanism is proposed.	<b>Hrvoje PANDZIC</b>	<a href="#">Link</a>
the Energia 2020 Project	Italy	The "Smart Polygeneration Microgrid" (SPM) is a LV demonstrator infrastructure hosted at Savona Campus facilities, within the project 'Energia 2020' lead by the University of Genova. It consists of renewable and innovative generation/cogeneration units (micro turbine fed with natural gas, photovoltaic plants, energy storage, EV charging stations), a dedicated electric network, integrated with the existing grid of the University Campus and an Energy Management System to optimally manage the sources. The entire system is supervised by a control room to which signals are sent from sensors, actuators and, in general, from all the smart distributed systems in the field.	<b>Mansueto ROSSI</b>	<a href="#">Link</a>
the SMARTGEO Project	Italy	The project aims to design, build and integrate an innovative concept of advanced remote diagnostic and prognostic system on the geothermal power plant «Rancia 2» (Italy- Tuscany), and its related equipment's and infrastructures (wells, steam gathering network, reinjection pumps and pipelines, steam cleaning systems, Amis).	<b>Matteo GALGANI</b>	<a href="#">Link</a>
<b>Session 4: Projects addressing topics within the scope of ETIP SNET's Working Group 4 (WG4): "Digitisation of the electricity system and Customer participation"</b>				
The SUCCESS Project	Romania	The SUCCESS project will develop an overarching approach to threat and countermeasure analysis with special focus on the vulnerabilities introduced by Smart Meters in the energy domain.	<b>Mihai SANDULEAC</b>	<a href="#">Link</a>

		<p>The project aims at designing, developing and validating on small scale field trials a novel holistic adaptable security framework. This would be able to significantly reduce the risks of cyber threats and attacks when next generation, real-time, scalable, unbundled smart meters are deployed in smart electricity grids, enabling innovative applications and value-added services within the emerging smart decentralised energy system paradigm.</p> <p>SUCCESS will achieve this objective by encapsulating the key challenges of Security, Resilience, Survivability and Privacy into 3 use cases which will focus the research, implementation and evaluation concepts of the project.</p>		
The "Smart metering LTD" Project	Hungary	<p>The main objective of the Pilot Project is to evaluate the possibilities of establishing a nationwide smart grid. The survey should be able to provide an opportunity to analyse the economic aspects of extending the smart grid nationwide in the future and to evaluate the operational experiences in relation to certain elements of the smart grid.</p> <p>The goal of the Smart Grid Pilot Project is to develop and test a metering infrastructure, mainly for electricity, natural gas and water, that may contribute to the modernization of the energy system as regards sustainability, competitiveness and security of supply, to increasing energy efficiency and consumer savings, as well as to the management of system balancing problems.</p>	<b>Gusztav VARGA</b>	<a href="#">Link</a>
The STEELFLEX Platform Project	Slovenia	<p>"The platform for flexible energy management in steel (STEELFLEX)" refers to the development of the advanced platform for flexible energy consumption management. Two pilot demonstrations will take place, a flexible energy consumption master platform and the Steelflex application that targets the steel industry, offering steel companies to optimize their energy flexibility potential to reduce their energy costs, provide ancillary services to TSO/DSOs and improve their forecasting activities to reduce balancing costs.</p>	<b>Tomaz FATUR</b>	<a href="#">Link</a>

During this workshop, there were no presentations of projects from Malta.

## 2.1.2 ROUNDTABLES

Four roundtables were held during the workshop, moderated by Coralie BADAJOZ and Daniel HERNANDEZ. The four were devoted to questions and different exchanges between the speakers of the projects presented, the representatives from EDSO for Smart Grids and EASE and the respective representatives of the different ETIP SNET Working Groups. The table below shows the participants in each roundtable.

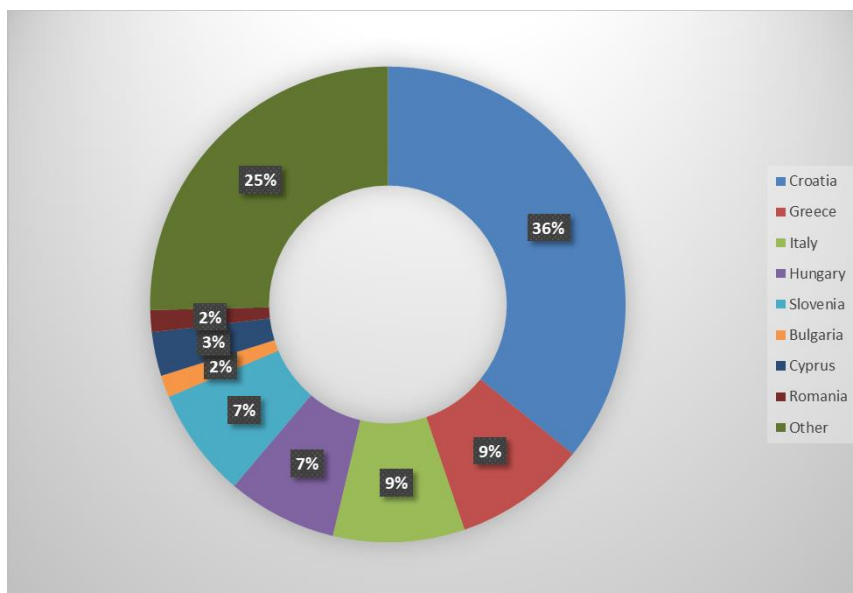
Table 3 – Participants in roundtables at the first regional workshop

Roundtable nr.	Participants
1	<ul style="list-style-type: none"> <li>• Gareth BISSEL (Enel, WG1 Representative)</li> <li>• Gregor OMAHEN (ELES)</li> <li>• Nikos HATZIARGYRIOU (NTUA)</li> <li>• Venizelos EFTHYMIU (FOSS)</li> <li>• Coralie BADAJOZ (ETIP SNET Support Team, DOWEL)</li> </ul>
2	<ul style="list-style-type: none"> <li>• Claire LAJOIE-MAZENC (RTE, WG2 representative)</li> <li>• Hrvoje PANDZIC (FER, University of Zagreb)</li> <li>• Venizelos EFTHYMIU (FOSS Research Centre)</li> <li>• Tomislav CAPUDER (FER, University of Zagreb)</li> <li>• Daniel HERNANDEZ (ETIP SNET Support Team, DOWEL)</li> </ul>
3	<ul style="list-style-type: none"> <li>• Michael LADWIG (General Electric, WG3 Representative)</li> <li>• Hrvoje PANDZIC (FER, University of Zagreb)</li> <li>• Mansueto ROSSI (University of Genova)</li> <li>• Matteo GALGANI (EGP)</li> <li>• Coralie BADAJOZ (ETIP SNET Support Team, DOWEL)</li> </ul>
4	<ul style="list-style-type: none"> <li>• Elena BOSKOV KOVACS (Blueprint Energy Solutions, WG4 Representative)</li> <li>• Mihai SANDULEAC (CRE)</li> <li>• Gusztav VARGA (KOM Central Smart Metering Plc.)</li> <li>• Tomaz FATUR (Solvera LYNX)</li> <li>• Daniel HERNANDEZ (ETIP SNET Support Team, DOWEL)</li> </ul>

### 2.1.3 LIST OF ATTENDEES

Around 70 participants were registered for the workshop. The distribution of participants by country is provided in the figure below:

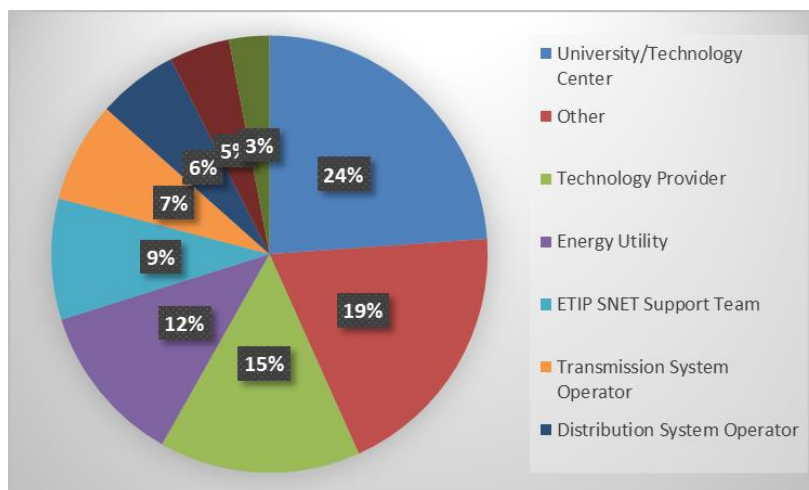
Figure 1 – Distribution of participants by country



It can be noticed that the three main countries represented from the eastern region are Croatia, Greece and Italy. Also, 25% of the participants are coming from other countries located outside of the eastern region: the UK, France and Germany are the most represented.

Moreover, the following figure gives an indication of the distribution of participants by their type of organization:

Figure 2 – Distribution of participants by organization



It can be pointed out that 24% of the audience comes from University/Technology Centres 19% from Other category (automobile, media, funding agency, research institute, NPO, etc.) and 15% from technology provider.

## 2.2 MAIN QUESTIONS FROM THE PROJECTS' Q&A SESSIONS

Each project presentation has been followed by a session of questions and discussions (10 minutes for each session). The main questions and comments are collected in the table below:

Table 4 – Main questions and comments by project (Zagreb)

Project	Country	Main Questions & comments
<b>Session 1: Projects addressing topics within the scope of ETIP SNET's Working Group 1 (WG1): "Reliable, economic and efficient smart grid system"</b>		
The NEDO Project	Slovenia	The main issues raised by the project concerned the mechanism used to involve potential participants in DSM projects observing that the present methods (e.g. mechanism of compensation for participation) are not very effective. The economic gain for consumers (20€/yr) is perceived as not "appealing" and it does not motivate participation on a large scale. Some questions were asked in order to investigate different mechanisms to motivate people (fee for non-participation? a more severe regulation? how to recruit voluntaries? by mail? by presentation in local communities?). In order to increase participation, solutions should be simple and cost effective. Home automation is good solution for quick response needs but questionably cost effective. A second important issue concerned the rural areas, difficult to reach, with problems of reliability of supply and where ICT is an issue. One of the solutions pointed out was to develop and apply innovative market approaches for flexibility services, such as for example a nodal flexibility market.
The LivinGrid Project	Italy	Main questions were focusing on the innovation level of the project. The project uses an existing microgrid, and the innovation consists in the high-speed communication (that is a target to be reached by 2050). Another point was the involvement of the prosumer in the project (bulk production VS prosumer generation). It was stressed that, in this project the prosumer is simply the interface.
Projects for Smartening the Greek Islands	Greece	The main issue was about the percentage (or the threshold) of RES that can contribute to the energy mix. The importance to have 50% of thermal generation in the system was reminded to keep the relevant frequency. Again, the participation of local community in the projects was discussed. Local energy communities (LEC) are key in the clean energy package: the intention to put the local into the equation and to develop incentives was raised.
<b>Session 2: Projects addressing topics within the scope of ETIP SNET's Working Group 2 (WG2): "Storage technologies and sector interfaces"</b>		
Husahagi Wind Power Plant and Battery Energy Storage System	Faroe Islands	The project generated an important reaction of the public about the 'very fast' Return of Investment reached of 4.5 years. It was mentioned that this project would have a very good replicability in MED islands; however, due to the specific network topology of the Faroe Islands, the remuneration schemes and cost-savings generated with the project, it was economic viable and profitable with the BESS used. It was said, that the reduction of curtailment will increase with more experience and the penetration of wind energy in the island will be higher than the 80 % (load share) reached nowadays. The speaker highlighted that the close cooperation of all the stakeholders involved in the project has been a key factor to succeed. The full integration of the BESS is a very big challenge and the coordination and cooperation between batterie manufacturers, power electronics manufacturers and integrators, is crucial for the well-development of the project and a viable business case.

The EVBASS Project	Croatia	<p>The scaling up of this project has been evoked. Some other cases about car batteries' swapping stations businesses have been discussed (i.e. Israel – Better Place). The lack of standards has been commented. This is a major issue impacting the technical and business viability of this type of projects.</p> <p>Possible users and customers have been discussed: i.e. transportation companies' fleet. Issues related to the life cycle of the battery when providing different type of services has been commented. Also, the impact and issues of using 2<sup>nd</sup> life batteries. EU Projects dealing with these issues have been mentioned (inteGRIDy, ELSA...).</p>
The StoRES Project	Cyprus, Greece, Slovenia, Italy	<p>The following questions were discussed in the context of this presentation: centralise vs decentralise storage? where is the right place to use the BESS (HV/MV/LV/household)? and who should own the assets? in order to maximise the impact and the technical and economic benefits of the batteries in the energy network. It has been said that it will depend on the local context and the specific needs of the energy system where the batteries are been deployed. Emphasis was given to the fact that ancillary services delivered by batteries are best suited to Operators for developing and operating. This will also determine the properties of the battery (cycling, manufacturing, composition materials).</p> <p>The need of innovative products and multiplicity of use in the different markets would help the BESS deployment and the business cases to be adapted.</p> <p>The differences between regulatory practices related to BESS in the Southern Region of Europe were evoked (Greek Islands, Cyprus, Croatia, Slovenia). Finally, it has been recommended that future policies should identify the right combined tariff system so as to favour the deployment of storage at EU level.</p>
The SUCCESS Project	Croatia	<p>It has been said that regulatory framework for aggregators is still missing. The lack of aggregators in EU is difficult to validate results of modelling (and business cases).</p> <p>The lack of reliable and accurate data related to EVs has been commented: data is needed to facilitate the planning and calculations for reinforcement of the grid, for developing charging stations, etc.</p> <p>When developing the business models for EVs, how to evaluate the cost for the owner? how to consider the degradation of the battery and the issues caused to the owner of the vehicle? It has been asked if the DSOs would need additional flexibility or if the grid is strong enough to be reliable.</p>
<b>Session 3: Projects addressing topics within the scope of ETIP SNET's Working Group 3 (WG3): "Flexible Generation"</b>		
the uGRIP Project	Croatia	<p>The discussions focused on the following topic:</p> <ul style="list-style-type: none"> <li>- How the aggregator can provide cheaper prices to the consumer: the need to pay more attention to the customers and learn their habits was stressed.</li> <li>- Moreover, additional information has been requested related to the final beneficiary of the project. It was indicated that the 2 main targets are the policy makers and the operators of the electricity system.</li> </ul>
the Energia 2020 Project	Italy	<p>The main topics discussed focused on the technical aspects of the project: why did the project use microturbines? How to co-optimize the thermal and electrical supply? It was indicated that the microturbines are more flexible and that an optimization algorithm has been used for the co-optimization of thermal and electrical supply. Indeed, the coupling of micro-turbines intends to satisfy the electrical and thermal demand. It was also stressed that renewable fuels shall be considered for the future such as liquid fuels. Last but not least, since the project was being developed at the campus scale, the question of the scalability of the project has been raised: the projects' outputs might be used for refurbishment areas in Savona.</p>
the SMARTGEO Project	Italy	<p>The collaboration between industries and Universities to foster synergies was stressed during the discussion. Moreover, the replicability of the outputs of the project within other industries' sectors was considered: it was reminded that the results could be used in industries that can adopt the platform developed within the project.</p>



<b>Session 4: Projects addressing topics within the scope of ETIP SNET's Working Group 4 (WG4): "Digitisation of the electricity system and Customer participation"</b>		
The SUCCESS Project	Romania	The need for standards and communication interfaces for the integration of smart meters has been stated. The industrialisation of 'enhanced' smart meters with a multiservice approach is a very difficult step towards deployment. Difficulty to reach the market. Also, who is going to pay for this technology? It has been proposed that a joint multi-actor investment for stacked services might be a solution for the deployment of this technology. A multi revenue stream business model is needed to have a viable business case. The issues related to data privacy, cybersecurity and the GDPR have been stated as essential when dealing with this type of technologies.
The "Smart metering LTD" Project	Hungary	The issues related to the deployment of smart meters in Hungary have been exposed and commented with the audience. When deploying smart meters, it is very hard to convince customers in countries where there are only a couple of euros/month earned. Impact in the energy bills matters. It has been commented that in some EU countries there is a need to build relevant infrastructure before thinking about the deployment of smart devices (smart meters, etc.) in the energy network. Discussions have taken place about the costs of this modernisation and who should be paying for this. The role of attractive applications (gamification) is very important to foster the social acceptance regarding smart meters and appliances.
The STEELFLEX Platform Project	Slovenia	It has been said that 'Interoperability' towards the deployment of flexibility platforms managed by aggregator(s) is a key success factor and a major challenge: for instance, between the steel industry and energy suppliers (STEELFLEX project). Issues related to the quality of the data and ownership of the data have been stated. The need for new markets and products for flexibility has been discussed. Technical questions have been made from the public regarding the voltage level of the steel factory involved in the project (TSO network) and about its power needs and issues (time frame).

## 2.3 RECOMMENDATIONS FROM THE PROJECTS AND CONCLUSIONS FROM THE ROUNDTABLES

These recommendations and conclusions have been discussed and agreed upon during the final wrap-up session of the workshop.

### 2.3.1 SESSION 1: ADDRESSING TOPICS WITHIN THE SCOPE OF ETIP SNET'S WORKING GROUP 1 "RELIABLE, ECONOMIC AND EFFICIENT SMART GRID SYSTEM"

- Societal aspects and communication campaigns have to be considered in order to foster the participation of stakeholders in evolving retail energy markets.
- Additional European standards are still needed to facilitate communication between stakeholders (regulated operators for instance) to avoid interoperability issues.
- Subsidies schemes are needed to foster and support the advent of local energy communities (with all its possible roles), in line with the Clean energy Package negotiations.
- A neutral body is needed to implement and assess the planning process of the integrated energy system, including the interfaces between energy vectors (mainly PtX).
- High level transparency is required to solve the lack of trust among stakeholders to achieve an integrated perspective of the energy system.
- Network regulation shall address both CAPEX and OPEX (TOTEX) when deploying innovative technologies in order to achieve viable business cases.

### 2.3.2 SESSION 2: ADDRESSING TOPICS WITHIN THE SCOPE OF ETIP SNET'S WORKING GROUP 2 "STORAGE TECHNOLOGIES AND SECTOR INTERFACES"

- Investment from the government in charging infrastructure is strongly recommended to increase the amount of EVs in some countries.
- To satisfy the energy system needs (specifications) and have a viable business case, a holistic design of the BESS is required. Full cooperation between batterie manufacturers, power electronics manufacturers and integrators, is needed.
- The regulated operators shall own and operate BESS in order to provide system services and to optimise the use of the grid (cost optimisation strategies).
- New approach to network planning to account for available flexibilities provided by the DRS.
- More accurate and reliable EV data is needed to facilitate the planning and calculations for reinforcement of the grid, for developing charging stations, etc.

- Many regulatory barriers need to be removed (double grid fees, add value of different services) in order to foster the development of BESS for instance.

### **2.3.3 SESSION 3: ADDRESSING TOPICS WITHIN THE SCOPE OF ETIP SNET'S WORKING GROUP 2 "STORAGE TECHNOLOGIES"**

- Regulatory barriers have to be removed to allow aggregators to participate in different markets and provide different kind of services to the energy systems (flexibility).
- Aggregators need to reach a critical mass (MW/MWh) to be able to participate to the ancillary services markets.
- Match making between industry and academia needs to be enhanced, for instance, with collaborative Platforms allowing optimum exploitation and dissemination strategies.
- For the development of microgrids, which provide flexibility, interoperability related standards are needed.

### **2.3.4 SESSION 4: ADDRESSING TOPICS WITHIN THE SCOPE OF ETIP SNET'S WORKING GROUP 4 "DIGITISATION OF THE ELECTRICITY SYSTEM AND CUSTOMER PARTICIPATION"**

- To allocate fund, the authority has to make sure that the societal aspects are considered within the project so as to have larger samples of stakeholders.
- Internet should be assured at European level, as a pre-requisit to support the digital agenda. Emphasis should be made in rural areas.
- In general, NORM as a DSO-only related equipment is a barrier. A joint investment between stakeholders for stacked services might be a solution.
- It is needed to generate the correct value chain of the different energy services without forgetting to create benefit to the end-user.
- Need to build and enhance the relevant infrastructure to continue the development of smart appliances
- « Qualified energy user », and « non-qualified energy user »: attractive communication strategies for each of these groups is needed.
- Right incentives (gamifications, contests) are to be foster to reach the critical mass.
- The need of societal approach hubs is needed to manage data. The identification of a responsible party is needed and data access from the source could be a solution.

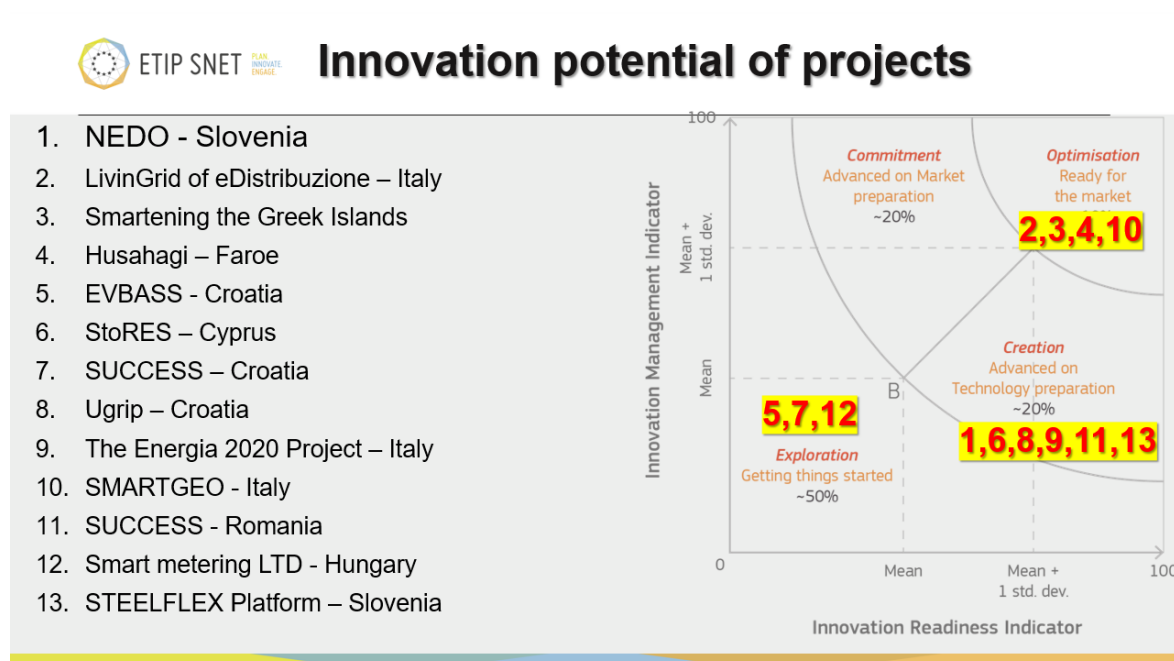
## 2.4 RECOMMENDATIONS FOR INNOVATION IMPLEMENTATION IN THE BUSINESS ENVIRONMENT

The 2018 workshops are now including a dedicated session related to the WG5 topics “Innovation implementation in the business environment”. The aim is to provide recommendations to the projects by identifying ways for commercial breakthrough or suitable next steps for the effective use of their results.

The WG5 representative highlighted the 3 main questions the Project consortia shall ask themselves regarding their innovation path:

1. What is the research path / main focus of your project?
2. What is the innovation potential, capacity and maturity of projects to successfully achieve targeted objectives and raise impact?
3. During project execution what actions / measures you have taken / addressed as consortia in extending the life of the project beyond funding period for fulfilling project objectives and raising impact?

Afterwards, the 13 projects presented during the workshop have been classified depending on their innovation potential as shown in the Innovation Readiness map below:



The above classification of the projects was based on the identified exploitation paths and high-level project objective of all projects presented following the methodology depicted in the drawing below, which are summarised in the following paragraphs. The high-level exploitation paths of projects were briefly discussed with the participants so as to obtain a rough estimation of innovation readiness and maturity depicted above. The main objective of the session was to identify the methodology and give an initial assertion of where each project stands as a genuine feedback to project consortia and not as a documented evaluation of projects. In this

respect, what is reported in this section is to be taken as a methodology and not as a detailed documented evaluation of project results on which future decisions will be based on. Further work is needed to reach valid evaluation stage, and this is on consortia to conduct and inform whoever is appropriate.

- NEDO – Slovenia

Investment project to validate technologies in solving real problems to generate policies for replication.

- LivinGrid of eDistribuzione – Italy

Move away from BAU to adapt SG solutions for managing distributed resources offering observability, controllability for cost effective integration and optimised utilisation of renewable energy sources.

- Smartening the Greek Islands

Mitigate emissions and cost of energy on islands through effective use of local resources by effectively adapting emerging technologies, automation and smart solutions.

- Husahagi – Faroe

Adapting wind parks to the needs of isolated grids with high wind penetration through the use of a suitable BESS.

- EVBASS – Croatia

Open investigation of options available for battery swapping stations to identify business options forward.

- StoRES – Cyprus

Optimal use of social and behind the meter storage in support of PV penetration to maximize benefits to all connected users.

- SUCCESS – Croatia

Complementary needs of the grid to increase benefits of fast charging systems with BESS that make them competitive.

- Ugrip – Croatia

Energy transition towards more optimal market operation models with level playing field for all actors including aggregators and microgrid operators.

- The Energia 2020 Project – Italy

Establishment of a living lab for the energy transition towards sustainability to meet educational and technological needs.

- SMARTGEO – Italy

Digitalization of processes in the geothermal industry for innovative technological solutions of prognosis and control to achieve higher optimization and efficiencies.

- **SUCCESS – Romania**

Interoperable gateway to the user meeting metrology needs together with system and market needs adaptable and expandable.

- **Smart metering LTD – Hungary**

Multi service smart meters with universal communication platform offering multi-operational use can be attractive for mass deployment. More work is needed.

- **STEELFLEX Platform – Slovenia**

Understand production in the steel industry, identify flexibility in production process, develop an operational interoperable platform using an integrated communication platform to generate economic benefits through effective use of the generated flexibility.

## 3. REGIONAL WORKSHOP 2 (DENMARK, ESTONIA, FINLAND, LATVIA, LITHUANIA, NORWAY AND SWEDEN)

The second workshop was held in Espoo (Finland) the 3-4 October 2018. The agenda of the event is available on the [ETIP-SNET website](#).

### 3.1 PROJECTS AND PARTICIPANTS IN THE WORKSHOP

#### 3.1.1 R&I PROJECTS PRESENTED

Fourteen R&I projects were presented during the second workshop, as shown in the table below:

Table 5 – Projects presented at the workshop 2

Project	Country	Purpose	Speaker	Link to presentation
<b>Session 1: Projects addressing topics within the scope of ETIP SNET's Working Group 1 (WG1): "Reliable, economic and efficient smart grid system"</b>				
FASaD - Fault and interruption handling in smart distribution systems Project	Norway	This project aims at investigating how smart grids technologies and solutions can be utilized in the electric distribution grid to reduce the number and duration of interruptions in the electricity supply and the related socio-economic costs. In particular, the project wants to demonstrate that the use of innovative directional protection schemes and equipment is fit for the decrease of the duration of faults, thanks to a faster localisation and a more precise and selective interruption. The project is divided into 2 parts: an experimental one where equipments from different makes and configurations are tested on the real field, and a more theoretical one, where the theories and simulation of system protection as well as the optimisation laws are assessed and the Cost of Energy non-Served (ENS) are evaluated. The experimental part consists in a field test into a real grid. The theoretical phase aims to carry out reliability analysis and socio-economic analysis.	<b>Kjell TUTVEDT (Hafslund)</b>	<a href="#">Link</a>
Kruzeme Ring project	Latvia	The project is internal transmission infrastructure reinforcement in Baltic States for secure and reliable operation of Baltic-Nordic interconnection NordBalt. Project is included in ENTSO-E TYNDP since 2012 as investment item under NordBalt Cluster. It is related to the transmission system interconnection between Baltic and Nordic, in order to reinforce transmission network in the region, thus increasing the system reliability and its capacity to host variable renewables without congestions and instability. From a technical point of view, the project is implementing as overhead lines (330 kV on the same pole structure as a 110	<b>Antons KUTJUNS (AST)</b>	<a href="#">Link</a>

		kV line – an innovative feature) and partially in underground cables. The final aim is the improvement of the security of supply in Latvia, especially in the Western part and it concerns the development of a reliable transit corridor for effective NordBalt operation and especially in the emergency and repair modes. The project aims also at investigating RES connection possibilities to the transmission network in Latvia, in order to improve the Baltic States electricity market efficiency and competition.		
Energy sector development and economic sustainability analysis	Lithuania	The scope of project to create a methodology for the energy sector development and economic sustainability analysis in Lithuania, through the development of an overarching simulation environment covering different energy vectors and fostering the optimisation of the overall system to enhance the national economy and society. The synchronous operation of the Lithuanian power system with the Continental European networks (ENTSO-E), considering the prospective development of generating capacities is also considered. The purpose is also to intensify the cooperation among different stakeholders from academia and network operators to have reliable and shared databases.	<b>Neringa RADZIUKYNIENE (Lithuanian Energy Institute)</b>	<a href="#">Link</a>
<b>Session 2: Projects addressing topics within the scope of ETIP SNET's Working Group 2 (WG2): "Storage technologies and sector interfaces"</b>				
The InteGER Project	Norway	The InteGER project (Integration of energy storage in the distribution grid) has the overall objective of contributing new knowledge and practical guidelines for the integration and use of energy storage (mainly electric batteries) for various applications in the Norwegian distribution grid. The Skagerak Energilab, part of the InteGER project, focuses on coupling PV panels installed on the roof of a football stadium with a li-ion battery (800 kW/1 MWh). Several different uses for the battery will be tested: maximising self-consumption/peak shaving/energy use management for the stadium; provision of grid services to the DSO; and provision of services to nearby customers.	<b>Henrik LANDSVERK, Skagerak Nett AS</b>	<a href="#">Link</a>
Sello smart energy system	Finland	This project focuses on optimising the energy consumption of Sello, one of the biggest shopping malls in Finland. Siemens was engaged to use data from energy efficiency and HVAC systems, air quality and temperature sensors, occupancy rates and weather data, to identify areas for improvement and deliver a comprehensive solution for optimising Sello's energy consumption and air quality. Using these different resources and a li-ion battery, Sello can also provide balancing and ancillary services to the Finnish TSO by serving as a virtual power plant.	<b>Anssi LAAKSONEN, Siemens</b>	<a href="#">Link</a>
Suvilahti Battery Energy Storage System	Finland	Using a 1.2MW/600kWh lithium titanate battery and conducting different trials over 3 years, the Suvilahti project is researching different aspects related to grid service provision by batteries and possibilities for stacking revenues. In doing so, the project also sought to answer key questions related to use cases, profitability of battery storage systems, market models, and grid codes/regulations.	<b>Kristiina HELEN SIILIN,</b>	<a href="#">Link</a>



CEDREN-HydroBalance project	Norway	The main goal of the HydroBalance Roadmap is to assess the possibilities for developing the flexibility of Norwegian hydropower resources, both by expanding existing hydro capacity and constructing new pumped-storage by 2040. The project analyses the amount of balancing capacity available in Norwegian hydro reservoirs, relevant business models, demand for storage, environmental impacts of hydropower for balancing, and social acceptance and regulatory frameworks.	<b>Michael BELSNES, SINTEF</b>	<a href="#">Link</a>
<b>Session 3: Projects addressing topics within the scope of ETIP SNET's Working Group 3 (WG3): "Flexible generation"</b>				
The Finnish Solar Revolution Project	Finland	The project covers the issues related to power quality and stability in interfacing solar PV to the grid, and in particular addresses the following technical aspects: Requirements for energy storage to compensate PV power fluctuation and maintain power balance, nowcasting of PV production, balance, control, operation and power quality of PV powered micro grids, grid stability with high level of renewables, reliable and efficient operation of PV power generators and reliability of PV converters, grid feeding and forming operation PV inverters, compensation of PV power fluctuations feed to the grid etc. Energy (battery) storages are a key issue in all these research themes. The aim is also to ensure that the system operators have the leading-edge scientific knowledge on their disposal on the main future technology and business concept trends related to global solar PV power production.	<b>Seppo VALKEALAHTI, Tampere University of Technology</b>	<a href="#">Link</a>
DGNETT Project	Norway	The overall goal of the project is to reduce costs related to grid connection and operation of distributed generation. Connecting large amounts of generation to the distribution grid, challenges the grid companies in new ways. An important topic is the calculation of hosting capacity (i.e the additional amount of generation that can be connected to a specific grid). This calculation determines whether a generation unit is allowed to be connected to the existing grid or if upgrades or new lines are needed. To this aim, the project has set up the most suitable grid codes defining the specifications for the connection of generators to the electricity grids, expanding the tool box available to grid companies in handling the connection of new distributed generation. It is expected that the main outcomes will allow to increase flexibility and the capability to handle uncertainties in the planning phase, and reduce connection costs.	<b>Stig FRETHEIM, REN</b>	<a href="#">Link</a>
The Neocarbon Energy Project	Finland	The project is about creating a path towards 100% renewable energy system, focusing on the role of power to gas and power to X. The approach is holistic, trans-disciplinary and whole-of-society perspective on energy system. The focus is on possible societal disruptions and transformations enabled and fostered by the renewable energy system. The main objective is to characterise possible socioeconomic futures related to neo-carbon energy system.	<b>Christian BREYER, Lappeenranta University of Technology</b>	<a href="#">Link</a>

<b>Session 4: Projects addressing topics within the scope of ETIP SNET's Working Group 4 (WG4): "Digitisation of the electricity system and Customer participation"</b>				
Arrowhead Project	Sweden	The objective of the Arrowhead project is to address the technical and applicative challenges associated to cooperative automation: 1) Provide a technical framework adapted in terms of functions and performances. 2) Propose solutions for integration with legacy systems. 3) Implement and evaluate the cooperative automation through real experimentations in applicative domains: electro-mobility, smart buildings, infrastructures and smart cities, industrial production, energy production and energy virtual market. 4) Point out the accessible innovations thanks to new services. 5) Lead the way to further standardization work.	<b>John LINDSTRÖM,</b> <b>Luleå tekniska universitet</b>	<a href="#">Link</a>
CloudGrid Project	Sweden	In the CloudGrid project, R&D on smart grid solutions will be focusing on three main areas: System stability, Ancillary services & energy management and Converter interoperability. The method used in the CloudGrid project to improve the research is to increase the cooperation between the partners based on an interconnection between smart grid labs. The establishment of this transnational smart grid cloud shall facilitate possibilities to validate research result in different laboratory environment, in this way the project will be able to provide solutions with a broader level of validation and suitable for a wider range of equipment.	<b>Michael CALDER,</b> <b>ABB</b>	<a href="#">Link</a>
The "Platform for Flexibility Services" Project	Estonia	One platform for flexibility services to provide environment to all flexibility market participants, from TSO to aggregators. On this platform it is going to be managed flexibility trading, information flows and flexibility operations.	<b>Kalle KUKK,</b> <b>Elering</b>	<a href="#">Link</a>
The TAKE-5 (5th Evolution Take of Wireless Communication Networks) Project	Finland	The project targets the creation of a multidisciplinary and open research platform for investigation and experimental evaluation of innovative ideas in networking and services of 5G. The platform and 5G functionalities are incrementally built and refined after each implemented extension. TAKE-5 concentrates on research and initial testbed setup and on End-to-End testing including new 5G technologies verification. One of the main application areas is grid communication focusing on latency and reliability aspects. The project belongs to the 5G test network of Finland (5GTNF) framework.	<b>Seppo HORSMANHEIMO,</b> <b>VTT</b>	<a href="#">Link</a>

During this workshop, there were no projects' presentations from Denmark.

### 3.1.2 ROUNDTABLES

Four roundtables were held during the workshop, moderated by Michele DE NIGRIS, Brittney ELZAREI and Daniel HERNANDEZ MALDONADO. The four roundtables evoked questions and different exchanges between the speakers of the projects presented, the representatives from EASE and the respective representatives of the different ETIP SNET Working Groups. The table below shows the participants in each roundtable.

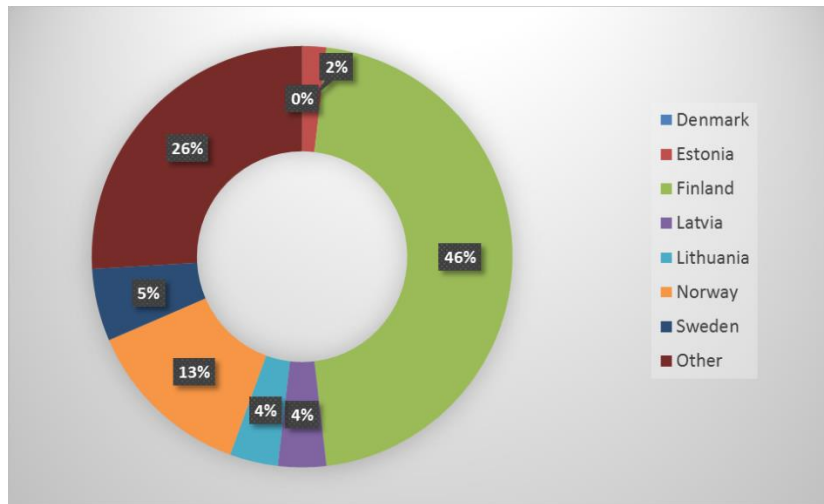
Table 6 – Participants in roundtables at the second regional workshop

Roundtable nr.	Participants
1	<ul style="list-style-type: none"> <li>• Anna KULMALA (VTT, WG1 Representative)</li> <li>• Kjell TUTVEDT (Hafslund)</li> <li>• Antons KUTJUNS (AST)</li> <li>• Neringa RADZIUKYNIENE (Lithuanian Energy Institute)</li> <li>• Michele DE NIGRIS (ETIP SNET Support Team, RSE)</li> </ul>
2	<ul style="list-style-type: none"> <li>• Seppo HANNINEN (VTT, WG2 representative)</li> <li>• Henrik LANDSVERK (Skagerak Nett AS)</li> <li>• Anssi LAAKSONEN (Siemens)</li> <li>• Kristiina SIILIN (Helen)</li> <li>• Michael BELSNES (SINTEF)</li> <li>• Brittney ELZAREI (ETIP SNET Support Team, EASE)</li> </ul>
3	<ul style="list-style-type: none"> <li>• Kaj PORTIN (Wärtsilä, WG3 Representative)</li> <li>• Seppo VALKEALAHTI (Tampere University of Technology)</li> <li>• Stig FRETHEIM (REN)</li> <li>• Christian BREYER (Lappeenranta University of Technology)</li> <li>• Michele DE NIGRIS (ETIP SNET Support Team, RSE)</li> </ul>
4	<ul style="list-style-type: none"> <li>• Maher CHEBBO (GE, WG4 Representative)</li> <li>• John LINDSTRÖM (Luleå tekniska universitet)</li> <li>• Michael CALDER (ABB)</li> <li>• Kalle KUKK (Elering)</li> <li>• Seppo HORSMANHEIMO (VTT)</li> <li>• Daniel HERNANDEZ MALDONADO (ETIP SNET Support Team, DOWEL)</li> </ul>

### 3.1.3 LIST OF ATTENDEES

Around 50 participants were registered for the workshop. The distribution of participants by country is provided in the figure below:

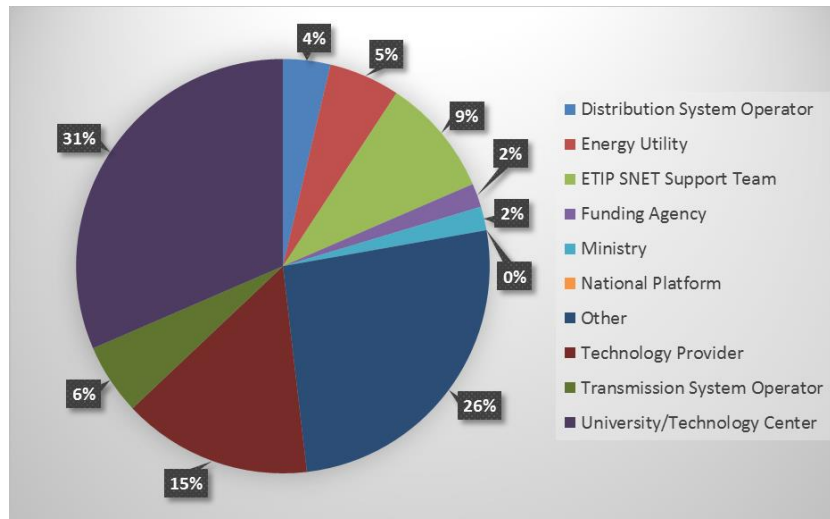
Figure 3 – Distribution of participants by country



The figure shows that the two most represented countries from the Northern region are Finland and Norway. Also, it is to highlight that 26% of the participants are coming from other countries located outside of this region such as: Belgium, France and Italy.

In addition, the following figure provides an overview of the distribution of participants classified by their type of organization:

Figure 4 – Distribution of participants by organization



The figure shows that 31% of the audience comes from University/Technology Centres, and 15% are technology providers. Among the 26% of the 'Other' category we can find: independent research centres, associations and consultants.

## 3.2 MAIN QUESTIONS FROM THE PROJECTS' Q&A SESSIONS

Each project presentation has been followed by a session of questions and discussions (10 minutes for each session). The main questions and comments are collected in the table below:

Table 7 – Main questions and comments by project (Espoo)

Project	Country	Main Questions & comments
<b>Session 1: Projects addressing topics within the scope of ETIP SNET's Working Group 1 (WG1): "Reliable, economic and efficient smart grid system"</b>		
FASaD - Fault and interruption handling in smart distribution systems Project	Norway	Interoperability and communication issues were 2 main key aspects of the presentation. About the interoperability, some questions were asked in order to understand if the project was carried out involving technology providers to design and apply the protection directional sensors for the system. The need of guidelines and procedures arose during the discussion. Regarding communication aspects, the problem of the dependability of the security of the system on the communication procedures was an issue commented during this session: How the system can be protected if the communication system fails? Issues about the channel reliability, stability, bandwidth and jitter for protection were discussed. One more point came out during the discussion related to the digitization of different functionalities in the substations, where the present operation is manual.
Kruzeme Ring project	Latvia	The discussion faced the issue of public acceptance of TSO overhead lines. During the development of the project, the regulation was changed in Latvia, allowing the building of the new transmission line. Each transmission line could be implemented only after public discussions with municipalities and land owners, taking into account opinions and proposals from them. Therefore, project promoters are implementing 330 kV and 110 kV in the same pylons). Environmental impact assessment and right of way studies were prepared in parallel with public consultations with municipalities and land owners. A further issue related to the resilience of the system was discussed, mostly thinking to extreme weather conditions. Resilience is a key issue to be taken into account during the planning phase of the lines and the system. During the discussion, the issue about interconnection for some States was touched, for example considering the possibility for Latvia to plan an interconnection network with the Russian transmission system: apart from the obvious political prudence, actual system issues would be linked to the interconnection of non-synchronous system, thus requiring the adoption of DC links.
Energy sector development and economic sustainability analysis	Lithuania	The discussion highlighted the need of a higher cooperation between industries and the Academia. In particular, it was mentioned that it would be required to create a National database in some EU countries, so as to allow testing of academic models with real data in real grid situations (real use cases). Another issue commented was about the protocols to be used for the agreement between the parties involved in this kind of projects, mostly concerning the sharing of results and their publication.
<b>Session 2: Projects addressing topics within the scope of ETIP SNET's Working Group 2 (WG2): "Storage technologies and sector interfaces"</b>		
The InteGER Project	Norway	Questions from workshop participants centred mainly on the business model for this project (who pays and who benefits? Is the project expected to generate a return on investment?) and ownership-related aspects (who owns the battery? Which services and uses did the regulator allow the DSO to provide with the battery?). The speaker explained that the exact revenue streams and therefore ROI of the project are not yet clear, but different uses will be trialled. The battery is owned by the utility for the

		moment. Participants also questioned the replicability of the project in Norway. The speaker noted that many football stadiums in Norway, but also other countries, have expressed interest in possibly replicating the project. A final point of discussion was societal acceptance and the fact that this project was able to reach a population (football fans) that does not generally about renewables and storage. The speaker underlined that the most urgent policy recommendation from the project would be to clarify the ownership of storage b regulated entities.
Sello smart energy system	Finland	Again, most of the questions related to the Sello project centred on the business case and the use of the battery. The speaker explained that the project would be profitable without public support, as the building can provide significant demand response and flexibility services to the grid, which generate significant revenue for the building owner. Also, some of the value of the battery is provided by peak shaving. One of the most urgent policy recommendations from this project would be to address safety issues and standards for installation of batteries in commercial buildings.
Suвилаhti Battery Energy Storage System	Finland	The participants asked about how this project led to the removal of double grid charges for storage devices in Finland. The speaker explained that the regulator was receptive to the storage industry's arguments but noted that only grid-scale storage is now excluded from double grid charges; behind-the-meter storage still faces this problem. Asked about which business model is most profitable, the speaker noted the need to stack different services, but explained that FCR-N is currently the most valuable market. A market for services to the DSO could significantly improve the business case for storage in the future. The speaker emphasised the need to clarify ownership of storage, as well as remove double grid charges of storage devices. As in the other presentations, it is essential to have a clearer view of the different revenue streams for storage, access to different services tendered on the market, and for long-term views on possible revenue streams.
CEDREN-HydroBalance project	Norway	One participant asked whether Norway faces an issue regarding competition for the use of water. The speaker explained that in Norway, there are significant water resources and little tension related to competition. There were also discussions about social acceptance of hydropower and how this is changing over time. The speaker noted that his most urgent policy recommendation would be to ensure that EU policy is technology neutral and accepting all different sources of flexibility.
<b>Session 3: Projects addressing topics within the scope of ETIP SNET's Working Group 3 (WG3): "Flexible Generation"</b>		
The Finnish Solar Revolution Project	Finland	The discussion was about the contribution of RES to system stability, at large. Curtailment issues (the most widely used approach from system operators implies that, as soon as a problem occurs in the network, the operator has the faculty to curtail RES; in smart grids systems the RES must remain connected as much as possible to the network in such a way as to contribute to the stability of network), grid codes, connection requirement (e.g. interface protection, faults management, behaviour during the islanded operation of a microgrid, where one of the existing generators must take the function of master generator, while the other would act as followers). It was also highlighted that additional research is needed in the microgrid management and control. It has been commented that more accurate specifications are needed for batteries to be implemented in the grid: several difficulties have been encountered during the demonstrations deployment related to storage integration, it has been stated that this is not a 'simple' plug & play operation.
DGNETT Project	Norway	Questions were asked about the monitoring of power quality: issues can come up from user part, so the question was in order to understand how to discriminate who generates the problem. For Norway this is a big question because there is no present means to discriminate the origin of disturbances. So there is the need to install equipment to better assess power quality and decide who is responsible for the costs in case of damages. Small households are being treated in the same way as big producers: there is therefore the necessity to differentiate responsibility through adequate laws and grid codes so as to respect the safety rules as well.

The Neocarbon Energy Project	Finland	The discussion was about the position of the project with respect to ETIP SNET Vision 2050 and IEA scenarios. Also, some definition issues were faced (like using 'de-fossilisation' instead of 'decarbonisation': Analysis of full H2-based value chain vs electricity-based value chain can make the difference. It has been commented that more research is maybe needed for synthetic inertia by means of the most adequate use and control of power electronics: power electronics can be improved to facilitate the use of storage to ensure the grid reliability.
<b>Session 4: Projects addressing topics within the scope of ETIP SNET's Working Group 4 (WG4): "Digitisation of the electricity system and Customer participation"</b>		
Arrowhead Project	Sweden	The benefits of Arrowhead systems that could be useful for the energy applications have been explained: local clouds concept (flexible and modifiable) and predictive maintenance for instance for grid for district heating applications. The lack of education and training of the staff working with new digital/software technologies such as the one developed by Arrowhead and the consequences when implemented have been discussed. Different types of contrasts between classical legacy systems vs Internet of things (IoT) and System of systems (SoS) when implemented have been commented: financial, time saving, competences between ICT and OT (Operational Technology)... Questions from the audience were related to the time consumed to secure the Arrowhead system and its ratio when compared to the productivity time.
CloudGrid Project	Sweden	Questions regarding the pilot site implementing the CloudGrid technology and its scalability and replicability were raised. Technical questions about the convertor interoperability were asked: different interactions DC/AC, DC/DC... It has been pointed out that to foster the development of viable business models for the ancillary services and energy management studied in the project, the cooperation with network operators would be a powerful asset. It is to highlight that the cooperation between laboratories allowed this project to perform tests and analysis that would not be possible stand-alone. This kind of cooperation are to be enhanced in some EU countries.
The "Platform for Flexibility Services" Project	Estonia	It has been discussed the necessity of continue developing interoperable flexibility platforms at EU level such as the one developed by Elering as they could facilitate the coordination between network operators when managing the network. Interesting discussions with the audience have been held about who should own and operate these flexibility platforms and at which level (local, centralised...). The audience has concluded that a 'neutral body' would be needed to play these roles to avoid data compromising and market-driven behaviour from different stakeholders. The lack of flexibility products definitions has been commented. The need of a single EU flexibility market was discussed. Questions about the cooperation with other flexibility platforms and their differences were raised to the speaker (NODES-Microsoft, PICASSO project).
The TAKE-5 (5th Evolution Take of Wireless Communication Networks) Project	Finland	The need of reliable communication networks has been commented. Questions regarding the use of communication networks of private companies by regulated players were discussed. Differences between the 4g which is more technology-driven as it focuses on offering mobile services to consumers and 5g which is more service oriented (industrial customers and communications between machines) were commented. The differences between the technology readiness level (TRL) and the System Readiness Level of technologies in the telecom sector when deployed in the EU energy system were discussed. Questions about who is affording the costs for the 5G deployment in the energy system were raised. The stakeholders recruitment phase and how to involve them in the pilot sites was commented by the speaker.

### **3.3 RECOMMENDATIONS FROM THE PROJECTS AND CONCLUSIONS FROM THE ROUNDTABLES**

These recommendations and conclusions of the Northern workshop have been discussed and validated during the final wrap-up session of the event. They are announced hereafter.

#### **3.3.1 SESSION 1: ADDRESSING TOPICS WITHIN THE SCOPE OF ETIP SNET'S WORKING GROUP 1 "RELIABLE, ECONOMIC AND EFFICIENT SMART GRID SYSTEM"**

- Efforts are needed at EU level for the finalization of the set of standards, to ensure actual smart grid (real) interoperability.
- Research and development activities are needed for the setting up of common data and information models with the final goal to ensure the final development of digital twins for the energy system.
- Research activities are needed to assess the system vulnerability characteristics in view of increasing system resilience towards different types of stresses.
- There is a need to consider requirements for the system characteristics to minimize dependability issues from the communication systems.
- The need of considering existing and retrofitted networks (not only new) should not be neglected when developing new functionalities (software and hardware) by technology providers.
- Public acceptance of transmission infrastructures and the related tools for the community involvement still need to be enhanced.
- Cooperation between Academia, public research centres and industry (technology providers and network operators) is a top priority in some EU countries.

#### **3.3.2 SESSION 2: ADDRESSING TOPICS WITHIN THE SCOPE OF ETIP SNET'S WORKING GROUP 2 "STORAGE TECHNOLOGIES AND SECTOR INTERFACES"**

- There is a need to clarify as soon as possible the ownership of storage by regulated entities.
- Support the development of standards for integration of storage in buildings/commercial and industrial sites.
- Efforts to encourage MS to remove double grid fees/charges related to storage. NSCG would need to be more involved.
- Pursue a technology neutral approach at EU level for energy storage R&D and regulation/policies.



- More research efforts should be allocated to assess storage revenues, stacking of services, BMs, and monetization of storage services.
- Social acceptance and environmental impact should not be neglected in storage projects.
- Innovative communication strategies are needed to reach a bigger audience when projects deployment.

### **3.3.3 SESSION 3: ADDRESSING TOPICS WITHIN THE SCOPE OF ETIP SNET'S WORKING GROUP 2 "STORAGE TECHNOLOGIES"**

- Innovative methods to maintain the reliability of the system are to be further developed, with a special reference to power electronics diagnosis (but not limited).
- The response of the system with high shares of RES in the occasion of large failures needs to be further investigated.
- Evaluate the consequences of application of grid codes in terms of responsibility for power quality deviations and the necessity of monitoring power quality at the different level in the network, to asses responsibility.
- Additional research is needed towards flexibility means so as to investigate the impact of the market consequences when curtailing RES production or limiting low consumption in case of network issues.
- Protocols and guidelines are still needed to control and monitor microgrids in terms of responsibilities of the different stakeholders (frequency and voltage control).
- Starting from the ETIP-SNET vision, scenarios should be developed taking into consideration the dynamics of the energy at '*sufficiently short-time steps*' to correctly investigate the effects of flexibility through sector coupling.

### **3.3.4 SESSION 4: ADDRESSING TOPICS WITHIN THE SCOPE OF ETIP SNET'S WORKING GROUP 4 "DIGITISATION OF THE ELECTRICITY SYSTEM AND CUSTOMER PARTICIPATION"**

- Lack of analytical tools to train the algorithms to monitor and detect abnormal grid operation for the benefit of TSOs and DSOs.
- Lack of full understanding, analysis and modelling approaches for hybrid HVAC/HVDC systems, with particular emphasis on the dynamics arising from their interconnection.
- There is a need for a single EU flexibility market, and platforms for data information exchange and for the development of flexibility services market places.
- In general, (not only from the ICT perspective) there is a need to define flexibility products.

- TSO-DSO platforms should be fostered to leverage coordination within the energy system.
- The blockchain is to be assessed for the energy system applications and services: i.e. real time data exchange across many systems.
- A 'neutral actor' would be needed to manage and operate flexibility market/platform to ensure independency and transparency.
- The TRL of the communication technologies may not be fully aligned with the system needs as potential functionalities do not match with the present requirements (gap between TRL vs SRL).

### 3.4 RECOMMENDATIONS FOR INNOVATION IMPLEMENTATION IN THE BUSINESS ENVIRONMENT

During the session hosted by Marina MILOSEVIC (Vattenfall, WG5 Representative) the following high level recommendations were identified and validated with the different projects:

- **Identify & recruit the right receivers/influencers**
  - Collaborate with influencers effectively, and stay within regulations
  - Cooperate with/involve receivers in early stage of research, maybe even from idea level
- **Base research on business case**
  - The market/industries are more willing to support and implement innovation that solves their specific problems
- **Build team with interdisciplinary, intersectoral competence**
  - Successful results require expert skills in technology, data management, marketing...
- **Be transparent**
  - Supply right information to market/influencers, with clear business case(s). Supplying the right information to the influencers upfront, can prevent a lot of back and forth and other common pitfalls.
- **Work in agile manner** and be prepared to do some compromises in order to go further in your own research.

## 4. REGIONAL WORKSHOP 3 (BELGIUM, NETHERLANDS, LUXEMBOURG, POLAND, AUSTRIA, GERMANY, SWITZERLAND, CZECH REPUBLIC, SLOVAKIA)

The third workshop was held in Brussels the 11-12 October 2018. The agenda of the event is available on the [ETIP-SNET website](#).

### 4.1 PROJECTS AND PARTICIPANTS IN THE WORKSHOP

#### 4.1.1 R&I PROJECTS PRESENTED

Eleven R&I projects were presented during the third workshop, as shown in the table below:

Table 8 – Projects presented at the workshop 3

Project	Country	Purpose	Speaker	Link to presentation
<b>Session 1: Projects addressing topics within the scope of ETIP SNET's Working Group 1 (WG1): "Reliable, economic and efficient smart grid system"</b>				
The Rural Intelligent Grid project	Poland	The aim of the project RIGRID is to develop new interactive energy and infrastructure design tool for optimal planning and operation of new emerging energy infrastructures in rural areas with active participation of citizens and test it in a Polish town/village and demonstrate the added value for the region and employment effects (visibility, regionality, energy efficiency, creation of new jobs). The three pillars/actors on which the development of the tool will be based are: smart grids, renewable energy sources (RES) and active participation of the citizen/loads and end customers.	<b>Marcin DELEGACZ</b>	<a href="#">Link</a>
The Integration of sustainable Multi-Energy-hub Systems at neighbourhood scale project (IMES)	Switzerland	The project will develop and provide a comprehensive simulation approach for decentralized power production which tackles at the same time technical, economic and social issues. A new methodology will be established in order to evaluate decentralized power production solutions and formulate techno-economic decision guidelines for implementation of decentralized power production integrating renewable energy sources, natural gas-based micro-cogeneration and storage (power-to-gas and batteries). These guidelines will contain recommendations on how neighbourhood-scale power productions should optimally be implemented today and in the future, which are the technical, economic and social barriers to be overtaken and where innovation is necessary to bring distributed power generation to the market.	<b>Portia MURRAY</b>	<a href="#">Link</a>

The Microgrid services for Local Energy Communities project	Belgium	Based on a concrete project in Mechelen the focus was to look for suitable functionalities for a controller of smart microgrid solutions that create the most value in the value chain and for the end users without extra system costs. The Winter Package of the European Union with new regulations, roles and responsibilities were a guideline to maximise the EU commercial perspective and ensure scalability. The project is focused on the involvement of the end-users, the concrete architecture and functionalities for the microgrid controller, the value chain, business models and replicability.	<b>Fredrik Loeck</b>	<a href="#">Link</a>
<b>Session 2: Projects addressing topics within the scope of ETIP SNET's Working Group 2 (WG2): "Storage technologies and sector interfaces"</b>				
The Smart Grid Battery Storage Project Prottes	Austria	Netz NÖ erected a large battery system based on Li-Ion technology sized 2,5 MVA and 2,2 MWh at the location of a 110kV/30kV substation. The substation is in a section of Netz NÖ's grid with a high injection of wind energy. The aim of the project is to demonstrate that battery systems can contribute to system stability by providing ancillary services as well as services for DSOs like voltage control, reactive power compensation as well as phase-balancing. The focus is multimodal operation (several functions simultaneously) which could improve overall economy of the system. In addition, black start capability and island mode operation have been tested.	<b>Dr. Wolfgang VITOVEC</b>	<a href="#">Link</a>
The Smartwater project	Belgium	The SMARTWATER project will generate some investigation tools to assess the feasibility of the rehabilitation of end-of-life quarries and mines into medium-sized PHES units. The project implements a holistic approach encompassing legal, environmental, economic, hydraulic, electro-mechanical, and geological aspects. The reservoir capacity and hydraulic head of most of the sites under consideration are around a few hundreds of thousand cubic meters and a few dozen meters respectively. Economic feasibility includes assessment of the cost reduction opportunities offered by such site configurations (widespread in Wallonia) and the exploration of innovative multi-service (DSO and TSO) exploitation strategies in the context of an increasing intermittent production.	<b>Prof. Patrick HENDRICK</b>	<a href="#">Link</a>
The Industrial waste heat utilisation project	Germany	In energy-intensive industries, e.g. foundry industry or cement industry, the use of waste heat for example as process or space heating energy reduces the consumption of primary energy. In the Project researchers are testing an energy storage system for discontinuous industrial waste heat of a furnace at a foundry.	<b>Richard GURTNER</b>	<a href="#">Link</a>
<b>Session 3: Projects addressing topics within the scope of ETIP SNET's Working Group 3 (WG3): "Flexible generation"</b>				
The iCarus project	Netherlands	iCarus system forecasts solar energy production for preventing the increasing number of PV systems to cause congestion in the electricity infrastructure. iCarus is able to forecast with 5-minute intervals and on various levels (national, regional and local system level), and works with a combination of complex weather models, real time inverter data and self-	<b>Frank KREUWEL</b>	<a href="#">Link</a>

		learning algorithms. Currently inverter data of 5.000 systems are gathered in the Netherlands and Belgium.		
The Flexignite project	Germany	The project focuses on the increase of flexibility and competitiveness of coal power plants through the development of a novel electric burner start-up systems based on plasma technology. Experimental activities in different scales are foreseen. Following the evaluation of the experimental results, a technical and economic analysis of the proposed start-up concepts will be proposed.	<b>Christian BERGINS</b>	<a href="#">Link</a>
The Industore project	Belgium	InduStore has the objective to quantify and leverage the potential of energy flexibility in industrial sites, using advanced analytic methods such as optimization and artificial intelligence. The InduStore project offers a threefold approach associating industrial knowledge, mathematic modeling and social aspects in order to offer to industrial sites an optimal decision-making solution to respond three key questions: What is the flexibility potential of an industrial site, a sector, a region? How to leverage these flexibilities, considering all industrial constraints, to create value? What is the impact of flexibilizing an industry on the workers?	<b>Héloïse HOYOS</b>	<a href="#">Link</a>
<b>Session 4: Projects addressing topics within the scope of ETIP SNET's Working Group 4 (WG4): "Digitisation of the electricity system and Customer participation"</b>				
The eSafeNet project	Germany	Development of a secure and efficient communication infrastructure for the Internet of Energy	<b>Padraic MCKEEVER</b>	<a href="#">Link</a>
Test of Blockchain for settlement of decentralized flexibility	Belgium	The goal is to test the improvement of the processes linked to the activation of tertiary reserve by using blockchain and to understand whether the technology is suitable for the management of a large amount of small decentralized flexibility sources. The test will focus on different steps of reserve activation: registration of new players, offering of flexibility, settlement and payment of an activation.	<b>Loïc TILMAN</b>	<a href="#">Link</a>

During this workshop, there were no projects' presentations from Luxembourg, Czech Republic and Slovak Republic.

## 4.1.2 ROUNDTABLES

Four roundtables were held during the workshop, moderated by Michele DE NIGRIS, and Coralie BADAJOZ. The four roundtables evoked questions and different exchanges between the speakers of the projects presented, the representatives from EDSO and EASE and the respective representatives of the different ETIP SNET Working Groups. The table below shows the participants in each roundtable.

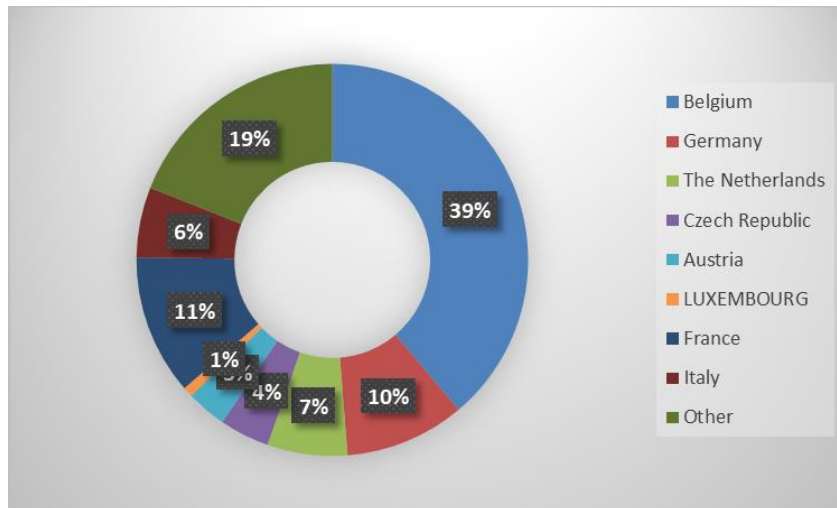
Table 9 – Participants in roundtables at the second regional workshop

Roundtable nr.	Participants
1	<ul style="list-style-type: none"> <li>• Gilles TIHON (Service Public de Wallonie, WG1 Representative)</li> <li>• Portia MURRAY (ETH Zürich)</li> <li>• Frederick Loeckk (Flux 50)</li> <li>• Michele DE NIGRIS (ETIP SNET Support Team, RSE)</li> </ul>
2	<ul style="list-style-type: none"> <li>• Cristina GOMEZ SIMON (ENTSO-E, ETIP SNET WG2 representative)</li> <li>• Dr. Wolfgang VITOVEC (Netz Niederösterreich GmbH)</li> <li>• Prof. Patrick HENDRICK (Université Libre de Bruxelles)</li> <li>• Richard GURTNER (ZAE Bayern)</li> <li>• Coralie BADAJOZ (ETIP SNET Support Team, DOWEL)</li> </ul>
3	<ul style="list-style-type: none"> <li>• Pascal FONTAINE (CMI Energy, ETIP SNET WG3 representative)</li> <li>• Frank KREUWEL, (ALLIANDER)</li> <li>• Dr. Christian BERGINS (MHPS)</li> <li>• Héloïse HOYOS (N-SIDE)</li> <li>• Michele DE NIGRIS (ETIP SNET Support Team, DOWEL)</li> </ul>
4	<ul style="list-style-type: none"> <li>• Esther HARDI (ALLIANDER, ETIP SNET WG4 representative)</li> <li>• Padraic MCKEEVER (RWTH Aachen)</li> <li>• Loïc TILMAN (ELIA)</li> <li>• Coralie BADAJOZ (ETIP SNET Support Team, DOWEL)</li> </ul>

### 4.1.3 LIST OF ATTENDEES

More than 100 participants were registered for the workshop. The distribution of participants by country is provided in the figure below:

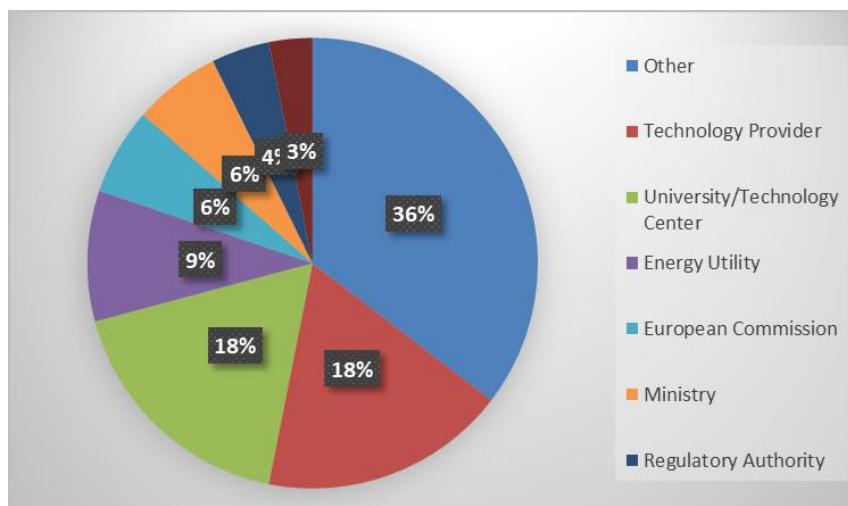
Figure 5 – Distribution of participants by country



The figure shows that the two most represented countries from the Central region are Belgium and Germany. Also, it is to highlight that more than 30% of the participants are coming from other countries located outside of this region such as: France, Italy and Greece.

In addition, the following figure provides an overview of the distribution of participants classified by their type of organization:

Figure 6 – Distribution of participants by organization



The figure shows that 18% of the audience comes from Technology providers, and 18% are from University/Technology centre. The 'Other' category gathers mainly representatives of consultancy companies.



## 4.2 MAIN QUESTIONS FROM THE PROJECTS' Q&A SESSIONS

Each project presentation has been followed by a session of questions and discussions (10 minutes for each session). The main questions and comments are collected in the table below:

Table 10 – Main questions and comments by project (Espoo)

Project	Country	Main Questions & comments
<b>Session 1: Projects addressing topics within the scope of ETIP SNET's Working Group 1 (WG1): "Reliable, economic and efficient smart grid system"</b>		
The Rural Intelligent Grid project	Poland	The project (developed under the ERA-net Smart Grids framework) has a strong connection with the ETIP SNET priorities and addresses not only technical aspects (as it appears from the presentation delivered) but also market and consumer engagement aspects. The discussion focussed on the EMACS (Energy Management and Control System) which gathers the functionalities of a classic SCADA system, an Internet of Things platform, a Business Intelligence software and a system for modelling and design of microgrids. The system is installed and operated in real world situations, demonstrating its functionalities and usefulness. There has been no need of any specific regulatory exception as the project ran in compliance with the normal regulation. The project has shown that the engagement and motivation of final users and investors is a major difficulty. The system, used in scenario simulation modes, has been used also for the evaluation and selection of energy storage systems as well as the optimal localization of infrastructures. R&I activity about storage facilities is still strongly needed.
The Integration of sustainable Multi-Energy-hub Systems at neighbourhood scale project (IMES)	Switzerland	The project addresses an innovative simulation framework to evaluate the potential of decentralized power production considering technical, economic and social issues. The issues discussed during the sessions dealt with the modelling approach adopted and the assumptions used to predict the energy consumption in the prospective scenarios 2020, 2035 and 2050. Two retrofit strategies have been considered and a sensitivity analysis has been carried out. Moreover, additional discussions were undertaken about the necessary level and detail of modelling of the different components of the system. All the models adopted in the simulations are based on technical datasheet from manufacturer and described in details in the literature. Some of them are also available for download in libraries. About the public perception, it was asked if the concern of the people is on ownership, financial issues and/or privacy? It seems that people are mainly concerned about financing and privacy. Finally, about district heating, high temperature networks were considered to address the two real situations addressed (Amsterdam and Zurich).
The Microgrid services for Local Energy Communities project	Belgium	The main issue faced during the discussion was about the user engagement motivation and psychology. Addressing the energy-psychology nexus of the citizens has been one of the key success factors of the project: it is learned that creation of trust and understanding about what the energy system is exactly is a real necessity in such public-oriented projects. The business model adopted and tested was questioned by the audience, in terms of viability and about the necessary transition in the value proposition from a "product-centric" approach, towards a "service-centric approach". How to evaluate the revenue stream? Metering is the key application here, and the privacy of measurements appears to be one of the major discussion points: in fact with the recent GDPR regulation, the management of the data from measurements is becoming more complex.

<b>Session 2: Projects addressing topics within the scope of ETIP SNET's Working Group 2 (WG2): "Storage technologies and sector interfaces"</b>		
The Smart Grid Battery Storage Project Prottes	Austria	Discussions addressed the ownership of the battery (DSO, independent party), the short licencing and erection times for battery systems compared to conventional technologies as well as the use of batteries to temporarily postpone system expansion in low voltage grids. The concept of vehicle-to-grid was briefly discussed, however there is some scepticism if vehicle owners will accept such uses, as long as vehicle battery capacity is relatively small. Finally, it was reminded that according to the directive, and the Article 36 and 54, regulated players might own a battery only under certain specific conditions. The wish was expressed, to expand battery use for DSOs as a tool for system services to facilitate integration of high shares of renewable power into the grid.
The Smartwater project	Belgium	The main discussions were focused on the fact that, today, no market is existing for such system: there is no tariff scheme or revenue needs. It is also stressed that constraints are imposed by pumps/turbines (working domain) which reduce the profits expected from reserve services. For this example, the need of simulation tool to validate optimised configuration including dynamic effects is highlighted.
The Industrial waste heat utilisation project	Germany	The main topics developed were the following: - The system costs: depending on the costs (OPAX) the storage can be used for power to heat applications. Future main task: further improvement of the profitability of the system; - The replicability of the project: this aspect is of importance so as to demonstrate the added value of the project and its viability; One challenge was also emphasized: the difficulty to find partners only for technology demonstration due to risks in terms of technical and economic aspects, the difficulty of the economic demonstration under real conditions and the lack of benefits from marketing the technology.
<b>Session 3: Projects addressing topics within the scope of ETIP SNET's Working Group 3 (WG3): "Flexible Generation"</b>		
The iCarus project	Netherlands	The issues discussed were linked with the quality of the data acquired and the necessary methods and systems to "clean" and validate the data coming from very different sources widespread over the territory, with different installations, configurations, manufacturers, and even with different time clocks: sophisticated algorithms and IA are needed to clear and interpret the patterns obtained. The performance of PV panels is also influenced by the maintenance of the PV systems (e.g. cleanliness of the panels). There was interest in the possibility to use data of widely distributed systems, to make more robust forecasts: this fact represents a very interesting opportunity. The situation is much simpler for wind parks (also because of the limited number of plants and their much bigger size), and because the classical wind forecasts are simpler: they are made based on measurements at few meters from to ground level and reported at windmill level by well-known models.
The Flexignite project	Germany	During the discussions, it was questioned that R&D money be devoted to fossil fuel-linked technologies. There is still a need of incentives for research on conventional power plant in view of studying their conversion towards green plants. The plasma technology adopted has no major impact on the remaining different components of the plants (e.g. turbine or other parts...). The system is also compatible with combustion of biomass (pellets), characterized by high volatility and low contents of fine particle. The system is also fully compatible with CCUS. The German government is funding CCUS technology mostly in view of exporting the technology outside Europe.
The InduStore project	Belgium	The discussion started about the business model of the approach which is based on the one hand on the variability of the energy costs in time, and the possibility that energy consumption peaks may fall into high price time zones because of the overall energy system situation, and on the other hand on the opportunity for the industry to offer flexibility services to the network. It is a fact that peaks are difficult to forecast and a stochastic approach needs to be adopted. The mission is to avoid industries from taking

		wrong or risky decision, giving them orders of magnitude of the most appropriate operation zones to help in the planning. Flexibility is not new to industrial processes: several sectors have, for example, CHP that can be modulated their electricity/steam ratio to leverage the market opportunities (day ahead market or balancing market). Other industries having overcapacity on their processes (reaching sometimes between 20-30 %) are already active using flexibility to cope (partly) the price volatility at peak load. A discussion point addressed the relation between flexibility and efficiency: efficiency deals with the opportunities to reduce the MWh consumed, while flexibility is about reducing the €/MWh bought or paid. There may be situations (very high level of efficiency) where an addition of flexibility may reduce the overall cost. The project modelling considers both flexibility and efficiency to help the decisions on the load profile modulations. The idea is to minimize the cost, not only the euro per MWh neither the MWh. The model is mainly focused on industries having a continuous production cycle (24/7). Specific applications can be sought in flexibilising the process in steel industries (which are very CO2 emission intensive). There is a need to invest on creating innovative process (for example using electrolysis). This evolution will bring new challenges and new opportunities, being more reactive in term of flexibility and electrifying more the process to fit the CO2 emission requirements from Europe. The tertiary sector is also of potential interest: the minimum size of flexible load (or generation) which can potentially participate in a balancing market approach should range around 1MW. At present there is no focus in residential flexibility, which is strongly influenced by human behaviour aspects. Acting on industry will leverage 30% of the overall consumption pattern. Addressing flexibility may also impact the organisation of the production cycles and therefore the workers. Additional discussions dealt with the remuneration of flexibility and the markets of flexibility. Finally, a question was asked about the possible need for flexibility standards or certification (using the same approach as for standards for efficiency): this is a complex issue: flexibility may be seen as a recommendation not only as a standard.
<b>Session 4: Projects addressing topics within the scope of ETIP SNET's Working Group 4 (WG4): "Digitisation of the electricity system and Customer participation"</b>		
The eSafeNet project	Germany	The main discussions were related to blackout management: the project stressed that one of its result was the development of method for autonomous, independent black start of islanded microgrid (without switching off loads) by means of distributed control of local generation and storages. Question related to the time scaling in terms of decentralised control/automation (neighbourhood scale? City scale?) has been raised. It was stated that, for the moment, the project is developed at the lab scale and that the next step will be to develop black start functionalities at the microgrid scale and then at larger scale. More technical discussions were focusing on the possibility of reconnection of the low voltage to the medium voltage based on the coordination of local resources.
Test of Blockchain for settlement of decentralized flexibility	Belgium	The main characteristics of the blockchain supporting the settlement of decentralized flexibility are highlighted: no central authorities, remote independent writers, economic benefit, disintermediation and confidentiality. Technical aspects are addressed related to the process of mining and which players are involved. Indeed, this could have an impact in terms of "decentralization" potential. It is stressed that not only one group of players would be able to mine but each player would have its specific key to access the blockchain. The blockchain use will be federated (consortium-based).

## 4.3 RECOMMENDATIONS FROM THE PROJECTS AND CONCLUSIONS FROM THE ROUNDTABLES

These recommendations and conclusions of the Central workshop have been discussed and validated during the final wrap-up session of the event. They are announced hereafter.

### 4.3.1 SESSION 1: ADDRESSING TOPICS WITHIN THE SCOPE OF ETIP SNET'S WORKING GROUP 1 "RELIABLE, ECONOMIC AND EFFICIENT SMART GRID SYSTEM"

- Foster collaboration in view of setting up of methodologies for energy system model parameters identification based on distributed measurements (internet of things), also in view of the development of "digital twins"
- Multi-energy-hub systems (MES) for residential neighbourhoods shall be considered as they can be economically and environmentally competitive with conventional solutions, when designed, optimized, operated and controlled using an integrated methodology
- In order to foster the adoption of advanced technologies and solutions by the final users, additional work is needed in terms of segmentation, consumer behaviour and business models
- The approach to the final user must evolve from a "product centric" to a "service centric" approach
- Projects and demonstrators should not only involve technical stakeholders, but also social, finance and legal partners
- Decentralized and local control approaches have demonstrated their effectiveness in pilot projects: regulatory evolution is needed to set the rules for large scale implementation
- Scaling up and replication should be considered when setting up a pilot/demonstration.

### 4.3.2 SESSION 2: ADDRESSING TOPICS WITHIN THE SCOPE OF ETIP SNET'S WORKING GROUP 2 "STORAGE TECHNOLOGIES AND SECTOR INTERFACES"

- Foster the opportunity of developing the competitive entire value chain for storage technologies in Europe
- Continue to push for storage technology neutral approach (battery, PHES, Power to gas, etc.) so as to respond to the different demands in the different areas
- Need to clarify the regulation concerning the second-life of electric vehicles batteries (vehicle to stationary storage)

- Need to integrate the different storage technologies at the DSO level: better specify the ownership of storage and the responsibility of the different ancillary services.
- To push harmonization of fiscal approach better fit for storage to avoid double taxation that inhibits any business models
- Increasing knowledge about technology from customers, manufacturers, planners, plant engineers

#### **4.3.3 SESSION 3: ADDRESSING TOPICS WITHIN THE SCOPE OF ETIP SNET'S WORKING GROUP 2 "STORAGE TECHNOLOGIES"**

- Research is needed in the setting up of nowcasting (production, load, peak load, day ahead, etc.) especially in presence of renewable energy sources in view of the increased importance of balancing/near real time markets
- Regulation tools should be adapted to enhance the possibility of using data for load and production forecasts in view of setting up flexibility services
- Enlarging the working profiles of thermal power plant (minimal technical loads, faster dynamics, etc) to support flexibility services preventing stranding assets. In this aim, foster the European excellence to export knowledge and products abroad.
- Additional research is needed at all levels (from academia to industries) to make the flexibilized thermal power plant greener
- Industrial flexibility must complement tertiary and residential flexibility: industrial flexibility may have positive impact also at national level while tertiary and residential will impact on local need
- Flexibility must be considered in synergy with efficiency: flexibility indexes shall be used to point out rationally the potential of processes and to optimize them

#### **4.3.4 SESSION 4: ADDRESSING TOPICS WITHIN THE SCOPE OF ETIP SNET'S WORKING GROUP 4 "DIGITISATION OF THE ELECTRICITY SYSTEM AND CUSTOMER PARTICIPATION"**

- Puts focus on ICT solution that survives blackout and can restore power, which is a fundamental requirement which directs towards a distributed, robust architecture
- Need to have an effort on communication standards (measurement devices).
- The company need to re-invent themselves to support the digital transition
- Regulation shall be adapted to accelerate the digital tools testing and to foster the participation of the different stakeholders

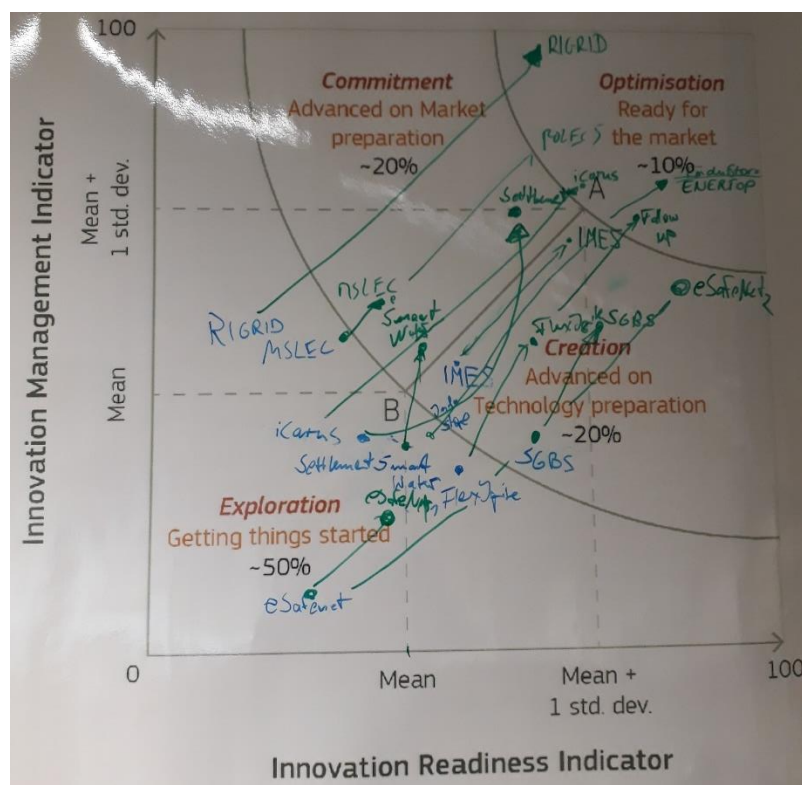
- The blockchain technology can be added value for the energy system applications and services: i.e. Real time, data exchange accross many systems, flexibility, trust, smart contract (no intermediate)
- Cybersecurity shall be embedded in the discussion of energy, not only at the DSO level but also on the ICT and technology providers, market players, levels

## 4.4 RECOMMENDATIONS FOR INNOVATION IMPLEMENTATION IN THE BUSINESS ENVIRONMENT

For the central workshop, a new approach has been implemented so as to foster the active participation of projects in the definition of main recommendations. In this aim, all along the workshop, the different projects presenting indicated on a white board their path to exploitation (where they were and where they wanted to go) with the support of the WG5 representative.

### 4.4.1 STATUS OF PROJECTS RESULTS' EXPLOITATION

The outputs of the work collected from the different projects is illustrated by the figure below:



In summary, the status of the projects results' exploitation is the following:

Full product development ready for the market:

- Next step: Commercialisation, exploitation processes, product management, sales
- Projects: iCarus (forecasts), Rigrig (rural grids), InduStore (Awareness on Flexibilities), eSafeNet (secure communication)

Ready for market, but waiting for better market conditions (costs, legislation, regulation):

- Next step: Efforts to remove barriers
- Projects: Smart Water (pump stations), SGBS (large scale grid battery), eSafeNet (secure communication)

Research work to be developed in a follow-up project or for others to exploit the results:

- Next step: Follow up research (Innovation Action)
- Projects: IMES (Energy hubs), MSLEC (Microgrid services), FlexIgnite (plasma ignition), waste heat utilisation, eSafeNet (secure communication), Settlement (blockchain)

#### **4.4.2 CHALLENGES THAT WERE ADDRESSED: HOW CAN WE INFLUENCE; HOW CAN WE IMPACT?**

During the WG5 slot, challenges related to innovation implementation in the business environment have been identified:

- Large scale storage (battery) services are limited to frequency regulation/ participation in the reserve market. Why doesn't it work? More dates
- Who pays the grid costs if more and more prosumers generate and store their own energy?
- How to overcome or deal with the consumers 'resistance to change, they want electricity as a service and don't want to be actively involved in storage and generation.
- How to utilise energy flexibility on DSO level? What are the requirements of the DSO? What are the friction points regarding the TSO?
- How to use decentral generation to improve black start capability?
- What is blockchain exactly in the energy context?
- How to communicate blockchain to the public? Is it need to bother the public?
- Who has the responsibility for the security of supply in decentralised system?

## 5. REGIONAL WORKSHOP 4 (FRANCE, IRELAND, PORTUGAL, SPAIN AND THE UK)

The fourth workshop was held in Madrid the 22-23 November 2018. The agenda of the event is available on the [ETIP-SNET website](#).

### 5.1 PROJECTS AND PARTICIPANTS IN THE WORKSHOP

#### 5.1.1 R&I PROJECTS PRESENTED

Thirteen R&I projects were presented during the fourth workshop, as shown in the table below:

Table 11 – Projects presented at the workshop 3

Project	Country	Purpose	Speaker	Link to presentation
<b>Session 1: Projects addressing topics within the scope of ETIP SNET's Working Group 1 (WG1): "Reliable, economic and efficient smart grid system"</b>				
The IdEAS project	Spain	The overall objective of the project is to develop and demonstrate a complete solution for a HV / MV substation incorporating IEC 61850 into its Integrated Control and Protection System. The developments will cover all the lines associated with a new automation system: specification of interoperability profiles, both functional (adaptation of existing services and incorporation of new ones) and equipment (with validation and adaptation in the CIRCE I2SET laboratory, so as to be tested on site). The rest of aspects involved in an initiative of this kind are not left aside: configurations, logic, design of the communications network, integration with the remote-control elements, introduction of new tools, etc.	<b>Jesús TORRES</b>	<a href="#">Link</a>
VISOR project	UK	VISOR is a ground-breaking collaboration project that has brought together the three mainland GB Transmission Owners and the System Operator to improve visibility of dynamic system behaviour and enhance network resilience. The Network Licensees have been supported by technology provider, GE Grid Solutions as well as research partner, the University of Manchester. Through the deployment of Phasor Measurement Units (PMUs) and the first ever Waveform Measurement Units (WMUs), VISOR has truly revolutionised the real-time monitoring of the GB system by combining synchronised measurements from all three GB Transmission Owners to provide GB-wide real-time visibility of system voltage and stability limits. The improved system visualisation also helps protect against catastrophic events that could result in a complete or partial blackout of the GB system.	<b>Chris HALLIDAY</b>	<a href="#">Link</a>



The REDACTIVA project	Spain	The main goal of the REDACTIVA Project is the development of new solutions and innovative equipment that enable a higher degree of automation in the medium and low voltage distribution networks in order to improve grid operation. At the same time their efficacy and effectiveness will be improved, as well as the quality of the service that currently not being offered to the final user. Within this objective, the project includes various specific objectives: - Development of applications to avoid undesired “isle” generation - Development of solutions to avoid or reduce ferro-resonance appearance in the medium voltage distribution grids - Development of voltage / intensity sensors: - Assets management: early detection of faults for predictive / preventive maintenance - Implementation of the solutions in the pilots for their validation	<b>Rafael MINGUEZ MATORRAS</b>	<a href="#">Link</a>
CECOPMU Project	Spain	This project achieves greater efficiency and security in the electrical system by providing more and better information in real time to the control centre about the state of the system through measures based on synchro phasors.	<b>Javier PÉREZ CASTRO</b>	<a href="#">Link</a>
<b>Session 2: Projects addressing topics within the scope of ETIP SNET’s Working Group 2 (WG2): “Storage technologies and sector interfaces”</b>				
MV Storage System Microgrid operation and Techno-Economical Performance Evaluation	Portugal	Assess the performance of EDP Distribuição’s MV Storage System based on key performance indicators like overall efficiency and avoided distributed energy losses. A weather station was installed on the system container to evaluate the AVAC system performance throughout the year as this is the main component of energy efficiency losses. Evaluation of system performance when grid connected and in MV island and microgrid (LV and MV) scenarios.	<b>Ricardo SANTOS</b>	<a href="#">Link</a>
The REFER (Energy reduction and energy flexibility in retrofitted buildings) project	Spain	The project aims at developing and demonstrating smart energy solutions for increasing renewable and storage energy solution into buildings, increase smart energy management within the building and energy flexibility between buildings and energy networks with special focus on tertiary buildings and thermal energy in residential buildings	<b>Mattia BARBERO</b>	<a href="#">Link</a>
The Smart Lab project	Portugal	SmartLab is an infrastructure that intends to create in a controlled scenario close to real electric network conditions and with an integrated global view of EDP SmartGrid to test and validate any technical solution, before its installation on the field. This Lab infrastructure has different scopes of activities (smartmetering, smarhome systems, residential and network storage, distributed generation, etc...) and has been developed by phases and according with the needs of the several projects in which EDP group is involved in. The operation started in 2017 and it is expected that in 2019 new features will	<b>Carlos ALVES VARANDAS</b>	<a href="#">Link</a>

		be added, mainly dedicated to the interoperability tests on substation automation and protection systems.		
<b>Session 3: Projects addressing topics within the scope of ETIP SNET's Working Group 3 (WG3): "Flexible generation"</b>				
Accelerating Renewable Connections	UK	Deployment of Active Network Management that takes real-time and direct control Distributed Energy Resources managing power flow across both the distribution and Transmission system governed by clear commercial principles of access. The project allows for real-time management of constraint locations maximising the use of the existing asset base and inherent latent capacity by obtaining real-time measurements without the need for state estimation or network configuration and power flow forecasting. The project permitted an additional 155MW of generation capacity to connect to a network that was considered full based upon conventional planning techniques and network modelling.	<b>Euan NORRIS</b>	<a href="#">Link</a>
La Graciosa Project	Spain	The project has focused on three key topics, which have been integrated and validated in the real electrical grid in the La Graciosa island, those include: - Development of an innovative hybrid storage system capable of compensate energy fluxes and with enough capacity to provide fast response – dynamic response-. It can be treated as the SMART STORAGE, which ensure generation and consumption power balance in the island. - Management of demand response (both in single and aggregated form) from the users by means of development of autonomous control systems and interactions tools with the user/client. It has been called SMART CITIZENS, aiming to increase the self-management of the users and their benefits. - Management and control of distributed generation and all the flexibility assets on the grid, to ensure the proper energy management, through a central manager that rules the whole microgrid. So called, uGRID Manager to decide what is needed at each moment.	<b>Poi PARADELL SOLA</b>	<a href="#">Link</a>
Intermittence Plus project	France	New solutions to be implemented both before and after the smart meter to allow real-time monitoring of a large amount of flexible charges such as electric water boilers. This will allow flexibility depending on the needs of the electric grid which will have to handle more and more distributed generation and VEs.	<b>Jerome GILBERT</b>	<a href="#">Link</a>
<b>Session 4: Projects addressing topics within the scope of ETIP SNET's Working Group 4 (WG4): "Digitisation of the electricity system and Customer participation"</b>				
The SolarCamp and ERock projects	France-USA	The objectives of the SOLARCAMP project are the following: 1. Demonstrate that blockchain technology optimizes the management of local self-consumption networks - By monitoring energy transactions at the user's grid - By certifying the origin of energy (green or green) Conventional)	<b>Martin LESNER</b>	<a href="#">Link</a>

		<ul style="list-style-type: none"> <li>- By automating the transfer of energy between the different components of a local network thanks to the real-time monitoring of production and consumption and the use of "smart contracts"</li> <li>- Realtime visualization to engage user participation and incentivising on user behaviour</li> </ul> <p>2. Demonstrate that the energy stored in fleets of electric vehicles can be used to optimize the balancing of local self-consumption networks ("Vehicles-To-Grid" technology) and to valorise these energy transfers by using a cryptocurrency (ie SUDCOINS) that would reward vehicle owners' electric vehicles for the provision of their vehicles.</p> <p>3. Define new business models for local self-consumption networks that include "Vehicle-To-Grid".</p> <p>The ERock is into the business of production and sale of energy. The ERock is currently looking for Bovlabs's pilot program (BPP) to facilitate a market place to trade energy in a peer to peer way. The objective of the project is to:</p> <ul style="list-style-type: none"> <li>a) Integrate the program (BPP) with smart meters to sell and buy of energy peer to peer</li> <li>b) Develop a mobile application enabling to view the trade value by mapping it with energy measuring device ID's</li> <li>c) Register users can access the value of energy traded through the mobile application</li> <li>d) The platform enables real time visualization of the energy traded by the users.</li> </ul>		
SecureGrid project	Spain	<p>The SECUREGRID main goal is to develop new knowledge in the field of cybersecurity applied to IEDs and substations. The following objectives have been achieved:</p> <ul style="list-style-type: none"> <li>- A cybersecurity model for IEDs has been defined, based on IEEE 1686 standard and establishing the level of security (basic/medium/high) that an IED can achieve. Thanks to this model it is possible to define what functions an IED must incorporate to reach a certain level of security in terms of confidentiality, integrity, availability and non-repudiation. The model is completed with a testbook that allows to verify the compliance of an IED with each of the clauses of the standard.</li> <li>- A reference architecture has been defined, visualizing cybersecurity in a holistic way for the entire installation under the defense-in-depth paradigm, that is, defining protections at the system level and detailing at the component level, thus facilitating alignment with reference standards with similar perspective (IEC-62443 or NERC-CIP).</li> <li>- IEDs have evolved from basic-medium level to a high level of security by including several cybersecurity features at the end of the project, as role-based access control, audit trail, encryption of communications, digital encryption of firmware, deactivation of unused communication ports and services...</li> <li>- A tool (SecureGrid Hacking Tool Box) has been developed to allow to configure and perform different penetration tests to IEDs, such as scanning of IEDs, obtaining credentials, access to the IED and tests of denial of service, in order to compromise them</li> </ul>	<b>Iñaki ANGULO</b>	<a href="#">Link</a>

		<p>and obtain valuable information about their security weaknesses, generating a final report with all this information obtained. SecureGrid HTB can be used by IED manufacturers to check the level of security offered by their IEDs.</p> <ul style="list-style-type: none"> <li>- An attack detection system has been developed, based on data analytics with a proven methodology (Kill Chain) and complemented by a common knowledge base of a model for the behaviour of the attacker that allows understanding the risks of cybersecurity against known attackers' behaviour to plan security improvements and verify that defences work. Likewise, the system includes a network of industrial HoneyPots simulating elements of a substation. In this way, a simulation environment visible from the Internet has been created, where attacks on these industrial devices are monitored in order to collect statistical information about these attacks and to determine concepts such as the type of attacker and the technique used.</li> <li>- A test laboratory has been developed in one of TECNALIA's buildings in the Scientific and Technological Park of Bizkaia, which emulates the communication between a substation or transformation centre and the control centre of a distribution company, allowing to reproduce and detect cyber-attacks and to validate the solutions developed in the IEDs during the project.</li> </ul>		
Smart Substation (Poste Intelligent)	France	<p>The « Smart Substation » demo project aims at designing, building, testing and operating two fully digital smart substations in the Northern area of France. The project also assesses the benefits provided by these solutions such as a lower environmental impact, better integration of the renewable energies, improved transmission capacities, and optimal use of the existing assets, etc. The main scientific and technical objectives are :</p> <ol style="list-style-type: none"> <li>1) Full digitalization of all links between the high voltage equipment and the Intelligent Electronic Devices.</li> <li>2) Development of an open architecture which allows to plug through a standardized interface high level system functions like local state estimation, local analysis and diagnosis of incidents and auto-adaptive protection schemes.</li> <li>3) Implementation of sensors and monitoring for system operation and maintenance.</li> <li>4) Implementation of a digital interface between the TSO and DSO</li> <li>5) Full redundancy for relays and telecontrol. Innovative solutions are implemented and tested in real operating conditions with appropriate cyber security measures.</li> </ol>	<b>Thierry BUHAGIAR</b>	<a href="#">Link</a>

During this workshop, there were no projects' presentations from Ireland.

## 5.1.2 ROUNDTABLES

Four roundtables were held during the workshop, moderated by Enrique MORGADES, Marine DELHOMMEAU, Giovanni CICERI and Rainer BACHER. The four roundtables evoked questions and different exchanges between the speakers of the projects presented and the respective representatives of the different ETIP SNET Working Groups. The table below shows the participants in each roundtable.

Table 12 – Participants in roundtables at the second regional workshop

Roundtable nr.	Participants
1	<ul style="list-style-type: none"> <li>• Raphael RINALDI (ENEL, WG1 Representative)</li> <li>• Jesús TORRES (CIRCE)</li> <li>• Chris HALLIDAY (SP Energy Networks)</li> <li>• Rafael MINGUEZ MATORRAS (VIESGO)</li> <li>• Javier PÉREZ CASTRO (Red Eléctrica)</li> <li>• Enrique MORGADES (Technical Secretariat, FutuRed)</li> </ul>
2	<ul style="list-style-type: none"> <li>• Carlos ARSUAGA (CIRCE, WG2 representative)</li> <li>• Ricardo SANTOS (EDPD)</li> <li>• Mattia BARBERO (IREC)</li> <li>• Carlos ALVES VARANDAS (EDP Labeltec)</li> <li>• Marine DELHOMMEAU (EASE)</li> </ul>
3	<ul style="list-style-type: none"> <li>• Miguel GARAGORRI MIOTA (ETIP SNET WG3 representative)</li> <li>• Euan NORRIS (SP Energy Networks)</li> <li>• Pol PARADELL SOLA (IREC)</li> <li>• Jerome GILBERT (Degetel)</li> <li>• Giovanni CICERI (ETIP SNET Support Team)</li> </ul>
4	<ul style="list-style-type: none"> <li>• George HUITEMA (ETIP SNET WG4 representative)</li> <li>• Martin LESNER (BOVLABS)</li> <li>• Iñaki ANGULO (TECNALIA)</li> <li>• Rainer BACHER (ETIP SNET Support Team)</li> </ul>

### 5.1.3 LIST OF ATTENDEES

More than 100 participants were registered for the workshop. The distribution of participants by country is provided in the figure below:

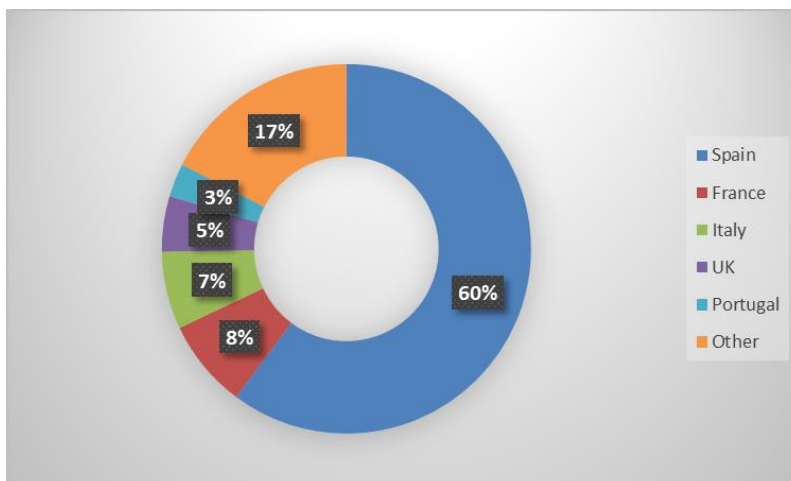


Figure 7 – Distribution of participants by country

The figure shows that the most represented country of the Western region is Spain. Also, it is to highlight that 17% of the participants are coming from other countries located outside of this region such as: Germany, Lithuania, etc.

In addition, the following figure provides an overview of the distribution of participants classified by their type of organization:

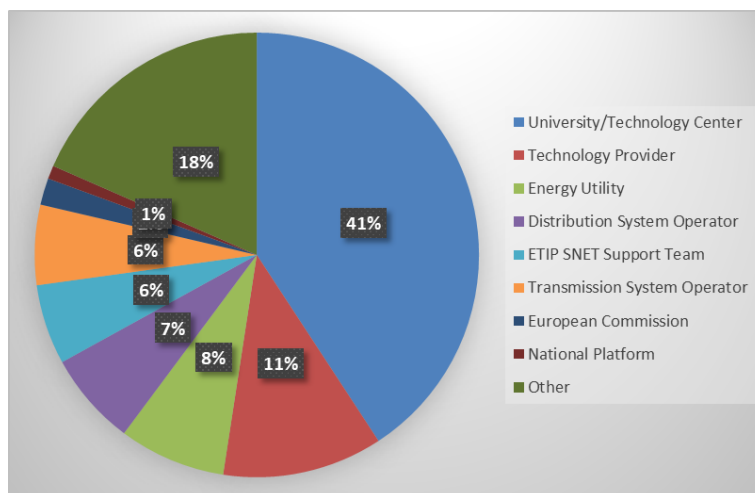


Figure 8 – Distribution of participants by organization

The figure shows that 41% of the audience comes from University / Technology center and that 11 % are from Technology Provider. The 'Other' category (18% of the participants) gathers mainly representatives of consultancy companies.

## 5.2 MAIN COMMENTS FROM THE PROJECTS' Q&A SESSIONS

Each project presentation has been followed by a session of questions and discussions (10 minutes for each session). The main comments are collected in the table below:

Table 13 – Main questions and comments by project

Project	Country	Purpose
<b>Session 1: Projects addressing topics within the scope of ETIP SNET's Working Group 1 (WG1): "Reliable, economic and efficient smart grid system"</b>		
The IdEAS project	Spain	In the digitalization process it is important to go for information from the data, not merely stay on the data layer. Data by itself is not providing any value.
VISOR project	UK	Information coming from data will trigger the future functionalities towards reliable and efficient smart grid. New tools for planning and operation are key, but maybe new considerations on the revenue model should be considered, not only assets investment.
The REDACTIVA project	Spain	DSO and TSO are asset focused businesses, there is not incentives to perform innovation. This is something to take care of in the future. In the innovation projects it is important to have all the actors involved. It is equally important to activate the innovation in a bunch of DSOs that are currently inactive, considering that we have a total of 2.400 DSO in Europe.
CECOPMU Project	Spain	Coordination between asset operators (DSO and TSO) is key for achieving efficiency and reliability in the smart grids. Power electronics are becoming more important in the smart grids sphere. It is going to be very complicated to impose specific controls as each manufacturer has a different solution, therefore the grid should be ready to integrate such technologies efficiently
<b>Session 2: Projects addressing topics within the scope of ETIP SNET's Working Group 2 (WG2): "Storage technologies and sector interfaces"</b>		
MV Storage System Microgrid operation and Techno-Economical Performance Evaluation	Portugal	This project looks into how low and medium voltage networks can be operated first as microgrids and second on islanding mode through energy storage systems and their intelligent operation during emergency situations. Project's results showed that the solution developed is technically feasible and increase consumer confidence but is not yet economically attractive and cost-efficient enough: finding the right applications, use cases at the right location is key to solve this problem.
The REFER (Energy reduction and energy flexibility in retrofitted buildings) project	Spain	During the presentation, key results were identified: <ul style="list-style-type: none"> <li>- Decrease in the amount of self-generated PV energy injected into the grid (PV surplus)</li> <li>- New business to exploit flexibility identified (aggregator)</li> <li>- Decrease in energy costs</li> <li>- Automatization avoids excess of energy consumption due to misuse of HVAC system</li> </ul> However, some hurdles were also identified: difficulty to find a converter for the battery system and to transport the batteries... It was concluded that greater harmonisation and better implementation/transposition of EU laws is needed to improve the business case for many energy storage projects.
The Smart Lab project	Portugal	The main findings of the project are the following:

		<ul style="list-style-type: none"> <li>- In projects with technical complexity, laboratorial validation is a key quality step for the deployment of the real environment demonstration</li> <li>- Advanced smartgrids and smarthomes require appropriate ICT infrastructure to enable grid services to DSO – integration and interoperability tests are crucial.</li> <li>- Uniform protocols to test different energy storage technologies and capacities are a powerful tool to standardize laboratorial activities</li> </ul> <p>Laboratories are crucial to support companies maximising their tests and therefore save time and money.</p>
<b>Session 3: Projects addressing topics within the scope of ETIP SNET's Working Group 3 (WG3): "Flexible generation"</b>		
Accelerating Renewable Connections	UK	The main lesson learned concerning the management flexible generation have been pointed out: it was stressed that desktop-solutions are not the reality for managing flexible generation. Real-world applications and a constant interaction with costumers and stakeholders will foster the development of knowledge.
La Graciosa Project	Spain	The manage of the FV production has been part of the discussion. The "quick clouds" issues have been described: this phenomenon is the result of the coverage of the sky by clouds in a very short time and producing a very fast drop of the FV production.
Intermittence Plus project	France	The replicability of the project in Europe is possible. The projects' solution can be adapted to the exact needs and particular constraints of each other European country for a tailor-made implementation of the solutions. The importance of the share of the project's results to help local partners to adapt them to specificities of other countries in the frame of a new collaborative R&D project is stressed.
<b>Session 4: Projects addressing topics within the scope of ETIP SNET's Working Group 4 (WG4): "Digitisation of the electricity system and Customer participation"</b>		
The SolarCamp and ERock projects	France-USA	Blockchain application in the area of V2G of car parking at SNCF train station: Real-time energy-trading marketplace. Strong "trust" concepts. Increases grid resilience. Should lead to low costs for customer-related expenses (reading meters, billing ...); Renewable energy credits should be REAL TIME; Marketplace provides revenue for small energy producers; Much wider flexibility to integrate DERs
SecureGrid project	Spain	Goal is to improve the security of electrical equipment; control taker of any equipment must be fully certain; Need for registration of actions related to security; all communications must be encrypted and signed; Collaboration between competitors to achieve common (cyber) security should be undertaken; Apply ethical hacking as a tool to improve security of IEDs, already during the manufacturing process. OT (Operational technology) must be combined with improved IT (Information technology) to reach high security measures. Cybersecurity Laboratory for Smart Grid can help to achieve robust and trusted results.
Smart Substation (Poste Intelligent)	France	First full digital substation in France has been presented: smart extends from the SCADA to the substation in a distributed way First step toward an optimisation of IEDs; Powerful real time response to DER integration challenges; Total remote control; Concept for the secondary equipment: maintenance free. Local integrated monitoring: Clustered approach; Enhanced operational capabilities; Scalable solutions; includes early warnings, trend analysis, conditional maintenance, custom asset management, extended life; Corporate Vision: Data lake; Ready for Edge to cloud; Ready for Machine Learning and Analytics



## 5.3 RECOMMENDATIONS FROM THE PROJECTS AND CONCLUSIONS FROM THE ROUNDTABLES

These recommendations and conclusions of the Western workshop have been discussed and validated during the final wrap-up session of the event. They are announced hereafter.

### 5.3.1 SESSION 1: ADDRESSING TOPICS WITHIN THE SCOPE OF ETIP SNET'S WORKING GROUP 1 "RELIABLE, ECONOMIC AND EFFICIENT SMART GRID SYSTEM"

- Information modelling and engineering tools for IEC 61850 are not yet interoperable.
- WMU (Waveform Measurement Units) may be of future use (scanning at 200Hz; higher than PMUs).
- PMU (Phasor Measurement Units) synchronization from different vendors using only one synchronization source (only GPS, only GLONASS, only GALILEO...) and not having any backup synchronization source can be problem. An atomic clock is needed to satisfy n-1.
- Data itself is not providing any value, we need to obtain valuable information from such data, much of them currently unused though available. Information coming from data will trigger the future functionalities towards reliable and efficient smart grid.
- Coordination among agents becomes of utmost importance in the future smart grids scenario, market operators and regulated actors to foster efficiency and system visibility.
- New tools for planning and operation are key, but new considerations on the revenue model should be considered, not only assets investment.
- Not enough and efficient actions take place to foster innovation in the whole picture of DSOs and TSOs, with over 2.400 players in Europe.
- DSO and TSO as regulated entities should have better (rewarded) incentives to become innovative
- Regulation for a minimum competitive innovation level in the DSO/TSO revenue model may be needed.
- There are many smart grids project throughout Europe: there should be mechanisms to better share information and feed the ETIP SNET R&D roadmap.

### 5.3.2 SESSION 2: ADDRESSING TOPICS WITHIN THE SCOPE OF ETIP SNET'S WORKING GROUP 2 "STORAGE TECHNOLOGIES AND SECTOR INTERFACES"

- It is crucial to have RD&D hubs to maximise accuracy of tests (quality and validation of RD&D results).

- Harmonising energy legislations and making sure that these legislations are well implemented in Member States is key for the deployment of storage technologies (e.g. problem of lack of harmonisation of grid fees when loading storages).
- The definition for “energy storage” needs to cover all type of storage technologies including energy in/energy out technologies (e.g. electricity-to-gas-to-electricity, to and from liquid fuels, to and from heat and to and from cold storage).
- The provisions on ownership of storage by regulated entities (such as TSO and DSO) needs to be clarified at EU level.
- Energy storage and sector interfaces are essential to operate a decarbonised EU economy.
- Storage development and deployment is supported by:
  - Increasing the performance of storage technologies and decreasing their costs
  - Having self-sustained storage facilities (plug-them in without any additional costs)
  - Supporting a deployment of storage based on sustainable materials

### **5.3.3 SESSION 3: ADDRESSING TOPICS WITHIN THE SCOPE OF ETIP SNET’S WORKING GROUP 2 “STORAGE TECHNOLOGIES**

- The right management of a lot of flexible generation (“more than load”) creates risk-awareness.
- Desktop-solutions are not the reality for managing flexible generation; we learn “only” through real-world applications.
- How to curtail any type of generation: Pro rata curtailing is not the best option; key for curtailing is financial certainty; curtailment contract: first in his last out (first in his last curtailed participant)
- Higher OPEX for saved CAPEX is not yet acceptable in today’s grid regulation of some Member States.
  - DSOs need risk-related incentives and rewards in improved grid cost regulation
- Only robust communication can promote optimal solutions for controlling integrated RES + battery + grid challenges
- Simple low-cost radio broadcasting or PLC control could enable the mass control of loads (e.g. water heating by electricity) to enable grid resilience.

### **5.3.4 SESSION 4: ADDRESSING TOPICS WITHIN THE SCOPE OF ETIP SNET'S WORKING GROUP 4 “DIGITISATION OF THE ELECTRICITY SYSTEM AND CUSTOMER PARTICIPATION”**

- The blockchain applied to V2G technology can be used for higher grid resiliency
- User engagement and behaviour is key for the digitalisation
- Ethical Hacking or testing tools can serve high security in DSO substations
- Security in DSO substations is modelled by confidentiality, integration, availability and non-repudiation
- Digitalisation is a huge challenge (almost disruption) to TSO environments
- Cybersecurity in TSO substations is handled by “military-like” rules
- TSOs will need “Digital twins” for any components of the electricity system
- Digitalisation and flexibilities are friends
  - A difference between digitalisation and flexibility management is the amount and quality of data (much more in digitalisation)
  - Many consumers lead to much more data.
- Digitalisation brings the need of new business processes.
- Digitalisation needs to be speeded-up for all aspects of energy systems integration needs

## 5.4 RECOMMENDATIONS FOR INNOVATION IMPLEMENTATION IN THE BUSINESS ENVIRONMENT

Following the approach of the previous workshops, the active participation of participant projects was fostered both in the definition of main recommendations and in the positioning of the projects in their path to exploitation.

An **introductory session** towards the **'Innovation Implementation in the Business Environment'** was provided by Sandra SCALARI (Enel Green Power) and Michael C. LAUBENHEIMER (EC DG RTD) ([link to the presentation](#)).

### 5.4.1 STATUS OF PROJECTS RESULTS' EXPLOITATION

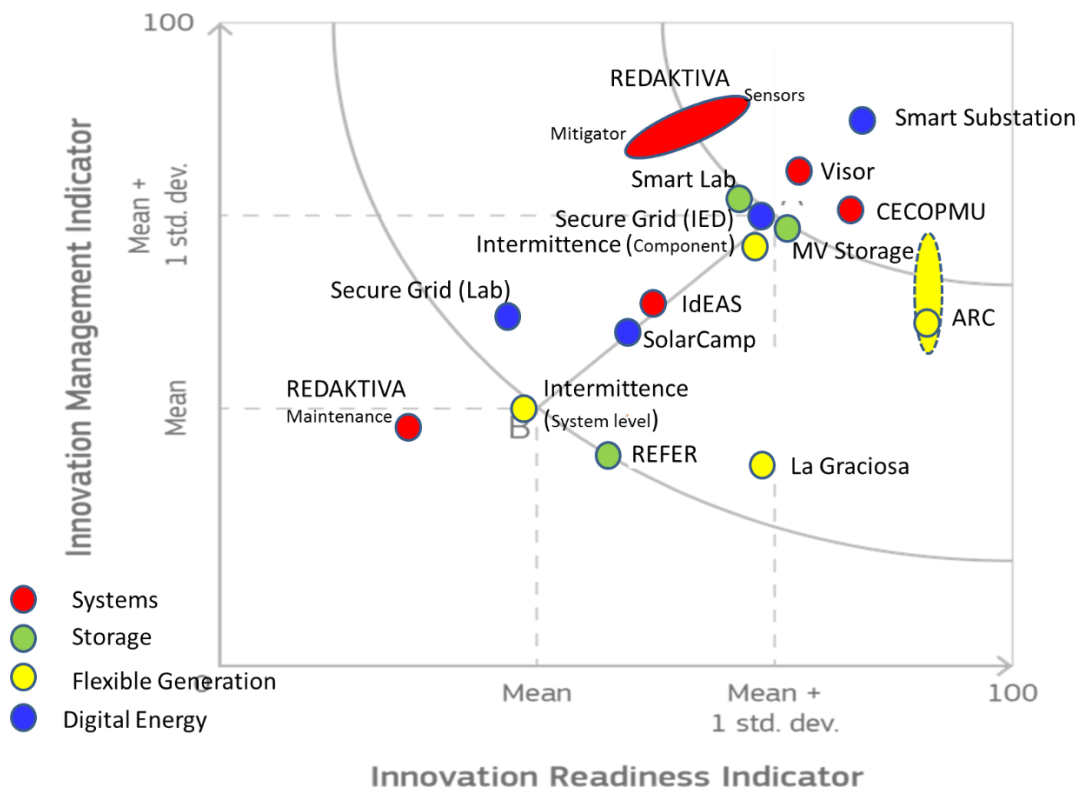
The JRC Innovation Radar methodology and diagram<sup>1</sup> can support consortia in assessing the innovation potential of their outcomes and of their beneficiaries. The full application of the methodology is a quite complex process and requires the calculation of several indicators.

The Innovation radar diagram, mapping Innovation management respect to Innovation Readiness was used as a reference to map the different projects position.

The final aim was supporting the projects in the understanding of the next steps to be taken to get their results to the market. During the workshop, the different projects presenters indicated with the support of the WG5 representative their path to exploitation the Innovation Radar diagram. The outputs of the work collected from the different projects is illustrated by the figure below:

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<sup>1</sup> De Prato, G., Nepelski, D. and Piroli, G. (2015). Innovation Radar: Identifying Innovations and Innovators with High Potential in ICT FP7, CIP & H2020 Projects. JRC Scientific and Policy Reports – EUR 27314 EN. Seville: JRC-IPTS



### 5.4.2 CHALLENGES ADDRESSED: HOW CAN WE INFLUENCE; HOW CAN WE IMPACT?

Taking into account what emerged from the project presentation, from the round tables, and from the project positioning on the previous diagrams, the following points can be addressed and some recommendation can be issued.

- Presentations were mostly project oriented and not solution oriented:
  - Elaborate better the problem addressed (where is the actual problem), the solution developed/tested (is there a market for the solution) and its Unique Value Proposition (why is it different, why it is worth 'buying')
  - Elaborate more the chosen exploitation paths
- Presentations were rather technical:
  - Adapt your project reporting/presentation to the audience, use their language
  - Involve 'commercial' guys, involve customers and users
  - Consider the whole value chain (the different business models, where the materials come from, who will produce)
  - Follow the lean canvas model
- Silos / out of the box:

- Between the projects more exchange of information, experiences, and encountered barriers is desirable.
- Thus, joint recommendations could be drafted in order to push for example the regulators or to deal with
  - the issue of GPS/Galileo
  - the current speed of development and implementation versus regulations adaptation
  - European approach: long tests and evaluation before regulation evolves (US is faster) that is to say to bridge/shorten the 'valley of death': could be covered by the BRIDGE initiative.



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NETWORKS FOR  
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TRANSITION



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