



ETIP SNET

EUROPEAN
TECHNOLOGY AND
INNOVATION
PLATFORM

SMART
NETWORKS FOR
ENERGY
TRANSITION



D3.3 Minutes of the regional workshops

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Delivery date: 03 November 2017

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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 2017 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	Belgium, Netherlands, Luxembourg, Poland, Austria, Germany, Switzerland, Czech Republic and Slovakia	Aachen (Germany)	18-19 September 2017
2	Spain, France, Portugal, Ireland and the UK	Lisbon (Portugal)	28-29 September 2017

3	Italy, Slovenia, Malta, Hungary, Romania, Bulgaria, Croatia, Greece and Cyprus	Nicosia (Cyprus)	23-24 November 2017
4	Denmark, Sweden, Norway, Finland, Latvia, Lithuania and Estonia	Riga (Latvia)	7-8 December 2017

In Cyprus, the ETIP-SNET workshops was organised in cooperation with the JRC in order to stimulate the participation of local stakeholders.

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	ETIP SNET support team	Introduction to R&I activities in the scope of the ETIP SNET; presentation of the R&I roadmap 2016-2025 – focus on the topics of the concerned WG(s); presentation of the other workshops (past and future)
Project session 1 (group of projects addressing topics within the scope of ETIP SNET WG1)		
15 min	ETIP WG1 representative	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)
30 min per project	Projects' representatives	Presentation of the findings of the project. Focus on: <ul style="list-style-type: none"> the new knowledge gained so far; the main lessons learnt; the next projects steps; the needs for future R&I coming out of the project; deployment prospects. Each presentation is followed by Q&A.
30 min	Roundtable to conclude session N (animated by ETIP SNET support team)	Presence of all speakers in the session + ETIP WG1 representative + ENTSO-E, EDSO, EASE and EERA representatives
Project session 2 (group of projects addressing topics within the scope of ETIP SNET WG2)		
Similar structure than first session		
Project session 3 (group of projects addressing topics within the scope of ETIP SNET WG3)		
Similar structure than first session		
Project session 4 (group of projects addressing topics within the scope of ETIP SNET WG4)		

Similar structure than first session		
Concluding session		
20 min	ETIP SNET support team	Wrap-up of the recommendations from the projects presented and of the conclusions from the roundtables
10 min	ETIP SNET support team	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;
- Summary of the main recommendations from the projects and conclusions from the roundtables.

2. REGIONAL WORKSHOP 1 (BELGIUM, NETHERLANDS, LUXEMBOURG, POLAND, AUSTRIA, GERMANY, SWITZERLAND, CZECH REPUBLIC AND SLOVAKIA)

The first workshop was held in Aachen (Germany) on the 18th and 19th of September, 2017. 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

Fourteen 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
Session 1: Projects addressing topics within the scope of ETIP SNET's Working Group 1 (WG1): "Reliable, economic and efficient smart grid system"				
Hybrid AC/DC overhead lines in Switzerland	Switzerland	Swissgrid together with electric utilities, manufacturer and universities is testing the concept of hybrid AC/DC lines on existing AC towers: increasing the transfer capacity without the need for new transmission corridors.	Joshu JULLIER (Swissgrid)	Link
Proaktives Verteilnetz Project	Germany	The project shows synergies between market- and grid-driven usages of flexibility. The traffic light system indicates the actual status of the interaction of the grid with the market. Flexibility in this project means adapting generation and/or demand behaviour by external signals.	Thomas WIEDEMANN (Innogy)	Link
Automatic voltage regulation and reactive power system (SAVR) Project	Czech Republic	The project deals with controls of power systems including the reactive power. The SAVR controls voltage in pilot nodes by reactive power of the connected generators. Demanded voltage is defined by dispatcher or by the OPF. Producers with the SAVR installations support the distribution grid instead of neutral behaviour only.	Jaromír BERAN (EGÚ Praha Engineering, a.s.)	Link
Ampacity- Superconducting medium-voltage	Germany	Development, manufacturing and field testing of a 10 kV superconducting cable system in the city centre of Essen. Proof of the technical and economic feasibility of a high-temperature superconducting cable system in a distribution network under real operating conditions.	Thomas WIEDEMANN (Innogy)	Link

cables for urban power supply				
Session 2: Projects addressing topics within the scope of ETIP SNET's Working Group 2 (WG2): "Storage technologies and sector interfaces"				
StEnSEA Project	Germany	The development and research project "StEnSEA" (Stored Energy in the Sea) is investigating the installation of large storage facilities on the sea floor, in combination with offshore wind farms. The physical principle on which the energy storage facility operates is similar to that of conventional pumped storage power plants, but based not on two reservoirs, but a hollow sphere.	Matthias PUCHTA (Fraunhofer IWES)	Link
WESpe Project	Germany	How can surplus wind energy be stored efficiently in the form of hydrogen at large scale? Scientists consider the value chain from a technical and economic point of view. The Analysis includes electrolysis, underground storage facilities and the connection to gas grids.	Ulrich FISCHER (Brandenburgische Technische Universität)	Link
Underground Sun Storage Project	Austria	The project attempts to demonstrate the ability of underground natural gas storage facilities to reach hydrogen content of up to 10%, in order to extend the storage potential of the gas network as a whole. To achieve this aim, the project comprises laboratory experiments, simulations and a field trial conducted on an industrial scale at an existing storage reservoir with similar characteristics to Austria's large storage facilities.	Stephan BAUER (RAG)	Link
SAVE Project	Belgium	The project looks for practical solutions for the smart use of renewable energy at SME level (with a focus on energy storage and demand side management in agriculture). The target groups are end users as well as providers of energy technology. The main results are: simulation tools (offline and online) to define the potential of demand side management and/or energy storage, 3 demonstration sites, a guideline with economic analyses for representative cases and knowledge dissemination.	Jeroen BÜSCHER (VITO)	Link
Session 3: Projects addressing topics within the scope of ETIP SNET's Working Group 3 (WG3): "Flexible Generation"				
Dynamo Project	Netherlands	The DYNAMO project develops a well-functioning and open market for flexibility and ensures that the DSO is capable of procuring flexibility for grid management. It is applying the open-source Universal Smart Energy Framework (USEF), which defines what roles contain what responsibilities and what information exchange is necessary for optimal use of flexibility of consumers.	Bram SIEBEN (Alliander)	Link
Kryolens Project	Germany	This project focuses on the technical development and assessment of liquid air energy storage (LAES). The LAES technology combines flexible generation and energy storage as it can be integrated in conventional generation facilities as well as designed as stand-alone energy storage system. Process analysis as well as component analysis are performed.	Dr. Christian BERGINS (Mitsubishi Hitachi Power Systems Europe)	Link
PV Forecast project	Luxemburg	The project developed a forecasting scheme for timely resolved (hourly resolution), spatial PV power forecast, up to 72 hours ahead, for whole Luxembourg. Beside the irradiance forecasts, the algorithm uses a feedback loop of online measured PV reference systems, distributed all over Luxembourg.	Daniel KOSTER (LIST)	Link

Session 4: Projects addressing topics within the scope of ETIP SNET's Working Group 4 (WG4): "Digitisation of the electricity system and Customer participation"				
Planning the future electricity grid by using 3D Decision Support System	Switzerland	The project developed a 3D Decision Support System that supports finding the optimal path between two points for a new overhead line. The developed system allows stakeholders to assess various spatially-explicit factors concerning social, environmental and economic impact in order to compute corridors, path alternatives, and corresponding costs.	Joshu JULLIER (Swissgrid)	Link
HelloData	Netherlands	HelloData authorizes consumers to share real-time data from the commercial exit point of their smart meter in a secure way. The project creates an equal level playing field which facilitates the development of innovative data-based products and services by introducing an open standard for energy data handling.	Bart JANSSEN (Hellodata)	Link
SHAR-Q Project	Slovak Republic	The SHAR-Q project aims at establishing an interoperability network that connects the capacities of the neighbourhood and wide regional RES+EES ecosystems into a collaboration framework that mitigates the requirement on the overall EES capacities thanks to the shared capacities among the participating actors.	Stefan VANYA (Bavenir)	Link

Poland was not represented during this workshop but several projects being at an early stage of development have already been identified. Those projects would be involved in the next years' workshops.

2.1.2 ROUNDTABLES

Four roundtables were held during the workshop, all moderated by Eric PEIRANO and Rainer BACHER. They were mainly devoted to questions for the speakers of the projects presented. Representatives from EASE, EDSO for Smart Grids and ENTSO-E, were also attending in the audience. Table 3 below shows the participants in each roundtable.

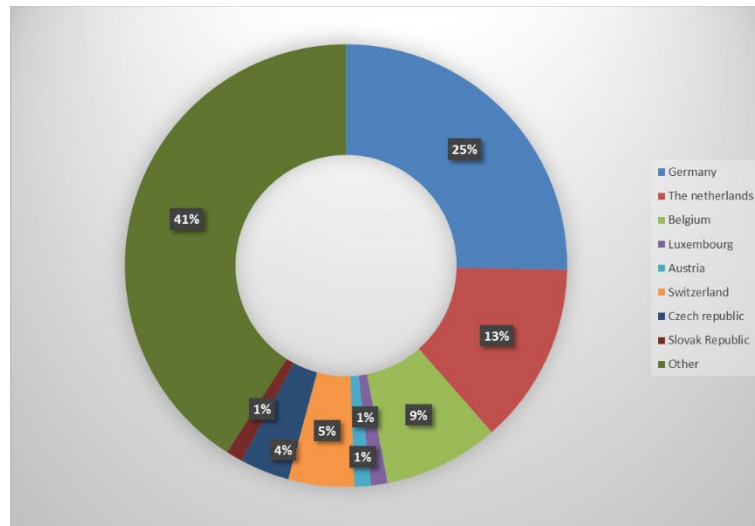
Table 3 – Participants in roundtables at the first regional workshop

Roundtable nr.	Participants
1	<ul style="list-style-type: none"> • Frank WIERSMA (TenneT, WG1 Representative) • Joshu JULLIER (Swissgrid) • Thomas WIEDEMANN (Innogy) • Jaromír BERAN (EGÚ Praha Engineering, a.s.) • Rainer BACHER (ETIP SNET Support Team, BACHER)
2	<ul style="list-style-type: none"> • Mathilde BIEBER (General Electric, WG2 Representative) • Matthias PUCHTA (Fraunhofer IWES) • Ulrich FISCHER (Brandenburgische Technische Universität) • Stephan BAUER (RAG) • Jeroen BÜSCHER (VITO) • Niels Leemput (TRACTEBEL) • Eric PEIRANO (ETIP SNET Support Team, TECHNOFI)
3	<ul style="list-style-type: none"> • Alexander WIEDERMANN (MAN Diesel & Turbo SE, WG3 representative) • Bram SIEBEN (Alliander) • Dr. Christian BERGINS (Mitsubishi Hitachi Power Systems Europe) • Daniel KOSTER (LIST) • Eric PEIRANO (ETIP SNET Support Team, TECHNOFI)
4	<ul style="list-style-type: none"> • Prof. Antonello MONTI (E.ON Energy Research Centre, RWTH Aachen University, WG4 representative) • Joshu JULLIER (Swissgrid) • Bart JANSSEN (Hellodata) • Stefan VANYA (Bavenir) • Rainer BACHER (ETIP SNET Support Team, BACHER)

2.1.3 LIST OF ATTENDEES

In total, the workshop was attended by 82 participants. The distribution of participants by country is provided in the figure below:

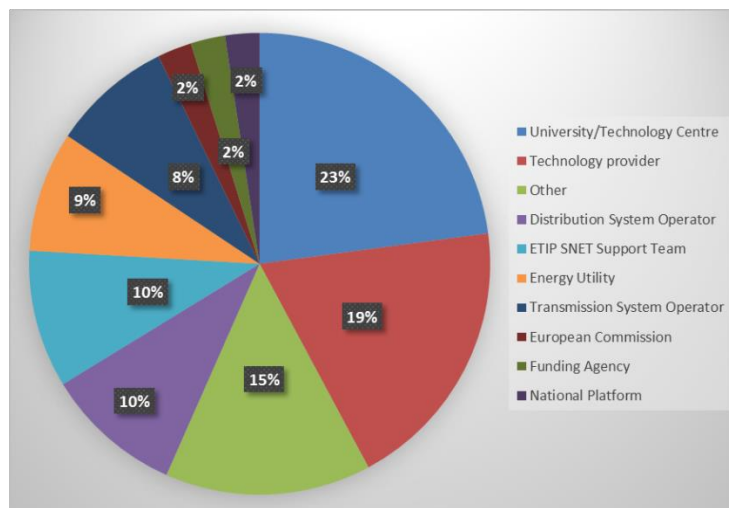
Figure 1– Distribution of participants by country



It can be noticed that the three main countries represented from the central region are Germany, The Netherlands and Belgium. It is also to highlight that 41% of the participants are coming from different countries outside of the central region.

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

Figure 2– Distribution of participants by organization



It can be pointed out that more than 40% of the audience comes from University/Technology Centre as well as 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. The important questions and comments are collected in the table below:

Table 4 – Main questions and comments by project

Project	Country	Main Questions & comments
Session 1: Projects addressing topics within the scope of ETIP SNET's Working Group 1 (WG1): "Reliable, economic and efficient smart grid system"		
Hybrid AC/DC overhead lines in Switzerland	Switzerland	Measures to increase the transmission capacity of an existing line were discussed. It was explained that the first step to increase the capacity of a line is to increase the voltage from 220 to 380 kV. If the line has already 380 kV, an increase of capacity is just possible with a new line or with the conversion into a hybrid line. Moreover, it was highlighted the importance of communication campaigns for the acceptance of new technologies.
Proaktives Verteilnetz Project	Germany	The size, the role and the feedback from market players in the congestion management issues have been discussed. Again, the transparency between the different actors has been emphasized.
Automatic voltage regulation and reactive power system (SAVR) Project	Czech Republic	The presentation raised some questions about how central and distributed new control systems would need to be. This project showed that country-specific regulations/laws would require the adaption of existing central control mechanisms leading new questions such as: How to handle the need for much more automation?
Ampacity- 10-kV-Superconducting medium-voltage cables for urban power supply	Germany	The question related to the investments expected with the development of the technology presented by the project was raised. It was specified that different investment scenarios are foreseen. Moreover, it was reminded that social acceptance was the key to support the use of new technologies. Once more, communication campaigns must be done at an early phase of the project and involve the different parties affected.
Session 2: Projects addressing topics within the scope of ETIP SNET's Working Group 2 (WG2): "Storage technologies and sector interfaces"		
StEnSEA Project	Germany	The questions were linked to the specific investment costs of the storage facilities developed within the project which were indicated to be around 1500 to 2000 euros/kW. Moreover, environmental aspects were tackled in order to point out the potential impact of the technology: the project indicated that it was working, among others, on bio films to protect the environment.
WESpe Project	Germany	Legal aspects related to storage in Europe and specifically, to underground's storage permits were highlighted during this presentation. It was reminded that, in Germany, where the next R&D projects will be set, the legal framework authorizes such activities.
Underground Sun Storage Project	Austria	The process described within the project highlighted the presence of micro-organisms being able to convert Hydrogen and CO ₂ to Methane in depleted gas reservoirs and questions related to their speed of development, the repetition cycle of the process, etc. fed the discussions. A follow up project called "Underground Sun Conversion" plans to study further those micro-organisms and their behaviour within its next step of development. It was stressed that, those microbial processes could be a sustainable way to convert renewable energy in an energy carrier which is seasonally storable and completely compatible with the existing gas infrastructure. A sustainable closed carbon loop can be established.

SAVE Project	Belgium	The project indicated that the smart use of own produced electricity does not have a generic solution. Each situation can be different (location, power needed, activities of the facilities,...) and for this reason it was reminded that case by case solutions would be more relevant. It was also highlighted that, the project was able to develop a profitable business model for the battery in niche markets (such as agriculture, etc.).
Session 3: Projects addressing topics within the scope of ETIP SNET's Working Group 3 (WG3): "Flexible Generation"		
Dynamo Project	Netherlands	During the discussion, it was stressed that the DSO is not the only customer of flexibility, all interactions between market roles (especially emerging market players) should be defined. As such it is very important that these (new) players fully the DSO requirements versus flexibility product characteristics of different flexibility sources. Also, it is pointed out that the open platform introduced in the project is of high value (standardized information exchange is essential) and that it would make a relevant link with topics encountered within WG4.
Kryolens Project	Germany	The comments following the project presentation were mainly related to the size of the land needed for the <u>Cryogenic air energy storage</u> infrastructures introduced. It was reminded that the energy density for the liquefied air is in the range of the one for CAES (Compressed Air Energy Storage) and LNG (Liquefied Natural Gas). Also, it was indicated that 1600 m ³ of storage capacity are enough for a facility of 100 MWh. This would enable to locate a pilot plant next to a city.
PV Forecast project	Luxemburg	Possible optimisations for the PV Forecast tool presented were focused on: <ul style="list-style-type: none"> - Incorporation of a hybrid method (e.g. using machine learning) to reach higher accuracy – which is intended to be done in a further development step, - Consideration of the underline grid - planed as soon as the necessary degree of detail on the grid is available, - Prediction of the wind and of the clouding effect -which is incorporated in the used irradiance forecast and additionally the feedback loop of connected PV systems delivers data to correct for prediction errors - Consideration of the eclipse – which is comparably straight forward, from a forecasting perspective but not yet included in the ECMWF solar irradiance forecast model <p>All these aspects could be taken into account or are already considered by the project.</p>
Session 4: Projects addressing topics within the scope of ETIP SNET's Working Group 4 (WG4): "Digitisation of the electricity system and Customer participation"		
Planning the future electricity grid by using 3D Decision Support System	Switzerland	The demonstration tool introduced by the project was appreciated and leads to different discussions: <ul style="list-style-type: none"> - Some alternative scenarios were presented in order to plan future electricity grids - The tool is a good approach to communicate with the public but the real influence of such tool in the decision process is not yet known. <p>One of the next step of the project is to compare the tool's results with the solutions of the experts so as to identify significant discrepancies in order to improve the underlying decision making algorithm.</p>
HelloData	Netherlands	Different topics related to the secure sharing of energy data have been raised: who is controlling? Does it have to be anonymous? What about the connectivity and freedom of choice? Etc. The main challenge of the project would be to develop an ecosystem/platform enabling to prepare the future management of consumers' energy data.
SHAR-Q Project	Slovak Republic	The projects introduces several challenges: data privacy, tracking of the data ownership, etc. It was indicated that most of the challenges to be faced could be solved with the blockchain technology. Today, because of the lack of regulatory framework, the

		project works as if the regulation were available so as to provide relevant recommendations to the commission.
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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"

- Public acceptance for innovative solutions is key for future grid developments.
- AC/DC hybridisation is a promising technology to increase transmission and distribution grid capacity without building new lines. HVDC converters will bring additional degree of freedom.
- Superconducting cables are a promising solution for reinforcements in densely populated areas.
- Interactions between regulated players (grid operators) and market players should be performed on the basis of user-friendly and efficient signals, especially for the "yellow light" state.
- The full monitoring, automation and control of the flexible electricity grid (all voltage levels) calls for new approaches (governance and technical solutions) so as to be able to handle at different time scale the huge amount of data.
- Enhanced TSO/DSO (market makers) coordination is needed so as to be able to have, at the same time, efficient markets at all spatial scale (wholesale and retail) within an open, adaptive regulatory framework.

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

- Deep water off-shore PHS (StEnSEA concept) seems to be a promising solution (in terms of costs) provided that key maintenance issues are solved at affordable costs (e.g. fouling).
- Direct electrolyser H₂ use for transport application (H₂-powered passenger vehicles) is nearly cost competitive provided that regulatory issues can be addressed (storage of H₂).
- Storage of energy (H₂) is technically feasible with available know-how and provides solutions for large-scale (including seasonal) storage of renewable electricity.
- Microbiological applications can be a way to establishing a sustainable carbon cycle (CH₄ and CCU): more R&I needs.

- Small-scale BESS can provide cost competitive solutions in niche markets (e.g. agriculture).
- Need for system optimisation to find the most efficient coupling between electricity and gas (including large-scale storage of electricity).

2.3.3 SESSION 3: ADDRESSING TOPICS WITHIN THE SCOPE OF ETIP SNET'S WORKING GROUP 3 ““FLEXIBLE GENERATION”

- R&I activities are needed for the development of adaptive solutions so as to quickly set up a 100% RES based energy system at affordable costs.
- There is a need to study the overall coherence between the different aspects of the Energy Union, for instance mechanisms to foster the penetration of renewables and CO2 prices (ETS).
- Open source environment are needed (e.g. the USEF framework) so as to define the interactions between the different market players at local level (ancillary services for DSOs), stressing on the essential need for standardized information exchange.
- LAES could be an alternative solving some of the drawbacks of CAES: more research is needed to prove the commercial soundness provided that the ancillary services brought by this technology are fairly valued and remunerated on electricity markets.
- Efficient PV forecasting tools at local level (small cells) could help local system players (DSO level) to better handle decentralized PV generation.

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”

- GIS-based solutions can provide a practical framework to quantify and visualize the possible impact and costs of new OH lines and cables and to support public acceptance processes.
- Customer (end-users) should keep control over their data and give access permissions through dedicated platforms (who has the right to use the data? To what end?).
- Peer-to-peer interoperability of smart energy components might provide further local flexibilities supported by blockchain technology.
- Smart meters should be used for network management and billing services; service provisions should be performed through other channels (energy box?).

3. REGIONAL WORKSHOP 2 (FRANCE, IRELAND, PORTUGAL, SPAIN AND THE UK)

The second workshop was held in Lisbon (Portugal) on the 28th and 29th of September, 2017. The workshop [agenda](#) is available on the [ETIP-SNET website](#)

3.1 PROJECTS AND PARTICIPANTS IN THE WORKSHOP

3.1.1 R&I PROJECTS PRESENTED

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

Table 5 – Projects presented at the workshop 2

Project	Country	Purpose	Speaker	Link to presentation
Session 1: Projects addressing topics within the scope of ETIP SNET's Working Group 1 (WG1): "Reliable, economic and efficient smart grid system")				
The REN and Nester Projects	Portugal	<p>Three projects have been introduced during this presentation:</p> <ul style="list-style-type: none"> - The power system simulation project: within this project a real-time power systems simulation laboratory is set-up to enable the simulation and testing capabilities of both power systems and communication networks, either in a stand-alone mode or by performing co-simulations. Another relevant component of this project is the assessment, both from operational and planning power systems' perspectives, resulting from an improved and better structured collaboration between TSOs and DSOs. - The substation of the future project: this project defines a new set of technical specifications for the secondary systems of a transmission substation, oriented to demanding requirements of TSOs. It takes advantage of a real-time testing platform to demonstrate the concept of a smart substation and its homologation processes. - The renewable Energy dispatch tools project: The aim is to deploy new and improve existing tools to be used by the Portuguese system operator to manage high levels of intermittent renewable energy such as wind and solar. The tools developed aim at improving the decision making of system operators under uncertainty. 	Rui ALVES (NESTER)	Link
The SINAPSE Project	Portugal	The project consists in developing an information platform to improve the visibility over the low voltage grid, making available an automatic communication channel (for EDP and its customers) for low voltage	Jorge SIMOES (EDP)	Link

		anomalies, with internal and external sources of data, adding intelligence to the distribution grid.		
The CONIFER / MASSENA Projects	France	<p>The <u>CONIFER project</u> proposes to anticipate the electrical energy production and distribution evolution of the railways and to provide the following tools:</p> <ul style="list-style-type: none"> - A sizing for Fixed Installations of new Railway Electric Traction (IFTE) (electrical substations, catenary ...) that will integrate delocalized production sources and storage systems (including additional features to enhance the recovery of braking energy of trains); - The design of the future electric railway networks in a smart overall approach that will be based on a systemic view of the network requiring to consider the conversion components between the energy transportation network and the power supply network. <p>The <u>MASSENA Demonstrator</u> includes:</p> <ul style="list-style-type: none"> - A reversible DC Substation Demonstrator; - A Smart grid study integrating: substation, François Mitterrand Library stop (RER C), renewable energies production and EVs (V2G services). 	Benoit ROBYNS (HEI) and Guillaume GAZAIGNES (SNCF)	Link
Session 2: Projects addressing topics within the scope of ETIP SNET's Working Group 2 (WG2): "Storage technologies and sector interfaces"				
The SMART ZAE Project	France	<p>The project aims at controlling and reducing the energy consumption of an industry park (in Toulouse), by storing the energy produced on the site.</p> <p>The expected results are:</p> <ol style="list-style-type: none"> 1) Innovation: smart control algorithm that optimizes the consumption profile of the park. High-efficiency flywheels with very low self-discharge rate; DC bus reducing the number of stages of energy conversion. 2) Economic and social: New offers of dynamic energy optimization of activity areas and reduction of the energy bill of the users, collaboration between actors of the same zone. 	Eric CAHUET (Engie Ineo)	Link
The CECOVEL Project	Spain	The Control Centre for Electric Vehicle (CECOVEL) is REE's control centre created to integrate in the electric system and under security conditions electric mobility. The centre controls the charging of electric vehicles receiving real-time information.	Joan MANRESA BALLESTER (REE)	Link
The Storage Project	Portugal	This is a Pilot project to test several use cases on the use of energy storage for grid management support: backup, voltage control, peak shaving, and fault ride-through. This project will also provide MV storage for the H2020 SENSIBLE project, to test MV/LV extended islanding operation and central control systems for grid operation with heavy penetration of renewable resources.	Ricardo Jorge SANTOS (EDP)	Link
The Renovagas Project	Spain	The objective of the project is to develop a synthetic natural gas production plant with a power of 15 kW. This will produce hydrogen in an electrolyser and then in a methanation reactor, hydrogen will be introduced with a biogas stream for the production of synthetic natural gas. A Spanish P2G (power to gas) potential analysis is included in the project.	Piedad MARTINEZ (Gas Natural Fenosa)	Link

Session 3: Projects addressing topics within the scope of ETIP SNET's Working Group 3 (WG3): "Flexible Generation"				
MMC Project	Spain	The project aims at designing and developing a small scale Modular Multilevel Converter and the necessary electronic boards to interface with a HIL (Hardware in the Loop) system. The final goal of the whole system is to get a fully flexible and modular converter to test different control algorithms, to validate multi-terminal HVDC architectures that are being designed to integrate offshore wind farms into the main grid.	Susana APIÑANIZ (Tecnalia)	Link
The DS3 Projects	Ireland	The "Delivering a Secure, Sustainable Electricity System" (DS3) Programme is designed to ensure that the Irish power system can be securely operated with increasing amounts of variable non-synchronous renewable generation over the coming years. Achieving high levels of renewable integration in a synchronous system is unprecedented and presents significant challenges for the real-time operation of the power system.	Ian CONNAUGHTON (Eirgrid)	Link
The HVDC LINK Project	Spain	The project investigates HVDC technologies aiming at reducing the cost and complexity of the current HVDC existing architectures to connect offshore wind farms to the main grid. In particular, the following specific objectives are proposed: - Design innovative HVDC architectures based on Diode Rectifier Units beyond the SoA; - Develop models and run simulations to verify the proposed architecture; - Develop a laboratory scale prototype to validate the solution.	Susana APIÑANIZ (Tecnalia)	Link
Session 4: Projects addressing topics within the scope of ETIP SNET's Working Group 4 (WG4): "Digitisation of the electricity system and Customer participation"				
Power off and Save Project	Ireland	It is a new pilot demand-response programme that will reward customers who agree to reduce their energy use when electricity demand is high. This programme involves 1,500 residential customers over an 18 month-period. Those who sign up are asked to switch off appliances for about 30 minutes on ten occasions. Customers will be rewarded with up to €100 off their bill.	David PHELAN (Electric Ireland)	Link
The Predis Project	Portugal	Disaggregated load and generation forecast in real time: this project aims to build an infrastructure and analytics to be able to make a short-term load and generation forecasts for all the distribution grid assets in real time. The forecast algorithms are based on Big Data technologies.	Pedro TAVARES FERREIRA (EDP)	Link
The Smart Electric Lyon Project	France	The large-scale demonstration consists in offers of information services, technical solutions and new tariffs helping consumers to better control their energy bills. The project participants are households, industrial firms, tertiary companies and local authorities. The solutions are being tested in 25,000 homes and 100 businesses and local authority agencies located in the Grand Lyon Metropole. The participants will assess the performance of new equipment and digital solutions that manage energy consumption in their everyday lives.	Sylvie PERRIN (EDF)	Link
The Re:DY Project	Portugal	Home energy management system based on a gateway and several hardware components allowing the monitoring, control, automation and optimization of home electrical systems. This system already allows the monitoring of the load, the solar panels generation and EV charging, and the control of air	Pedro GEIRINHAS ROCHA (EDP)	Link

		conditioning, heat pumps, water heaters and electrical appliances.		
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During this workshop, there were no presentations from projects in the UK. Several projects have been invited but they were not able to attend and some other being at an early stage of development have already been identified in order to be invited to participate in the next years' ETIP SNET workshops of the Western Region of Europe.

3.1.2 ROUNDTABLES

Four roundtables were held during the workshop, moderated by Rainer BACHER and Eric PEIRANO. The four were devoted to questions and different exchanges between the speakers of the projects presented, the representatives from EASE, EDSO for Smart Grids and ENTSO-E and the respective representatives of the different ETIP SNET Working Groups. The table below shows the participants in each roundtable.

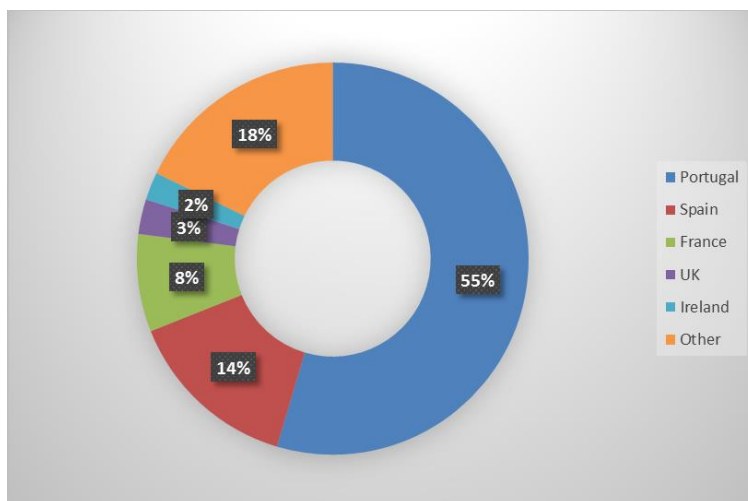
Table 6 – Participants in roundtables at the first regional workshop

Roundtable nr.	Participants
1	<ul style="list-style-type: none"> • Raphaël Rinaldi (Enel GI&N, WG1 Representative) • Rui ALVES (NESTER) • Jorge SIMOES (EDP) • Benoit ROBYNS (HEI) and Guillaume GAZAIGNES (SNCF) • Norela Constantinescu (ENTSO-E representative) • Ricardo PRATA (EDSO representative) • Rainer BACHER (ETIP SNET Support Team, BACHER)
2	<ul style="list-style-type: none"> • Jean-Baptiste BART, (EDF R&D, WG2 representative) • Eric CAHUET (Engie Ineo) • Joan MANRESA BALLESTER (REE) • Ricardo Jorge SANTOS (EDP) • Piedad MARTINEZ (Gas Natural Fenosa) • Patrick CLERENS (EASE representative) • Eric PEIRANO (ETIP SNET Support Team, TECHNOFI)
3	<ul style="list-style-type: none"> • Jesus GARCIA MARTIN (Iberdrola Renovables, WG3 Representative) • Susana APIÑANIZ (Tecnalia) • Ian CONNAUGHTON (Eirgrid) • Susana APIÑANIZ (Tecnalia) • Eric PEIRANO (ETIP SNET Support Team, TECHNOFI)
4	<ul style="list-style-type: none"> • Bruno SOARES (R&D NESTER, WG4 representative) • David PHELAN (Electric Ireland) • Pedro TAVARES FERREIRA (EDP) • Sylvie PERRIN (EDF) • Pedro Geirinhas Rocha (EDP) • Rainer BACHER (ETIP SNET Support Team, BACHER)

3.1.3 LIST OF ATTENDEES

In total, the workshop was attended by 150 participants. The distribution of participants by country is provided in the figure below:

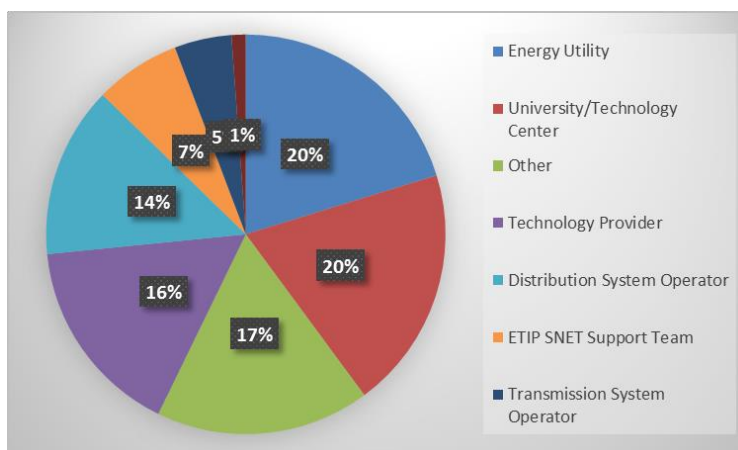
Figure 3– Distribution of participants by country



It can be noticed that the three main countries represented from the western region are Portugal, Spain and France. Also, 18% of the participants are coming from other countries located outside of the western region.

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

Figure 4– Distribution of participants by organization



It can be pointed out that 40% of the audience comes from Energy Utilities and University/Technology Centres. Within the category “other”, around 50% of the attendees comes from Research and Development and Innovation organizations.

3.2 MAIN QUESTIONS FROM THE PROJECTS' Q&A SESSIONS

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

Table 7 – Main questions and comments by project

Project	Country	Main Questions & comments
Session 1: Projects addressing topics within the scope of ETIP SNET's Working Group 1 (WG1): "Reliable, economic and efficient smart grid system"		
The REN and Nester Projects	Portugal	<p>During this session it has been highlighted that cooperation between regulated players, TSOs and DSOs for instance, would need to be enhanced in order to bring more benefits to the system such as energy efficiency and reliability, since most generation is going to be connected at MV/LV level.</p> <p>In addition, discussions about how forecasting tools would represent today a very important enabler of flexibility for network operators have taken place. The future role of storage in this context has been mentioned.</p> <ul style="list-style-type: none"> - Moreover, it has been commented that power electronics (not only from wind energy) used already nowadays are capable to solve low inertia issues (i.e. examples from US were cited).
The SINAPSE Project	Portugal	<p>The outages situation in Portugal were discussed: how often? for how long? and the costs related to these events were explained. It has been specified that micro-outages are taken place every day and they are practically unnoticed.</p> <p>Furthermore, it has been pointed out that the collaboration between different nature of stakeholders (consumers included) is needed in order to share high-quality data in order to generate value-added services for the energy and telecommunications sectors for instance (setting win-win deals), with the end purpose to better monitor the state of the network.</p>
The CONIFER / MASSENA Projects	France	<p>For the management of the reverse flows coming from the braking energy of high-speed trains, the difference of using energy storage assets (batteries, EVs, etc.) vs invertors for the reversible substations presented in the CONIFER and MASSENA projects respectively have been discussed. Cost issues and value proposition of storage solutions for these cases were discussed during this session.</p> <p>The speakers have explained that electricity-based trains must be considered as a significant part of the load of the power system (i.e. French TGVs at high speed need 10-12 MW and when they break the braking power goes down to 4MW).</p>
Session 2: Projects addressing topics within the scope of ETIP SNET's Working Group 2 (WG2): "Storage technologies and sector interfaces"		
The SMART ZAE Project	France	<p>Discussions about the software used in the innovative Energy Management System of the project have taken place during this presentation. It was highlighted that the EMS has been developed specifically by and for the project itself.</p>
The CECOVEL Project	Spain	<p>The involvement of DSOs and their possible role within the CECOVEL project were discussed. It has been pointed out that DSOs would need to monitor closely EV's charging loads at station level (i.e. be provided with sufficient data, data management, etc.).</p> <p>Moreover, the "Gestores de carga" and their role in Spain were explained. It was stated that these players should be more involved in V2G R&I projects in order to deliver more accurate recommendations towards the Spanish regulatory framework related to EVs.</p>

The Storage Project	Portugal	Questions regarding the economic valuation of the project were raised. It was pointed out, that the business cases taken into account in the project (tackling issues related to system's flexibility) have been closely related to real-life situations in order to assess the possible economic benefits that these solutions may provide.
The Renovagas Project	Spain	Issues about the geographical location of the biogas plants were discussed during the session (i.e. how far the biogas plant should be from the grid and gas pipelines? The efficiency of this type of technology was debated. It has been stated that an efficient pre-treatment in order to optimise as much as possible the general process (i.e. catalyst, electrolysers, methanation reactor, raw materials, etc.) is necessary to have satisfactory conversion yields in the overall reaction. The importance of using the heat produced during the biomethane production was mentioned (i.e. use of steam turbines).
Session 3: Projects addressing topics within the scope of ETIP SNET's Working Group 3 (WG3): "Flexible Generation"		
MMC Project	Spain	During this session, the lack of a regulatory framework for HVDC grids was commented and pointed out. It was expressed that this topic would need to be better addressed from the regulations' point of view.
The DS3 Projects	Ireland	One of the main concerns during this session was related to the size of storage that would be convenient for the DS3 project to achieve its ambitious objectives about fostering RES integration. It was mentioned that the focus of the project was in the overview of the entire Irish energy system and not only on the adaption of some technologies that may allow more RES integration, but however, in order to Deliver a Secure Sustainable System (DS3) with many RES, Eirgrid was aware that the use of technologies such as power electronics, storage, forecasting tools, etc. foreseen in the Irish grid and the coordination between different stakeholders in the scope of the project would take time. Moreover, it has been stressed that for some services and some technologies, the market would need to be more attractive to facilitate their integration into the energy system.
The HVDC LINK Project	Spain	The challenges for HVDC technologies' manufacturing were discussed. The audience agreed that the promotion of more R&I activities (from public and private entities) in this topic is fundamental to achieve better and more efficient technologies at lower prices. The very expensive costs of these technologies would be hindering their development and massive deployment.
Session 4: Projects addressing topics within the scope of ETIP SNET's Working Group 4 (WG4): "Digitisation of the electricity system and Customer participation"		
Power off and Save Project	Ireland	During this session, the importance and the focus of customer's engagement and the relevance of communication campaigns in order to increase and improve customer's behaviour in this kind of projects have been highlighted. It has been stated that informing and training the customer before and during the project duration is as important as the contractual agreements between the involved stakeholders for the success of these projects. Customer participation would be the main driver towards energy savings. Exchanges about controlling smart appliances (IoT) with "set-away" communication have taken place.
The Predis Project	Portugal	The daily load forecast with a time resolution of 15 mins (few margins of forecast errors) which is one of the main results of the project was matter of different discussions. It was commented that EDP Distribucao was able to collect enough information at the PV plant level to foster forecasting tools and their development in order to handle in a more optimal manner the negative residual loads resulting from PV.
The Smart Electric Lyon Project	France	The relevance of providing real-time information in a very accessible manner (i.e. text messages about weather conditions to better manage customer's energy consumption) to the customers participating in these projects was stated. It was also explained that tariff stimulation was a very powerful way of influencing people's behaviour towards better use of electricity. Once again, the importance of communication campaigns, customer's training and technical help to the households at the beginning of the project are key drivers for the success of these demonstrators dealing with active customer's participation.

The Re:DY Project	Portugal	The future possibilities of EDP Distribucao functioning as an aggregator in order to provide different type of services to the system with this project were commented. In addition, the price of this EDP technology and the multiple energy saving benefits (i.e. avoiding/preventing extra power demand fees for the households in Portugal) for the household/users were detailed during this session.
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3.3 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.

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

- Probabilistic approaches embedding different sources of risks can bring a new efficient way to perform security assessments.
- Accurate forecasting tools are today a key flexibility mean for network operators while waiting for storage to be fully integrated in the power system.
- Operating networks with low inertia (rotating machines) is already possible today thanks to power-electronics solutions. RES generators are already able to provide various ancillary services for FCR and aFRR.
- IIoT: many connected objects can bring valuable information streams for service providers and grid operators if they are able to handle in an efficient way the space and time correlations of the output data.
- IIoT: the engagement of all stakeholders of the telecom systems is needed in order to reach a critical mass of data so as to be able to estimate accurately the space and time correlations.
- Stakeholders of the power system could have access to exogenous data through available open source platforms provided that the quality of the data can be assessed.
- Consumers, telecom operators and energy service providers (Win-Win-Win) should join forces to share data so as to help generate value-added services using generated high quality data as input for improved system efficiency (Social welfare).
- Electricity-based transport must be considered as a significant part of the load of the power system.
- The use of reverse flows coming from braking energy within the railway DC electricity system (high speed trains) can bring flexibility to power system with batteries and/or power electronics.
- The power system should remain the backbone of the energy system: overall energy system optimization must however be accounted for (including connections with telecom networks).

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

- BESS: need for new duty cycle standards so as to give undisputed performance certifications (link with ongoing IEC activities).
- There is still a need for focused demonstration projects (with a set of specific applications) so as to understand how the BESS can be used in the power system.
- Multiservice business models for storage integration might be a solution provided that the system services brought by storage are fairly valued (regulations and market mechanisms).
- There is a wide portfolio of storage technologies which fulfil different functionalities. Hybrid systems (e.g. flywheel-BESS-supercap) could help to cover a wide range of functionalities.
- Further LCA studies are needed to fully appraise the environmental impact of BESS.
- Storage is one possible flexibility mean which must be compared (services and associated costs) with other flexibility means (generation, demand, grid).
- Power-to-gas: there is a need for an adapted regulatory framework to unlock the potential of these solutions and reach affordable costs.

3.3.3 SESSION 3: ADDRESSING TOPICS WITHIN THE SCOPE OF ETIP SNET'S WORKING GROUP 3 "FLEXIBLE GENERATION"

- Flexible generation can be achieved with all different generation technologies.
- The combination of enhanced capabilities of existing power plants and different technologies providing a range of new ancillary services is enough to operate the power system at very high shares of renewables, within the physical limits and at affordable costs.
- These (new) ancillary services, at different time scales, can be provided by market players through transparent procurement and adapted qualification trial processes of the equipment
- Synergies between manufacturers and research centres have to be favoured in order to foster partnership delivering reliable and efficient HVDC converter solutions at affordable costs.

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”

- Short-term operational needs can be supported by consumers equipped with adequate digital technologies.
- Small-scale hot water tanks are an efficient solution to couple electricity and heat to bring flexibility in the energy system.
- For system operators, big data issues can be handled with available on-the-shelf hardware and open source software.
- Solving big data problems brings cross-sectoral cooperation (system operators, service providers, research centres, etc.) which foster knowledge exchange as well as scientific and technological progress.
- Demand response for households: tariffs associated to penalties are more efficient than reward. However, the optimum is automatization of the management. Customization (parametrization) is needed for the adoption of the technical solution(s) by the consumer.
- Utilities of the future might be a new type of companies that have the knowledge on how to address the end users at very large scales.
- Utilities must develop new tools for customer adoption and understanding when promoting their services. Interoperability remains a key issue.

4. REGIONAL WORKSHOP 3 (BULGARIA, CROATIA, CYPRUS, GREECE, HUNGARY, ITALY, MALTA, ROMANIA AND SLOVENIA)

The third workshop was held in Nicosia (Cyprus) on the 23rd and 24th of November, 2017. For this workshop, a specific session about Islands challenges has been held. The workshop [agenda](#) is available on the [ETIP-SNET website](#).

4.1 PROJECTS AND PARTICIPANTS IN THE WORKSHOP

4.1.1 R&I PROJECTS PRESENTED

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

Table 8 – Projects presented at the workshop 3

Project	Country	Purpose	Speaker	Link to presentation
Session 1: Projects addressing topics related to Islands Challenges				
RESGRID project: Integration of a high share of variable RES in the power system	Cyprus	Technical assistance for assessing the current state of the transmission and distribution electricity systems and proposing optimum solutions for increasing the amount of Renewable Energy Sources (RES) generation that can be fed in the electricity system of the Republic of Cyprus.	Stamatios CHONDROGIANNIS (DG JRC)	Link
The GRACIOSA Project	Portugal	Multi-Megawatt-Scale renewable microgrid project on Portuguese Azorean Island: Intelligent power controls and a purpose-built Energy Management System by Younicos are combined with a 3.2 MW battery storage system powered by Leclanché lithium-ion cells, a 4.5 MW wind park and a 1 MW photovoltaic power plant. The system allows to power the island by wind and solar energy with the existing diesel needed only for back-up power during prolonged periods of unfavourable weather. About 2/3 of annual consumption will be provided through renewables energy.	Marco FURTADO (YOUNICOS)	Link
The UK- Malta Joint Projects	UK-Malta	The project aims at investigating the drivers and opportunities to facilitate an increase in the role of solar energy in the UK energy futures. It will develop a range of future energy scenarios out to 2050. This project aims to maximize the contribution of PV to the UK renewable energy mix and to carbon reduction targets by strategically assessing the system level challenges for: the electrical system; material/resource availability; cost reduction; maximizing life-cycle carbon reductions; delivering social benefits. The presentation also gave directions for the transfer of knowledge to the context of Malta.	Brian AZZOPARDI (MCAST Energy)	Link

The SmartPV/StoRES Project	Cyprus	<p>The main objectives of the SmartPV project are the following:</p> <ul style="list-style-type: none"> - To develop and validate a cost-optimum scheme for higher RES penetration in the energy mix of Cyprus. - To give market-driven incentives to consumers who become local producers (prosumers) thus alleviating any "need" for costly Feed-in-tariff (FIT) schemes to be in place. - To facilitate implementation and have a real contribution to environment policies adopted in Cyprus as set by the EU. - To use the gained knowledge on optimization of net metering in Cyprus for the development of metering schemes & policies in other EU countries. <p>The objective of StoRES is to boost PV self-consumption in the MED region through an optimal residential storage solution. The approach is to test coupled solutions for the consumer in different pilot sites taking into account local parameters for optimization and using energy efficiency measures. StoRES is expected to change the current situation concerning grid reliability with higher RES deployment in islands/rural areas giving a cost-effective option to the public on more affordable and sustainable energy supply.</p>	Dr. Venizelos EFTHYMIOU (FOSS)	Link
Session 2: Projects addressing topics within the scope of ETIP SNET's Working Group 1 (WG1): "Reliable, economic and efficient smart grid system"				
The DREAM Project	Greece/Italy	<p>The project aims at:</p> <ul style="list-style-type: none"> - Utilizing aggregated flexibility at the DSO level, according to economic incentives in order to compensate short-term power imbalances; - Resolving significant deviations from the predicted load/renewable energy generation or other reasons causing imbalances; - Evaluating the decentralized balancing market; - Resolving network contingencies (i.e. voltage control, congestions, etc.) using distributed optimization techniques (using agent-based, scalable and robust implementation). <p>Two pilot sites are presented: the trial sites at Milan Malpensa Airport (Italy), characterized by the presence of a trigeneration plant and the Meltemi Community Smart Grids pilot site (Greece).</p>	Nikos HATZIARGYRIOU, Aris DIMEAS (HEDNO) And Matteo GIAMPAOLO (SEA)	Link pt1 Link pt2 Link pt3
The eBADGE Project	Slovenia	The project aims at proposing an optimal pan-European intelligent balancing mechanism, piloted on the borders of Austria, Italy and Slovenia, that is also able to integrate Virtual Power Plant Systems that can assist in the management of the electricity transmission and distribution grids in an optimized, controlled and secure manner.	Peter ZIDAR (Telekom)	Link
Advanced dispatching and real-time forecasts of active & reactive load	Italy	<p>It is a real-time software currently in use in the National Dispatching Control Room of Terna (Italian TSO). Its main goal is to define and propose the best dispatch of all the power-generating modules qualified for the Italian ancillary services market such that:</p> <ul style="list-style-type: none"> - the real-time updated forecast of active power load is balanced; - the tertiary reserve margins, in terms of adequacy, are granted; - at the minimum overall system costs. 	Cristiano MARTARELLI (Terna)	Link

The Puglia Active Network Project	Italy	The project objectives and expected benefits are the following: - Enabling customers to participate in new markets: ability to interact in real-time with active customers and involved steps; - Quality and security of supply: monitoring voltage profile to ensure operation in accordance with EN50160; - Increase network flexibility: integration of charging stations for electric vehicles; - Energy efficiency: enabling new energy efficiency services.	Gareth BISSELL (ENEL)	Link
Session 3: Projects addressing topics within the scope of ETIP SNET's Working Group 2 (WG2): "Storage technologies and sector interfaces" and Working Group 3 (WG3): "Flexible Generation"				
The Storage Lab Project	Italy	Field testing of power-intensive Electrochemical Storage Systems (ESSs) installed in the main Italian islands of Sardinia (Codrongianos) and Sicily (Ciminna) and connected to the national transmission grid for the provision of system services (e.g. primary and secondary frequency response, black start). The systems deployed in Sardinia and Sicily consist each of several 1 MW-scale EESs, which are based on different technologies (Lithium, Zebra, Flow and supercapacitor) and are characterised by an energy-to-power ratio between 0.5 and 3.	Maura MUSIO (Terna)	Link
The SIREN Project	Croatia	The project objectives are the following: - Investigate operating procedures of running the Croatian power system with high level of uncertain wind generation. - Derive investment strategies that will enable high penetration of wind energy into the Croatian power system. - Determine requirements for connection of new wind power plants to the Croatian transmission network. - Analyze the needs for storage in the Croatian transmission network. This analysis includes the services that storage needs to provide to the system, as well as suitable storage technologies. - Define regulations for utilization of such storages depending on the ownership (transmission system operator HOPS vs. third parties).	Hrvoje PANDZIC (FER)	Link
The ProME3The2US2 Project	Italy	The ProME3The2US2 project aims to create, validate and implement high efficiency innovative solid-state mechanism to convert solar energy into electric energy. The primary demand for these systems comes from energy market because of its high cost effectiveness.	Daniele TRUCCHI (CNR –ISM)	Link
Cyprus Solar Thermal Energy Chair for the Eastern Mediterranean (CySTEM)	Cyprus	The project aims at consolidating and enhancing the already substantial activity at the Cyprus Institute (Cyl) in Solar Energy, principally solar-thermal and related activities. The principal focus is on Concentrated Solar Thermal (CST) technologies for electricity production, desalination, air conditioning and heating, either in isolation or in multi-generation modes. The key characteristics of the technology are the thermal storage and hybridization capabilities, and the potential to drive solar chemistry related processes and thereby contributing to decarbonize the transportation sector, not just the energy sector	Prof. Manuel J. BLANCO (The Cyprus Institute)	Link
Session 4: Projects addressing topics within the scope of ETIP SNET's Working Group 4 (WG4): "Digitisation of the electricity system and Customer participation"				

Smarter EMC2	Greece	The presentation highlighted the objectives, implementation methodology and key outcomes of the SmarterEMC2 project, with emphasis on the piloting of Demand Response in a group of residential customers in Greece.	Ilias LAMPRINOS (Intracom Telecom)	Link
The SUNSEED Project	Slovenia	The project objective is to produce a set of guidelines how to overlap, combine and interconnect, i.e. converge, DSO and telecom communication networks for dense distributed energy generation (DEG) smart energy grids as an evolutionary development.	Peter ZIDAR (Telekom)	Link
Best practices of the Smart Synergy Project and Hungarian Case Study leading to the SET UP Project	Hungary	The presentation highlighted two Hungarian use cases that led to the SET UP project: The Smart Synergy project whose goals are to: - Analyse the attitude of the consumers related to SM; - Examine the technological possibilities of multi-utility smart metering; - Define possible business models for SM system; - Observe the data security&protection aspects; And the Central Smart Metering LTD project aiming at: - Developing and testing an infrastructure for data collection contributing to the modernisation of the energy system; - Contributing to solving system regulation problems (household power plants, e-Mobility) and decreasing the system level energy losses; - Providing necessary information for the country wide roll-out of smart metering in Hungary, collecting and methodizing experiences, creating recommendations.	Robert BAN (Tolna County Development Agency)	Link

During this workshop, there were no presentations of projects from Bulgaria and Romania.

4.1.2 ROUNDTABLES

Four roundtables were held during the workshop, moderated by Michele de NIGRIS, Mihai SANDULEAC, Eric PEIRANO and Venizelos EFTHYMIOU. The four were devoted to questions and different exchanges between the speakers of the projects presented, the representatives from EDSO for Smart Grids and ENTSO-E and the respective representatives of the different ETIP SNET Working Groups. The table below shows the participants in each roundtable.

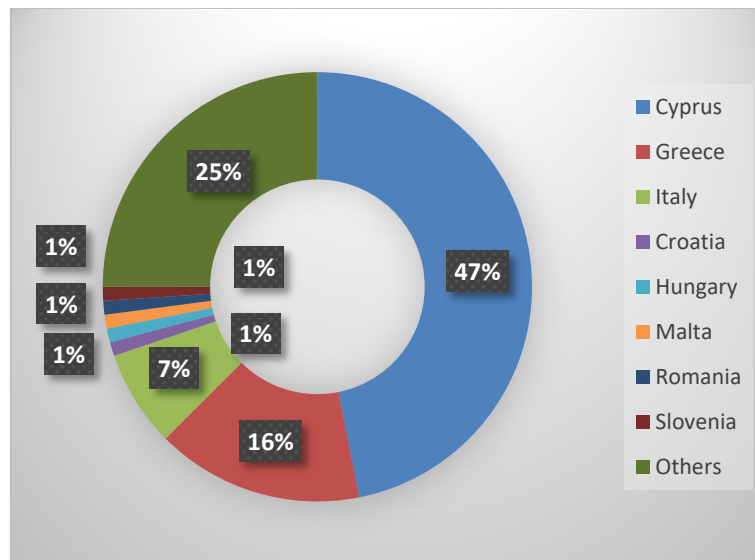
Table 9 – Participants in roundtables at the third regional workshop

Roundtable nr.	Participants
1	<ul style="list-style-type: none"> • Nikos HATZIARGYRIOU (ETIP SNET Vice-Chair) • Stamatios CHONDROGIANNIS (DG JRC) • Marco FURTADO (YOUNICOS) • Brian AZZOPARDI (MCAST Energy) • Dr. Venizelos EFTHYMIOU (FOSS) • Michele de NIGRIS (ETIP SNET Support Team, TECHNOFI)
2	<ul style="list-style-type: none"> • Raphael RINALDI (ENEL, WG1 Representative) • Aris DIMEAS (HEDNO) • Matteo GIAMPAOLO (SEA) • Peter ZIDAR (Telekom) • Cristiano MARTARELLI (Terna) • Gareth BISSELL (ENEL) • Mihai SANDULEAC (University of Bucarest)
3	<ul style="list-style-type: none"> • Jan Hendrik ERNST, Maxwell Technologies, WG2 Representative • Michele DE NIGRIS, RSE, WG3 Representative • Maura MUSIO (Terna) • Hrvoje PANDZIC (FER) • Daniele TRUCCHI (CNR –ISM) • Prof. Manuel J. BLANCO (The Cyprus Institute) • Eric PEIRANO (ETIP SNET Support Team, TECHNOFI)
4	<ul style="list-style-type: none"> • Dr. Venizelos EFTHYMIOU, FOSS, WG4 Representative • Ilias LAMPRINOS (Intracom Telecom) • Peter ZIDAR (Telekom) • Robert BAN (Tolna County Development Agency) • Dr. Venizelos EFTHYMIOU (FOSS)

4.1.3 LIST OF ATTENDEES

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

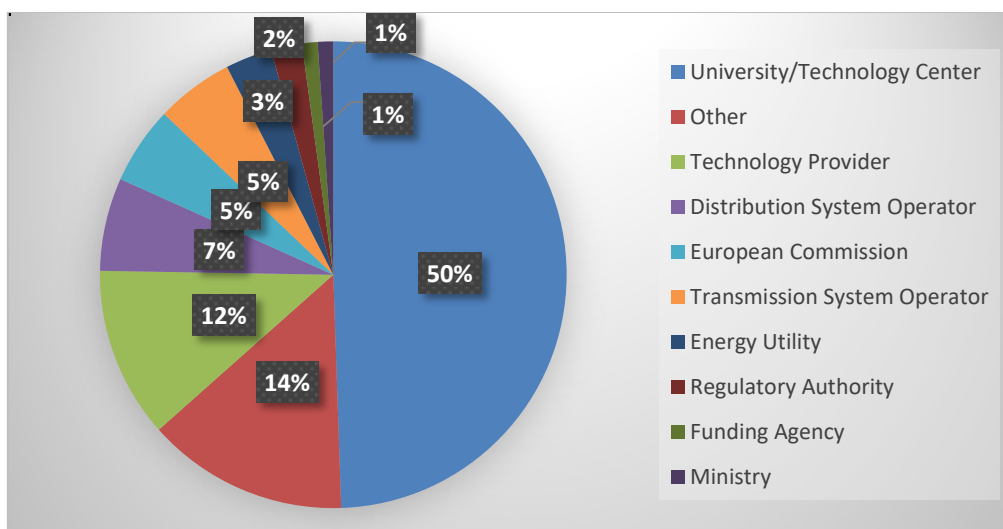
Figure 5 – Distribution of participants by country



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

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

Figure 6 – Distribution of participants by organization



It can be pointed out that 50% of the audience comes from University/Technology Centres 12% from Technology providers and 14% from other category (student, municipality, consultancy, etc.).

4.2 MAIN QUESTIONS FROM THE PROJECTS' Q&A SESSIONS

Each project presentation has been followed by a session of questions and discussions (5 minutes for each session). The main questions and comments are collected in the table below:

Table 10 – Main questions and comments by project

Project	Country	Main Questions & comments
Session 1: Projects addressing topics related to Islands Challenges		
RESGRID project: Integration of a high share of variable RES in the power system	Cyprus	Several contributions from the project were discussed such as the development of an evaluated transmission system dynamic model incorporating all new technologies. Also, the impacts of the project have been highlighted, among others, the identification of criticalities (small PVs) and solutions (battery storage with enhanced frequency response). Finally, two lessons learned have been presented: <ul style="list-style-type: none"> • In small isolated systems UCED has to incorporate in detail balancing reserves and inertial response; • Under high-RES penetration, long-term energy planning has to take into account dynamic security constraints.
The GRACIOSA Project	Portugal	The project highlighted the benefits of the battery storage systems emphasising the fact that it is a system: <ul style="list-style-type: none"> • securing the production processes against risks from low-energy quality from the grid; • optimizing the production processes and energy procurement (peak load management, reduction of grid fees, optimizing the diesel consumption; • bringing revenue opportunities such as balancing services, renewable integration and grid investment deferral. Further technical discussions focussed on the rate of charge and discharge of the batteries used within the project and the technology considered.
The UK- Malta Joint Projects	UK-Malta	The policies recommendations developed for the UK government through the Wise PV project have been presented: the aim was to take into account those lessons learned and to transfer this knowledge to the specific case of Malta. This transfer has been carried out through an Internationalisation Partnership by the local research council of the Island.
The SmartPV/StoRES Project	Cyprus	Within the smart PV project, time of use tariffs have been identified to help the prosumer making responsive decision. The project highlighted the benefits for policy makers and market participants such as the technical know-how on smart meters installation, communication and data acquisition that could enable dynamic tariff structures. Afterwards the StoRES project has been presented and raised two important questions: what is the optimal size of storage behind the meter that will maximize the economic benefit and what is the optimal size of “socialized” storage? The general conclusion of the discussion was that the more distributed the storage might be, the more obvious would be the benefits.
Session 2: Projects addressing topics within the scope of ETIP SNET's Working Group 1 (WG1): “Reliable, economic and efficient smart grid system”		
The DREAM Project	Greece/Italy	Several discussion points have been raised during the presentation of the project. Concerning the Greek pilot case, the advantages of the decentralized architecture used were highlighted: it enabled an easy deployment, a scalability and plug and play services. Furthermore, the Italian pilot case demonstrated the high degree of confidence in the achievement of profitability from the deployment of an advanced integrated energy system.
The eBADGE Project	Slovenia	During the discussions, the project concluded that the simulation results highlight great benefits for the integrated system of a common management of the balancing energy market. Also, system cost reductions were indicated in case of common balancing market for Austria

		(cost reduction of 63%), Italy (cost reduction of 21%) and Slovenia (cost reduction of 8%). Finally, question related to the flexible consumption of the consumers have been raised and it was indicated that this flexibility depended on the timeframe.
Advanced dispatching and real-time forecasts of active & reactive load	Italy	The main conclusions of the discussions made a focus on advanced dispatching and how it could be a suitable tool for supporting real-time control to manage the transition from energy to balancing market. Also, technical aspects used by the project (data mining and distributed computing) could represent a direct way for predicting nodal active and reactive loads. Questions related to the total cost of the platform have been raised and it was indicated that the total cost shall be under 1 million euros.
The Puglia Active Network Project	Italy	The project enables to demonstrate several points, among others: - Installations of more efficient charging station including fast recharge and better distribution, - Realization of improved customer engagement results from Smart Info deployment. The main question was focused on the argument used to convince the consumer participation in the project: it was indicated that the data were coming from the smart meters.
Session 3: Projects addressing topics within the scope of ETIP SNET's Working Group 2 (WG2): "Storage technologies and sector interfaces" and Working Group 3 (WG3): "Flexible Generation"		
The Storage Lab Project	Italy	The results of different simulations have been presented. It was demonstrated that the efficiency and the lifetime of a battery depend on the application that will be made of it and on the technology considered. Also, it was indicated that in continuous operation, the efficiency falls dramatically when the cycled energy volumes are lower than standard ones. It has been stressed that most of unavailabilities were caused because of failures and malfunctions of the power conversion system, as well as related to adjustments on the innovative control logics and functionalities presently implemented. Furthermore, during the Q&A session, it was asked whether the development of national grid codes for storage were planned. It was indicated that an adaptation of the grid code to make it more suitable for the characteristic of the storage was a willingness.
The SIREN Project	Croatia	The project introduced several laboratory testing: AC microgrid, hydro power plant, thermal power plant, power system. The final conclusion leads to the fact that battery storage investment remains more expensive compared to traditional transmission expansion and total costs of contingencies. Also, it was commented that the operation of storage by the system operators would increase the social welfare.
The ProME3TheE2US2 Project	Italy	During the presentation, it was highlighted that the concentrated solar conversion technology based on thermionics could be combined with storage systems or current thermal-electrical technologies (turbines, Stirling engines, etc.). It was also stressed that the technology has a great potential of very high efficiency (up to 70%) due to the combination of photonic and thermal conversions. Moreover, the project indicated the low concentration ratio (typically less than 100) needed by the technology for reaching operating temperatures, that extends its application to linear concentrating systems.
Cyprus Solar Thermal Energy Chair for the Eastern Mediterranean (CySTEM)	Cyprus	The discussions highlighted the very precise prediction of the production thanks to the project technology. An important output from the presentation is that devices that utilize both photonic and thermal processes for energy conversion could prove to be a complementary dispatchable solar generation solution when coupled to specifically designed thermal cycle and/or (thermal) storage systems. Moreover, it is indicated that small scale CSP plants (10 MW) could be profitable and adapted to islands as well as all small communities.
Session 4: Projects addressing topics within the scope of ETIP SNET's Working Group 4 (WG4): "Digitisation of the electricity system and Customer participation"		
Smarter EMC2	Greece	The presentation indicated that for the residential sector demand response could be combined with energy efficiency initiatives. This might not be the case for commercial/industrial customers: having shifting processes, the overall impact on energy efficiency cannot be easily evaluated. Moreover, it is recommended that demand response should be automated to be efficient.
The SUNSEED Project	Slovenia	From the presentation, an important fact has been raised: wireless solutions for the grid shall be taken into account (5G) so as to solve latency difficulties and enhance the security of the data through encoding.

<p>Best practices of the Smart Synergy Project and Hungarian Case Study leading to the SET UP Project</p>	<p>Hungary</p>	<p>Two specific Hungarian projects have been presented. The smart synergy project measured the impact of smart meters on consumers and it was shown that external GSM antenna was needed for 4 % of the meters and that during the installation of the meters only minimal consumer resistance was found. Moreover the central smart metering LTD project contributed, among others, to solve system regulation problems (household power plants, e-Mobility) and to decrease the system level energy losses.</p>
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4.3 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.

4.3.1 SESSION 1: ADDRESSING TOPICS RELATED TO ISLANDS CHALLENGES

- Spatial and temporal modelling of generation/demand is key to assess real resilience of future energy systems.
- Planning should include dynamic security constraints while considering all flexibility means.
- Planning studies for HV systems (transmission) should include well-suited models of the distribution systems so as to carry out coupled transmission-distribution simulations.
- 100% renewable penetration on islands today would be very expensive to achieve (non-linear cost - RES penetration relation). Regulations should evolve so as to favour high-RES penetration (revenues from electricity markets should not be based solely on short-term energy marginal cost approaches).
- Storage should be located at every level of the energy system to maximize impact and social welfare: location is important, i.e. where the service is needed. Further research is needed to optimize the spatial distribution as a function of the local system condition.
- Few (at least 3) time-of-use (ToU) tariff slots per day help to flatten the load curve and improve penetration of RES generation. Difference in price between the different ToU slots should be at least 20% to create interest.
- ToU tariffs have to evolve with the energy mix so as to maximize the use of the generation assets (including storage) and to be cost reflective.
- Demand response from water treatment plants (desalination) should be considered as a mean to flatten the load curve.
- Islands are a test bed for developing smart energy systems. However, energy systems as a whole cannot be fully tested since not all energy vectors are available on most islands. Further research is needed to go beyond the hybrid generation concept being planned on Greek islands.
- When considering decentralized energy storage, EVs with Vehicle-to-Grid (V2G) capability present a huge potential to provide system services.

4.3.2 SESSION 2: ADDRESSING TOPICS WITHIN THE SCOPE OF ETIP SNET'S WORKING GROUP 1 "RELIABLE, ECONOMIC AND EFFICIENT SMART GRID SYSTEM"

- Use of smart metering as an enabler for new services, new solution needed for smart meters.
- Aggregate and coordinate solutions for flexibility, balancing market operation, RES curtailment mitigation and EV integration.
- Use Virtual Power Plant Systems for an optimal pan-European (cross-border) intelligent balancing mechanism.
- Real-time forecast and advanced dispatching as solutions for managing the transition from energy to balancing markets.
- Improve RD&I attention on resilience by smart means e.g. prosumers, microgrids and smart communities / smart cities.

4.3.3 SESSION 3: ADDRESSING TOPICS WITHIN THE SCOPE OF ETIP SNET'S WORKING GROUP 2 "STORAGE TECHNOLOGIES AND SECTOR INTERFACES" AND WORKING GROUP 3 "FLEXIBLE GENERATION"

- Efficiency and lifetime of BESS strongly depend on the use profile cycling and the technologies.
- There is still a need for focused demonstration projects (with a set of specific applications and technology) so as to understand how storage can be used in the power system.
- Multiservice business models for storage integration is the solution for profitability provided that the system services brought by storage are fairly valued (regulations and market mechanisms) and that the devices are designed for these applications.
- Need for new duty cycle standards so as to give undisputed performance certifications (link with ongoing standard activities, e.g. IEC) for storage systems.
- There is a wide portfolio of storage technologies which fulfil different functionalities. Hybrid systems (e.g. flywheel-BESS-supercapacitors) could help cover a wide range of functionalities.
- When performing numerical simulations of power system components, accurate models that fully cover the physics is still an issue.
- Devices that utilize both photonic and thermal processes for energy conversion could prove to be a complementary dispatchable solar generation solution when coupled to specifically designed thermal cycle and/or (thermal) storage systems.

- CST technologies are already mature and can be combined with conventional power blocks to provide low-carbon forecastable electricity generation.

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”

- Open source and open data initiatives should be encouraged.
- Full digitalization in both transmission and distribution networks is a need.
- Ensure physical and cyber-security in energy system.
- Leverage knowledge of consumer data while respecting privacy and data protection.
- End-user involvement in the development and operation of the energy system.
- Web application that supports multiple users and roles.
- Using external antenna for data collection meets minimal resistance from consumers, but the system is not interoperable.
- More flexibility towards power users - telco services for power distribution network providers, water and gas - 5G required.
- Consider more involvement of social aspects in projects to be more effective with end users. Maybe include social scientists to achieve simplicity and clarity.
- Interoperability for digitization of the energy system is a key issue. More research is needed for understanding how to deal with a system in constant evolution and different lifetimes of technologies (electrical/electronic/ICT equipment).

5. REGIONAL WORKSHOP 4 (DENMARK, ESTONIA, FINLAND, ICELAND, LATVIA, LITHUANIA, NORWAY AND SWEDEN)

The fourth workshop was held in Riga (Latvia) on the 7th and 8th of December, 2017. The workshop [agenda](#) 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 displayed in the table below:

Table 11 – Projects presented at the workshop 4

Project	Country	Purpose	Speaker	Link to presentation
Session 1: Projects addressing topics within the scope of ETIP SNET's Working Group 1 (WG1): "Reliable, economic and efficient smart grid system"				
The FlexNett Project	Norway	FlexNett will increase future smart grid distribution flexibility in a cost effective, sustainable and reliable way. This will be done by demonstrating and verifying technical flexibility solutions in the market on different grid levels, benefitting different actors. The purpose is to identify the effect of solar production on flexibility. Firstly, the project will enable more efficient management of IT-security related to surveillance and control in the distribution grid. Secondly, it will manage people's privacy with increased surveillance and control. Furthermore, the project will evaluate how flexibility can be available to third parties.	Bernt A. BREMDAL (Smart Innovation Østfold)	Link
The STRONgrid Project	Latvia	The overall objective in STRONgrid is to develop knowledge and solutions to improve security and efficiency in operation and control of the next generation of systems.	Anna MUTULE (IPE)	Link
Improved Modelling of Electric Loads for Enabling Demand Response by Applying Physical and Data-Driven Models	Finland	The aim is to develop enhanced models for load and control response forecasting required by dynamic on-line optimisation of demand response (DR) actions and network operation in a future sustainable energy system.	Anna KULMALA (VTT)	Link
Session 2: Projects addressing topics within the scope of ETIP SNET's Working Group 2 (WG2): "Storage technologies and sector interfaces"				

The EI upgraded biogas Project	Denmark	The project shall on a scale of 10 Nm ³ /h demonstrate highly efficient upgrading of biogas to pipeline quality by catalytic conversion of the CO ₂ content in the biogas to methane by reaction with hydrogen produced from steam in a Solid Oxide Electrolyzer. In parallel, a full-scale plant will be designed and the economic aspects evaluated.	John HANSEN Topsøe A/S)	Bøgild (Haldor)	Link
The Hydro Balance Project	Norway	Large-scale balancing and energy storage from Norwegian hydropower. Hydro Balance will: - Draw a picture of potential future uses of hydropower flexibility and storage up to the year 2050; - Assess the need for flexibility and storage by Norwegian hydropower; - Investigate how balancing as a service provided by hydropower may enter the markets, and assess economic opportunities; - Examine environmental impacts of new operational regimes in reservoirs, and how to mitigate these; - Analyse challenges in terms of regulatory framework, policy, public acceptance and economic conditions; - Summarise results throughout the project in a roadmap for large-scale energy balancing and storage from Norwegian hydropower.	Michael BELSNES	Martin (SINTEF)	Link
The Multi-objective role of battery energy storages in energy system Project	Finland	The project aims at defining and verifying optimal operation strategies for the battery energy systems in different use cases. With optimal operation strategy, the battery storage system is charged and discharged in a multi-use way which provides the least socio-economic costs and best economic result for the battery operator. The target of the project is to define and verify this kind of strategies in practise with existing storage installations in the present operational and electricity market environment.	Ville (Lappeenranta University of Technology)	TIKKA of	Link
The High Temperature Thermal Energy Storage Project	Denmark	The limit on how much non-controllable, renewable energy the current Danish energy network can manage is about to be reached. Over the next year, SEAS-NVE will, in collaboration with DTU Energy, Aarhus University Geoscience, Danish Energy Association, Energinet.dk and Rockwool, try to come up with an innovative solution to the problem by developing a high-temperature thermal storage solution, in which the energy is stored in rock heated up to 600 degrees with air from an electric fan heater. The ambition is to implement the solution on a large scale throughout Denmark at competitive prices, while addressing the challenge of saving large amounts of energy in a cheap and environmentally friendly manner.	Eva LAURITSEN	SASS (SEAS-NVE)	Link
Session 3: Projects addressing topics within the scope of ETIP SNET's Working Group 3 (WG3): "Flexible Generation"					
Flexible use of biomass on PF power plants	Denmark	The project will provide tools that support the conversion of Danish pulverized-fuel fired boilers from coal to biomass.	Peter JENSEN	Arendt (EUDP)	Link
The VaGe Project	Finland	Power/energy system simulations with high shares of renewables, enabling optimisation for storage time scales (up to 10 days) and wind/PV forecasting with uncertainty estimates in different time scales.	Juha (VTT)	KIVILUOMA	Link
The Flex4RES Project	Latvia & Denmark	The project "Flexibility for Variable Renewable Energy Integration in the Nordic Energy Systems" will assess how to integrate and consolidate different energy markets to make a solid base to anchor resilient, sustainable, cost-efficient and coherent Nordic energy systems in 2050.	Prof. BLUMBERGA	Dagnija (Riga Technical University)	Link

Session 4: Projects addressing topics within the scope of ETIP SNET's Working Group 4 (WG4): "Digitisation of the electricity system and Customer participation"				
The Estfeed Project	Estonia	Estfeed is a data sharing platform between data sources and application. It allows network companies, energy producers, other energy service providers and consumers to interact more efficiently and make energy consumption data understandable and usable for end users. The objective of the project is to create a smart grid data exchange platform that allows market players to access energy consumption information securely and transparently from one platform, understand the needs related to the metering point and change their behaviour accordingly. Estfeed brings together data sources and applications. Data sources range from electricity, gas and district heating smart meter readings to weather forecast and energy day-ahead prices. It also can be consumption information from individual devices in industry, offices, and households.	Kaija VALDMAA (Elering)	Link
The IHSMAG Project	Norway	IHSMAG (Integrating households in the smart grid) contributes with new knowledge on how to develop a comprehensive design of household smart grid solutions that integrates the specific characteristics of the three domains that intersect at the household level: 1. Technologies in households; 2. Electricity consuming everyday practices of the household member; 3. The electrical system, the administrative and institutional rules that affect the implementation of new smart grid solutions (e.g. standards for home automation and economic incentives).	William THRONSEN (NTNU)	Link
The Digitalization of Vidiškiai transformer substation Project	Lithuania	Vidiškiai 110 kV transformer substation (TS) is a part of the Lithuanian power transmission grid. Substation has been in operation for over 35 years and in 2012 was included in Litgrid's plan of ongoing reconstructions. Substation has been selected to be the first digital substation in the grid. New generation RPA equipment manufactured under IEC 61850 which ensure interoperability in the horizontal communication within the optical data network was introduced. An analysis of the digital substation has led to a conclusion that IEC 61850 equipment has very good prospects as a technology of the future. The number of cables connecting microprocessor equipment and basic equipment in the substation was reduced. If this technology is used consequently the TS reconstruction costs would be cut significantly, due to minimization of cable communications between units. This, in turn, would lead to the reduced need for related secondary circuit equipment. There are however challenges remaining, such as standardization, personnel skills during design and implementation phases, availability and compatibility of equipment.	Audrius BARANAUSKAS (Litgrid)	Link

During this workshop, there were no projects presented from Iceland and Sweden.

5.1.2 ROUNDTABLES

Four roundtables were held during the workshop, moderated by Rainer BACHER and Eric PEIRANO. They were devoted to questions and different exchanges between the speakers of the projects presented, the representatives from EERA, EASE, EDSO for Smart Grids, ENTSO-E and the respective representatives of the different ETIP SNET Working Groups. The table below shows the participants in each roundtable.

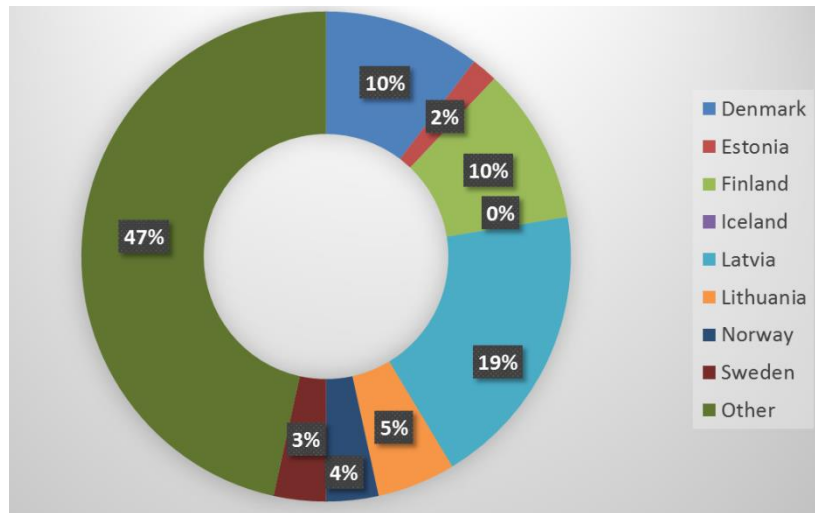
Table 12 – Participants in roundtables at the fourth regional workshop

Roundtable nr.	Participants
1	<ul style="list-style-type: none"> • Anna KULMALA (VTT, WG1 Representative) • Cristina GOMEZ SIMON (ENTSO-E) • Florian GONZALEZ (EDSO) • Irina OLEINIKOVA (EERA) • Bernt A. BREMDAL (Smart Innovation Østfold) • Anna MUTULE (IPE) • Rainer BACHER (ETIP SNET Support Team, BACHER)
2	<ul style="list-style-type: none"> • Cristina GOMEZ SIMON (ENTSO-E, WG2 Representative) • Marine DELHOMMEAU (EASE) • Anna KULMALA (EERA) • John Bøgild HANSEN (Haldor Topsøe A/S) • Michael Martin BELSNES (SINTEF) • Ville TIKKA (Lappeenranta University of Technology) • Eva SASS LAURITSEN (SEAS-NVE) • Eric PEIRANO (ETIP SNET Support Team, TECHNOFI)
3	<ul style="list-style-type: none"> • Eric PEIRANO (TECHNOFI, WG3 Representative, ETIP SNET Support Team) • Henrik BINDNER (EERA) • Peter Arendt JENSEN (EUDP) • Juha KIVILUOMA (VTT) • Prof. Dagnija BLUMBERGA (Riga Technical University)
4	<ul style="list-style-type: none"> • George HUITEMA, TNO, WG4 Representative • Anna KULMALA (EERA) • Kaija VALDMAA (Elering) • William THRONSEN (NTNU) • Audrius BARANAUSKAS (Litgrid) • Rainer BACHER. (ETIP SNET Support Team, BACHER)

5.1.3 LIST OF ATTENDEES

Around 55 participants attended the workshop. The distribution of participants by country is provided in the figure below:

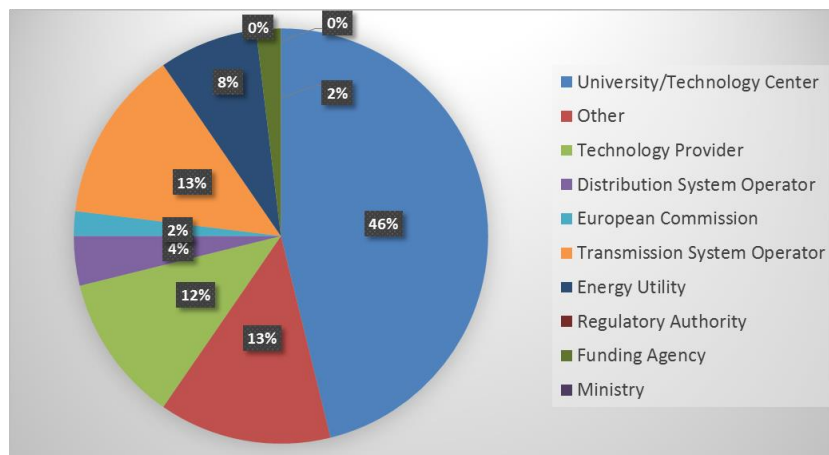
Figure 7 – Distribution of participants by country



It can be noticed that around 50 % of the attendees were from the countries of the Northern region and the rest were from different countries of the world. For instance, the participants coming from other countries located outside of the Northern region are¹: UK, Czech Republic, Netherlands, Egypt, Germany, Greece, Hungary, Indian, Libya, Romania, Russia, Spain and USA.

In addition, the following figure shows the distribution of participants by their type of organization:

Figure 8 – Distribution of participants by type of organization



Almost 50% of the audience comes from University/Technology Centres, 13% from TSOs and the category “Other” (mostly consultants) and 12% Technology providers.

¹ The countries enlisted do not take into account the origin countries of the INTENSYS4EU consortium (Associations: ENTSO-E, EDSO and EASE and the ETIP-SNET Support team) to better illustrate the countries represented by the attendees.

5.2 MAIN QUESTIONS FROM THE PROJECTS' Q&A SESSIONS

Each project presentation has been followed by a session of questions and discussions (5 minutes for each session). The main questions and comments are collected in the table below:

Table 13 – Main questions and comments by project

Project	Country	Main Questions & comments
Session 1: Projects addressing topics within the scope of ETIP SNET's Working Group 1 (WG1): "Reliable, economic and efficient smart grid system"		
The FlexNett Project	Norway	<p>The availability of calculations about community-shared BESS and hybrid systems by the project were discussed.</p> <p>It has been highlighted that the adequate emplacement of PV panels in Norway (inclination of 45°C and orientation) is fundamental for optimising the energy conversion. The difficulty of retrofit in facilities where the PV panels are not well positioned is very high. Communication campaigns to inform prosumers about these issues are still missing.</p> <p>Sharing data issues between regulated players were discussed (1 TSO and 6 DSOS participate in the project). Transparency and trust are fundamental for these activities. Data ownership problems were evoked.</p> <p>Storage and DR market based services issues were commented: energy prices fluctuation does not favour business cases with these technologies in Nordic countries.</p> <p>The use of EV batteries for V2G applications were debated: how to deal with the charging and discharging wear of the battery? Who is paying for that? How to proper measure the lifespan of the battery? How the automotive sector is dealing with these business cases?</p>
The STRONgrid Project	Latvia	<p>The use of PMUs in operation and control activities by TSOs was debated.</p> <p>The adoption of standards and interoperability for PMUs were evoked: there are issues of standardisation for real-time data exchange and software application systems.</p> <p>The collaboration between research institutes and technical centres and the STRONgrid project was emphasized: exchange of technical equipment and data from real use cases to foster research.</p>
Improved Modelling of Electric Loads for Enabling Demand Response by Applying Physical and Data-Driven Models	Finland	<p>Questions about the difficulty of modelling methods for active demand were raised.</p> <p>Discussions about the exchange of information between system operators and aggregators were held. In addition, the methodology and protocols to determine the perimeter of control of different aggregators was debated: how to determine if one house is under the control of one, 2, or more aggregators when providing ancillary services? How to achieve reliable data towards this issue? Legal issues were discussed.</p>
Session 2: Projects addressing topics within the scope of ETIP SNET's Working Group 2 (WG2): "Storage technologies and sector interfaces"		
The EI upgraded biogas Project	Denmark	<p>It has been stated that the competition between SNG and natural gas itself, is very difficult because of the lack of subsidies for the first one.</p> <p>The need for further development of technologies allowing sector-coupling (Power to X-[including mobility- batteries and fuel cells]) was highlighted.</p> <p>The flexibility provided by biogas plants when operating was highlighted. The challenges to speed up the "cold start" (~10h) were also evoked.</p>

The Hydro Balance Project	Norway	The <i>pros and cons</i> of the very high Norwegian storage hydro capacity were discussed: High potential and economic viability vs societal acceptance and environmental impact. Automation of operation and trading, new hydro technology and artificial intelligence for modernisation of PHS were mentioned: optimisation of operation and reinvestment costs.
The Multi-objective role of battery energy storages in energy system Project	Finland	The interoperability difficulties about the integration of different BESS technologies, connected at different voltage levels, and providing different multiple services were debated: standards, communication protocols and innovative business cases. The Clean Energy Package regarding the ownership of BESS by DSOs was also discussed (articles 36 and 54).
The High Temperature Thermal Energy Storage Project	Denmark	Discussions about the efficiency rate (40% - electricity and over 95% for heating) of the rock-innovative technology presented were held. This ambitious project has shown that large-scale high temperature thermal storage would highly favour cross-sector interfaces such as power-to-heat with very competitive solutions. So as electricity storage at competitive prices.
Session 3: Projects addressing topics within the scope of ETIP SNET's Working Group 3 (WG3): "Flexible Generation"		
Flexible use of biomass on PF power plants	Denmark	Flexibility limitations about this technology were debated: hard to deal with very low loads when using biomass plant because of the unburned fuel which could result in safety issues. It has been explained that the type of technology presented could provide flexibility to support high-RES penetration. Ramping up issues were also evoked. Ashes recycling aspects were discussed: the use of additives and other substances (e.g. metals) contained in the ashes mix is a major issue.
The VaGe Project	Finland	It has been mentioned that estimating forecasting errors could create an impact in the distributed heaters (i.e. Real Value project collaboration) when going beyond the comfort zone in the demo houses. From the household perspective, the economic compensation is maybe not that important for the mentioned business cases so this may represent a very big issue when deploying the solutions. The project SPINEi would continue with the development and accuracy of the main model. Questions about the timescale resolution of the simulations and the way to introduce different kind of constraints in the simulations (market-oriented, flexibility...) were answered.
The Flex4RES Project	Latvia & Denmark	Discussions about how to identify and evaluate regulatory and technical pathways to foster the energy transition in Nordic countries have taken place: flexible supply vs flexible demand. More research is still needed. Heat pump and boilers (heat-electricity) prices were also discussed from the tables showed in the presentation.
Session 4: Projects addressing topics within the scope of ETIP SNET's Working Group 4 (WG4): "Digitisation of the electricity system and Customer participation"		
The Estfeed Project	Estonia	The smart metering (100 % electricity and 80% gas) deployment in Estonia has been commented. Data accessibility and ownership have been discussed. Different applications of the Estfeed platform have been explained: i.e. the use of IoT sensors by telecom companies in order to provide real-time data for the service providers. Examples about ESCOs have been mentioned as well. The challenging business model(s) of the multi-sided platform has/have been debated: who will have to pay for the platform? Would the cost be absorbed by the grid tariff? At this stage the platform is still in free access. Issues about the value proposition definition for all the stakeholders have been commented. One of the main technical challenges exposed was the real-time data provision for some services (i.e. for flexibility services) and also the technical and security barriers for cross-country data exchange.

The IHSMAG Project	Norway	<p>The importance of a “loud and clear” message could be enough to keep stakeholders involved and interested in demo projects: cognitive business, influencing factors, etc.</p> <p>The prediction of social behaviour with calculations and its impact have been discussed (Modelling - Project MATCH).</p> <p>The peer effect and role of gamification in this kind of projects was commented.</p>
The Digitalization of Vidiškiai transformer substation Project	Lithuania	<p>The lack of standards and standardisation issues for software were raised: merging and switchgear control units. Is the IEC 61850 standard not being adopted fast enough? Should incentives/subsidies be required?</p> <p>The need of creating a design tool to foster improvement of substations has been discussed: similar projects and design issues in Spain were also mentioned. Should EU TSOs have to enhance their collaboration about these issues to improve the digitalization of substations in a reliable and secure manner? Another major prerequisite for step forward is a development of the equipment in which the standard is released.</p>

5.3 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.

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

- Yield of PV in Scandinavian countries can be optimized for system operation with suitable orientation (east-west) and tilt (42°).
- V2G applications provide support for short-time scale services (balancing, possibly energy for intra-day markets). Additionally, fast charging provides better opportunities for power applications.
- PMUs can provide a wide-range of monitoring functionalities but also control signals. Modern PMUs follow common standards that guarantee homogeneous and fully synchronous measurements.
- Hybrid models (machine-learning and physics-based) provide a reliable framework to accurately model load and demand response.
- More research is need to understand how to organize flexibility-based markets optimizing social welfare, and how to design the associated policies

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

- Coupling SOEC (H₂) and biogas production (CH₄, CO₂) allows to reach very high system efficiency in terms of SNG production. There is a challenge to speed up the "cold start" (~10h), although there is a very high flexibility when operating (few seconds to ramp up and down).
- Under future pan-European market conditions, PHS is competitive even when accounting for externalities and necessary network reinforcements.
- When managing a heterogeneous (technology and characteristics) portfolio of batteries providing multi-services, connected at different voltage levels, two main challenges remain: to solve complex optimisation problems to recover the maximum economic value and to develop communication infrastructure with standardized protocols so as to ensure full interoperability.
- Large-scale high-temperature thermal storage can provide market-competitive solutions for network coupling (electricity-heat) and large-scale electricity storage.
- The electrification path of the energy system should account for the needs of industry in "renewable carbon" (chemicals, concrete, etc.).

- Regulatory framework changes and more research is needed to foster a decarbonised energy system including efficient and cost-competitive cross-sectorial interfaces (Power-to-X) and different energy storage sources.

5.3.3 SESSION 3: ADDRESSING TOPICS WITHIN THE SCOPE OF ETIP SNET'S WORKING GROUP 3 "FLEXIBLE GENERATION"

- Bio-fuel flexibility for pulverized-fuel boilers is technically feasible. There remain several R&I challenges relative to fuel storage, fuel properties, deposits and ash formation, and corrosion. Innovative additives might provide solutions. There are also R&I challenges regarding operating conditions at partial loads.
- DR from thermal storage must account both for thermal inertia of the building and the variation of the outdoor temperatures.
- The technical requirements for generation, conversion, storage units of the energy system must be specified based upon system analyses.
- System analysis is a multi-time-scale problem: operation, asset management and planning must be addressed jointly.
- System analyses, forecasting tools, etc. require high-quality data sets, which are already available in many European countries, under different licensing terms.

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"

- Interoperable multi-sided platforms operated by regulated players can provide a unique cross-country data exchange layer/platform between data hubs and service providers (applications) fostering the advent of different services offered by market players while maximizing social welfare.
- There is a need for a coordination initiative at EU level dealing with all kinds of stakeholders' data (and data model) aiming at an inventory in order to facilitate the access to this data (e.g. ENTSO-E transparency platform, CGM (Common grid model), etc.).
- When engaging customers in DR, non-economic arguments should also be considered.
- Energy literacy (understanding) is needed so that consumers engage in new technologies and uses.
- Research and Implementation complement each other. Learning from innovation application reveals the barriers faster especially when innovation happens fast.
- Evolving training methodologies (knowledge and skills) are needed to accompany the very dynamic digitisation environment.



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This publication has been developed in the frame of the INTENSYS4EU project,
co-funded under the Horizon 2020 Programme

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