ETIP SNET

EUROPEAN TECHNOLOGY AND INNOVATION PLATFORM

SMART NETWORKS FOR ENERGY TRANSITION

D3.3 Minutes of the regional workshops 2019

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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, 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, 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

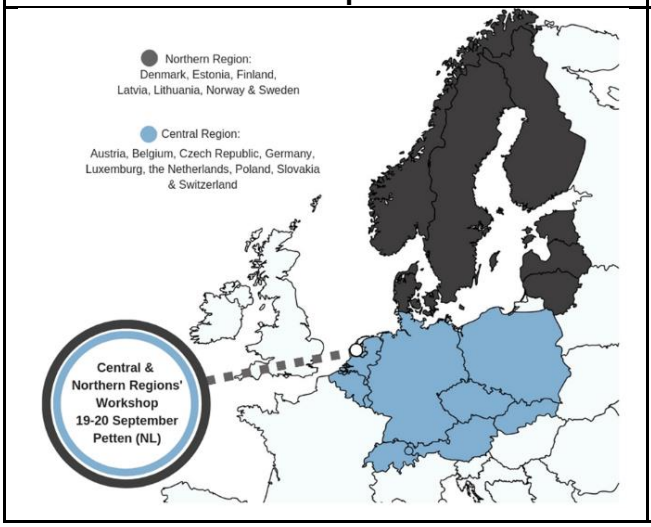
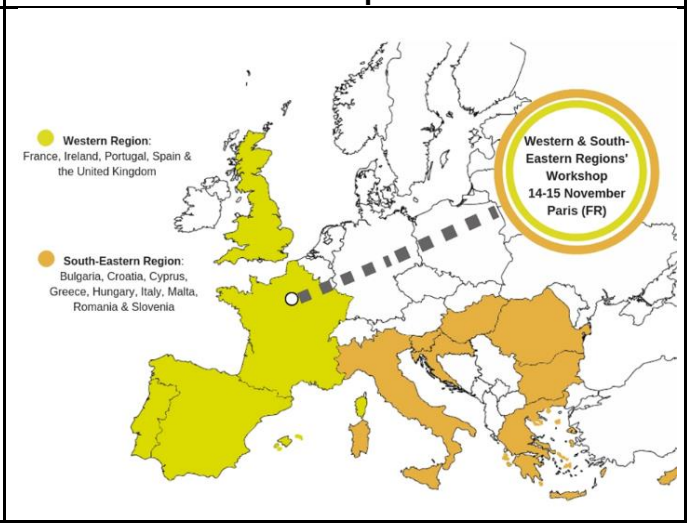
In 2017 and 2018, 4 workshops per year were organised (please see https://www.etip-snet.eu/regional-workshops/).

Based on the feedback from the 2018 regional workshops, the four regions were combined to foster knowledge sharing between regions of similar contexts.

In 2019, two workshops were set between September and December 2019:

- one workshop mixing projects from the central and northern regions and
- one workshop with projects from the western and eastern regions.

Table 1 – Planning for the 2 regional knowledge sharing workshops

Workshop nr. 1	Workshop nr. 2
	

1.2.2 PROGRAMME OF THE KNOWLEDGE SHARING WORKSHOPS

The 2 workshops are held over 1.5 days for the one in Petten and over 2 half days for the one in Paris, according to the agenda below (adjusted depending on logistical constraints and number of projects presented):

DAY 1		
30 min.	*Registration and Welcome Coffee*	
Introduction Plenary session		
10 min.	Host	Welcoming words
10 min.	European Commission	Horizon Europe Presentation
10 min.	ETIP SNET Vice-Chair	ETIP SNET: for an innovative and successful European energy transition
15 min.	ETIP SNET WG5 representatives	Presentation of the scope and activities of WG5. Projects' support during the workshop
Parallel sessions 1 on Projects' results		
	Reliable, economic and efficient smart grid system	Storage technologies and sector interfaces
10 min.	WG1 representative: scope of WG1 + expectations from projects to feed WG work	WG2 representative: scope of WG2 + expectations from projects to feed WG work
20 min.	Project (country), speaker (company) + Q&A (5 min)	Project (country), speaker (company) + Q&A (5 min)
20 min.	Project (country), speaker (company) + Q&A (5 min)	Project (country), speaker (company) + Q&A (5 min)
20 min.	Project (country), speaker (company) + Q&A (5 min)	Project (country), speaker (company) + Q&A (5 min)
30 min.	ETIP SNET support team Roundtable Confrontation of national opinions, collection and prioritization of R&I topics	ETIP SNET support team Roundtable Confrontation of national opinions, collection and prioritization of R&I topics
20 min.	*Break*	
Plenary session: Conclusions from parallel sessions 1, pathways to innovation and ETIP SNET roadmap/IP		
30 min.	ETIP SNET support team	Identification of main recommendations from projects' presentations and roundtables' discussions
30 min.	ETIP SNET WG5	Recommendations from WG5 in terms of "Innovation implementation in the business environment" for the projects presented during the parallel sessions 1
30 min.	ETIP SNET Support Team: ETIP SNET Roadmap / IP	Interactive discussions with the projects on ETIP SNET Roadmap/ IP

DAY 2		
30 min.	*Welcome and Registration*	
Parallel sessions 2 on Projects' results		
	Flexible generation	Digitisation of the electricity system and Customer participation
10 min.	WG3 representative: scope of WG3 + expectations from projects to feed WG work	WG4 representative: scope of WG4 + expectations from projects to feed WG work
20 min.	Project (country), speaker (company) + Q&A (5 min)	Project (country), speaker (company) + Q&A (5 min)
20 min.	Project (country), speaker (company) + Q&A (5 min)	Project (country), speaker (company) + Q&A (5 min)
20 min.	Project (country), speaker (company) + Q&A (5 min)	Project (country), speaker (company) + Q&A (5 min)
30 min.	ETIP SNET support team Roundtable Confrontation of national opinions, collection and prioritization of R&I topics	ETIP SNET support team Roundtable Confrontation of national opinions, collection and prioritization of R&I topics
30 min.	*Break*	

Plenary session: Conclusions from parallel sessions 2, pathways to innovation and ETIP SNET roadmap IP		
30 min.	ETIP SNET support team	Identification of main recommendations from projects' presentations and roundtables' discussions
30 min.	ETIP SNET WG5	Recommendations from WG5 in terms of "Innovation implementation in the business environment" for the projects presented during the parallel sessions 1
30 min.	ETIP SNET Support Team: ETIP SNET Roadmap / IP	Interactive discussions with the projects on ETIP SNET Roadmap/ IP
Conclusion		
15 min.	ETIP SNET Support Team	Main conclusions from the workshop
10 min.	Host	Closing words

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;
- Recommendations for innovation implementation in the business environment;
- The results of the interactive discussions with the projects on the next ETIP SNET Roadmap / IP.

2. REGIONAL WORKSHOP IN PETTEN (NORTHERN AND CENTRAL REGION)

The first workshop of the year 2019 was held in Petten, The Netherlands, the 19-20th of September 2019 in the TNO Premises.

2.1 PROJECTS AND PARTICIPANTS IN THE WORKSHOP

2.1.1 R&I PROJECTS PRESENTED

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

Table 2 – Projects presented at the workshop in Petten

Project	Country	Purpose	Speaker	Link to presentation
Introduction Plenary session				
Dynamic Modeling Energy Pathways project	The Netherlands	The project aims at modelling the system transition, trying to quantify the impact of the solutions w.r.t sustainability ambitions, being able to monitor and manage the transition itself. It is about data acquisition, system description languages, simulation tools and communication about the results in such a way decision maker can base their decisions on it. The modelling approach was applied to the Island case of Ameland.	Richard Westerga	Link
Session on Reliable, economic and efficient smart grid system				
VINPOWER	Finland	The main objective of the VINPOWER project is the development of the expertise based Smart Grid Innovation environment at the University of Vaasa (Living Labs) and a platform focusing on the development of a physical research environment related to smart-grids system. The project provides new knowledge and concepts to the industry and promotes the utilization of new technology in power distribution like improved solutions to the protection and fault location of long MV cable feeder. Relevant use cases were developed for the Sundom Smart Grid Living lab (SSG).	Katja Sirviö	Link
FutureGas	Denmark	The project analyses the gas chain from supply to regulation in order to foresee the future of the gas in an energy transition context: efficient production and use of green gases including potential conditioning to natural gas quality, flexible use of gas also for transport, district heating, system integration, as well as application of measures to ensure an economically efficient use of gas. As a key part of the project, Danish energy system models are improved by including the comprehensive gas system, integration of green gas technologies, storage and smart use of gas, national and international transmission links, as well as improved	Rasmus Bramstoft	Link

		mathematical modelling. Energy system integration is key in this project as well as markets and regulation analyses to provide recommendations. Data are open source and available/applicable for other countries. Results are today used by the Danish Energy Authorities.		
ETIP SNET WG1 "White paper on sector coupling"		Among other activities, ETIP SNET WG1 is elaborating a white paper about "Sector coupling concepts and frameworks". This white Paper intends to be both Tutorial and Position Paper. It will cover and map technologies and processes with technical details including Role of storage for sector coupling, power to heating and cooling, power to mobility and power to carbon-neutral gas/fuels.	Antonio Iliceto	Link
PRIBAS: Pricing balances services in the future Nordic power market	Norway	The objective of the PRIBAS project is the design, development and verification of a multi-market model concept able to compute marginal prices for all physical electricity products in the Nordic power market, including different types of reserve capacity and balancing energy, flexible consumption and local storages. It is a Knowledge building project as basis for future market model development and initial analysis for future short-term market design in the Nordics.	Stefan Jaehnert	Link
Session on Storage technologies and sector interfaces				
Large-Scale Energy Storage in Salt Caverns and Depleted Gas Fields	The Netherlands	The projects aims to provide a technical assessment of the various options for the underground energy storage in the Netherlands. The technologies investigated are the ones that can support the large-scale increase of renewables, secure energy supply, and can be implemented in the subsurface (more efficient way!) and deployed within the next 10-30 years. The choice of the right storage can guarantee flexibility both for short-term (day) and long-term (monthly, seasonal) . Among the different options (P_tG, CAES, Hydrogen…) a technical, economic and spatial analysis is performed also in order to identify possible knowledge gaps. The analysis also includes an evaluation on how much these technologies will contribute to flexibily and security of supply on a regional level. Public acceptance issues and lack of incentives and industry investments are the main barriers to be challenged.	Serge van Gessel	Link
Energy Lab 2.0 & Kopernikus Project "P2X"	Germany	Two projects were presented: Energy Lab 2.0 and Kopernikus. Energy Lab 2.0 is a large-scale research infrastructure for the research on the interaction of components for future (2050) energy systems and the testing of new approaches to stabilise energy grids (with demonstrations until 2030). In order to understand and control such interactions, new methods for simulation and analysis are being developed and tested at the "Smart Energy System Simulation and Control Center" (SEnSSiCC). The SEnSSiCC serves as a central platform for the investigation and development of smart interlinked energy systems in the Energy Lab 2.0 (EL2.0). The focus is on sector coupling. EL2.0 demonstrates the successful integration of RES in the power grid, by a dynamic process to follow the fluctuations.	Michael Klumpp	Link

		The Kopernikus project (integrated inside the EL2.0) aims at exploration, validation and implementation of “Power to X” concepts (from electricity and air to liquid hydrocarbons and synthesised fuel). These technologies have the potential for sector coupling and CO_2 reduction.		
StoreITup-IF	Austria	Developing thermal energy storage is the main objective of StoreITup project (short term).The goal is to create solutions that are scalable (from kW to MW), and to create a flexible charging/discharging system, through heat storage and using phase changing polymers (PCM, Phase Change Material). The main advantage is that the polymers can be compounded, resized (thanks to modular design in order to influence capacity and power), recycled, created and reused by fully sustainable (circular) processes. The goal is to obtain certified polymers, following industrial standards, to be able to enter into the market. The next step is the creation of a demonstration project.	Christoph Zauner	Link
INVADE	Norway	This project delivers a cloud-based flexibility management platform where electric vehicles and battery storages at mobile, distributed and centralised levels are integrated. The platform is tested and verified in 5 pilots in Bulgaria, The Netherlands, Germany, Spain and Norway. New business models were developed related to flexibility management at distributed storage facilities and smart EV charging facilities. The Flexibility Operator (FO) is one of them. Recommendations were provided for regulations and standards for flexibility management using batteries and smart EV charging. The innovative approach in the INVADE project is the exploitation phase which was started from the very beginning (instead of at the end of the project). The key idea was the successful idea of “learning by doing”.	Dieter Hirdes	Link
Session on Flexibility at the level of the network and for conventional generation technologies				
LEAFS	Austria	The aims of the project are the development, field testing and analysis of advanced flexibility schemes for LV networks, based on the integration of loads and electric storage systems. The schemes shall allow the grid friendly activation of flexibility for market services and increase the possible penetration of distributed generation in LV grids. The project is demonstrated by 4 main concepts in fields trials: the first concept implements a separate remote control for grid control and market services to activate flexibility (PV-BESS); the second also uses PV-BESS, but the DSO controls the system as single entity for grid control and provision of market services (not as a market participation but as a platform operator). The third concept is a community storage. The forth is with monetary bonus for end customers.	Johannes Kathan	Link
Flexturbine	Czech Republic	FLEXTURBINE aims to strongly advance state-of-the-art fossil fuel power plant engine technology, enhancing the turbomachinery performances and service life under flexible operation conditions. The project focused on improved flutter-resistant turbine blade design, improved seal and bearing design and improved life	Alexander Wiedermann	Link

		cycle management. The project provides the technology basis for the next generation of flexible turbomachinery essential to enable transition to low carbon-emission power generation.		
FLEXITES	Germany	The project aims at supporting grid integration of RE (Renewable Energy) through a more flexible operation of remaining conventional power generation, thanks to thermal energy storage (TES) systems. Different plant configurations, with different storage schemes, have been studied, to improve load gradients, reduce minimal loads to avoid cold starts, increase the capability to participate in reserve, intraday, day-ahead markets. The project concluded that, despite the proved effectiveness of TES integration, revenues are currently too low to make this solution possible today.	Stefan Zunft	Link
SOFlex'hy	France	The project is about Solar-Wind-Hydro Virtual Power Plant (HPP) and the aim is to give proof of concept of a VPP with existing generation hydro power plants with nearby renewables in a same network area. It is important to create the day-ahead forecasting of the renewables to send it to the HPP in order to fulfil the gap between forecast and real-time states in the right moment. These new services can be provided at a low cost. Cyber-security issues has been analysed and tested for the different stakeholders.	Jean-Francois Balmitgere	Link
Session on Digitisation of the electricity system and Customer participation				
ITCity	Latvia	The ITCity project aimed at developing an Intelligent ICT framework to support EU and LAC (Latin American and Caribbean) cities in their transformation into Smart Cities with key focus on intelligent use of energy and digital services implementation, achieving social, economic and environment sustainable solutions. A functional architecture and structure of a game platform was elaborated, to collect energy consumption data from residences in developing countries. The main goal of the platform is to collect data on energy appliances that make possible the prediction of energy consumption in residences. The platform with gamification principles was created based on the Tamagotchi game principles, with the use of visual elements - an aquarium, where a small fish will evolve or not during the game, depending on successful challenges solving by users by quick answering the questions about energy consumption at home. The implementation in a very large diversity of district and cities allowed the evaluation of the knowledge and increased awareness of citizen about smart cities and specify patterns behaviour.	Ivars Zikmanis	Link
Connected Buildings	Belgium	Beyond the 'Connected Buildings' study, the project aims at accelerating the transition of the energy sector by delivering easy-to-use energy services for consumers and small companies. 'Connected Buildings' was during a period of 6 months involved in the Flux50 Innovator Zone Energy Cloud Platforms. A total package of innovative energy measurements and service models leads to greater	Miha Sajko	Link

		comfort and energy cost savings at home. By using real-time energy data obtained by low-cost sensors and other internet of things data sources, different services for residential users can be provided for home renovation. The 3 key steps are a) the digitization of the energy audit, installing the device and advising the customer on the energy solution and appropriate suppliers, then b) monitor the installation and finally c) validate that it is working to provide a quality assurance.		
WIVE (Wireless for Verticals)	Finland	The WIVE project designed and implemented a communication platform to support a cost-effective development and testing of 4G/5G and IoT technology components for smart grid monitoring, control, and protection in realistic environments. The platform enables more integrated development of new products and services from both energy and communications sides. The platform offers several core, cloud core, and radio access network alternatives and data connections to other test sites across Finland to test wide area services. A wide geographic area was tested: 3 cities separated by hundreds of km, different type of services and infrastructures and 6 pilots connected to each other.	Seppo Horsmanheimo	Link
Cyber-phySicAl security for the Low-VoltAGE grids - "SALVAGE"	*Poland*	The purpose of the SALVAGE project is to develop better support for managing and designing a secure future smart grid. This approach includes cyber security technologies dedicated to power grid operation as well as support for the migration to the future smart grid solutions, including the legacy of ICT that necessarily will be part of it. The objective is further to develop cyber security technology and methodology optimized with the particular needs and context of the power industry. Today, this is to a large extent lacking in general cyber security best practices and technologies. The focus of the project is on smart grid with many small distributed energy resources, in particular LV substation automation systems and LV distribution system.	*Project briefly presented by ETIP SNET Support team based on the initial presentation prepared by Robert Czechowski*	Link

2.1.2 ROUNDTABLES

Four roundtables were held during the workshop, moderated by members of the INTENSYS4EU support team (BACHER, DOWEL, RSE, EASE). The four were devoted to questions and different exchanges between the speakers of the projects presented and the respective representatives of the different ETIP SNET Working Groups. The table below shows the participants in each roundtable.

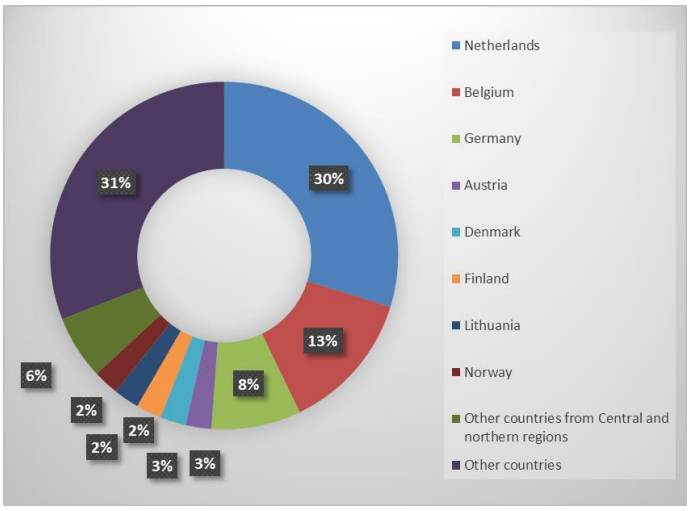
Table 3 – Participants in roundtables at the workshop in Petten

Roundtables	Participants
Reliable, economic and efficient smart grid system	• Gareth Bissell (ETIP SNET WG1 representative) • Antonio Negri (ETIP SNET support team) • Katja Sirviö (University of Vaasa) • Rasmus Bramstoft (DTU) • Stefan Jaehnert (SINTEF Energy Research) • Michael Laubenheimer (ETIP SNET WG5 representative)
Storage technologies and sector interfaces	• Davide Grazioli (ETIP SNET WG2 representative) • Brittney Elzarei (ETIP SNET support team) • Serge van Gessel (TNO) • Michael Klumpp (KIT) • Christoph Zauner (AIT) • Dieter Hirdes (Smart Innovation Norway AS)
Flexibility at the level of the network and for conventional generation technologies	• Alexander Wiedermann (ETIP SNET WG3 representative) • Coralie Badajoz (ETIP SNET support team) • Johannes Kathan (AIT) • Stefan Zunft (DLR) • Jean-Francois Balmitgere (EDF)
Digitisation of the electricity system and Customer participation	• Mark Mcgranaghan (ETIP SNET WG4 representative) • Rainer Bacher (ETIP SNET support team) • Ivars Zikmanis (IPE) • Miha Sajko (June energy) • Seppo Horsmanheimo (VTT) • Esther Hardi (ETIP SNET WG4 representative)

2.1.3 LIST OF ATTENDEES

Around 85 participants were registered for the workshop. The distribution of participants by country is provided in the figure below:

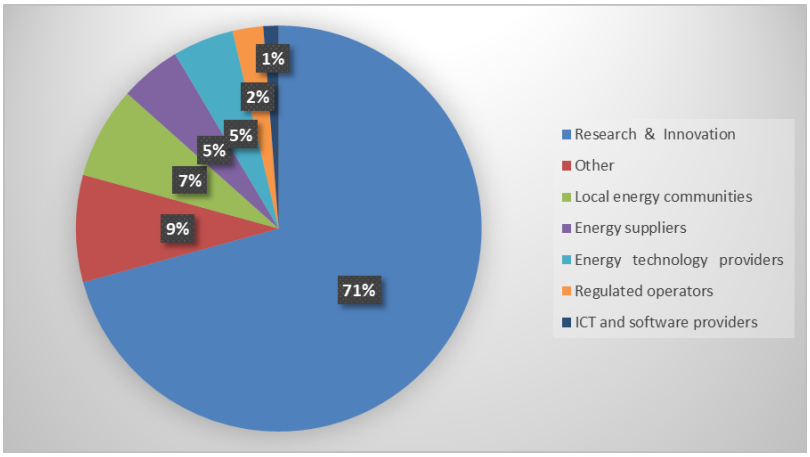
Figure 1 – Distribution of participants by country



The three main countries represented are Netherlands (30%), Belgium (13%) and Germany (8%). 31% of the participants were coming from other countries located outside of the central and northern regions: France and Italy are the most represented.

Moreover, the following figure gives an indication of the distribution of participants by their type of organization[1]:

Figure 2 – Distribution of participants by organization



It can be pointed out that 71% of the audience comes from Research and Innovation Centres 9% from “Other category” (European Commission, ETIP SNET support team) and 7% from local energy communities.

[1] **Regulated operators** are TSOs and DSOs as defined by the Electricity and Gas Directives; **Energy technology providers** gather manufacturers for energy transmission, distribution, generation, conversion and storage; **ICT and software providers** , include software and telecommunication vendors; **Energy suppliers** include energy retailers, energy generators, energy service companies (ESCOs) or aggregators acting in energy markets; **Research & Innovation** stakeholders include research centres, universities, think-tanks, consultants and other stakeholders providing R&I-based services. **Local energy communities** are defined as associations, non-profit organizations, cooperatives, partnerships

2.2 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 4 – Main questions and comments (Petten)

Project	Country	Main Questions & comments
Introduction Plenary session		
Dynamic Modeling Energy Pathways	The Netherlands	▪ *Regulation is leading to involve the technologies. Are sand boxes needed?* This question was asked to the governmental representatives: It appears that sand boxes will not be enough. Sand boxes regulation in NL is clear but not their application.
Session on Reliable, economic and efficient smart grid system		
VINPOWER	Finland	▪ *What is the Sundom Smart Grid living lab?* It is a digital version of the Vaasa region. It regroups Vaasa energy cluster, VEBIC's Smart Grid Laboratory, DSO, manufacturers and 2 000 consumers. Two years-data are collected and could be utilized by R&D of protection relays, verification of relay algorithms, sales purposes, education (universities), customer training (companies) and AI for proactive fault detection. ▪ *Does the Database with the disturbance library have models available or is it just time series DB? Is it possible to develop intelligent applications with them?* Yes. It is extremely important to have new concepts tested. VINPOWER stressed the collaboration between academia and industry but it is usually difficult: it's a technology transfer from Academia to industry. ▪ In *the other way is it really possible to transfer the results in other projects that need to be funded?* In Vaasa, with the living labs, they are trying to pool it.
FutureGas	Denmark	▪ *PtG depends on price of electricity and availability of the price of biomass. Did you analyse different scenarios?* Electricity mix basically set the process and the internal variables in the model (i.e. they can be computed inside the model itself). Availability of biomass is used as an external variable (i.e. input for the model) and depending on the international and national trades. ▪ Another question that may arise is how to use the biofuels for the aviation, sailing and other transport system.
ETIP SNET WG 1 white paper on Sector Coupling		▪ *In the case where TSOs are not subject to cap global costs (CAPEX and OPEX) and the realization of new infrastructures is being remunerated at a very good WACC, how can we talk about optimization in economic terms and not just implement infrastructures*? A cap in global costs is advisable, see the case of TERNA, the Italian TSO. The suitable regulatory framework has to be established, in order to incentivize the best possible use of the economic resources.
PRIBAS: Pricing balances services in the future Nordic power market	Norway	▪ *Have you included the methodology where it is more beneficial to allocate the transmission capacity to the market?* For the exchange between Northern Europe countries, 5% reservation is actually beneficial. More cases have to be run on that. ▪ *Difficult market modelling – how to forecast the market behaviour?* Both social and economic aspects have been considered in the optimization.
Session on Storage technologies and sector interfaces		
Large-Scale Energy Storage in Salt Caverns and	The Netherlands	▪ *Are Biogas storage and ammonia storage considered in the Project?* Biogas storage is considered and has shown to be a really proven technology. Ammonia storage is not considered due to the poisoning issue.

Depleted Gas Fields		▪ *Timing of storage (seasonal or daily) with respect to the economic price for storage?* The parameters involved have been considered. The economic price (also for H_2) is not critical for the storage in itself but the issue is about the production cost. ▪ *What about site mapping?* Subsurface storage and site location/s: all the storage sites available have been investigated and mapped, then based on the characteristics of the site, one of them will be chosen for a real (pilot) project. The Ministry is interested; however, currently the key question for the government is if the Netherlands really need a LSES or not. The technical aspects are now not an issue
Energy Lab 2.0	Germany	▪ *What is meant by "Democratization of energy"?* It means to involve masses of buildings (heat pumps or capture CO_2) and involvement of consumers in the energy system. The energy will not be depending only on the big companies, but people can produce their own energy. ▪ *What about low efficiency of several subsequent conversion processes?* There is always a loss of energy during conversion process. But if the fossil sources have to step out, then the only alternative is a non-fossil - although non fully efficient - process. Of course the pricing is not yet competitive today.
StoreITup-IF	Austria	▪ *How can this solution (PCM) be enhanced?* The need to develop a lot of technology is the main barrier, but customers want to see examples already done and don't want to invest in new solutions. So they are looking for partners and possible applications. An idea to enhance can be to publish some solutions, but of course they have also to be competitive and they cannot publish really everything. ▪ *What happens to polymer at the end of life?* Most parts of the polymer materials are recyclable (see next question) *How long is the polymer lifetime?* Since it is a new technology, it is not possible to know for sure how long it lasts. Nobody has used this kind of storage for 10 years yet. This is still research.
INVADE	Norway	▪ *About open source algorithms*: the algorithms are made by university, but the implementation is not open. This is the challenge: Europe uses to publish the results and to promote the open source, but this does not match with the business issue. There is a need to focus more on this challenge. ▪ *Time of recharge?* In a common garage 20 cars can be parked. Using a smart charging algorithm, the time depends on how many cars are connected at the same time. The charging time will change to avoid to have one car charged and not the others.
Session on Flexibility at the level of the network and for conventional generation technologies		
LEAFS	Austria	▪ *What is the monetary bonuses for customers?* The monetary bonus is given to customers by the DSO for shifting electricity consumption to times of high local PV generation. Customers receive 10ct/kWh for every additional kWh consumed during times of high local PV generation. Customers are informed about the availability of the bonus via a smartphone app.
Flexturbine	Czech Republic	▪ *Is it possible to see a turbine?* there is a demonstration. The TRL was between 5 and 6, most of these developments have been tested in representative situations. In another project called "Turboreflex" we are working much closer to field installation. ▪ *What about flexibility when CCS technology will be connected to the system?* It is a business opportunity. Many parts of industry rely on the carbon (see also the CORETECH project). In many countries coal is phased out but still for a long time it will play a very important role in Europe
FLEXITES	Germany	▪ *Thermal efficiency values are quite low. Why?* The reported values (40-70%) do not refer to storage itself, but are calculated on the basis of the so-called "round-trip" efficiency. ▪ *Participation on ancillary market? Since it's legally decided that fossil fuel will step out, why are fossil-based solutions still studied?* There is a transition time and it is necessary to take action to make it as smooth as possible. Research funding allocated for this project is still necessary because traditional power plants will still be needed and not be shut down immediately. This technology can also be exported.

SOFlex'hy	France	▪ *Is it possible to pump water back?* Yes it's possible if necessary but not implemented in the Proof of Concept. ▪ *Policy makers involvement?* There was some interaction through presentations in congresses. ▪ *This solution has been made available to a set of private plants. If in future it will be made available to all plants, then flexibility will be higher and the profitability should increase. Is this correct?* In principle yes. The application has been done at the level of local network, with the aim of maximizing storage utilization. The diffusion of such VPP will help to avoid or solve congestions.
Session on Digitisation of the electricity system and Customer participation		
ITCity	Latvia	▪ *Is there enough collaboration between social and technical research?* Surveys were performed in this project to understand the consumptions use, the awareness of the citizen in order to understand the key to involve them. ▪ *Was the transcontinental collaboration, easy or perhaps even too complicated (overhead)?* There were of course some issues and it was sometimes difficult to work overseas with the language barrier but there was a real determination to communicate the results, the experience and share the different point of view based on the life habits and infrastructures specific to each cities and districts. This multi-country experience exchange allowed the achievement of quality results. The different behaviour patterns appeared to be quite different with a lot of leverage. It was possible to specify the costumer role. The next step will be to define what is the most convenient ICT tools for municipalities.
Connected Buildings	Belgium	▪ *What's in it for the consumer? How will they see the impact? As an individual what could be done?* One incentive could be to follow the contribution of the customer at a national level. "If we promise you to reduce your bill and that you don't save money higher than you pay us, we give you money back." Today, there is a need to go further and study the links between behaviour and economics.
WIVE (Wireless for Verticals)	Finland	▪ *What is the business model and what are the IP issues?* It will expand as the cities will be more and more connected. There should be a larger collaboration with other EU countries. Anyone should be able to join the service test. Standardization and regulatory from the telecommunication sides define the IoT timeframe: 0.5 minutes are needed to have the required resolution (for smart grid functionality).

2.3 RECOMMENDATIONS FROM THE PROJECTS AND CONCLUSIONS FROM THE ROUNDTABLES

These recommendations and conclusions have been discussed and agreed upon during the specific plenary sessions on Day 1 and Day 2 “Identification of main recommendations from projects’ presentations and roundtables’ discussions”.

2.3.1 SESSION ADDRESSING TOPICS WITHIN THE SCOPE OF ETIP SNET’S WORKING GROUP 1 “RELIABLE, ECONOMIC AND EFFICIENT SMART GRID SYSTEM”

- Projects should result in sustainable business models (in many cases subsidies are necessary).
- There are alternatives for massive undergrounding of medium voltage network in rural areas. Those alternatives shall be supported by the regulatory framework.
- The Role of PtX in the energy system integration depends on the definition of climate targets, the available biomass that is characterized as being sustainable, a well-functioning market, future electricity prices and a proper and coherent regulatory framework.
- Data availability and domain knowledge are crucial to replicate the power system operation realistically.
- There is a strong need to quantify the real “value” of flexibility.
- Demonstration and Planning: the development of the grid shall be optimized in coordinated manner with development of many other independent actors and sectors: not only generation and load, but also new services and new interfaces.
- System optimization depends strongly on the regulation.
- National funded project could be the basis to launch EU funded project involving other countries and other stakeholders.
- Pilot and/or sandboxes are needed to accelerate the energy transition and should not be related only on technological aspects but also on social/community issues.

2.3.2 SESSION ADDRESSING TOPICS WITHIN THE SCOPE OF ETIP SNET’S WORKING GROUP 2 “STORAGE TECHNOLOGIES AND SECTOR INTERFACES”

- A lowest marginal-generation cost market approach undervalues storage-based flexibility technologies (Requirements: Time, regionality, quantity) to balance supply and demand.
- Regulatory framework (double taxes, grid fees, ownership, stacking of services) for storage needs to be updated.
- Consider long lead-times for certain technologies: 10 years for P2X (invest now to use it after 2030).
- Utilize only renewable, green electricity (grey in the transition) for carbon-neutral gases and liquids.
- Capture CO2 from ambient air in order to guarantee a closed carbon cycle.
- Scaling up carbon-neutral liquids and gases needs to have reduced CAPEX. But: OPEX = electricity costs + Carbon-pricing.
- “Democratisation” may have value to citizens (own carbon-neutral oil/fuels/gases).
- Polymer PCM heat storages work well (can be compounded; recyclable polymers): Keep them at different hours at different temperatures, thus provide different levels of storage; Store heat as heat; only modularisation allows scaling up (50 … 1000 kWh/m3; 30 EUR/kWh … 200 EUR/kWh).

- Energy efficiency in industry requires a holistic approach (energy efficiency rethought; adapt processes!); consider in particular efficient waste-heat concepts.
- Fossil energy today is still too cheap: CO2-price/tax needed.
- Regulations and standards are needed for business models related to flexibility management (Flexibility operator as aggregator), realized by platforms.
- In flexibility business, focus on the end-user first (for a viable and economic flexibility regime; incentives); Optimize their capacity (kW) or Time-Of-Use (ToU) tariffs; Bundle flexibility with "something": e.g. combine company car renting (during day) with private or tourist renting (after work).
- For flexibility business, put activities of DSO + BRP (Balance Responsible Party) second; First achieve critical mass of end-users; then negotiate with them (no battery ownership of DSO).
- Openness of project results (making data and programs public) is hard to realise due to non-European competition (China).
- It is better to store wind / renewable energy in other forms than loose/curtail it (even accepting the losses due to conversion).
- We need incentives so that politicians are driven by motivated consumers, and not only by DSO: DSO are rather conservative; but consumers want "new things".
- Regulation must be unified among countries (example: pay 5000 EUR/EV; higher CO2-taxes everywhere).

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

- Advanced flexibility schemes at Low-voltage level proved to be very effective; however, there are significant barriers for a real-world implementation (regulatory, economic and technical). Moreover, there is a limited willingness of consumers to participate (integration efforts must be low).
- Interoperability, interfaces standardization and efficient monitoring are needed for integration. Community-scale ESS (Energy Storage Services) proved to be quite effective, while PV-BESS (Battery ESS) single consumer-scale are not economically viable.
- There's still a need of fossil-fired power generation, in the transition to low-carbon economy. The main character of the new and/or refurbished generation plants shall be the flexibility (in terms of fuel, load, efficiency, lifetime).
- In particular, advanced gas turbine powered plants are the backbone of future low-carbon power system, thanks to their ability to use "green" fuels and their flexible operation.
- Thermal energy storage (TES) could help improving the generation plants flexibility, in particular as a cost-effective retrofit tool. However, TES application still lack profitability, due to high volatility electricity prices and regulation issues (i.e. flexibility "value").
- VPP (Virtual Power Plant) could be a powerful and very cost-effective tool to locally optimize RES operation with benefit to the grid, taking into account community needs and constraints. An effective VPP type is obtained by combining variable RES (solar, wind) with hydro power plant.
- New regulations are needed, to give appropriate value to congestion avoidance, load shifting etc., thus allowing the definition of suitable and effective business models.
- Carbon emission reduction and, in general, circular economy initiatives will need ASAP a carbon price (at least at EU level), to assess the cost impact in all the involved sectors.
- Blue" vs "Green" Hydrogen: If hydrogen should be the fuel after 2050, we need a lot of RES generation sufficient to produce the (green) H_2. It is still very unclear how we want to realise a fully sustainable cycle for CO2 before 2050.

- To ensure the transition towards a low carbon economy there's a need of new infrastructures. The technical community shall therefore engage the public (citizen, opinion groups etc.) to share such a need and to agree together on the solutions (both at local and central level).

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"

- Lack of customer awareness is major barrier to roll-out of smart solutions. The level of awareness and engagement varies significantly across locations: this needs further study & pilot programmes.
- Customers' motivation still needs to be understood better: this will allow for more effective strategies to 'nudge' customers to implement changes.
- Information sharing between different stakeholders (e.g. energy, ICT, psychology/behavioural economics) is a big challenge. RD&I projects need to bring these different perspectives together.
- End-to-end architecture & integrated decision-making needs buy-in from range of stakeholders (customers, regulators, utilities, etc). This is key to make these solutions work.
- Cybersecurity and data protection issues are important across all applications.
- Information sharing is very difficult in the digitalisation space; the challenge of competition prevents closer collaboration between stakeholders.
- Today there is a huge number of projects with many players involved, different requirements for data exchange/security, different range of different architectures: It is difficult to align and integrate into energy system at scale. But much more efforts need to be undertaken in creating a common End-to-end architecture.

2.4 RECOMMENDATIONS FROM WG5 IN TERMS OF "INNOVATION IMPLEMENTATION IN THE BUSINESS ENVIRONMENT" FOR THE PROJECTS PRESENTED DURING THE PARALLEL SESSIONS

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

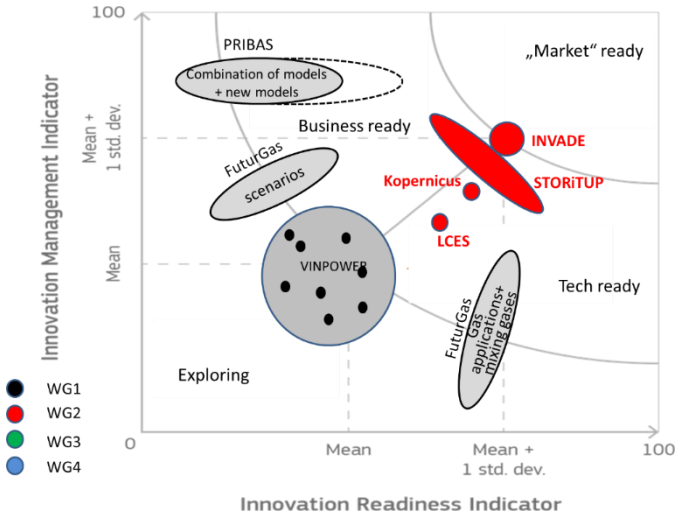
2.4.1 STATUS OF PROJECTS RESULTS' EXPLOITATION

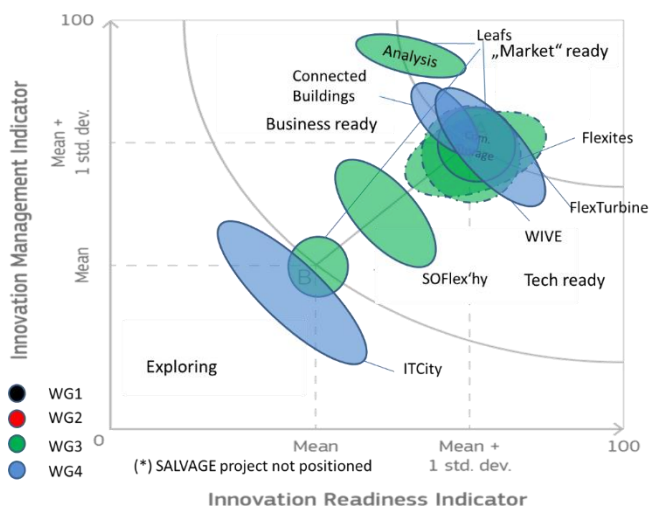
The JRC Innovation Radar methodology and diagram[2] can support consortia in assessing the innovation potential of their outcomes and of their beneficiaries. The full application of the methodology is a quite complex process and requires the calculation of several indicators.

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

The final aim was supporting the projects in the understanding of their position with respect to the roadmap to be followed to get their results to the market, to the real economy. During the workshop, the different projects presenters agreed with the WG5 representatives their path to exploitation on the Innovation Radar diagram. The outputs of the work collected from the different projects is illustrated in the figures below. For the sake of clarity, results from the different session topics are reported on different diagrams:

- **Session related to ETIP SNET WG1 topic** "Reliable, economic and efficient smart grid system" in black
- **Session related to ETIP SNET WG2 topic** "Storage technologies and sector interfaces"
- **Session related to ETIP SNET WG3 topic** "Flexible generation"
- **Session related to ETIP SNET WG4 topic**" Digitisation of the electricity system and Customer participation"





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

2.4.2 CHALLENGES ADDRESSED: HOW CAN WE INFLUENCE; HOW CAN WE RAISE IMPACT?

Taking into account what emerged from the project presentations, from the roundtables, and from the project positioning on the previous diagrams, the following points can be addressed, and some recommendation can be formulated.

As a whole:

- Consortia reacted positively in the challenge to be innovative sensitive, knowledge building and knowledge sharing.
- Communicating the need for innovation readiness has proved beneficial and consortia are receptive.
- Value proposition and knowledge building of projects to raise impact is critical in R&I. Consortia have shown readiness to respond in enhancing the process. We need to formalise it and provide the means to support.
- Key exploitable results are more in focus with respect to previous ETIP SNET workshops. This work shall be maintained by consortia.
- Market study for the KERs Exploitation is still very limited: it is recommended that projects think beyond the project timeline.
- The project deliverables are still more in the focus of consortia and reviewers: it is recommended to focus more on outcomes and solutions.

Moreover, recommendations were provided on how projects can be more proactive in support of their communication of results achieved to foster their targeted endeavours for ultimate evolution of their work to the level of utilization / implementation in the business environment and the real economy:

General recommendations towards projects willing to communicate about their results to push for their exploitations

- Prepare a presentation "solution oriented":
  - Focus on main results of the project
  - Identify the Unique Value proposition or the Key Performance Indicator
  - Regarding the challenge to be addressed by the project: specify what is the actual difficulty, who faces it?, describe the solution developed/tested (is there a market for the solution?) and its Unique Value Proposition (why is it different, why is it better, why is it worth 'buying') and concentrate on the essentials (less is more)
  - Focus on the exploitation paths by looking beyond the end of the project in two directions: for low TRL projects to identify research horizon ahead and for high TRL projects identify the road to utilization / exploitation in the business environment or wider economy
  - Indicate SMART Objectives: Specific, Measurable, Achievable, Realistic/relevant, Time-bound

- Prepare a presentation "communication oriented":
  - Adapt project reporting/presentation to the audience, use their language
  - Involve 'commercial' guys, involve customers and users
  - Consider the whole value chain (the different business models, where the materials come from, who will produce)
  - Proposal to follow the "lean canvas model" to develop a 'business' model

2.5 INTERACTIVE DISCUSSIONS WITH THE PROJECTS TO CHECK THEIR COMPATIBILITY WITH THE NEW ETIP SNET ROADMAP

During this regional workshop, ETIP SNET has been undertaking a check of the currently (August 2019) proposed structures (7 Research areas, 14 Functionalities 2030) by the project participants being present at the Regional Workshop.

Some (non-conclusive) points related to the discussions and questions raised during the workshop:

- The presently 14 functionalities are derived from the building blocks defined in the ETIP SNET Vision 2050. In addition, the 36 Functional objectives of the ETIP SNET Roadmap 2017-2026 were reduced to seven research areas simplifying complexity without losing detail.
- Should there be - in the future – new requirements on projects at the proposal stage e.g. to say: “to which of the 14 functionalities will you contribute and how?”; success and failure stories on this could then be collected during project execution.
- “Contributions of projects to functionalities” could be scaled, in order to see how much the functionality has been fulfilled by an individual project. This would allow stakeholders to better see the depth of functionality completion.
- It is currently planned that "Integration Enablers” will be addressed in the Actions specified in the upcoming ETIP SNET Implementation Plan (IP). But first, the roadmap needs to converge on Functionalities 2030 and the Research areas and associated tasks, needed to achieve these functionalities. The approach is a connected approach. Putting functionalities in front of research area is a way to understand where we are going and how to do it.

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