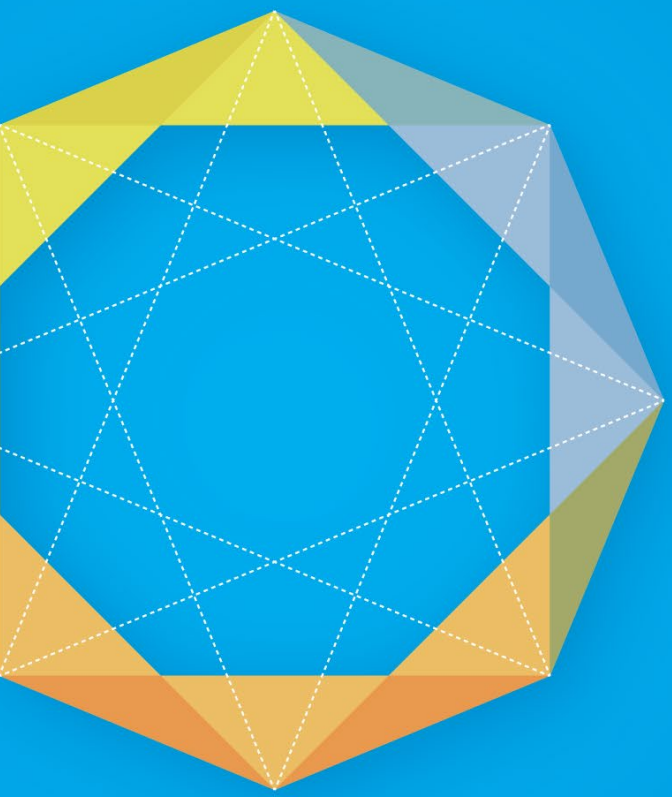
European Commission

Proceedings of the 12th ETIP SNET Regional Workshop

2021



ETIP SNET

European Technology and Innovation Platform
Smart Networks for Energy Transition

ETIP SNET Workshop Proceedings – 12th Regional Workshop (22 June 2021)

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1. INTRODUCTION

As part of its mission of guiding Research and Innovation activities to support Europe's energy transition, the European Technology and Innovation Platform for Smart Networks for Energy Transition (ETIP SNET) will organize 8 Regional Workshops in the course of the next 3 years, covering the whole European Union.

To guarantee to cover all EU countries (including associated ones), these Workshops have been named "Regional" because they gather together Member States in 4 Macro "Regions". The gathering is mainly based on criteria of neighbourhood and common geographic characteristics and priorities.

Please find them below:

- Western Region: (France, Ireland, Portugal, Spain and the United Kingdom)
- Central Region: (Belgium, Netherlands, Luxembourg, Poland, Austria, Germany, Switzerland, Czech Republic, Slovakia)
- South-Eastern Region: (Bulgaria, Croatia, Cyprus, Greece, Hungary, Italy, Malta, Romania and Slovenia)
- Northern Region: (Finland, Denmark, Norway, Latvia, Lithuania, Estonia)

This "Regional" dimension has been discarded for the first 3 workshops due to the pandemic crisis and due to the fact that the workshops have been held online. In this context the regional dimension did not bring any added value to this format.

In the framework of ETIP SNET – from 2016 till today – a first series of 8 Regional Workshops has already taken place. You can find the minutes and PPTs of all of them HERE.

The 2nd workshop of the new series of the 8 Regional Workshops took place **on 22nd June 2021 from 9.30 till 13.00.**

1.1 OBJECTIVES OF THE REGIONAL WORKSHOPS

The aim of the regional workshops is to contribute to the next ETIP SNET R&I Implementation Plans, Roadmap update and the Progress Reports. The selected R&I projects present their findings and will help to identify R&I gaps to update the R&I Implementation Plans (2023-2026) and update of the current Roadmap 2020-2030.

The Regional Workshops have four overall objectives:

- Present and create knowledge on project research results, good practices and lessons learnt of R&I projects on energy system integration;
- Monitor and identify gaps in R&I topics and priorities and to have convergence among national, regional and the European levels;
- Ensure consistency between national and European views;
- Collect information from national and regional projects to feed the Progress Reports and Implementation Plans and Road Map.

1.2 ORGANISATION OF THE REGIONAL WORKSHOPS

To achieve all the main goals mentioned in the paragraph above, the workshops are divided in 2 Panel joint sessions and 4 Parallel sessions.

During the first join session the main aim is to map ETIP SNET Research Area, R&I Priorities and link them to the Topics of the 4 Parallel sessions. Discussions around the general R&I priority gaps at EU and National level from EC angle, from the Members States perspective and from the stakeholders' perspective are concluded.

During the 4 parallel sessions, European, national and regional projects addressing energy system integration issues are presented, according to the 4 thematic priorities identified before each Workshop on the basis of exchanges with EC, ETIP SNET Working Groups and Projects Representatives.

During the final Joint session, the Key conclusions from each of the Parallel sessions are presented along with specific Recommendations from ETIP SNET WG5 in terms of "Innovation implementation in the business environment".

All the inputs collected during these workshops will be used by ETIP SNET in drafting the two Implementation Plans scheduled to be published in December 2021 and in August 2023.

As stated in the Introduction, 8 workshops are planned for the 2020-2023 period. In 2021, due to the sanitary crisis, it was decided to organise these workshops virtually.

The 4 themes selected for the second workshop held on 22nd June 2021 – and object of this proceeding report – have been the following:

- Theme 1: Market based Energy Systems
- Theme 2: Integrated Energy Networks – focus on storage
- Theme 3: Digitalisation as the Key Enabler: Semantic Interoperability; Protocols; Data Gateways; IoT Integration
- Theme 4: Consumer and Citizen Engagement: Engaging groups and individuals

The 4 themes have been selected based on the research areas of the ETIP SNET Working Groups and the BRIDGE initiative as well as with the aim to contribute to the ETIP SNET Implementation Plan and Road Map.

1.3 STRUCTURE OF THIS REPORT

For each of the Workshops a Report including all the proceedings and key recommendations will be produced.

The proceedings will gather the following information:

- List of projects presented at the workshop, with a short description of each of them;
- Number of people registered to the workshop and their distribution per country and organisation of origin;

- Minutes of each session and main questions raised during the panel sessions, including SLIDO questions and results from each session;
- Recommendations for innovation implementation in the business environment.

2. ETIP SNET 12th REGIONAL WORKSHOP

The 12th ETIP SNET Regional workshop was held online via MICROSOFT TEAMS on 22 June 2021, 9:30 – 13:00 CET.

The workshop was attended by 148 people and overall, 15 projects from all over Europe presented their findings.

Detailed information is included in the next paragraphs.

2.1 PROGRAMME OF THE WORKSHOP

The agenda of the 12th Regional Workshop held on 22nd June 2021 from 9.30 to 13.00 is the following:

Draft AGENDA		
PLENARY SESSION - introduction 09:30 – 10:40		
TIME	***TOPIC***	***SPEAKERS***
9.30 – 9.40	**Welcome and opening**	**Maria Laura Trifiletti** - ZABALA
9.40 – 9.50	**ETIP SNET and BRIDGE Presentation**	**Norela Constantinescu** - ENTSO-e

9:50 – 10.00	**Interaction with the audience via SLIDO**	SLIDO • Do you know ETIP SNET? • Have you already participated in previous Regional Workshops? • In which country is your company/organisation located? • Which sector are you from?
10:00-10:30	**Panel session**	**Moderators:** **Ludwig Karg** - B.A.U.M. Consult **Shenja Ruthenberg** - CLERENS ***Panellists:*** ➢ ***ETIP SNET Technical CORE TEAM*** ✓**Rainer Bacher** - BACHER Energie ✓**Aris Dimeas** - ICCS ✓**Nikos Hatziargyriou** - ICCS ➢ ***ETIP SNET Working Groups Co-Chairs*** ✓ **Santiago Gallego** - IBERDROLA (WG1) ✓ **Franco Di Persio** - CIRCE (WG2) ✓ **Carlos Herce** - ENEA (WG3) ✓ **Elena Boskov-Kovacs** – Blueprint Energy Solutions (WG4) ✓ **Christina Papadimitriou** - UCY/FOSS (WG5)
10:30-10:40	Q&A Session	

Parallel Sessions **10.40 – 12.10**	
Market based Energy Systems	**Integrated Energy Networks – focus on storage**
MODERATORS	**MODERATORS**
Aris Dimeas - ICCS **Antonio Iliceto** - ENTSO-e (ETIP SNET WG1 Co-Chair)	**Nikos Hatziargyriou** - ICCS **Franco Di Persio** - CIRCE (ETIP SNET WG2)
PANELLISTS	**PANELLISTS**
• **Álvaro Nofuentes** - ETRA (TRINITY project) • **Ilias Lamprinos** - Intracom Telecom (FEVER project) • **Aleksandra Krkoleva** – FEEIT Skopje (CROSSBOW project) • **Helena Gerard** – VITO/EnergyVille (EU-SysFlex project)	• **Iñigo Azpiri Irazabal** - Iberdrola (ETIP SNET Association Representative for Energy Storage technology and services providers) • **Silvia Bodoardo** - Politecnico di Torino (ETIP SNET WG2) • **Georgios C. Christoforidis** - University of Western Macedonia (ETIP SNET WG3) • **Gianluigi Migliavacca** - RSE (FlexPlan project)

	• **Jean-Jacques FRY** - Hydropower Europe Coordinator (HYDROPOWER EUROPE project) • **Nathalie Grisey** - RTE France (Osmose project) • **Shafi Khadem** - IERC (StoreNet project) • **Mia Ala-Juusela** – VTT Finland (STORY project)
STRUCTURE	**STRUCTURE**
99 second's pitches Panel discussion Q&A	99 second's pitches Panel discussion Q&A
Digitalisation as the Key Enabler: **Semantic Interoperability; Protocols; Data Gateways; IoT Integration**	**Consumer and Citizen Engagement:** **Engaging groups and individuals**
MODERATORS	**MODERATORS**
Rainer Bacher - BACHER Energie	**Ludwig Karg** – B.A.U.M. Consult **Esther Hardi** – Energiecooperatie 2030
PANELLISTS	**PANELLISTS**
• **Markus Bechmann** - ESMIG (ETIP SNET Association representative for ICT & Network solutions providers) • **Sandra Riaño** - Tecnalia (ETIP SNET WG4) • **Krzysztof Piotrowski** - IHP (Ebalance-plus project) • **Gerfried Cebrat** - effiziente.st Energie- und Umwelt-Consulting e.U. (EPC4SES project) • **Milenko Tosic** - VizLore Labs (InterConnect project) • **Thong Vu Van** - EMAX (INTERRFACE project)	• **Laurent Schmitt** – Digital4Grids (ETIP SNET Association representative for Final Consumers) • **Johanna Höffken** - Eindhoven University of Technology (BRIDGE representative) • **Sergio Olivero** - Politecnico di Torino (REC-ECH project) • **Alessandra Porfido** & **Alvaro Sánchez Miralles** - COMILLAS University (ReDREAM project) • **Marcel Schweitzer** - Technikum Wien (R2EC project)
STRUCTURE	**STRUCTURE**
99 second's pitches Panel discussion Q&A	99 second's pitches Panel discussion Q&A

PLENARY SESSION – conclusions

12:10 – 13:00

TIME	*TOPIC*	*SPEAKERS*
12:10-12:15	**Session introduction**	**Moderator: Shenja Ruthenberg** - CLERENS
12:15-12:35	**Presentation by WG representative on results of questionnaire**	**Venizelos Efthymiou** - Chair WG5 ETIP-SNET
12:35-12:40	**Key conclusions session 1**	**Aris Dimeas** - ICCS
12:40-12:45	**Key conclusions session 2**	**Franco Di Persio** - CIRCE
12:45-12:50	**Key conclusions session 3**	**Rainer Bacher** - BACHER Energie
12:50-12:55	**Key conclusions session 4**	**Ludwig Karg** - B.A.U.M. Consult
12:55-13:00	**Conclusions**	**Shenja Ruthenberg** - CLERENS

2.2 LIST OF ATTENDEES

Around 260 people registered for the workshop. Overall, the workshop was attended by 148 people.

The distribution of registrants by country is provided in the figure below:

Figure 1: Distribution of registrants by country

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

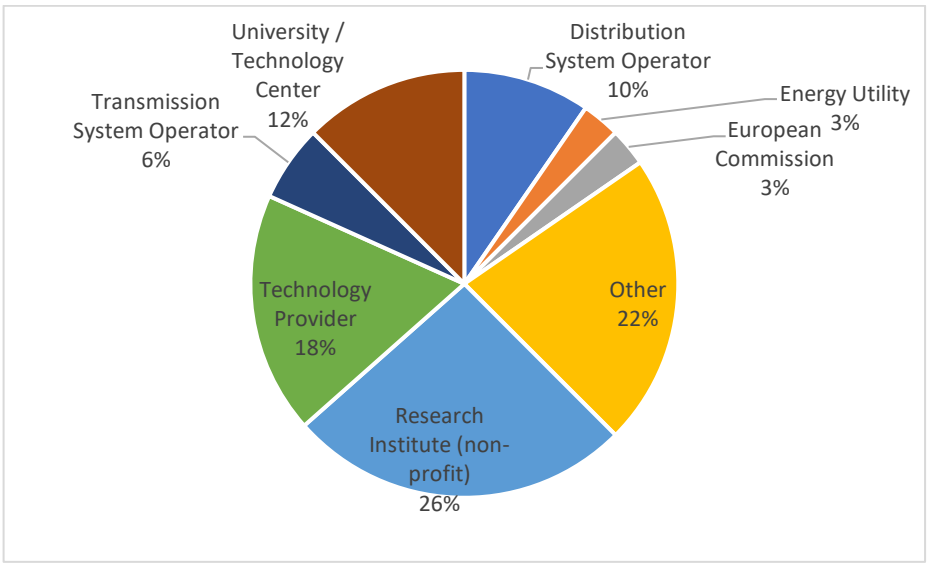


Figure 2: Distribution of participants by organisation

3. PROCEEDINGS

3.1 PLENARY SESSION

Maria Laura Trifiletti welcomed the participants, indicating that the scope of the workshop is to share R&I experience. A short introductory poll was also held with the following questions:

- *Do you know ETIP-SNET*: The great majority of the participants answered that they do know ETIP-SNET
- *What does ETIP-SNET stand for*? Similarly the majority of the participants identified the correct meaning of ETIP-SNET.
- *Have you participated in previous regional workshops*? The answers appeared to be split with many new participants in the workshop.
- *In which country is your company/organization located*? Germany, Spain, France, Cyprus, Italy, Portugal, Greece, Belgium, Netherlands, were among the main answers while participants from additional countries (Norway, Austria, Romania, Serbia, etc.) were also present.
- *Which sector are you from?* The majority of the participants are from a research institute, while additional participants are a Technology Provider or a Distribution System Operator. Additional participants (less popular answers) were from a University, Transmission System Operator or Energy Utility.

Norela Constantinescu, (new Vice Chair of ETIP SNET) presented an overview of ETIP-SNET. In particular she highlighted the goals and missions of ETIP-SNET which comprise integrating and optimizing all sources and vectors of the entire energy system, guiding R&I in support of EU's energy transition and addressing the innovation challenges for the energy system and market evolution towards climate resilience and renewables integration, ensuring affordability and security of supply. The actions of ETIP-SNET comprise bringing together a multitude of stakeholders and experts from the energy sector, particularly towards preparing and updating Visions, Roadmaps and Implementation Plans. The relevant initiatives are coordinated at national (member states), EU and international level.

ETIP-SNET is organized in 5 Working Groups, while the different input, coming from the relevant stakeholders, is organized in 6 Research Areas and 12 Functionalities. Concerning the Roadmaps, they are developed according to the input from Regional Workshops and from monitoring exercises (advancement on projects). In particular, based on surveys and analysis, gaps and ways to go forward are identified. The ETIP-SNET Implementation Plans are shorter from a time perspective, identifying priority actions for the next few years. Two new Implementation Plans are expected, one for December 2021 and one on August 2023.

The activities of the WGs within the ETIP-SNET were presented while also indicating the structure of the BRIDGE initiative.

In particular, the *1st Working Group* is dealing with the economic efficient and reliable energy system. Starting from the power system architecture and moving to the development of white papers towards the sector coupling. Up to this year a smart sector integration paper has been put forward (available on ETIP-SNET website). The relevant activity will further look into sector coupling, hydrogen and impact on the electricity grids, flexibility resilience and e-mobility. *Working Group 2* is related to the storage technologies and their integration into the energy system. Considering the energy transition challenge and the environmental requirements which will become more and more important in the period 2020-2030, the circular economy principles in the storage field are also evaluated in WG2. *Working Group 3* is related to renewable heating and cooling and of course the flexible generation. During last year, the WG has published a white paper on "Flexible power generation in decarbonised Europe". *Working Group 4* is looking at digitalization and customer integration. White papers, (available on the ETIP-SNET website) have been developed, looking at digital technologies and use cases. Now the WG's focus is to develop the digital use cases mainly related to residential customers, in order to have an integrated way of connecting the ecosystems which are related to electricity sector, mobility, heating and cooling, while also identifying the interoperability issues related to those architectures. *Working Group 5*, is looking at Innovation and Implementation issues in the business environment. It is gathering the inputs from the different projects, while also evaluating issues related to gap analysis, innovation support, market uptake, regulation and standardization and research infrastructure.

The *BRIDGE initiative* is collecting the inputs from more than 80 projects related to transmission distribution and storage and it is an activity extremely useful for pushing the outcomes of projects in a more streamlined

approach towards the future development of energy or digital policies. Working Groups have been created within BRIDGE concerning Regulation, Data management, Customer engagement and Business Models. Over the time Energy communities and self-consumption, Replicability, Joint communication and Research and innovation priorities were also considered.

Ludwig Karg informed the participants about the ETIP SNET Technical Core Team (Rainer Bacher, Aris Dimeas and Nikos Hatziargyriou).

Rainer Bacher indicated the relations among the different groups (SET PLAN – ETIPS – ETIPSNET – BRIDGE – HORIZON 2020), while noting that ETIP SNET tries to bring together all these worlds. The regional workshops are a key element towards advancing through the relevant projects (which shall be considered in the Implementation Plans and Roadmap). Concerning the relation of the Implementation Plan with the SET-Plan, it has been noted that the Implementation Plan and the Roadmap concern an EU industry and research point of view, while, on the other side, the relevant needs of the member states shall also be considered. Those two worlds are not independent and it is quite important to observe how those two worlds may come together.

Nikos Hatziargyriou noted that ETIP-SNET provides a consolidated view of industry, academia, national policies, while also indicating how those sectors view a sustainable future. Concerning the term '*Regional*' Workshops, it has been noted that there are national solutions and local initiatives and it is worth having lessons learned from such initiatives. Moreover, duplication of funding, waste of resources, etc. can be avoided. In this respect it is still proper to call those workshops '*Regional*'.

Aris Dimeas indicated that this workshop and the feedback from projects will provide important input for the Implementation Plan (which is providing the R&I goals in the relevant energy domain). In this respect, it is important to identify the relevant main achievements, to see which part of the Implementation Plan is covered, and also identify new goals and challenges for the new Implementation Plan.

Ludwig Karg also presented the representatives from the five WGs, while also discussing issues related to each WG.

Santiago Gallego (WG1) indicated that topics to always keep in mind is the high level of RES integration and resilience of the system. Contributions from WG1 can provide many interesting ideas for the relevant trends (also through the white papers concerning the impact of EVs on the grid, impact of hydrogen on the grid, etc.).

What is expected from the sessions in this workshop: It has been noted that the workshops will allow to indicate the relevant idea of addressing energy transition, while the 4 panels are well designed for knowledge sharing and for understanding the relevant topics across Europe.

Franco Di Persio (WG2) indicated the important role of storage. In particular, he noted that there are several technologies of storage (some of them very mature and some quite new). The issues that arise in this area concern the integration of those technologies. Moreover, all these technologies require a big effort on R&I.

He also highlighted that another important aspect of integration is the circular economy approach (offering a holistic approach to the system).

What is the new challenge today: The new challenge faced today concerns the amount of time-frame in which the stored energy can be available. In particular, the big advantage of having many technologies is that they offer different timeframes for providing resilience. Similarly, storage may offer services to the network.

The role of the EV battery in the future energy system: It has been highlighted that the EV Battery can play a significant role in the future energy system, since the EVs are parked for 90% of the time, allowing the exploitation of the relevant storage capacity.

Carlos Herce (WG3) highlighted the role of flexible generation. In particular he indicated that although storage can help in the resilience of the grid (due to the increased penetration of RES), the current cost of deployment of storage technologies is still high. Moreover, flexibility generation is a common approach in the system integration (also considering gas etc. among electricity).

Is there a business competition among storage and flexible generation? *Carlos Herce & Franco Di Persio* indicated that storage and flexible generation shall not be considered as a business competition, since both are working together forming the relevant business. In this respect, a common approach appears to be required from the regulation point of view.

Which is the more controllable and flexible RES technology: There does not appear to be a single answer due to the complexity of the available solutions. For instance, the wind and also the photovoltaics present a higher potential for large scale deployment. Hydropower, biomass and concentrated solar power present high dispatchability, but have some limitation on the deployment on their size. Geothermal solutions may not be very flexible but helps as a base load for the system. It has also been noted that it is necessary to address three dimensions/problems: Firstly, considering de-carbonization issues, it's important to include hydrogen, synthetic fuels, biomass and also the carbon capture use and storage. Secondly, it's important to increase the flexibility of the systems, the ramping, the minimum load, the start-ups and other technical specific topics. Finally, it is necessary to develop and improve new technologies, such as CO2 cycles, organic rankine cycles, etc., in order to increase the valorisation of very different waste heat sources while also increasing the flexibility of the system.

Elena Boskov (WG4) indicated that the customers are considered as a key element for a successful digitalization. Moreover, WG4 creates a one stop shop combining all the digital technologies for customers and technology industries.

The business angle of WG4 and the ICT industry: It has been highlighted that many stakeholders benefit from the participation in ETIP-SNET while also getting significant feedback from the white papers on digital energy (for instance, the white paper on 'Digital energy use cases technologies and cyber security'). It has also been noted that the energy industry will change rapidly in the next years. In this respect, it is really helpful to indicate how this innovation on technological-academic level can be implemented by organizations.

Issues related to people being afraid of providing their data: It has been noted that this is observed not only on WG4 but also on the EU–level. Data can solve many issues, yet the level of using them at a full potential has not been reached yet. More secure data-sharing can be proven helpful towards this goal. Additionally, initiatives exist on how to deal with such issues (anonymization of data, etc.).

What the users receive by providing their data: It has been noted that the users shall be aware of what they will receive by providing their data. Data-sharing must be consumer-centric, indicating that the relevant industries, by collecting the relevant data, have a goal of improving the peoples' quality of life. It has also been noted that one aspect where Horizon projects and innovation projects can contribute a lot, is building new operational models. In this respect, appropriate motives shall be considered for customers to share their data (the relevant motives/incentives shall also be recommended to the relevant policymakers).

Christina Papadimitriou (WG5) explained why WG5 is called the 'helicopter WG'. In particular, this WG undertakes all the horizontal activities to support all other WGs. There are different working teams within WG5 with a main objective to support the R&I communities. Moreover, the WG alerts the community on forgotten issues, while also helping R&I activities to come to market. A holistic view is adopted, while the relevant activities are supported in an integrated way.

Different approaches to the R&I activities among Europe and the Pantera project: The main outcome of the Pantera project is the creation of the functional platform of EIRIE (covering the gaps in R&I). The platform will balance the different approaches (towards building more homogeneity) to the relevant

activities. Apparently, beneath this platform everyone is working together towards the goal of knowledge sharing.

3.2 PARALLEL SESSIONS

After the plenary sessions, participants were invited to join one of the **four parallel sessions** devoted to different key topics of the energy transition:

1. Market based Energy Systems
2. Integrated Energy Networks: focus on storage
3. Digitalisation as the Key Enabler: Semantic Interoperability; Protocols; Data Gateways; IoT Integration
4. Consumer and Citizen Engagement: Engaging groups and individuals

Each parallel session was organised as follows:

- 99-second pitch by European, national and regional projects
- Moderated panel discussion between representatives of European Commission, ETIP SNET Working Group and projects
- Interaction with the audience via SLIDO and Q&A session

Below the list of participants for each parallel session:

Table 1: Panellists from the parallel sessions

Parallel session nr.	Participants
1	• Aris Dimeas - ICCS - Moderator • Antonio Iliceto - ENTSO-e (ETIP SNET WG1 Co-Chair) - Moderator • Álvaro Nofuentes - ETRA (TRINITY project) • Ilias Lamprinos - Intracom Telecom (FEVER project) • Aleksandra Krkoleva – FEEIT Skopje (CROSSBOW project) • Helena Gerard – VITO/EnergyVille (EU-SysFlex project)
2	• Nikos Hatziargyriou - ICCS - Moderator • Franco Di Persio - CIRCE (ETIP SNET WG2) - Moderator • Iñigo Azpiri Irazabal - Iberdrola (ETIP SNET Association Representative for Energy Storage technology and services providers) • Silvia Bodoardo - Politecnico di Torino (ETIP SNET WG2) • Georgios C. Christoforidis - University of Western Macedonia (ETIP SNET WG3) • Gianluigi Migliavacca - RSE (FlexPlan project) • Jean-Jacques FRY - Hydropower Europe Coordinator (HYDROPOWER EUROPE project) • Nathalie Grisey - RTE France (Osmose project) • Shafi Khadem - IERC (StoreNet project)

	• Mia Ala-Juusela – VTT Finland (STORY project)
3	• Rainer Bacher - BACHER Energie - Moderator • Markus Bechmann - ESMIG (ETIP SNET Association representative for ICT & Network solutions providers) • Sandra Riaño - Tecnalia (ETIP SNET WG4) • Krzysztof Piotrowski - IHP (Ebalance-plus project) • Gerfried Cebrat - effiziente.st Energie- und Umwelt-Consulting e.U. (EPC4SES project) • Milenko Tosic - VizLore Labs (InterConnect project) • Thong Vu Van - EMAX (INTERRFACE project)
4	• Ludwig Karg – B.A.U.M. Consult - Moderator • Esther Hardi – Energiecooperatie 2030 - Moderator • Laurent Schmitt – Digital4Grids (ETIP SNET Association representative for F • inal Consumers) • Johanna Höffken - Eindhoven University of Technology (BRIDGE representative) • Sergio Olivero - Politecnico di Torino (REC-ECH project) • Alessandra Porfido & Alvaro Sánchez Miralles - COMILLAS University (ReDREAM project) • Marcel Schweitzer - Technikum Wien (R2EC project)

3.2.1 PRESENTATION OF R&I PROJECTS

During each of the parallel sessions, R&I projects from a variety of European countries were presented, as displayed in the table below.

Table 2: Projects presented during the 12th Regional Workshop

Project	Country (Project Coordinator)	Purpose	Speaker
Session 1: Market based Energy Systems			
TRINITY	Spain	The TRINITY project is a project that aims to improve the coordination and cooperation of the transmission system operators of South-eastern Europe region and integrate at their electricity markets, whilst increasing the renewables in their energy mix. This will be achieved thanks to four different TRINITY technologies that will be addressing four different type of end users. These end-users are renewable energy promoters, market operators, transmission system operators and the regional security centre of Belgrade.	Alvaro Nofuentes

		Within the project 4 main products will be developed: 1)T-RES Control Center, that will manage a portfolio that will allow renewable planning in the region, 2)T-market Coupling Framework, that is a product for market operators in order to facilitate the integration of the electricity markets on the Southern Europe region, 3) T-Sentinel toolset that will provide a power security checks in close to real time frames, 4) T-coordination platform that will facilitate the work of the regional security coordinator in coordinating the different TSO of the region. These systems will be tested in three different scenarios. The most relevant to this session is the first scenario which is the South-Eastern Europe Market Integration and which will be demonstrated in Hungary Serbia, Bulgaria, North Macedonia, Bosnia, Montenegro and will mainly rely on the T-market Coupling Framework.	
Fever	Greece	Fever is a project that deals with the implementation of novel tools and mechanisms for leveraging flexibility and offering flexibility coming from the distribution grid to resolve the issues of the distribution grid. It is a project that will last 42 months. There are three pilots across Europe: in Spain, Germany and Cyprus as well as large scale simulation of novel market mechanisms. There are three main goals: 1) enhancing their monitoring and controllability of their transmission grid, 2) development of mechanisms for flexibility, aggregation and management, 3) development of novel market mechanisms that support and incorporate flexibility services. The project develops and demonstrates or simulates mechanisms related either to day-ahead market or intraday market or real time market including peer-to-peer markets where novel flexibility products are being formulated and traded. The role of energy communities is something that will also be explored.	Ilias Lamprinos
CROSSBOW	Spain	CROSSBOW is a large project that encompasses a number of partners coming from 8 TSO from South-Eastern European countries, one DSO, one regional security centre. The consortium of CROSSBOW is composed of large producers and technology partners, all of them cooperating together to develop and demonstrate new solutions that will facilitate further market developments within this region. In CROSSBOW nine different products will be presented and tested and these products are linked with nine high level use cases. Finally, the goal of these nine products is to increase and of RES within the region, the flexibility usage in an efficient manner, the reduction of network operational costs and the increase of the economic benefits for all of the stakeholders involved.	Alexandra Krkoleva
EU-SysFlex	Belgium	EU-SysFlex project is one of the big demonstration projects within Europe with 34 partners and 7 demonstrations all over Europe. The focus of EU-SysFlex is to see what are the services and tools that are necessary to meet the needs of the power system that can host 50% penetration of renewables. To produce efficient and coordinated solutions, the partners defined high-RES penetration scenarios and identified the challenges for the grid, ranging from stability to adequacy and congestion. Next, solutions have been designed for system services and markets supported by strong data management. Also, tools for operators to use these new services and market mechanisms are under development. In the project different market design options for all those system services are analysed, from centralised to decentralised including peer-to-peer markets. The DSO-TSO coordination is also investigated. Finally, the project analyses different incentives that will support and regulatory issues.	Helena Gerard
Session 2: Integrated Energy Networks: focus on storage			

FlexPlan	Italy	FlexPlan is a Horizon 2020 project aiming at establishing a new grid planning methodology that considers the opportunity to introduce new storage and flexibility resources in electricity transmission and distribution, so joint T&D planning, as an alternative to building new grid elements. The big novelty of this project is to consider a new planning methodology that is able to encompass not only traditional line reinforcements but also including flexibility elements and in particular storage.	Gianluigi Migliavacca
Hydropower Europe	Belgium	Jean-Jacques Fry, who is chairman of the European Club of the international Commission on Large Dams presented the project Hydropower Europe. This is a Coordination and Support Action funded by the European Commission to develop Research and Innovation Agenda - RIA - and the Strategic Industry Roadmap - SIR. The Research and Innovation Agenda identifies priority research themes covering all aspects of hydro generation and the Strategic Industry Roadmap identifies priority strategic action for the industry to address. The vision includes the promotion of new environmentally friendly, multipurpose hydropower schemes by using hidden potential in existing infrastructure, increasing the flexibility of generation from hydropower plants by adaptation and optimisation of infrastructure and equipment combined with innovative solutions for the mitigation of environmental impacts, increasing storage of existing dams to help ensure flexible energy supply and support food and water supply hence contributing to the Water-Energy-Food nexus and achievement of SDGs and finally strengthening flexibility of supply from pumped, storage schemes developing innovative arrangement with existing water infrastructure.	Jean-Jacques Fry
OSMOSE 2020	Ireland	The project includes three large scale storage demonstrators, including demonstration of grid forming. This is demonstrated by two of the self-storage systems. The first one is a hybrid system with supercapacitors and lithium battery and the second one upgraded an existing system to perform this new service by a battery lithium-titanate. The third demonstration was a high voltage battery, integrated in a modular hybrid device, combining STATCOM and supercapacitors and by optimal design of this device costs were reduced around 10%. Moreover, the role of storage, meaning battery but also hydropower, in long term scenarios for Europe is studied.	Nathalie Grisey
StoreNet	Ireland	The project describes the flexibility platform of a solar energy aggregator that includes behind the meter storage to benefit to the consumers and also for the network operators. The solutions developed in a real-life demonstration network provide mitigation of the peak demand with the voltage profile improvement and also provide grid services in terms of primarily operating reserves which are also services to the transmission network, as well for ancillary services. They also developed control algorithms that could help to improve the VPP platform in terms of the energy arbitrage, peak shaving and load levelling and also showed how utility suppliers can benefit from these services.	Shafi Khadem
STORY	Finland	The STORY project aimed to show the added value the storage could bring for a flexible, secure and sustainable energy system through small scale demonstrations and large-scale simulations. With six demos ranging from building to neighbourhood scale, from industrial residential buildings, including different types of thermal and electrical storages, the STORY team tested several scenarios for small and medium size storages. They developed control strategies, key performance indicators and business models for the demos. The economic, environmental and social impacts of the demos were assessed and recommendations to the regulations were provided. The large-scale simulations showed the potential impacts on the grid level. The challenges faced during the demos showed that the market is not fully mature yet. There are important challenges in the interoperability and an obvious lack of integrators. The business models require stability on the regulations. Technical, social and market issues are highly interrelated. Good user engagement will help mitigating the technical and market issues and vice versa. The environmental analysis showed that the environmental benefits are only acquired with important share of renewables in the grid.	Mia Ala-Juusela

Session 3: Digitalisation as the Key Enabler: Semantic Interoperability; Protocols; Data Gateways; IoT Integration			
Ebalance-plus	Spain	The Ebalance-plus project, is working on a data-centric energy management platform providing flexibility and resilience to the grid. A hierarchical structure, similar to the grid, is considered, allowing decentralised data storage and algorithms and supporting scalability. The project also works on developing and integrating devices and algorithms, to achieve interoperability and fulfil the chain 'monitoring-> data & processing-> controlling'. Although local data storage may limit the exposure of data, security at all levels of the heterogeneous system is desired. In this respect, an approach is followed where the owners of the data define what can happen with the relevant data.	Krzysztof Piotrowski
EPC4SCS	Germany	The EPC4SES project concerns the development of digital twins for buildings for implementing model predictive control. The project also concerns the unblocking of the exploitation of the relevant data by allowing the communication among suppliers and clients. Concerning the information exchange, the CO2, eq forecast is transmitted from the supplier to the client, then the optimal forecast for the load is compiled, which is then uploaded to the supplier. The relevant approach, alongside interoperability issues, will be validated with the SGAM scheme. Finally, the EPC based data will be exploited (for instance with the development of a joint EPC based data model in EU).	Gerfried Cebrat
InterConnect	Portugal	The InterConnect project concerns interoperable solutions that connect smart homes, buildings and grids. The mission of the project is to enable semantic interoperability between digital platforms, services and devices, facilitating the efficient energy management within the reach of the end-users through interoperable solutions. In order to achieve the relevant goal a semantic interoperability framework is introduced, comprising a set of tools and enablers, for establishing semantic interoperability layers between different stakeholders, their infrastructure and services.	Milenko Tosic
INTERRFACE	Luxemburg	The INTERRFACE project that has an objective to create an EU architecture for the coordination among the TSO and DSO. Peer to peer, and most specifically block chain, is considered in the project to coordinate the different parties (TSOs, DSOs). The platform is now live as a prototype. A pan-EU interoperable Grid Service Architecture will also be created within the project. The IEGSA logic is followed for grid qualification and product qualification.	Thong Vu Van
Session 4: Consumer and Citizen Engagement: Engaging groups and individuals			
REC-ECH	Italy	Sergio Olivero on behalf of the Alpine Pearls (AP) initiative presented the REC-ECH project, providing specific information on the Renewable Energy Community of Magliano Alpi (2000 inhabitants). The objectives of the AP project comprise the creation of additional Renewable Energy Communities, amongst others within the City of Magliano Alpi, the placement of the prosumers at the centre of the Energy Transition, while also proposing innovative business models to generate value at local level. An additional objective of the project concerns the replication of the approach at national and EU level. In the Alpes and beyond It has also been noted that multiple Renewable Energy Communities are expected to be developed, indicating the development of a "system of systems".	Sergio Olivero

ReDREAM	Spain	The ReDREAM project concerns the establishment of a connected user-centred energy ecosystem with the consumers at the centre of the ecosystem. 15 partners are involved in eight different countries, with four demo sites, in Spain, Italy, Croatia and UK. Consumer and citizen engagement is considered as an input to the project, while consumers are involved in the relevant activities from design to validation. Engagement is also considered as an output to the system, while people in vulnerable conditions are supported (energy poverty issues are also addressed). Finally, an energy social network will also be created in relation to the ecosystem.	Alvaro Sánchez Miralles
R2EC	Austria	The ERA-Net SES funded project concerns the development of (regional renewable) energy cells in five different test-beds (In Austria, Belgium and Norway). The concept of these cells, concerns the combination of different households in a community alongside photovoltaics, electric vehicles, energy storage capabilities, etc. New business models for these energy cells will also be developed, while stakeholder involvement is a key aspect in R2EC (organizing workshops keeping the participants updated on results and ongoing processes within the project). Moreover, surveys among the participants provide insight into attitudes, expectations, and actual energy behaviour of potential energy community members. The project contributes to the JPP SES Knowledge Community.	Marcel Schweitzer

3.2.2 Panel Discussions

Panel Discussions have been held within the parallel sessions. The main issues addressed and the relevant comments are collected in the table below:

Table 3: Main questions and comments by project

Discussion Topics & Comments
Session 1: Market based Energy Systems
New market mechanism: *It is important to combine centralised, decentralised, and local market. A nested approach will allow to combine the advantages of the different market types.* *Distributed concepts and local market are more suited for very local needs and for typical services while for system security a centralised approach is more appropriate. Different markets should be combined. The importance of the local markets in highly related with type of the available flexibility and the network needs.* *Local Energy Communities start having significant role and could actively support the system operation. The operation of Local Energy Communities could be supported by novel technologies such as the peer-to-peer trading.* *An interesting concept is the bilateral continuous trading that will take into account the available intraday cross-zonal transmission capacity between the markets in the South-Eastern Europe region.* *Novel market system where flexibility providers only need to provide the characteristics of their portfolio and system operators will actually shop like in a supermarket on a daily basis to select the right type of flexibility.*
Tools for market participation *Design business opportunities for these various resources to compete in providing sophisticated and close to real-time market services, instead of playing the passive roles and waiting for supporting measures.* *The markets in the South-eastern region are still in the developing phase but can be shown that the efficient use of resources and cross-border coordination is could provide several benefits.* *Flexibility from various industrial processes is sometimes hidden but extremely valuable. It is important to aggregate and manage this flexibility in an optimal way, not only from a technical perspective but also from the financial perspective.*
Regulation *The South-eastern region is somehow synchronized in terms of EU regulation but there is also some diversity regarding the market status and the implementation of the different network codes.* *It is especially important that all the involved countries in South-eastern region to commit to the same standard products to support the market coupling.* *Lack of competition and market liquidity is also an important barrier in South-eastern region.* *The new role and responsibilities of TSOs in not included in the laws of several countries. This blocks new services such as TSO/DSO coordination and use of flexibility.* *The regulators should find the right balance between on the one hand subsidizing and on the other hand revenue streams from current and future system services in the market.* *Certain system services like inertia, should be regulated typically via network codes and should not really procure these services via the market. However secondary market of trading of inertia certificates could be explored.* *There should be a European harmonization on capacity market mechanisms, and this will be one of the most important goals for the transition until 2050.*
Open Discussion *The synchronous areas extend beyond the borders of the EU, so there are countries that are part of the system although not implementing all the EU regulatory frameworks.* *A well-functioning market should respect grid constraints. For the integration of grid constraints there are multiple options that depend on when you will integrate the data of the grids and even more important which data you will integrate in your market process (e.g. use of a full grid model, partial data or sensitivities etc). Each option has advantages and disadvantages.* *Using block chain technologies in warranties of origin platforms will allow us to have faster and more reliable transactions.* *The supermarket concept (EU-SysFlex) is a concept where you have no fixed flexibility products, just a pool of flexibility and the FSP declares the typical characteristics. This is very compatible with concepts where multiple services are combined, for example a pool that can provide both balancing congestion management, maybe some restoration reserves and other specific services. This concept is not tailored to one specific service in one specific location.* *Accurate pricing is important for the flexibility producers and aspects such as the investment deferral on the TSO side should be somehow included.*

Session 2: Integrated Energy Networks: focus on storage

What are the main regulation, market and operational barriers for storage deployment?

The clarification for the figure of the aggregator is very important, because the aggregator is the central position in order to enable market access to small storage entities that normally cannot participate directly in real time market, especially those markets that are devoted to services. And this aggregator position should also not only have a more clarified status and regulation, but also some sort of institutionalisation policies that could make it possible, viable to create a business model for this figure.

Storage ownership should be better clarified from the point of view of what kind of incentivisation for settling new storage should be provided in order to get an optimised situation for investments regarding the planning by the system operators. There should be a triangle between system operators, national regulatory authorities and investors clarified from a regulatory point of view.

Special market products should be developed to allow level playing field access to the markets, especially real time markets for flexibility and in particular storage should be elaborated because normal products that were tailored time ago on participation to real time markets from typically centralised power plants should be integrated with new products.

Storage and flexibility are externalities for intermittent and viable energy and usually externalities are not taken by the market but they are tackled by regulation. This is why regulation barriers are now the main problem. Why all services provided to the grid should not be fully compensated according to their value? Another regulatory barrier could come from not enough effective European emission trading scheme giving a price to the carbon. We need higher price to go quicker on transition in energy. Another aspect is the concession duration. We need long duration concession. Why the owner would invest for energy transition if the concession stops in 10 or 20 years while we need to invest for 2030 or 2050. About market barrier we need only to ensure a level playing field between technologies and we need a global economic model for flexibility integrating all renewable energy in order to have the full picture of the future energy system and to understand how all this renewable energy could be integrated.

Storage is one of the different technologies which can provide flexibility but still we need to understand and how it works, for example electrochemical storage. One barrier is the cost of storage which is still high for certain services. Also, we can see that in some flexibility services, that there might be some kind of cannibalization of the benefits, meaning that the more participants you will have, the lower the benefits will be for each and so that might be an issue in the long term to ensure a proper revenue for the storage actors. Also, the environmental impact of some storage is not always taken into account in the big picture of the global impact of the system.

At the LV network, there is no regulation for the battery separately, it follows the grid code for micro generations. This also depends on where storage is actually connected, behind the meter in the residential network and what is the purpose of this storage. If it is for grid services at MV and HV network, then we should have something different about charging and costing to avoid double charging phenomenon. There should been different regulations if the storage is for both grid service and/or only for the consumers and though is indirectly helping to the network.

Frequent changes in the regulations create a lot of challenges in developing business models, the related optimization strategies and control algorithms. There are also some gaps in the building permits and fire safety regulations. Regarding the market there are several challenges but one of the biggest is the low market capabilities. Storage technologies are mostly there but the storage as system is still missing and it was not available in the state you would expect. In the project installations restoration times can be really slow and there was serious lack of maintenance services for instance. There were problems in interoperability that need to be developed and also as the storage implementation needs a good understanding of the systems, potentially a storage as a service could be a solution for this.

More important issues on regulation. It is important that the services the storage provides need to be properly remunerated. These services as the penetration of renewables increases will be more and more important. In some countries, not all of the services, for example frequency regulation, are remunerated. Also, long term contracts are important, because the technology especially on batteries is evolving very quickly and all the time, so when you get a price during project preparation and technologies become cheaper in just two years, new projects are more competitive. Regarding grid fees it's important to remove the double charging, i.e. when the energy is charged and you're paying for grid fees, but also when you're discharging in some regulations. Regarding fast regulation changes, some countries in Europe are quite evolved in this, but others, like for example Spain, are just in the beginning. In more technologically related issues, the main problem is that the cost is quite high, especially for batteries. Another issue is that the cycle life should be improved and the cost reduce, investigating new materials, increasing the amount of recycled materials in the batteries and a longer life is important because these storage technologies start degrading as soon as they are manufactured. It is common that projects are delayed, so batteries in a warehouse waiting for being installed, are degraded quite high and this affects the business of the project.

Vehicle batteries raises additional issues when the car is moving from one country to another and we need to consider regulations that allow charging and remuneration in different countries, should be strongly regulated also at European level, i.e. we should not get different regulation when storing energy produced in one country and distributed in another country. Regulation of transportation of batteries is also important, while these batteries will be produced in Giga factories in Europe and then considering how fast the chemistries are changing, we need to regulate safety aspects related to their transportation. For fast changing the storage system, sustainability and recyclability should be regulated. Some of the recycling methods, some of the materials in the electrochemical storage system in particular, are cost effective when recycled.

Ancillary services markets are at an early stage of development and are important for storage. Also other markets could appear in the future, like transmission upgrade, deferral markets or avoidance. Storage can provide many services, but these are not monetized at the moment. The cost issue is still valid, although we do see that records of new installations happen every year. Seasonal storage which is strongly related with the topic of this discussion, i.e. the integrated energy networks, is very important in order to be able to harness increased RES benefits. When talking about seasonal storage, apart from traditional solutions, like hydro dams, we mainly refer to hydrogen storage or green fuels that we will be used in traditional thermal power plants.

What is the size (large centralized storage plant, distributed storage (industrial and residential) and what are the technologies used (e.g. batteries, reverse hydros, thermal storage (hot water tanks, cooling systems), gas storage, liquid storage)

Every kind of technology and every size of course is analysed to support planning. What we do is to match technology and size with the kind of congestion you have to solve in order to provide a candidate for specific nodes, also taking into account possible restrictions that the topology and other environmental conditions may set to the node. We use rigorous mathematical formulations, like Lagrange multipliers, but also some heuristic methods to cope with the big diversity of the grid for 2030 -40 –50-time horizons. We also use a Monte Carlo approach with different climate variants to create different kinds of scenarios.

Hydropower can provide all size of storage, for instance for medium storage, river hydro power plant can provide some MWs from an hour to couple of hours with storage a hydro power plant can provide up to several hundred MW from several hours to several months and a pumped hydro power plant can have very high power up to 2 GW and from 5 up to 100 hours.

There are different types of storage which are somehow in competition and it is not always easy to model all the different options. Size is quite relevant, for example in a small system like an island, 1 MVA of storage will have a big impact, much smaller in a larger system.

At distribution (LV) network all storage capacities are very small, a few kW. The challenge here is to deal with all distributed energy resources with lots of power electronics interfaces. It is very important to maintain the power quality at the LV networks and definitely storage can help the consumers and support the grid network, but the challenge is how better to coordinate these devices. Phase unbalance issues are also important, especially when placing and controlling storage in single phase or three phase networks.

A lot of different small and medium size storages have been tested regarding the way they can support the grid in industrial and residential areas, at building and neighbourhood level. Thermal and electrical storages and even compressed air energy storage system has been tried, but that demo had to be stopped because the technology wasn't ready yet. Different other flexibility options were also tried, like using the building shell as thermal storage and also some of the electric vehicles. The sizes were from some tens to several hundred kWh. There were different types of batteries lithium-ion, lead-acid batteries and some flow batteries, all types and styles of storage. It is not wise to put all the eggs in the same basket as they say. It's better to use all different options and try to find the best use for all of these options.

What are the main functionalities of your storage project, e.g. frequency regulation, renewable energy balancing, load time shift, etc?

The use of flexibility, in particular provided by storage, in the planning process for the transmission and distribution grids. The service is most notably congestion management.

Hydropower could provide all kind of service. In the future hydropower will share this service and will give room to other technologies, for instance we have successfully tried using battery for very short time scale, about some second or some millisecond, and in the future, we could have long duration storage from hydropower with hydrogen.

Frequency, balancing and congestion management from chemical storage to the grid have been tested.

For consumer support the main functionality was on peak demand reductions. Grid services were offered by discharging during peak time and by charging batteries when PVs are available in off-peak time.

Load shifting, peak shaving, power quality improvement, stability and security of the grid, reduction of line congestion, voltage control, increased self-sufficiency and increase of self-consumption have been all tested. The functionalities were generally achieved pretty well as long as the storages were available during the operation.

Have you performed a Cost Benefits Analysis and a Life Cycle Assessment of the related Investments?

Taking profit of storage and flexibility in planning, we hope that the cost benefit analysis will minimize system costs (OPEX plus CAPEX) and see among the wide range of candidates what are the best awarded. So, we also internalize the main environmental aspects that are air quality, CO2 foot print and environmental constraints and in that framework, we use also a lifecycle assessment framework.

Taking into account the current situation, the current way the market and the benefits are, there are some aspects that are very promising, for instance the fact that storage requires only a local investment and not a distributed investment. From the point of view of network refurbishment, storage can provide a quicker solution and sometimes a more effective solution, whenever some kinds of congestion are targeted, like for instance variability of some weak points of the network. In that case the effect of storage can be similar to the one of VPP power plant and the compensation of that variability is provided to the rest of the network.

Regarding the environmental benefits, it requires a lot of renewable energies in the system before the battery energy storage becomes environmentally beneficial. Regarding the economic analysis the incomes are really low as mentioned from small pieces of revenue streams and therefore you need to make a really good cost benefit analysis regarding the sensitivity to these different aspects before planning the system.

As we are dealing with the distribution network and storage, PVs will effect a change in the demand pattern, the overall demand profile will be changed. This will have lot of impact on the business, the strategy and the future planning of suppliers, and these stakeholders could not only supply the consumers but also play the role of aggregator or some sort of local market operator.

The EU needs more storage hydropower, first for independency and secondly for the security of the grid. However, these investments cannot be provided by private investors with investment return periods between 20 and 25 years. Pump storage hydropower is largely profitable with long lifetime and long-term contracts or 40 or more years.

In the last life cycle assessment, we did we observed that for construction operation and deconstruction there was a release of 11 gram of CO2 per kW, which for 80 years it was 250 MW. Last point, according to the green deal, we have to do life cycle assessment

but we need as well multi criteria analysis. I mean selection of technology should rely on other criteria, for instance the energy return on investment, the local development, the mineral depletion and so on.

Concerning the second use of electrical vehicle batteries for a storage project, is it a sustainable approach or are there a lot of barriers?

This depends on the cost of new batteries and in particular the cost of recycled materials. If we have a very good and efficient recycling methods that can provide new materials or direct recycling to revitalize materials, maybe the cost of a completely new battery will be so low that the second use of cells coming from vehicles in other storage from renewable will be not so efficient. In fact, when you use battery cells coming from other uses, in particular electric vehicles, they are not exactly at the same state of health or state of charge. It depends, it is still a very open discussion

Session 3: Digitalisation as the Key Enabler: Semantic Interoperability; Protocols; Data Gateways; IoT Integration

***Different technologies and the integration layer in the Ebalance-plus project**:*

In order to achieve interoperability, the energy management platform is based on a distributed middleware, with interfaces where different services can read and write data (the services that talk to the devices are called adapters). In the case of not-controllable devices, additional hardware may be required. The general idea is to translate different digital languages into the one used by the project's middleware (and distribute the data within the system to process it).

Ebalance-plus project *& the gap between ideas and reality:*

Sometimes there appears to be a gap among ideas and reality, however, research is able to close this gap. There are different levels of research: basic research is related to protocols and data transmission and product-related research may be linked to what the use-cases define as requirements and the relevant optimal solutions. It has also been noted that Ebalance-plus project is a follow-up project concerning a project starting on 2013. The initial idea was to create a pool (or data space) where someone may put their data, allowing others to perform services for them. The first platform developed in the first project, is now planned to be deployed on a larger. Moreover, it has been noted that the energy markets are pretty diverse in the EU region. Thus, it is important to provide a solution adapted to all the relevant legal and technical limitations.

Type of buildings and Research level of the EPC4SES project:
Residential buildings, a university and an office building are considered within the project. The project currently sets up the software for the relevant modelling. The implementation work of the project lies in the research level, yet actual data is used. Moreover, the project will demonstrate that real savings can be achieved.

Restrictions on the data collection due to data privacy issues in the EPC4SES project:
The building data is used to set up the EPC on an individual level. In this respect, the relevant application does not interfere with privacy issues, since the data is owned by the building owner. For regional planning the situation may be difficult (yet, in this case, the relevant authorities have the data in their hands and may not disclose the relevant data).

SGAM to validate interoperability in the EPC4SES project:

Prototypes can be set up in order to monitor and validate if the communication is OK, if the MPC is possible and if the system is stable. Moreover, the application of the smart grid interoperability testing methodology will be considered for the project.

A common language among all the technologies in all the pilot sites in the InterConnect project:

The project shall achieve semantic interoperability among existing solutions. The goal is to bring together existing digital platforms services and devices within this unifying interoperability layer, providing semantic interoperability. Moreover, a WP is dedicated on extending the existing ontology for the needs of the pilots, while an additional WP is dedicated to implementing the interoperability framework, which is developed to be ontology agnostic (apart from the scope of the project it can also be used in different domains), providing a toolbox for digital platforms, operators and service providers.

Main challenge faced in the development of the pilots in the InterConnect project:

The solutions in the project shall address semantic interoperability, while also allowing the optimal integration at the side of digital platforms, and existing service providers. In this respect it is important to provide a set of software components/tools for the interoperability framework, which shall be easily implemented by stakeholders in the pilots. Apparently, trade-offs and compromises shall also be considered in order for the solution to be used by different types of integrators (not just experts in energy).

Open-source and availability of the relevant solution in the InterConnect project:

The solution developed will be an open-source solution. The project is expected to end on 2023, yet the first interoperability framework version will be available at the end of September 2021.

Application of the developed solution (INTERRFACE project):

Today there is not a DSO/TSO platform coordination (no real-life exchange of data exists). Many platforms may be developed initially, yet a common architecture is desired. In this respect, many platforms may be developed, but gradually they may merge or converge at a single point that could be reusable among all TSOs and DSOs

Role of Smart meters (INTERRFACE project):

Smart meters are crucial to deal with the flexibility issues within the Interrface project. The important point is to collect the data via the API either independently or by the meter owner.

Decision makers and willingness of operators to change:

DSOs and TSOs appear to be very open for new concepts, especially related to the concept of flexibility. It has also been noted that DSOs and TSOs are regulated and ways exist to remunerate the relevant investments. Moreover, there needs to be a coordination among the operation department, asset department and innovation-management.

Flexibility trading, and a pan-EU or local solution:

There are many innovation projects on flexibility trading. Although a view of a pan-EU direction is desirable, yet the implementation shall initially happen at a local level initially. There will not be a big single solution from moment. A Big single solution rather needs to be built bottom up

Standardized interfaces and the BRIDGE management WG chart:

Markus Bechman noted that one of the main challenges appears to be the development of different standards. In particular, standardized software is being developed for commercial processes, meter data, etc. However, for the new use-cases connectivity to the devices is also required. The devices are depicted at the bottom of the chart, while the business systems are depicted at the top. It is important to find a way among those two layers without developing a great number of interfaces. Thus, the biggest challenge appears to be the creation of a standardised interface to provide data (from a smart meter, or another device in a smart home) without having to understand the protocol of each different hardware.

Data sharing:

Sandra Riaño noted that data sharing appears to be considered as a difficult issue. More specifically, there appears to be a lack of standards, particularly related to the distribution network. Thong Vu Van agreed that data sharing is difficulty addressed (issues on how the data shall be shared are raised). Additionally, it has been noted that the CIM format is applied to the TSO level yet the relevant application to the DSO or prosumer level shall be investigated.

Making people use the developed solutions:

Krzysztof Piotrowski noted that two groups of stakeholders appear to exist: small end users (convinced with easy-to-use solutions) and the large stakeholders, like DSOs or TSOs (who need to be convinced on a legal level: they may not change their behaviour unless they are forced to do so). Moreover, the development of data exchanging platforms is quite important, while the relevant data pool shall not only be used for energy related issues but shall also be exploited elsewhere. Additionally, synergies between different sectors shall also be considered. In particular, data storage (e.g. centralized/decentralized) or data processing have different requirements, indicating a need for optimization methodologies (e.g. data redundancy to speed the data exchange).

One-shot solutions may not be considered for everything:

Gerfried Cebrat noted that among all the available use-cases specific use cases may need to be picked and implemented. In this respect, the main problem may be broken down to sub-problems which shall be solved one-by-one.

Creating interoperability on top of existing solutions:

Milenko Tosic noted that the biggest challenge is to create a toolbox of proven integration points among existing technologies and the unified semantic inter-operability layer. Moreover, the relevant use cases and their implementation shall be made available in a more generic way. Additionally, on the business level, the proper value proposition for the stakeholders shall be defined (related to regulation or motivations). Finally, federated knowledge bases shall be created.

Session 4: Consumer and Citizen Engagement: Engaging groups and individuals

Addressing and meeting the needs of groups

People owning their own generator and using their own energy: Such an option lowers the pressure on the grid. Moreover, everybody shall have the right to participate in energy transition even if they do not have enough space in their homes to install PVs or wind generators. Additionally, the case where energy is produced by the community and revenues go back to the community may be more accepted compared to the case where a multinational company installs noisy wind parks or large PV plants in an area (with the company getting the relevant revenues).

The use of the term 'cells': When the R2EC project started the term 'energy cells' was considered. Today, this project would abandon the more technical term 'cells' use "energy communities" instead.

Different motivators/drivers for change in energy communities: There appear to be different aspects of motivation, due to the differences noted among the people participating in energy communities. The main motivator still appears to be related with money (, yet the environment is also considered (particularly by older participants that try to change the environment for future generations) and other triggers drive younger people, such as gaming, competing, being member of a (social) network.

Hiding the platform's complexity from the user: The energy system is complex and it requires a complex interaction with the user, which needs to be simplified. The automation of this interaction also needs to be simplified (the consumer/prosumer is not expected to view their tariffs or costs every day). Depending on the interest of the user, such interaction should be completely Moreover benchmarking (simplification of data to allow the comparison of benchmarks) is also something that people like (people like competition). In this respect, gamifications shall also be considered.

Getting people involved in energy thinking, restoration, etc.: Usually national incentives are the initial drivers. However, later the main motivator appears to be 'word of mouth' (People see energy communities with advantages for people, understanding that innovation makes your life better). Thus, today the relevant drivers are a combination of culture, innovation, and money.

Energy Transition and tourism activities: renewable energy communities can be created considering renewable energy for sustainable mobility (for instance with the use of e-bikes along the seaside or collective charging of e-cars). In this respect energy communities in tourist areas could include locals and guests as well (if the concept of Citizen Energy Communities will be adopted).

Flexibility at different levels (national, local): It has been noted that flexibility is not easily understood. On local level it usually relates to the reduction of the consumption and maximizing the self-consumption. On national level however, it is also related to balancing issues and stabilisation of the system (meaning that consumption may need to be adapted to availability of "green" energy). In this respect flexibility on a national level is more difficult to be understood and implemented

Group Dynamics

Group dynamics in cooperative approaches: The aspect has been tackled within the R2EC project with lots of workshops alongside the involvement of the users and the conduction of surveys. In this respect, the feedback from people is integrated in the project. Gamification can also be introduced by making the relevant UI needs or game oriented.

Bringing many households together alongside the industrial consumers: Many households (small consumers) may be grouped to work together with industrial consumers / prosumers to jointly face the challenges within the community.

Triggering the dynamic process: The trigger usually comes from businesses (which does not necessarily mean the triggers are all financial). In particular, small and local enterprises are usually the one triggering the relevant processes with their products and services (counselling with home-owners, creating the relevant offers for house insulation, installation of PVs, etc.)

Change of engagement over time: Within BRIDGE (and within the relevant projects) focus is applied on sustaining the engagement of people over time. Apparently, there are different phases within projects and people may change, however the need to have a sustained community (over time and not just for the time of a project) arises. Such "communities of innovation" are not easily established. So, they should be reused for subsequent projects (cf. "living labs").

Climate neutrality

Climate neutrality addressed at a national or local level: It has been noted that every citizen shall play a role in reducing the carbon footprint of their community. In addition to EC and national climate plans, local (municipal, regional) climate plans need to be developed and implemented.

A new type of energy system as a better approach for climate neutrality: Apparently the energy community (local) approach is well suited to municipalities, communities, etc. This approach may not be applied in big industries, where huge amounts of energy are

needed. Thus, both options shall be examined: Energy communities for a smaller-scale approach (citizens, etc.), while also examining the bigger players and the relevant developments required in the energy system.

The boomerang effect and reducing the energy consumption: It has been noted that in case the RES production is increased and such energy becomes ever cheaper, an increase may also be noted in the overall energy consumption (called as the 'boomerang' or "rebound" effect'. This case shall be avoided: using less energy shall be considered as the overall goal.

Global energy justice: Climate and energy justice is not only an issue within EU. For the energy transition it is important to think that we are connected globally. It has to be considered how industrial countries (e.g. in Europe) can closely cooperate with less developed countries (e.g. in Africa)

Needs for Research and development

It has been noted that while the technical power system evolves in a system of systems, an evolution is also noted regarding the IT architecture. In this respect, it is important to map this architecture into the system of systems. And in addition, the decentralisation of the energy organisations and businesses needs to be considered. Energey Communities may pave the way to a new energy organisation and market model. It is also quite important to evaluate the global effects, while at the same time addressing the boomerang effect by reducing the energy consumption. Finally reusing and recycling shall also be promoted.

3.2.3 SLIDO QUESTIONS

In most of the parallel sessions, the audience was polled using Slido. Here an overview of the main results:

Session 1: Market based Energy Systems

Figure 3: Do you think local energy markets are important?

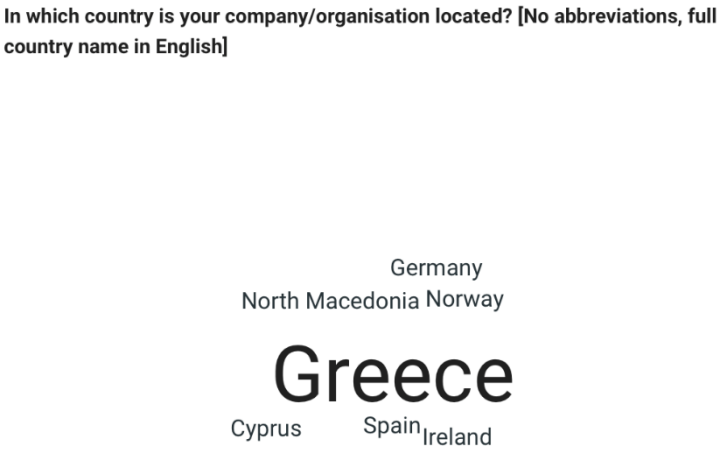


Figure 4: In which country is your company/organisation located?

Figure 5: Please, identify the main goal for European Energy Markets to be reached by 2050

Session 2: Integrated Energy Networks – focus on storage

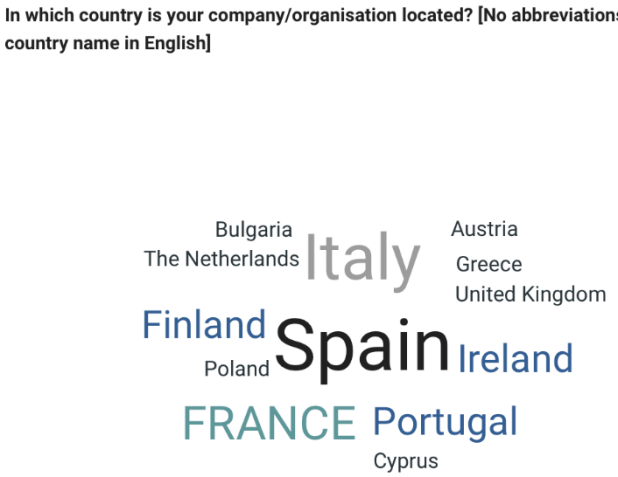


Figure 6: In which country is your company/organization located?

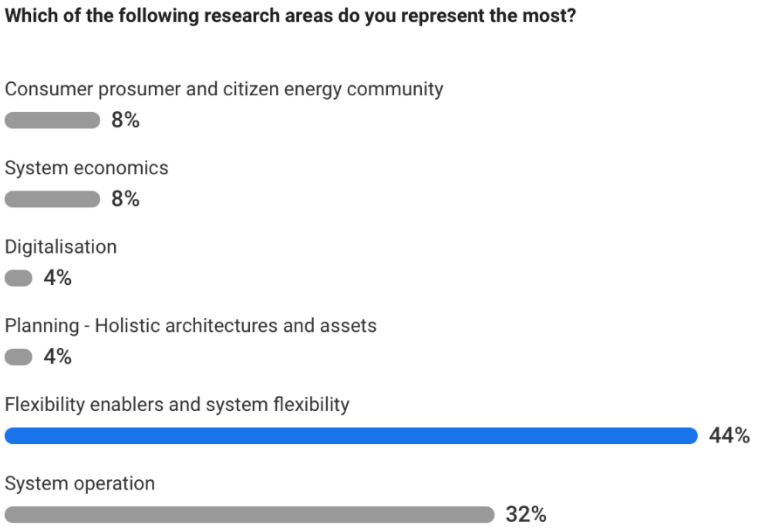


Figure 7: Which of the following research areas do you represent the most?

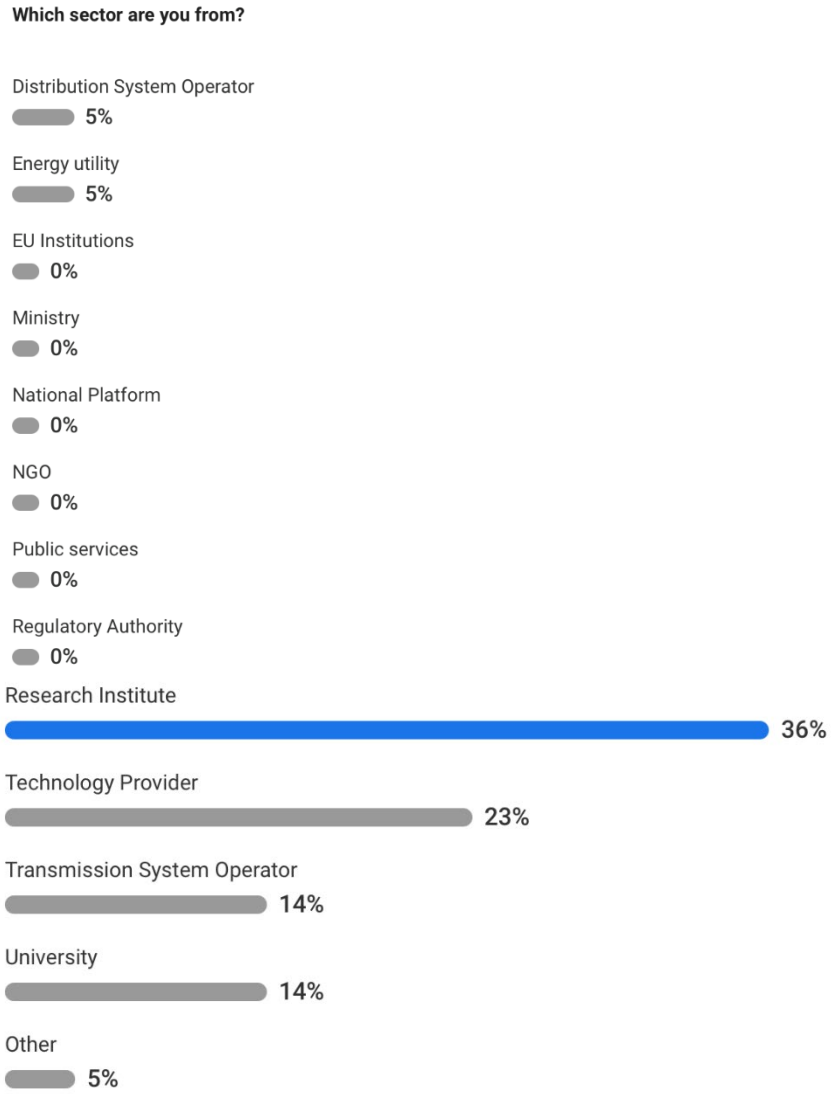


Figure 8: Which sector are you from?

Session 3: Digitalisation as the Key Enabler: Semantic Interoperability; Protocols; Data Gateways; IoT Integration

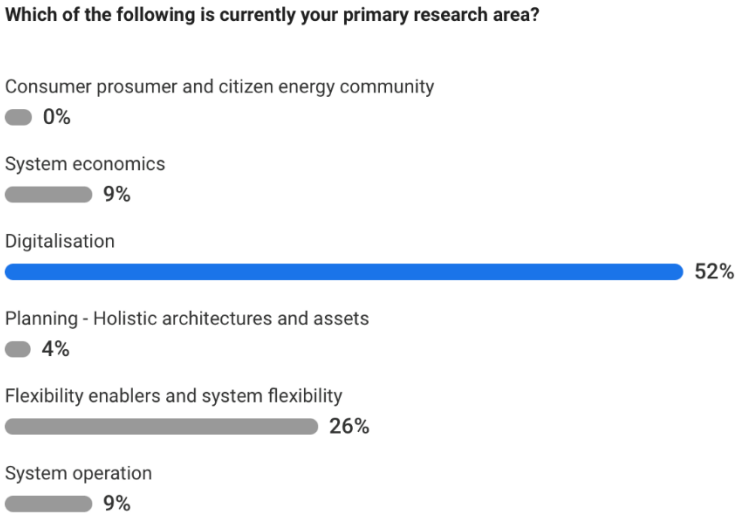


Figure 9: Which of the following is currently your primary research area?

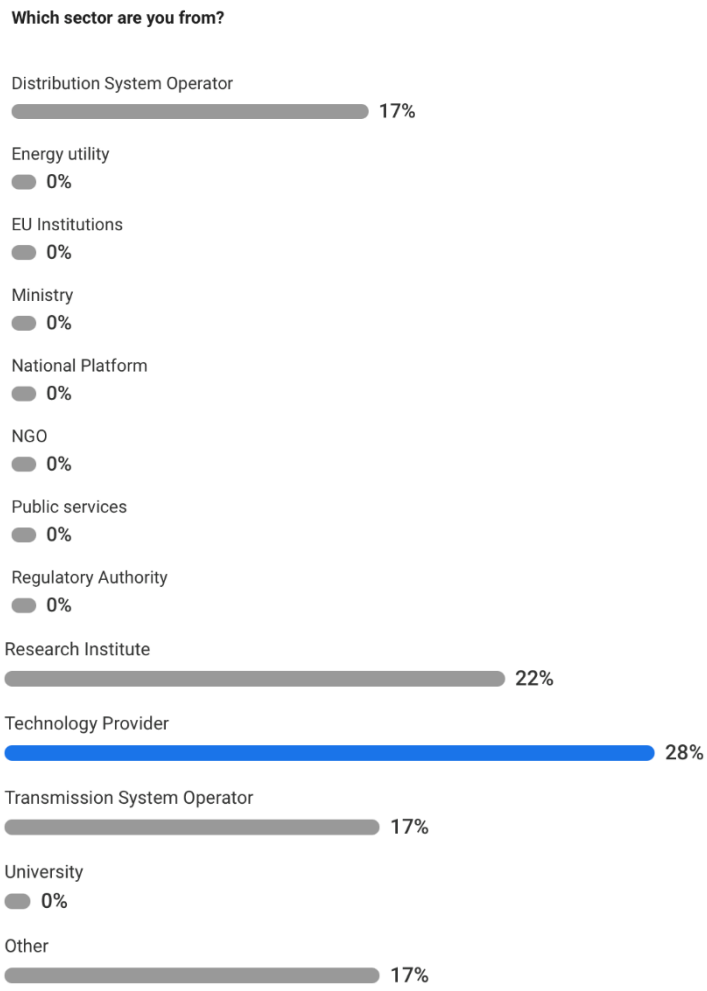


Figure 10: Which sector are you from?

In which country is your company located? [No abbreviations, full country name in English]

Figure 11: In which country is your company located?

Indicate up to three most important R&I-related Digitalisation Steps

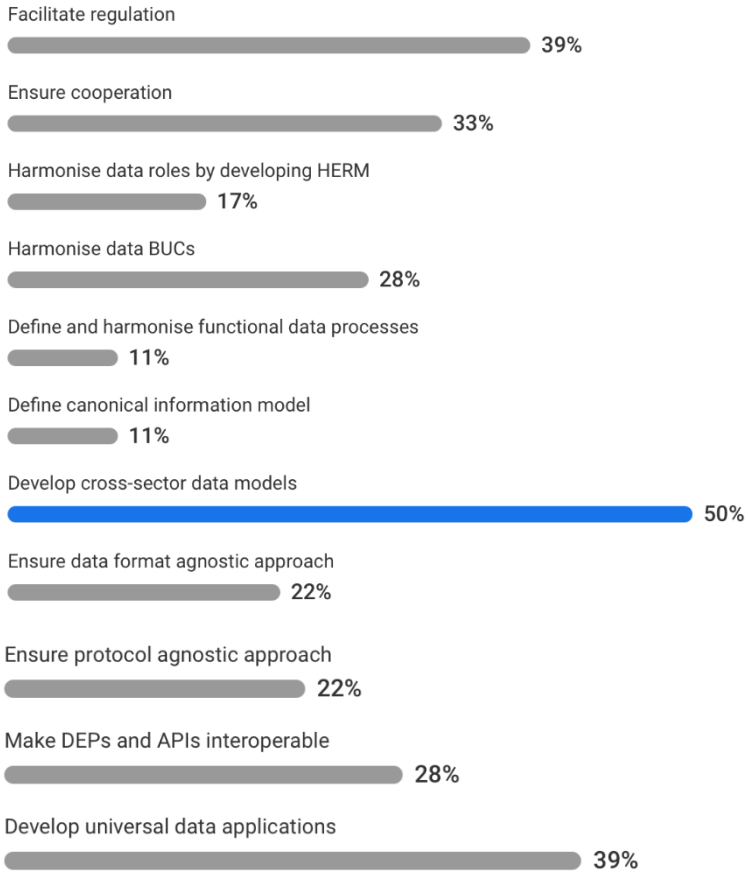


Figure 12: Indicate up to three most important R&I-related Digitalisation Steps

Session 4: Consumer and Citizen Engagement: Engaging groups and individuals Consumer involvement, citizen engagement and energy communities

In which country is your company/organisation located? [No abbreviations, full country name in English]

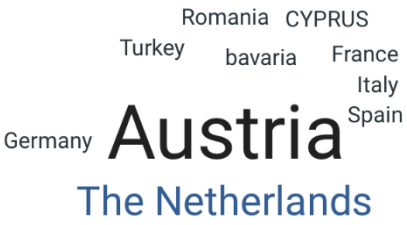


Figure 13: In which country is your company/organisation located?

Except money - what drives people to actively promote energy transition?

Figure 14: What drives people to actively promote energy transition?

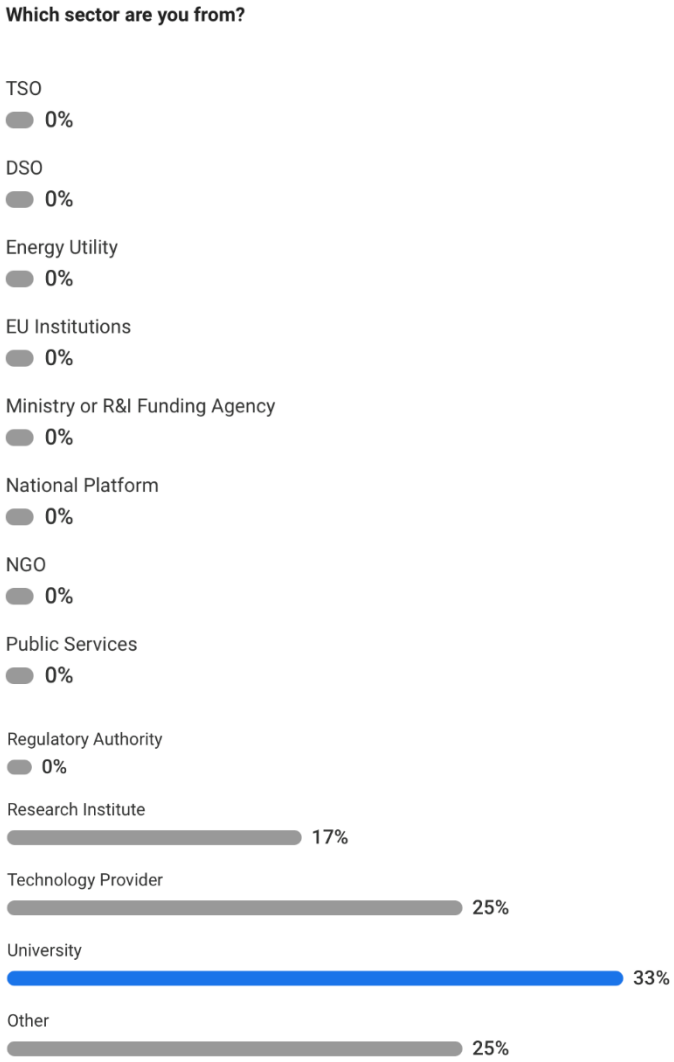


Figure 15: Which sector are you from?

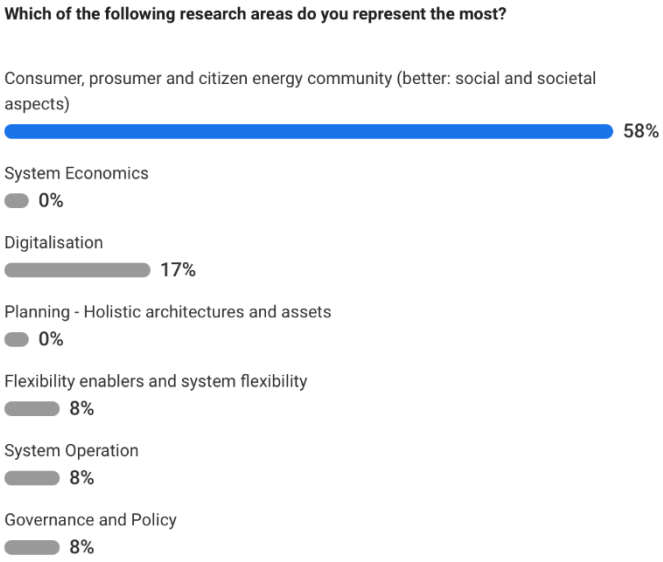


Figure 16: Which of the following research area do you represent the most?

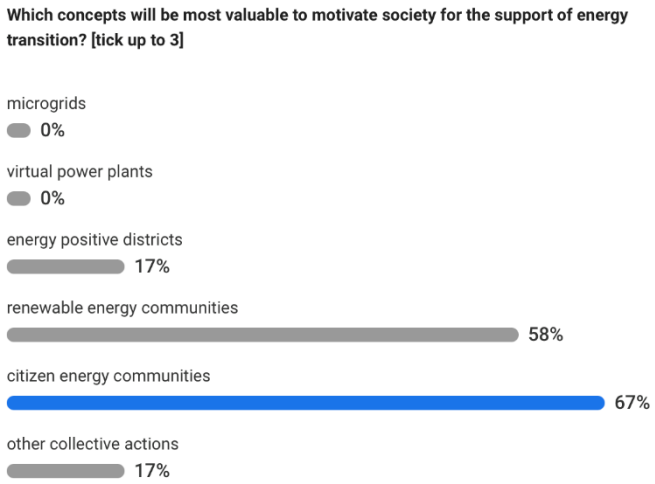


Figure 17: Which concepts will be most valuable to motivate society for the support of energy transition?

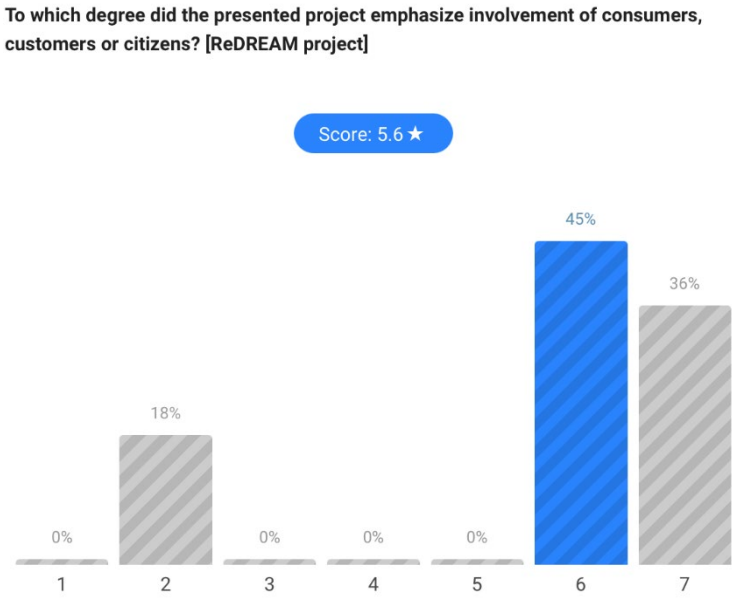


Figure 18: To which degree did the presented project emphasize involvement of consumers, customers or citizens?

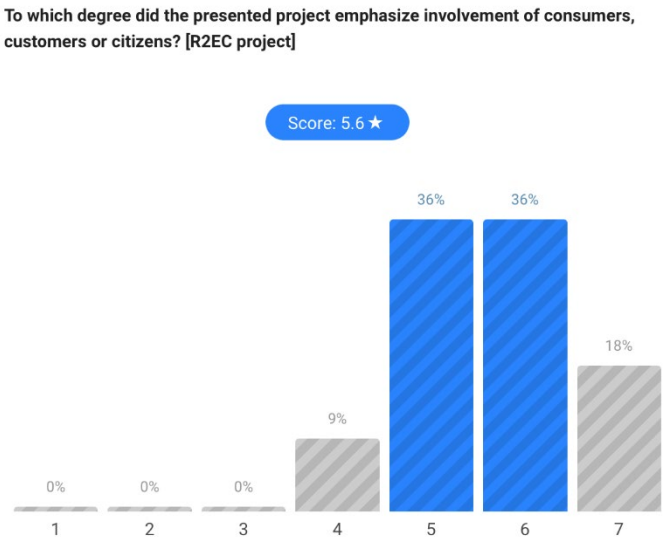


Figure 19: To which degree did the presented project e emphasize involvement of consumers, customers or citizens?

Figure 20: Express in one or two words the main gap in your country RDI agenda related to consumer involvement, citizen engagement and energy communities

4. CONCLUSIONS AND RECOMMENDATIONS

4.1 CONCLUSIONS AND RECOMMENDATIONS FROM THE PARALLEL SESSIONS

The following key conclusions have been drafted by the Parallel sessions' moderators as key outcomes of the discussions.

They are reported in the next paragraphs divided per parallel sessions.

4.1.1 PARALLEL SESSION 1: Market based Energy Systems

The following issues were noted during the first session regarding "Market based energy systems":

- Importance of regional cooperation and of deploying common regulation (Energy Community area)
- Importance of markets at local level, nested in larger footprint ones. Local Markets are more suitable to cope with local problems (e.g. Congestion Management)
- Network code for flexibility
- Integration of the new TSO role in National Laws
- How to consider grid constraints and cope with them
- Bilateral trading still has a role in pool-based markets
- Evolving role of gird operators and TSO-DSO interaction
- New tools for network monitoring and observability are important
- Third party/private actor roles for some grid services are required
- 'Supermarket' concept and new business models
- Demonstration of new technologies such as block chain

4.1.2 PARALLEL SESSION 2: Integrated Energy Networks: focus on storage

The following issues were noted during the second parallel session on "Integrated Energy Networks: focus on storage":

- Not uniform and harmonized approach along the EU MSs
- Level Playing field is required across the EU
- Figure of aggregator is central in a market devoted to provide services but it needs a clearer definition
- Duration of administrative process to get authorization can be too long for system requirements
- Long term contract and concessions are needed to cover the investments to deal with changing environment/technologies

- Flexibility services are not really compensated
- It is still required to fully understand the capabilities and constraints for integration and operation of storage systems, especially for batteries.
- Steering wheel of the system (control of operation of storage systems) may be missing because it is challenging to design control systems that are flexible enough to deal with the continuous changes in the regulatory market (e.g. frequency regulation especially considering the great variability across EU)
- For several MSs there is still uncertainty of definition between generation and storage resulting in e.g. double charging
- The environmental benefits come from the use of renewable energy, but the LCA is nevertheless required to fully understand implications for storage technologies across their lifetime.

4.1.3 PARALLEL SESSION 3: Digitalisation as the key enabler: Semantic Interoperability; Protocols; Data Gateways; IoT Integration

The conclusions on parallel session 3 "Digitalisation as the Key Enabler: Semantic Interoperability; Protocols; Data Gateways; IoT Integration" can be summarised as follows:

- Digitalisation projects are needed to close the gap between ideas and reality (implementation). Projects are the means to implement an idea with interested users.
- Cross-sector data exchange reference architecture (based on the BRIDGE Data Management WG graphics- SGAM based with details): There is a challenge on the level of dimensionality. From 'Business systems at the top' down to 'connectivity to devices at lowest level'. Issues are indicated on how the many layers in-between shall be used.
- Data sharing today is challenging. Especially in the DSO world, standards seem to be missing
- In order to enable people to use the developed solutions, two groups may be considered: small end-users and the DSO/TSO level. Data-based solutions may be useful beyond the energy sector.
- Apparently not everything can be solved in one shot. Thus, Use Cases need to be selected to be implemented (solving sub problems)
- There is a challenge in creating interoperability on top of existing solutions (Federated knowledge bases must be created)

4.1.4 PARALLEL SESSION 4: Consumer and Citizen Engagement: Engaging groups and individuals

The key conclusions on parallel session 4 regarding 'Consumer and Citizen Engagement: Engaging groups and individuals' can be summarised as follows:

- Concerning models to address and meet the needs of entire groups it appears that framing matters (e.g. "energy cells" shall better be called "energy communities"). It is important to organize people without a roof

or land to include them in the energy transition. Moreover, it is important to let people experience tangible changes in their neighbourhood, not the least to let them experience mutual appreciation. It is also important to make a distinction among young demographic and seniors. It is also important to look at gaming (how they attract and involve users) and in that sense it may help to let municipalities cooperate on the basis of benchmarks (people like competition).

- Regarding the group dynamics in cooperative approaches, it appears that group games motivate people of all ages and all cultural backgrounds. Dynamic engagement is an ongoing activity. Moreover, it appears that (local) governments can initiate the cooperative approaches, while crafts and small local businesses are catalysts.
- Concerning climate neutrality activities, directives for climate neutrality shall give direction to energy transition. Moreover, there is a need to define more models of participation than just the renewable and citizen energy communities as defined in EC directives. It is also important to involve intrinsically motivated ecologists in the co-creation of new energy systems; they may help finding ways to funnel money for carbon certificates into advanced (local or regional) energy installations. Although local issues are important the bigger (national) structures shall not be neglected.

4.2. RECOMMENDATIONS FROM ETIP SNET WORKING GROUP 5 IN TERMS OF "INNOVATION, IMPLEMENTATION IN THE BUSINESS ENVIRONMENT"

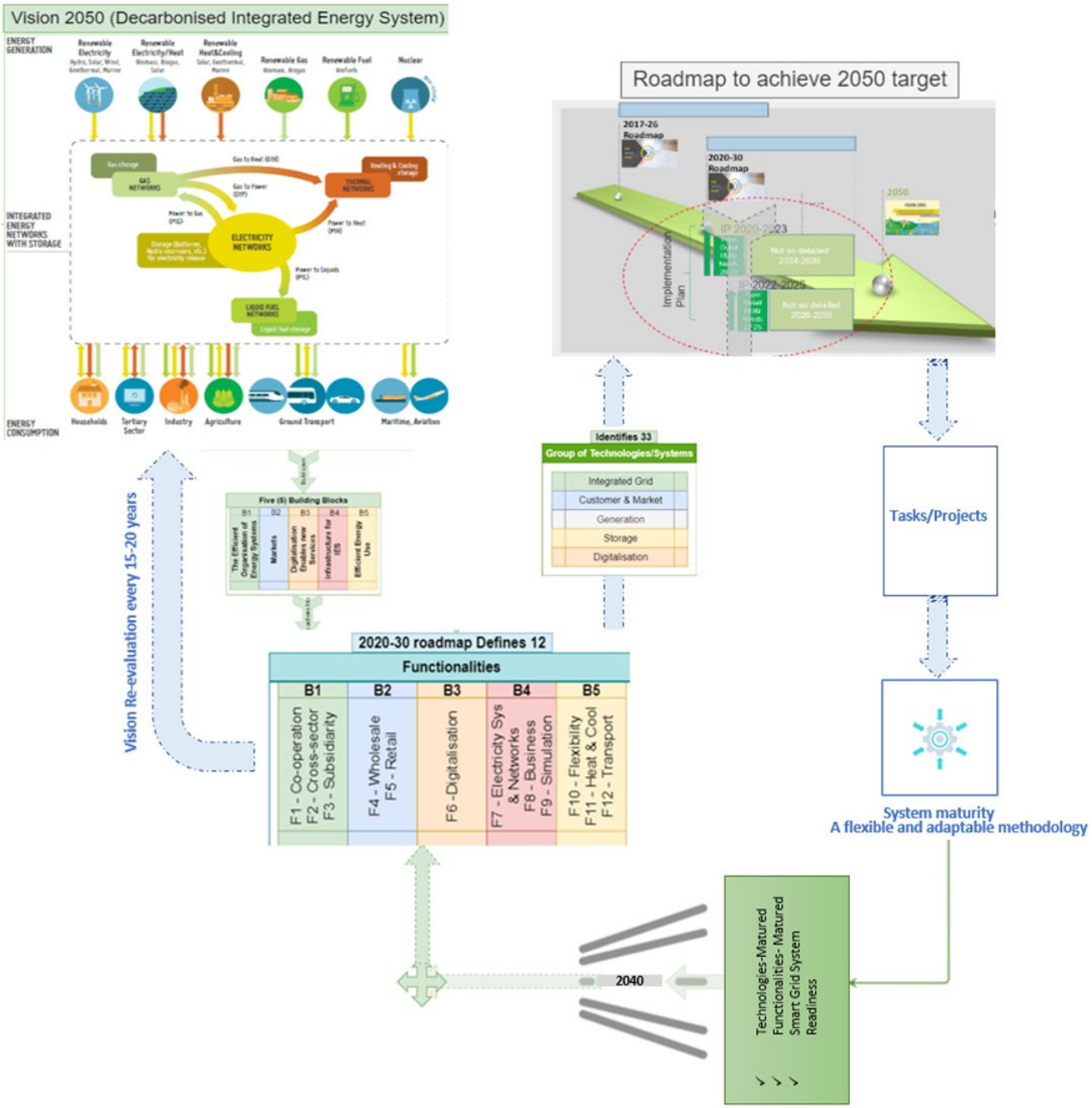
The objective of ETIP SNET Working Group 5 is to mobilise experts in support of R&I work in EU to reach the market. It works closely with all WGs of ETIP SNET to utilize projects' results in support of R&I needs for the years to come.

In order to reach this aim, it is essential to have a homogeneity of technology classification and a universal approach that allows to coherently structure and analyse all data coming from projects.

- Build **homogeneity in the analysis** of projects, work done, and lessons learned ⇨ Create a common platform
- Build a universal approach in the taxonomy of technologies that constitute the evolution of functionalities in building the smart networks of 2050 in support of the energy transition.
- Build a methodology to **judge system needs** in the energy transition capable of identifying tangible needs for building on progress made and give feedback to the other WGs for populating their R&I needs in the years ahead;

The results of projects are a valuable source for capturing the maturity of technology evolution contributing to the maturity of the functionalities!

The rolling process as build in the EIRIE platform that is planned to go live early July 2021, aims to help the identification of R&I needs to populate the Ten-year Plan and subsequently the Vision of ETIP SNET.



Purpose of the self-assessment

- ***In line with the Innovation Radar assessment***
  - Promoting and showcasing emerging innovations resulting from H2020 projects
  - Bringing together innovative solutions owners and investors/ incubators for facilitating the "go-to-market route"
- ***....and beyond the Innovation Radar***
  - Further deep-diving to the innovation and go-to-market enablers of most prominent solutions
  - A variety of new parameters enabling more detailed (self-) assessment and revelation (self-understanding) of:
    - Strong "go-to-market" aspects and enablers
    - Aspects and enablers that need to be further improved and require further analysis and elaboration

- Promote the creation of a business ecosystem, not only for business-ready solutions, but also for promising ones that underperform in certain enabling aspects.

➢ ***What is on for BRIDGE and ETIP-SNET?***

- A tool to collectively analyse and assess the level of business maturity of certain clusters of technologies
- Valuable input for fine-tuning Roadmaps, Implementation Plans and WGs/ TFs activities

Key features of the self-assessment questionnaire

➢ ***To whom and prerequisites***

- R&I project managers/results owners
- It requires about 30-40 min to go through a digital questionnaire dealing with a wide range of aspects of 'Innovation support to the market uptake'

➢ ***A multiple-choice questionnaire to assess the market uptake process of your project***

In this spirit to meet the above objectives, a questionnaire has been shared with all the projects presented during this 12th Regional Workshop. It is based on three pillars: innovation management, innovation readiness and market potential. The aim is to provide practical advice to projects with a focus on go to market strategy. It will also help the formulation of the Roadmap and Implementation Plan.

The questionnaire consists of 36 questions organised into six main areas covering the innovation facilitation:

1. Technical Description
2. Exploitation
3. Business Planning & Market Competition
4. Context & Ecosystems
5. Investors & Finance
6. Management

All the projects presented during this 12th Regional Workshop have been evaluated according to these six areas and each of them has received a specific score. Results are presented in the visualisations that follow.

4.2.1 FEEDBACK VISUALISATION: SESSION 1

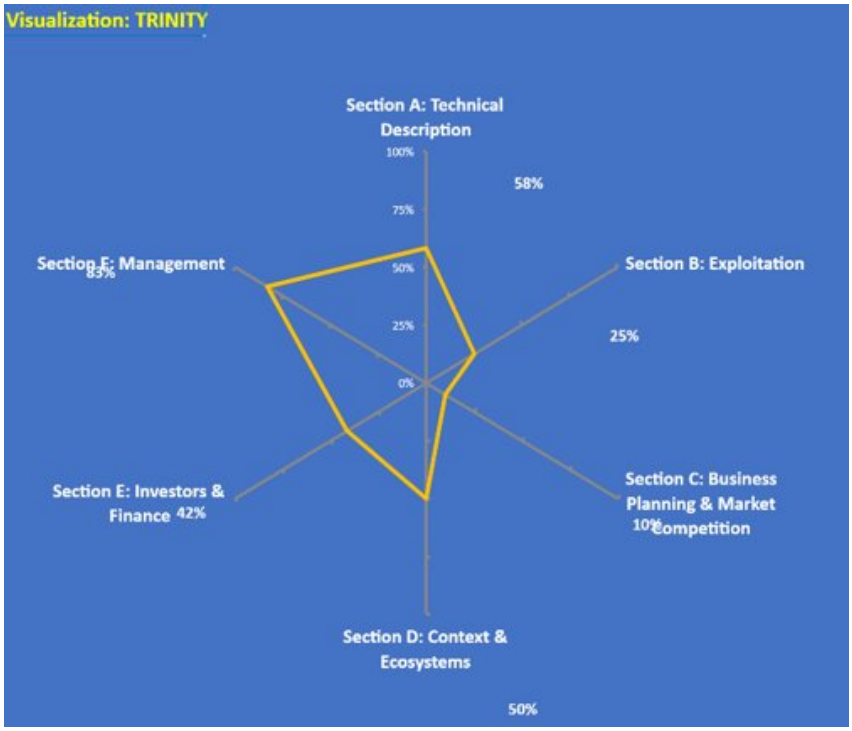


Figure 21: Visualisation TRINITY

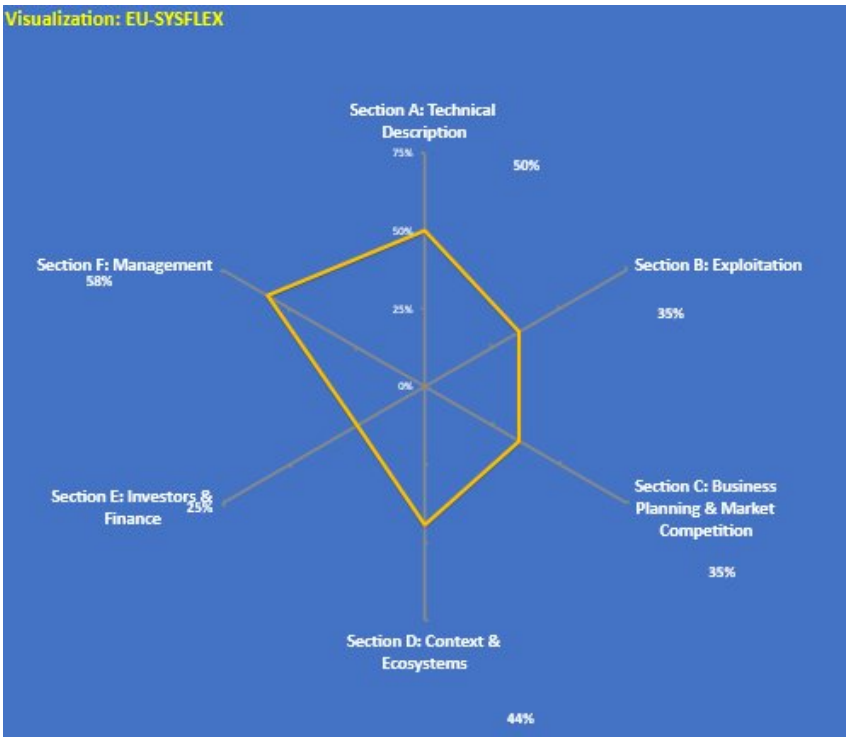


Figure 22: Visualisation EU-SYSFLEX

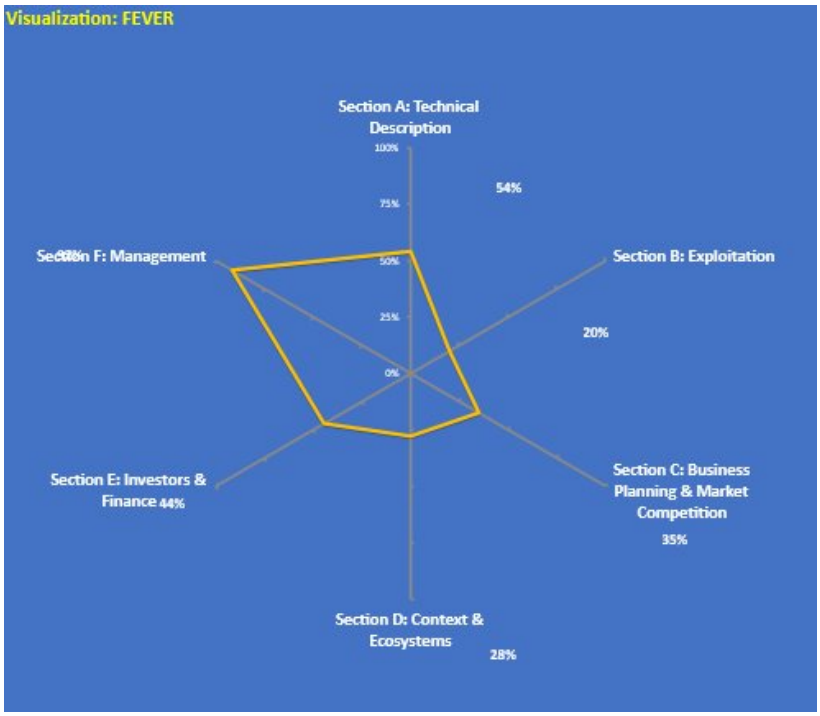


Figure 23: Visualisation FEVER

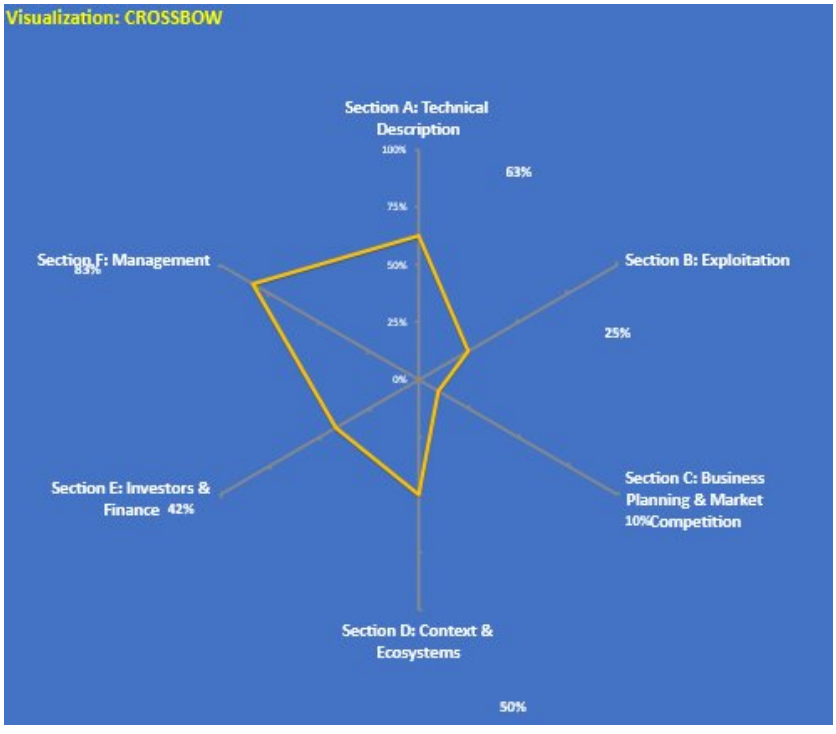


Figure 24: Visualisation CROSSBOW

4.2.2 FEEDBACK VISUALISATION: SESSION 2

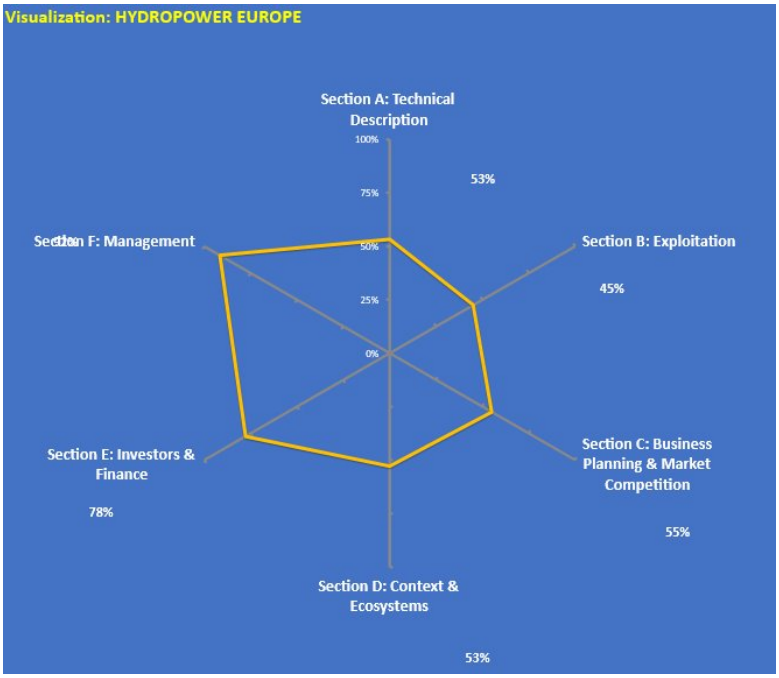


Figure 25: Visualisation HYDROPOWER EUROPE

4.2.3 FEEDBACK VISUALISATION: SESSION 3

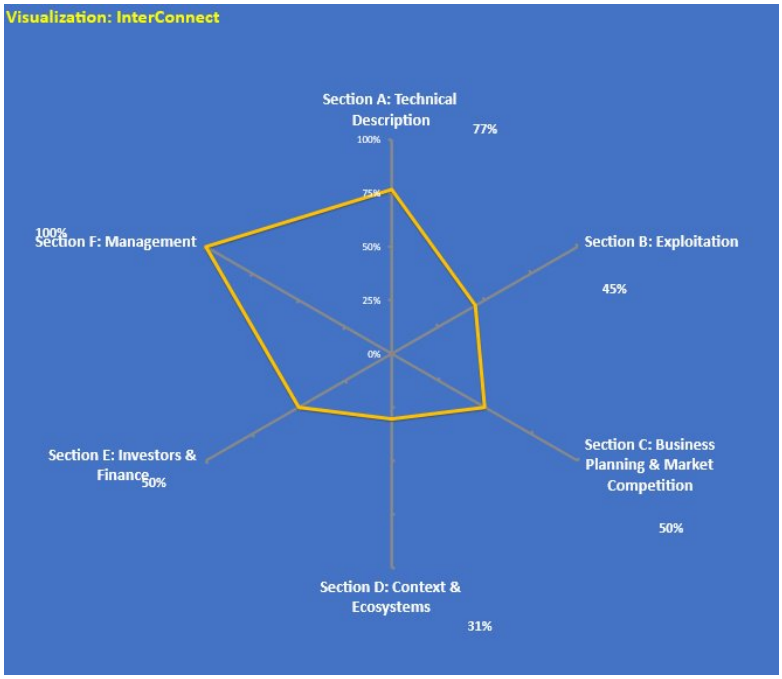


Figure 26: Visualisation InterConnect

4.2.4 FEEDBACK VISUALISATION: SESSION 4

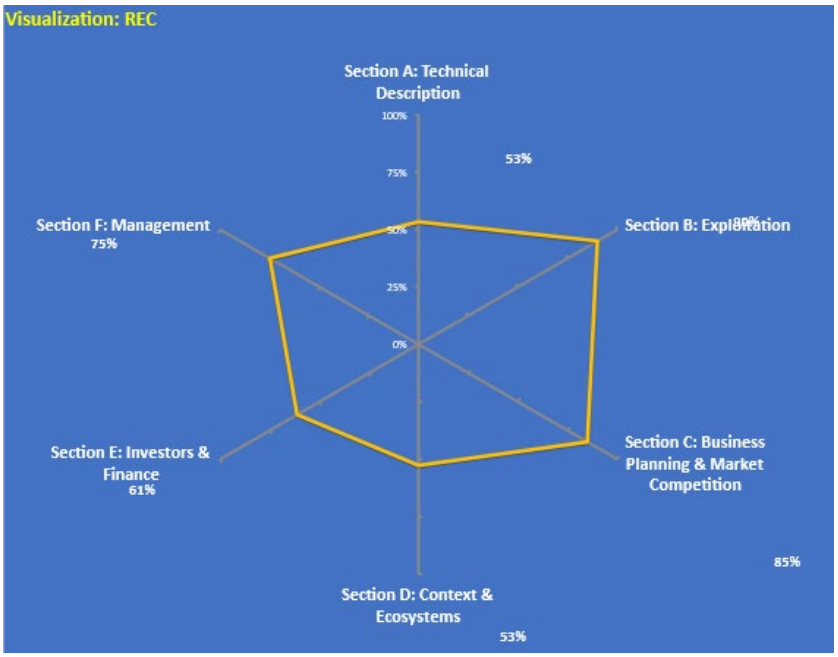


Figure 27: Visualisation REC

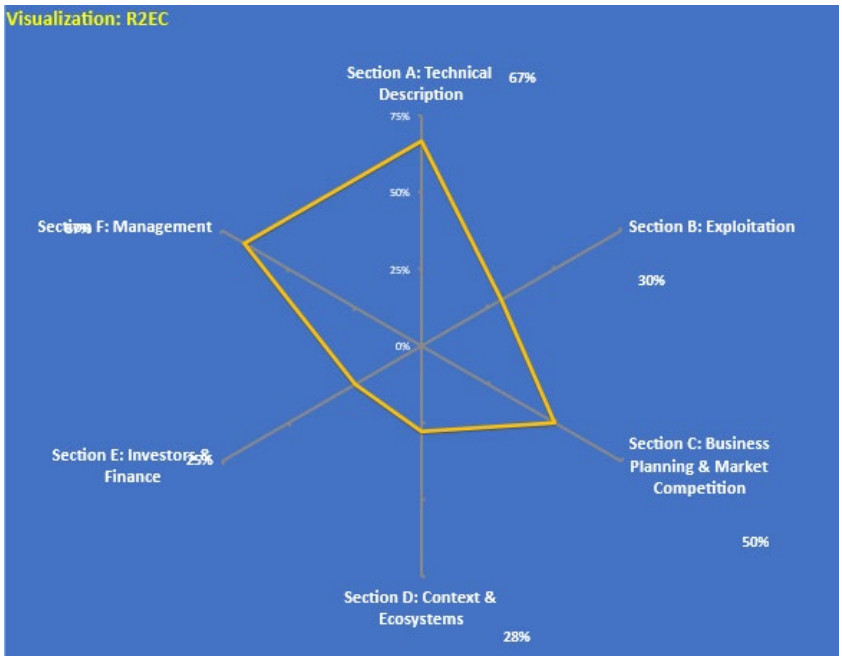


Figure 28: Visualisation R2EC

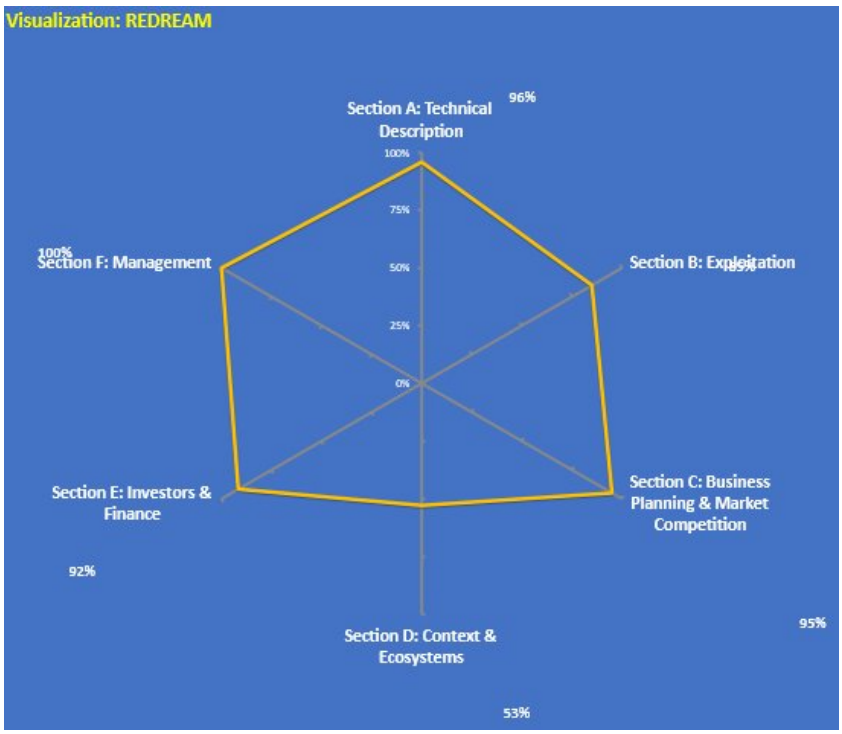


Figure 29: Visualisation REDREAM

5. FEEDBACK FROM ATTENDEES

Participants to the 12th ETIP SNET Regional Workshop received after the event an evaluation form, where they could express their appreciation for the event. In total, 23 responses were received.

Overall, respondents judged the event positively:

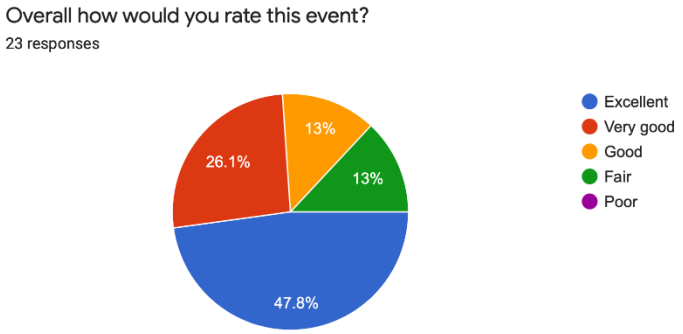


Figure 30: Overall, how would you rate this event?

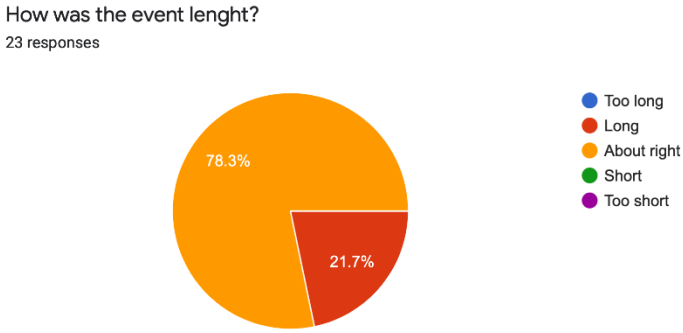


Figure 31: How was the event length?

Participants were also asked to express their opinion on the different sessions of the event. All sessions have been evaluated positively.

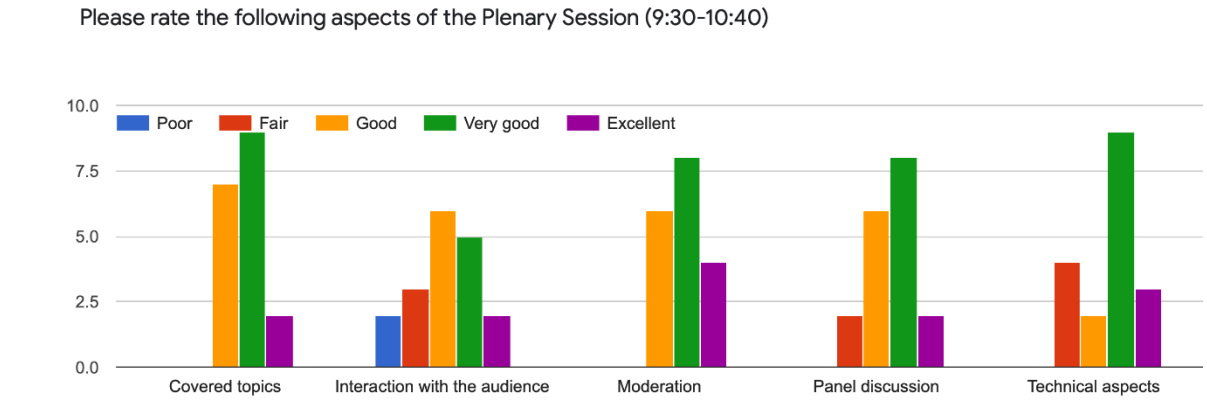


Figure 32: Please rate the following aspects of the Plenary Session

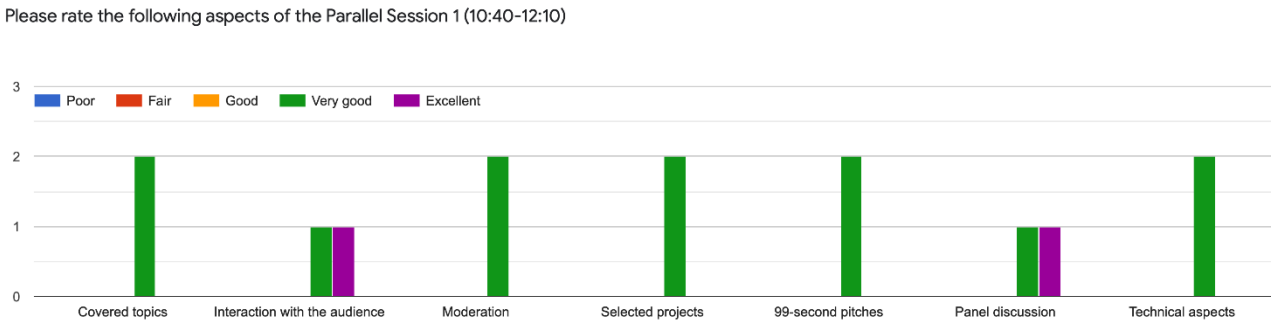


Figure 33: Please rate the following aspects of the Parallel Session 1

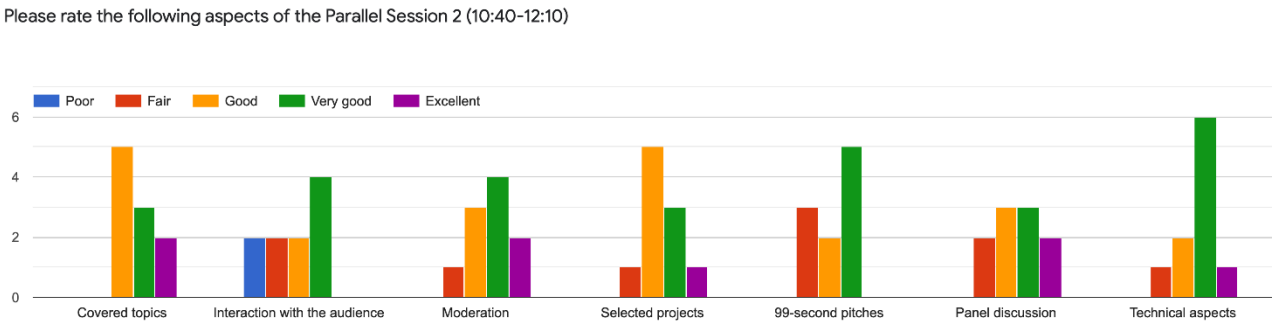


Figure 34: Please rate the following aspects of the Parallel Session 2

Figure 35: Please rate the following aspects of the Parallel Session 3

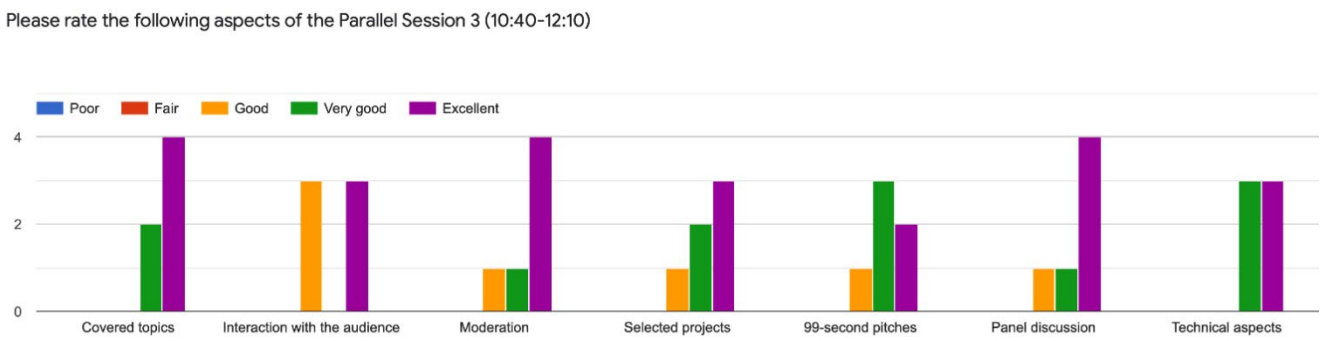
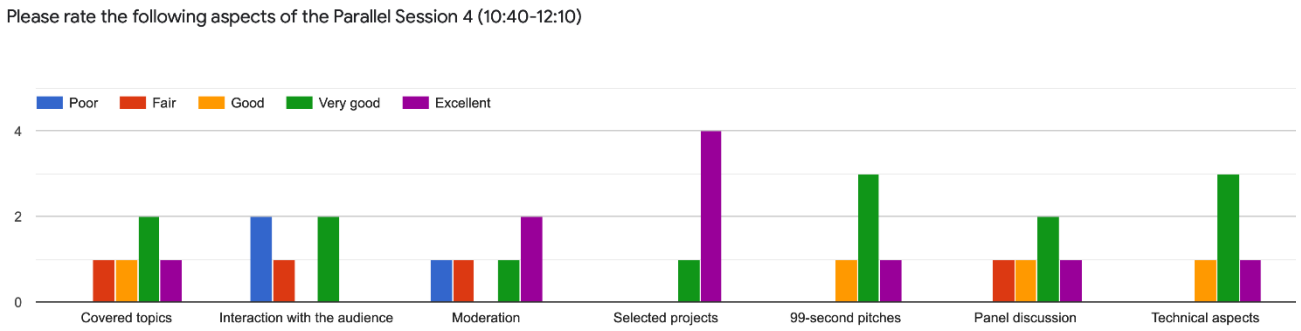


Figure 36: Please rate the following aspects of the Parallel Session 4



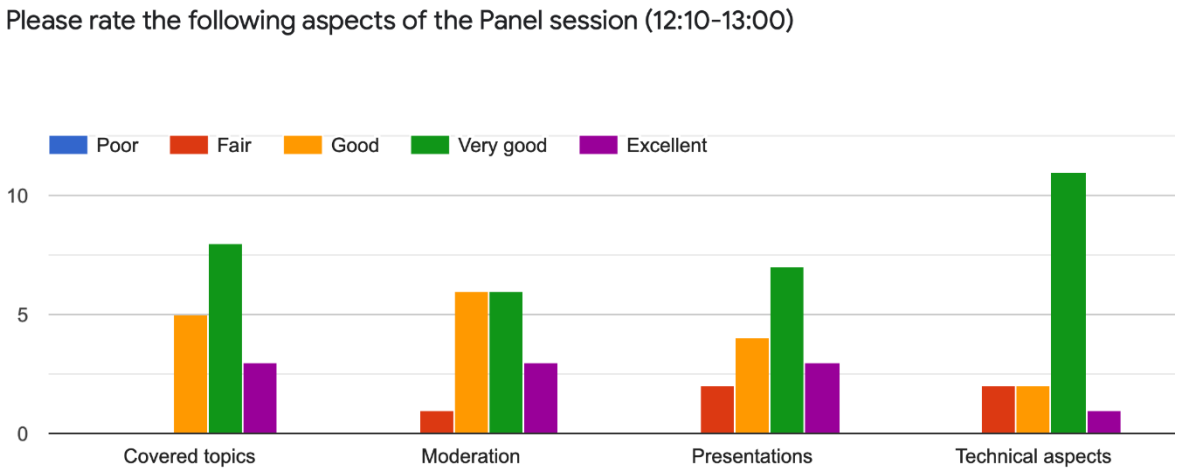


Figure 37: Please rate the following aspects of the Panel session

Among the suggestions, respondents included the need to leave more space for interaction within the audience and the need to have Q&A among panellists. Also, the event was perceived as too long and without enough breaks; the fact that pitches went beyond the established timing was highlighted as key negative factor impacting the perceived length of the event and the lack of time to exchange views.

The SPRING EU Service Contract (n. 300003009) supports the ETIP SNET's activities, funded by the EU.