



**No 727481 RESERVE**  
**D7.3 v1.0**  
**Report on Events**

The research leading to these results has received funding from the European Union's Horizon 2020 Research and Innovation Programme, under Grant Agreement no 727481.

<b>Project Name</b>	RESERVE
<b>Contractual Delivery Date:</b>	31.03.2019
<b>Actual Delivery Date:</b>	xxx
<b>Contributors:</b>	FEN, CRE
<b>Workpackage:</b>	WP7 – Creating Impact with RESERVE
<b>Security:</b>	PU
<b>Nature:</b>	R
<b>Version:</b>	1.0
<b>Total number of pages:</b>	50

**Abstract:**

This report describes the events organised within the Tasks 7.2, 7.3 and 7.4 in order to create awareness of the project concept and results and trigger open discussions, facilitate collaborations and to spark innovation in the overlapping domains of ICT and energy.

The activities organised in the first 30 months of the projects include the organisational and logistical enabling of communication and dissemination activities such as the participation in scientific and industrial events with exhibition stands, the organisation of workshops and special session in conferences, the organisation of stakeholder and advisory board meetings and of the RESERVE educational activities.

**Keyword list:**

Communication & Dissemination, Innovation Events, Scientific conferences, Exhibition fairs, stakeholder and advisory board, educational activities

**Disclaimer:**

All information provided reflects the status of the RESERVE project at the time of writing and may be subject to change.

## Executive Summary

The Deliverable 7.3 reports the events and activities organised within the Tasks 7.2, 7.3 and 7.4 in order to create awareness of the project concepts and results and to trigger open discussions, facilitate collaborations, and spark innovation in the overlapping domains of ICT and energy.

RESERVE partners have organised and participated in a significant number of targeted events in order to share stimulating knowledge and ideas especially with relevant stakeholders willing to adopt the RESERVE vision and implement new energy services based on the innovative RES integration technologies and on the new automation and monitoring concepts developed within the project.

A number of target groups were identified as the most relevant to approach in order to foster the support for the new set of the network codes and ancillary services proposed as a main project output. These include: primary stakeholders, standard developing organisations, advisory board, other European policy makers and the energy and ICT scientific communities. These audiences were approached during private consultations and public events including the advisory board meetings, stakeholder meetings, the participation to industry fairs and innovation events as well as through the active participation to initiatives promoted by the European Commission.

Moreover, RESERVE partners have intensively disseminated the project results among the energy and ICT research communities by attending in the first 30 months to numerous high level scientific and industrial conferences for a total of 49 contributions.

RESERVE has also addressed the gaps in the current educational programmes and the need for professionals with interdisciplinary skills (energy and ICT) to manage RES based energy networks by creating a multidisciplinary course with the aim to educate the energy sector on the RESERVE approaches and promote the concepts and the use of the project results internationally.

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## Table of Contents

<b>1. Introduction .....</b>	<b>6</b>
1.1 Objectives and outline of the deliverable .....	6
1.2 How to read this document .....	6
<b>2. Description of the RESERVE Events.....</b>	<b>8</b>
2.1 Exhibition stands and presentations at industrial and scientific events .....	8
2.1.1 European Utility Week (EUW).....	8
2.1.2 European Sustainable Energy Week (EUSEW) .....	10
2.1.3 Power Conference InnoGrid2020+ .....	12
2.1.4 E-World Energy & Water.....	14
2.2 Stakeholder consultations and networking Events .....	16
2.2.1 1 <sup>st</sup> RESERVE stakeholder meeting.....	16
2.2.2 International Event: “Securing the Smart Grid Towards up to 100%Renewables”.	17
2.2.3 Romanian Energy days .....	19
2.2.4 Stakeholder Consultation Event “Securing the Smart Grid towards 100% Renewables” RESERVE and SOGNO Projects. ....	22
2.2.5 ACER-CRE Bilateral Consultations and Workshops .....	24
2.2.6 ANRE-CRE Bilateral Meeting and Workshop .....	24
2.3 RESERVE Advisory Board Meetings.....	25
2.3.1 1 <sup>st</sup> RESERVE Advisory Board Meeting.....	25
2.3.2 2 <sup>nd</sup> RESERVE Advisory Board Meeting (2019).....	26
2.4 Innovation events.....	27
2.4.1 Global Real-Time Super Laboratory Demo.....	27
2.5 Conference special sessions and workshops.....	29
2.5.1 ISGT Europe 2017. Workshop: “Enabling 100% Renewable with new grid codes”	29
2.5.2 Scientific and industrial conferences attended.....	30
2.5.3 Exploitation Strategy Seminar (ESS) .....	34
2.5.4 RESERVE-MIGRATE Joint Workshop.....	36
2.6 RESERVE educational activities .....	37
2.6.1 RESERVE Training Course at the RWTH Aachen University: „Challenges and solutions in Future Power networks” .....	37
2.6.2 RESERVE online course: „Challenges and solutions in Future Power networks”	39
2.7 EU initiatives .....	39
2.7.1 BRIDGE.....	39
2.7.2 European Technology and Innovation Platform Smart Networks for Energy Transition (ETIP-SNET) .....	40
2.8 Plan for future events.....	42
2.8.1 Irish Field Trail Open Day .....	42
2.8.2 Exhibition stands and presentations at industrial and scientific events .....	42

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2.8.3 RESERVE Final Event .....	43
<b>3. Conclusions .....</b>	<b>44</b>
<b>4. References.....</b>	<b>45</b>
<b>5. List of Abbreviations .....</b>	<b>47</b>
<b>6. Figures .....</b>	<b>49</b>

## 1. Introduction

This deliverable is the major output of Tasks 7.3 and 7.4 of WP7, whose overarching objective is to maximize the scientific, industrial and societal impact of the project by creating awareness of the technologies and the innovation activities within the project but also to engage actively with the public and the relevant stakeholders channelizing guiding feedback that will be incorporated in the strategic orientation of the project. From a wider perspective, D7.3 reviews also the communication and dissemination measures implemented within Task 7.2 in order to foster specifically the support for the new set of the network codes and ancillary services.

With this aim, one potent instrument used by RESERVE is the organisation and participation in innovation and dissemination events like workshops, conferences, industrial fairs and other innovation events. Another important tool used is the development and organisation of educational activities (courses) aimed at creating awareness of the RESERVE results while training professionals with new skills to manage RES based energy networks.

The impact objectives of the communication and dissemination activities organised and attended by RESERVE can be sorted in three main groups based on different target audiences:

- Dissemination towards relevant stakeholders and policy makers. These activities include the participation to industrial conferences, fairs and innovation events, the private and public consultations with standard developing organizations (SDOs), stakeholders (manufacturers, energy providers, policy decision makers, etc.), as well as the commitment in initiatives promoted by the European Commission like BRIDGE and ETIP-SNET.
- Dissemination towards the research community. The activities in this category include the participation in international peer-reviewed scientific conferences, the organisation of special sessions, the publication in highly ranked, prestigious, international peer-reviewed journals and magazines. The aim is to create awareness of the project work and consequently new research starting points and stimuli that will focus innovation driven research regarding stability on highly RES reliant energy systems in the energy sector.
- Organisation of educational activities. RESERVE addresses the gaps in current educational programmes and the need for professionals with new skills crossing energy and ICT fields by organising a face-to-face and an online inter-disciplinary course to educate the energy sector on the RESERVE approaches and to promote the concepts and use of the results of the project internationally.

### 1.1 Objectives and outline of the deliverable

The objective of this deliverable is to report about all RESERVE communication and dissemination events that took place in the first 30 months of the project, and whose organizational and logistical enabling has been coordinated by WP7 within Tasks 7.2, 7.3 and 7.4.

The description of the events is reported in Chapter 2, where the activities have been organised according to the following categories:

1. Exhibition stands and presentations at industrial and scientific events;
2. Stakeholder consultations and networking events;
3. RESERVE advisory board meetings;
4. Innovation events;
5. Conference special sessions and workshops;
6. RESERVE educational activities;
7. EU initiatives; and
8. Plan for future events.

### 1.2 How to read this document

This is a stand-alone document that can be read on its own. However, more information regarding the activities listed in Section 2.2 (Stakeholder consultations and networking events) can be found

in Deliverable D7.2: “Report on fostering support for RESERVE codes and ancillary services”, which describes more in detail the communication and dissemination activities carried out in Task 7.2 in order to promote the RESERVE harmonised network codes and enhanced system services to relevant SDOs, stakeholders representing European utility operators, and the project advisory board. Preliminary feedback and suggestions received by the mentioned target groups were also collected and are included in the D7.2 report.

## 2. Description of the RESERVE Events

### 2.1 Exhibition stands and presentations at industrial and scientific events

In this section the participation of the project in scientific and industrial events with exhibition stands will be reviewed. The selected events include very well known and attended international fairs and specialised conferences such as the European Utility Week, the European Sustainable Energy Week, the Innogrid H2020+ and the eWorld energy & Water Fair.

#### 2.1.1 European Utility Week (EUW)

The European Utility Week is a business, innovation and information platform connecting the smart utility community and allowing to meet with experts from utilities, network operators, vendors, consultants, startups and system integrators covering the entire smart energy value chain.

##### 2.1.1.1 EUW 2016 in Barcelona, Spain

The launch event of RESERVE [1] took place on 15 September during the EUW 2016 [2] in Barcelona, Spain, at the Ericsson booth (Figure 1). The event was organized jointly with SUCCESS [3]. During the event, top executive level representatives of the partners Ericsson, RWTH, ESB and ASM (SUCCESS partner) have spoken and introduced the two EU Projects to the audience. The event started with a general introduction of the projects by the coordinator, Dr. Williams, which highlighted the importance of stabilising the energy system with up to 100% RES integration, and proceeded with the speech of RWTH-Aachen University Prof. Monti, which gave the audience more technical details about RESERVE. Then the representatives of the utilities as well as high-ranking representatives of Ericsson explained the context of the projects and the importance of the undertakings for the future energy grids. The event was closed with discussion with the audience and a Q&A section. As a result of the strong manning of the presentations and the statements, the event was a strong engagement pole and was well visited by the participants of the exhibition (estimated approx. 40-50 people). In addition, the event was published in social media partly through live streaming and posts, as well as reported in PR-reports increasing the visibility of the project and the awareness on its scope.



Figure 1. Launch event of RESERVE at the EUW 2016 in Barcelona, Spain.

### 2.1.1.2 EUW 2017 in Amsterdam, the Netherlands



**Figure 2. RESERVE Pod at the EU Project Zone, EUW 2017.**

One year after its launch, RESERVE came back to the EUW, which took place on the 3-5 October in Amsterdam, the Netherlands, to share the progresses made during the first year of the project and to exchange experiences and ideas with the varied public attending the event, which ranged from all levels of the utility value chain from technology giants to startups and from senior-level experts to young talent.

At the 2017 edition of the EUW, RESERVE teamed up with other 21 EU Commission Funded projects on Smart Grid and Energy Storage belonging to the BRIDGE Initiative [4] and shared with them a space (“EU pod”) in the so-called EU Project Zone. This EU Project Zone at European Utility Week aimed at showcasing the research and findings of several EU funded projects focusing at digitally supporting the energy transition. Visitors are able to hear and discover first-hand the current results, thus gaining industry knowledge and innovation of EU-funded research.

Other than having its own space at the EU Project Zone, RESERVE had, like all other BRIDGE projects, the chance to showcase the project concept and results by giving a presentation at the EU Project Zone theatre. The presentation was inserted in the Hub sessions - H2020: EU Research and Innovation - Innovative Approaches to Data Management and was given by the RESERVE technical manager Prof. Antonello Monti from the RWTH Aachen University. The contribution had the title: “*RESERVE: Enabling a transition to up to 100% RES*” and focused on the following points:

- Challenges of moving towards 100% RES;
- potential solutions to voltage control and their implications for ICT and business contexts; and
- potential solutions to frequency regulation and their implications for ICT and business models.

Moreover, Mihai Paun, Vice-President of the Romanian Energy Center and leader of the RESERVE Work Package 6, “Regulatory, legal Issues & business models for RES”, represented RESERVE at the panel: “Towards a pan-European approach to data handling giving a talk about the “*Regulation Perspectives and existing gaps of Network codes with focus on Data*”.

Focus of his presentation have been the regulation issues faced by the project and that are challenging the transition towards 100% RES, like the need for the development of new harmonised network codes and for a closer coordination with the European TSOs, as well as the expectations of the BRIDGE Working Group on Regulations, of which Mihai Paun is the rapporteur.

### 2.1.1.3 EUW 2018 in Vienna, Austria

The European Commission endorsed in 2018, for the second consecutive year, the EU Project Zone featured at the exhibition floor of European Utility Week. RESERVE was again invited to participate in the event, that this year took place in Vienna (Austria) from the 6 to the 8 of November.



**Figure 3. RESERVE Pod at the European Project Zone, EUW 2018.**

Like the previous year, also in this edition to RESERVE was assigned a timeslot to make a presentation in the EU Theatre. As a novelty, in the 2018 edition the participating BRIDGE projects were asked to prepare their presentations using default slide templates which were personalised depending on the specific session. The RESERVE project was included in the session: “Interoperable platforms and data exchange for energy services: practical experience from the BRIDGE projects”. The main idea behind this topic was to highlight that innovations in grid management, supported by digital technologies, are key for a successful energy transition. The context for the presentations reunited in this session were the ambitious targets agreed by the European Union for energy efficiency and renewables for 2030, as well as the ongoing discussions about the rules for the electricity market of the future.

In particular RESERVE, together with the H2020 projects WiseGRID [5], ELSA [6], INVADE [7] and SENSIBLE [8] gave each 10 minutes presentations on their work on Data sharing, access and storage, focusing on the ways smart grid projects are capturing, exchanging, storing and giving access to data.

Presentations were followed by panel discussions aiming to answer the following questions:

- Who is best suited to deploy and run a platform that aims to enable market competition, from a seamless data-exchange point of view?
- What works best to ensure that market parties have an interest in sharing data?
- How do you ensure interoperability between data owners/operators, in terms of appliances, systems, and in terms of interoperability with other markets (e.g. mobility, health or home-security services)?

Moreover, RESERVE had again a personal pod in the European Zone, where the partners attending the event could promote the project ideas and the ongoing work to the interested public. This year other than the regular RESERVE Flyers and Brochures about the project work on the definition of new network codes [9], a new flyer explaining the concept for new generation of power inverters was promoted by the RESERVE partner RWTH University, developer of the proposal, generating great interest among the stand visitors.

### 2.1.2 European Sustainable Energy Week (EUSEW)

The EUSEW is the biggest event dedicated to renewables and efficient energy use in Europe and it is organized annually in Brussels by the European Commission’s Directorate-General for Energy and the Executive Agency for Small and Medium-sized Enterprises (EASME). The conference sessions (Figure 4) focus on sustainable energy issues, debates new policy developments, best practices and sustainable energy ideas. In this regard, the European



**Figure 4. EUSEW conference session.**

Sustainable Energy Week helps to reinforce Europe’s role as a leader in the global clean energy transition by addressing the challenges on the way towards 100% renewable energy.

#### 2.1.2.1 EUSEW 2017, 19-25 June 2017, Brussels, Belgium

RESERVE participated together with the project SUCCESS in the 2017 edition of the European Sustainable Energy week (EUSEW) [10] that took place in Brussels from the 19 to the 25 June.



**Figure 5. RESERVE booth at the Networking Village.**

RESERVE shared with SUCCESS a booth at the Energy Fair of the Networking Village (Figure 5), a space situated in the Residence Palace where, for three days during the conference week, participants can choose from different networking activities in order to share information, make new contacts and learn about sustainable energy innovation. With its presence at the Networking Village, under the topic “DSO 2050 – security and automation towards 100% renewables”, RESERVE aimed at maximising the scientific, industrial and societal impact the project. This is done by creating awareness of the need for new solutions capable to ensure the stability of the grid in energy networks with up to 100% RES and by promoting the project concepts and the solutions proposed to address this challenge. Numerous participants engaged in the EU-policy on sustainable energy system visited the stand and expressed their interest in receiving more information about the project.

#### 2.1.2.2 EUSEW 2018

The 2018 edition of the EUSEW focused on the topic: “Lead the clean energy transition”. Besides the high-level policy conference, that took place on the 5-7 June, and that consisted of over 60 sessions attended by 2,500 participants, other side events were held as usual during the energy week. These were the Award Ceremony, aimed at recognizing outstanding innovations in energy efficiency and renewable, and the Networking Village activities, which included interactive exhibition stands at the Energy Fair, a variety of Energy Talks engaging presentations on topics related to the clean energy transition, and the Energy Lab, where 10 selected projects had the possibility to pitch in front of an expert panel of judges.

Like the year before, RESERVE participated to this year edition of the EUSEW with a stand at the Energy Fair of the Networking Village, jointly with the H2020 Projects SUCCESS and SOGNO [11].



Figure 6. RESERVE, SUCCESS and SOGNO joint stand at the EUSEW Networking Village.

The title of the joint stand was: “Stability, Security and Automation Towards 100% Renewables”. During the exhibition, the EUSEW participants had the opportunity to visit our stand and learn more about the topics of our projects, ask relevant questions and take home the project brochures and promotional materials made available. Once more, the EUSEW allowed us to showcase successfully our project and to increase our network of contacts.

### 2.1.3 Power Conference InnoGrid2020+

InnoGrid2020+ [12] is a yearly conference co-organised by the European Network of Transmission System Operators for Electricity (ENTSO-E) and the European Distribution System Operators for Smart Grids (EDSO). Initiated in 2012, InnoGrid2020+ has become over the years the unmissable conference on innovation in power systems and networks.

#### 2.1.3.1 InnoGrid2020+ 2017



Figure 7. Panel session at the InnoGrid+ 2017 policy conference.

The 6<sup>th</sup> InnoGrid2020+ edition was held in Brussels on 27-28 June 2017, and counted on about 350 attendees coming from industry, associations, Policy and regulators, Media and University. The industry representatives came from different fields, like RES+ storage, consultancy, TSO and DSO (Transmission and Distribution System Operators), IT + technology, Research and Utilities.

Besides the policy conference, an exhibition space dedicated to R&D projects and sponsors exhibitors was set up, where the conference attendees had the possibility, during the coffee and lunch breaks, to visit the project stands and get to learn more about the research and Innovation projects being implemented on these topics. RESERVE was one of the 23 projects who obtained a stand in the exhibition area of the conference, where it could promote the project ideas and results to the InnoGrid2020+ visitors and enlarge its network of contacts.



Figure 8. Networking at the RESERVE stand.

### 2.1.3.2 InnoGrid2020+ 2018, Brussels, 15-16 May 2018

The 2018 edition of InnoGrid2020+ focused on the next decade's challenges for the power grids and provided insights and solutions through innovative projects, demonstrators and pilots. The issues debated included system security including cyber security, flexibility and active system management, sector coupling and the role of e-mobility, among others.

In addition to engaging presentations, panel sessions and debates, InnoGrid2020+ ran, like in the previous years, an exhibition session, enabling participants to interact, share knowledge and best practices. The work and results of R&D innovative projects with EU added value was presented at the conference and at its networking exhibition.

Close to 30 projects in grid innovation exhibited during the two-day conference at BOZAR in Brussels. RESERVE was again selected for the second year as exhibitor.



Figure 9. Impressions from the exhibition area at InnoGrid2020+ 2018.

For RESERVE, representatives of FEN, RWTH and CRE attended the event, which was joined by a varied audience including high level European policy makers, researchers, project developers but also grid users and citizens. The exhibition resulted in being a very successful event for RESERVE, as proved by the interest shown by the public for our stand and for the topic of our project. It was a great networking opportunity for the project partners and resulted in the creation of new collaborations.



**Figure 10. Mihai Paun (CRE), presenting RESERVE during the session "Customer in the focus".**

Furthermore, RESERVE was presented by WP6 leader Mihai Paun during the conference session "Customers in the focus" dedicated to the project's presentations.

This podium presentation and the panel discussion that followed increased even more the visibility of RESERVE and gave us the opportunity to debate in front of a competent and interested publicum the RESERVE hot-topic related to the need of the definition of a new set of network codes for a scenario with a high share (up to 100%) of renewable energy sources integrated in the electric grid.

#### 2.1.4 E-World Energy & Water

RESERVE attended the E-world energy & water [13] trade fair that took place in from 6 to 8 February 2018, in Essen, Germany.

According to the organisers, 750 exhibitors from 26 nations (which was more than ever before) presented their solutions for the future of the energy supply at Messe Essen during the 2018 edition. Digitalisation, flexibilisation and decentralisation were the defining subjects on which the over 25,000 visitors from 73 nations obtained information and exchanged ideas.

The majority (76%) of the guests at E-world were commercial representatives interested in doing business with energy providers, consulting firms and companies selling support services such as SW, sensors or other devices. Moreover, in a dedicated hall of the fair, over 90 start-ups, i.e. newly established companies and research institutes, introduced products that consumers can expect in the future.

RESERVE shared with with the H2020 project SUCCESS a joint exhibition stand named "SecuRenewables" which merged the main topics of the two projects: 100% renewable energy sources (RESERVE) and cyber security (SUCCESS).

The RESERVE partners attending the three-days event in order to promote the project were supported by the presence of a "renewables hero" mascot who had the task to attract the attention and increase the interest of the fair visitors, bringing them to the stand where the projects' representatives could then explain the content and the objectives of the projects to them.



**Figure 11. The SecuRenewable hero mascot promoting the projects at the e-World 2018.**

Other than welcoming the visitors and presenting RESERVE at the SecuRenewable booth, the project members visited the stands of other companies present at the exhibition in order to find interesting potential contacts for our present and future work.

Some stimulating conversations were started and we succeeded in raising awareness of the security and frequency/voltage stability subjects. We also succeeded in explaining the need for fast and reliable communication networks such as 5G mobile systems to ensure that distribution and transmission networks are operating at maximum efficiency in the future.



**Figure 12. RESERVE and SUCCESS partners at the SecuRenewable stand.**

## 2.2 Stakeholder consultations and networking Events

The events described in this sections are organised in the project mainly within Task 7.2, which is aimed at fostering support for RESERVE ancillary services and network codes. This task receives input from WP 2-5 produce a comprehensive presentation to relevant stakeholders of the on-going work with a clear focus on harmonisation of network codes and ensuring energy system stability through the implementation and deployment of the RESERVE concepts.

### 2.2.1 1<sup>st</sup> RESERVE stakeholder meeting

The 1<sup>st</sup> RESERVE Stakeholder meeting took place in Bucharest on Friday 23 June 2017 and was organised by the RESERVE partner Romanian Energy Centre (CRE) [14] as part of the European Sustainable Energy Week (EUSEW) 2017. The event, named "Milestones towards 100% RES for all Europeans", promoted the two main themes of the EUSEW Energy Days: the integration of renewable energy sources (RES) and energy efficiency (EE).



**Figure 13. Impressions from the 1<sup>st</sup> RESERVE Stakeholder Meeting.**

Over 70 representatives of TSOs and DSOs together with officials from the Ministry of Energy and ANRE, Ministry of Research, decision-makers of national and European institutions, representatives of private and state energy companies, other active energy associations such as CNR-CME, ACUE and AFEER, the RESERVE project partners, general public interested in responsible energy consumption practices and further stakeholders interested in understanding the operation of a 100% RES system for safe and sustainable power supply have contributed to the event's discussions.

The main topics addressed in the event included:

1. Network integration scenarios of up to 100% RES,
2. network codes, governance and regulatory issues regarding the transition to 100% RES,
3. legal and regulatory models, business models for RES,
4. development of open, smart, stable, secure and customer centric European smart grid, and
5. innovative practices for efficient energy consumption.

The conference was structured in four sections: an introductory session, two discussion panels and a workshop, and brought together 20 speakers from the Romanian and European energy sector.

During the introductory session, Fiona Williams, coordinator of RESERVE, presented the two interconnected objectives of the project to the audience: the creation of new harmonised European network codes as well as the definition of new innovative ancillary services to meet the integration of up to 100% RES in the power transmission network. She pointed out that *"the new network codes will support the development of the European Energy Union by focusing on the three levels of the domestic electricity market: operational, connections and markets"*. The introductory session was complemented by the interventions of ANRE Vice-President Emil Calota

and by the TRANSELECTRICA's CEO Corina Popescu, who referred to the legal and regulatory issues of RES and the challenges towards power network integration of up to 100% of RES.



Figure 14. RESERVE 1<sup>st</sup> Stakeholder Meeting. Press conference.

### 2.2.2 International Event: “Securing the Smart Grid Towards up to 100% renewables”.

The Romanian Energy Center (CRE) organised on 28 and 29 June 2018 in Bucharest the International Conference “Securing the Smart Grid towards up to 100% Renewables” [15]. More than 70 energy specialists, decision and policy makers from Romania and several European countries contributed to the success of the event bridging together eight research consortia: other than RESERVE, the H2020 Projects SUCCESS, SOGNO, NRG5 [16] CROSSBOW [17], WISEGRID, NOBERGRID [18] and DEFENDER [19] were represented at the event. The first day included three panel discussions and presentations addressing eight specific projects on technology, grid codes and the regulatory and governance issues for RES. For the second day, a dedicated trip to two pilot sites of the above-mentioned projects (Stalpu – Buzau County and Ploiesti – Prahova County) was organised.



Figure 15. Impressions from the event.

The conference was opened by Corneliu Bodea, President of Romanian Energy Center, who highlighted the association's role in innovation and its participation in six RD&I International Consortia within the Horizon 2020 framework Programme. Mihai PAUN, Vice-President of Romanian Energy Center presented the association and briefly introduced the main innovation topics managed by CRE as direct partner with its members in five European Commission-funded projects starting in 2016: SUCCESS, RESERVE, CROSSBOW, WiseGrid, NRG-5 and SOGNO. In his introduction, Mihai Paun highlighted that the objectives of the conference were, among other:

- To facilitate dialogue with key industry representatives and disseminate SUCCESS project solutions for Securing the Smart Grid towards up to 100% Renewables;

- To explore identified synergies with other H2020 projects and consult with stakeholders on the preliminary results on regulatory aspects;
- To explore other relevant issues from the DSO and TSO perspectives with focus on network codes and RESERVE project results;
- To address the next decade's challenges for the electricity grids, regulation and governance and provide insights and solutions through innovative projects and demonstrators.

The session of the conference dedicated to the RESERVE project was introduced by Mihai Paun, leader of the WP "Regulatory, legal issues and business models for RES", who presented the project's vision, objectives, preliminary results and impact to the energy sector, and continued with the speech of Ion Dumitru, head of the RES division at ANRE (National Regulatory Authority for Energy) on the regulatory and legal issues for RES. These two presentations were followed by a Panel discussion that focussed on the following topics:

- Network codes, governance and regulatory issues for the transition towards 100% RES, priorities on network codes updates; and
- TSOs-DSOs relationship changing.

This panel was moderated by Mihai Paun and it was attended by a group of regulatory and network codes specialists, including the representative of the Romanian regulatory authority ANRE as well as representatives from TSOs and DSOs.



**Figure 16. RESERVE Panel discussion.**

The panel participants enjoyed discussing the topics proposed in the panel and provided answers to the following moderator's questions:

- What kind of framework is needed to allow the transition towards 100% renewables?
- Should the power community develop a specific network code for storage or is it better to continue the present approach?
- Do you consider useful the incentives for encouraging investments in storage?

Considering the context of the RESERVE project presented in the introduction as well as the panelists' own experiences and perceptions, the following information and points of view were highlighted within the panel discussions:

- Even if 100% of RES does not seem to be very close, this target is becoming more and more clearly outlined at the horizon and things are moving dynamically; in this context, both DSOs' and TSOs' activities need to be reconsidered, both types of entities will have to face new challenges and flexibility is a key issue to consider;
- Data demonstrate that even at present there are short periods of time going from hours to few days per year, when the proportion of 100% RES is reached in several European power systems (e.g. Germany and Portugal);
- When talking about changing regulations, resistance is opposed by both DSOs and TSOs, but a set of regulations need to be changed and measures to be taken for properly responding to the new reality which is increasingly making its way into the electricity market.

In view of the above mentioned, the following assessments, requirements and solutions have been brought to the fore:

- Renewable energy sources certainly generate high benefits, but their proper management generates extra costs (for example, the operating costs of transmission and distribution operators will be higher); regulatory authorities will be in a position to provide support to power network operators for the above-mentioned resilience to change (generated by objective factors, that is, additional costs) to be removed;
- Virtual Power Plant initiatives are welcome, being very important in reaching the 100% RES target;
- Regulators must consider and provide a framework for the emergence of flexible products on the market, in particular allowing electricity producers to sell what they produce;
- The regulatory framework must be stable, reliable, and intuitive at the same time to allow DSOs to properly run the necessary investments;
- The need for incentives to support investments in storage, as well as other support solutions will be needed, from the perspective of what regulators can do to overcome resistance to change.

The possible changes in the network codes have been discussed, and the following were mentioned:

- a special focus must be on requirements for storage, as part of electricity generation;
- in the situation up to 100% RES in the power system, we are not only talking about possible updates, but profound structural changes (changes in the architecture of network codes, given the prosumer's role, microgrids, etc.).

## 2.2.3 Romanian Energy days

### 2.2.3.1 6<sup>th</sup> Romanian Energy Day, 30-31 May 2017, Brussels, Belgium

The 6<sup>th</sup> Romanian Energy Day (RED) was organised by CRE in Brussels on the 30-31 May 2017, and had as subject: "Regional cooperation, a key driver for the Energy Union: Mechanisms and initiatives for the energy industry and policymakers" [20]. Various RESERVE representatives attended the two-day event, which counted among the participants Victor Negrescu, MEP, Luminita Odobescu (Permanent Representative of Romania to the European Union) and Mihnea Constantinescu (Ambassador, coordinator with special tasks for energy security), Toma Petcu (Minister of Energy, Romania) and Maros Sefkovic (Vice-President of the European Commission, responsible for the Union Energy).



**Figure 17. the RESERVE representatives at the Romanian Energy Day 2017.**

Running over two days, the talks focused on renewable energy sources and combating energy poverty. The decision of the Heads of State and Government of the region to extend CESEC's mandate to electricity, renewable energy and energy efficiency was at the forefront of the discussions in RED 2017. CRE members, representatives of the European Commission (EC) and partners of the EU Projects RESERVE and CROSSBOW have discussed the challenges and

opportunities associated with increasing renewable energy production and the importance of coordination among all categories of market operators to ensure modern, safe, uninterrupted and cost-effective services.

The event started with the welcoming words from Corneliu Bodea, president of the Romanian Energy Center, and Dragoş-Alexandru Banescu, Chargé d'affaires at the Romanian Embassy in Belgium. After that the discussions in the industry panel, the real core of the event could start.

The 1<sup>st</sup> day was dedicated to the “Regional cooperation mechanisms and initiatives for the energy industry”, and 4 different panels addressing the following topics were organised:

I. CESEC 2.0 or how to maximise RES integration through infrastructure

Participants were faced with industry representatives in a dialog on how to maximize renewable energy sources integration by putting the right infrastructure in place. Among others, Catharina Sikow-Magny (DG ENER), Corina Popescu (Transelectrica), Antonio Marques (ETRA) participated as speakers to the debate.

II. Addressing energy poverty in Central and South-East Europe

The panel discussed about what is the EU doing or should be doing in order to ensure that a wide array of measures are implemented to reach its most vulnerable citizens. Among the participants to the discussion we can mention Andreea Strachinescu (DG ENER), Aleksandar Kovacevic (Oxford Institute for Energy Studies), Claude Turmes (European Parliament member).

III. How to improve energy security in the Central and South-Eastern European region

The uninterrupted availability of energy sources at an affordable price currently faces a wider range of vulnerabilities due to the increasing complexity of energy systems. EU proposed a set of actions in five key areas. How these five areas of action are addressed in Central and South-East Europe was the subject of the panel discussion which was attended, among others, by Stefan Moser (DG ENER), Judith Szilagyi (Hungarian Ministry of Foreign Affairs), and Alexey Golovin (KazMunayGas).

IV. Energy services companies' digital path to energy transition

Steadily moving from analogue to digital, the European energy sector is reaping the benefits of ICT technologies and of the 4<sup>th</sup> industrial revolution. How can the company's digital path to energy transition be better targeted and supported? Among the speakers we can mention: Maher Chebo (ESMIG), Massimo Bertoncini (EU R&D), and Marco Cupelli (RWTH Aachen and RESERVE partner).

The detailed agenda of the event including the background description of the discussions can be retrieved through the CRE website [21].

The 2<sup>nd</sup> day of the event took place at the European Parliament and was opened by the speech of Victor Negrescu – European Parliament member [22]. During his speech, Mr. Negrescu highlighted the important role of the Romanian Energy Center in the context of the Energy Union; he recalled the topics discussed during the first day of the assembly such as the CESEC Project as well as the major issue of the energy poverty and the connected subject of the energy efficiency. Mr. Negrescu defined the energy efficiency as the most effective and holistic way of dealing with energy poverty, and said that it has to be firstly addressed by the Clean Energy for all Europeans package.

The Clean Energy Package was actually the main topic of the second day of the event at the EU Parliament, and the discussions and successive Q&A session were dedicated to answer the question if the package can be seen as a mechanism to foster the C&SEE energy market integration.

Mr. Corneliu Bodea (President of CRE) and Mr. Paul Tumes (member of EP) highlighted the winning position of Romania in the energy transition and its important role in the central and south Europe region in fostering the cooperation that can help Europe to reach its climate targets, which include, among others, increasing energy efficiency and electricity production from RES at EU level, diversifying routes and supplier countries, completing the internal energy market and completing the missing infrastructure.

### 2.2.3.2 7<sup>th</sup> Romanian Energy Day, 5-6 June 2018, Brussels, Belgium



**Figure 18. Location of the 7th Edition of RED.**

The 7<sup>th</sup> edition of the Romanian Energy Day was organised in Brussels on the 5 and 6 June 2018, and covered the topics of “Regional Energy Security in the Context of the European Internal Energy market” on the first day and “European Strategies, Regional Thinking, National Impact” on the second day.

The conference reunited the most important specialists from the energy sector with policy and decision makers from the Romanian and European Institutions and was attended by more than 150 participants. The conference

benefited from 47 speakers representing European institutions, Romanian ministries, public authorities and private institutions, universities and think tanks, on top of relevant energy companies from 10 countries.

During this 7<sup>th</sup> edition of RED, several topics emerged as key components for the future of the energy sector, namely the targets and effects of the Clean Energy Package (CEP), the 3 Ds – digitalization, decarbonization, decentralization – and the regulatory and financial frameworks’ implications of the transition to a low carbon economy.

Like the previous editions, the RED 2018 was organised in different panel discussions, divided this year in two industry panels on the day one and three policy panels on the day two, addressing five specific topics [23]:

1. Industry Panel 1 - Infrastructure and Resources. Diversification of Sources and Supply Routes Interconnectors;
2. Industry Panel 2 - Securing the Smart Grid through Innovation and Digitalization;
3. Policy Panel 1- Financing the Transition Costs to a Low-Carbon Economy. Legislative & Regulatory Implications;
4. Policy Panel 2- Romanian Presidency of the Council of the EU Priorities and Opportunities; and
5. Policy Panel 3 - Providing a Fair Deal for the European Consumer. Romania as the Key Regional Hub for Resources and Supply Routes.

The voice of RESERVE was brought to the discussion through the presence of prof. Antonello Monti, director of the Institute for Automation of Complex Power Systems (ACS) of the RWTH Aachen University, in the 1<sup>st</sup> Policy panel, which addressed the topic of Financing the Transition Costs to a Low-Carbon Economy. Moderated by Mr. Christian Egenhofer, Senior Research Fellow and Director at CEPS Energy Climate House, the session benefited from the keynote speech of Mr. Ion Cimpeanu, State Secretary in the Environment Ministry of Romania and from the active discussions from, besides Prof. Monti, other relevant speakers: Christophe Gence-Creux, Head of Electricity Department at ACER, Mr. Vladimir Dumitru, Advisor to the President of Environment Fund Administration, Mr. Sorin Boza, General Manager of Complexul Energetic Oltenia, Mr. Teodor Chirica, Principal Advisor of Nuclearelectrica and President of Foratom, Mr. Nikolaos Chatziargyriou, CEO of Hellenic Electricity Distribution Network Operator, Mr. Francesco Gazzoletti, Managing Partner of FortyEight Brussels. The panel was wrapped up by Mr. Tudor Constantinescu, Principal Advisor to the Director General of DG ENERGY.



**Figure 19. Prof. Antonello Monti talking during the Policy panel: "Financing the Transition Costs to a Low-Carbon Economy".**

Kicking off the panel, Mr. Cimpeanu reminded the audience about the Paris Agreement and the negotiations from last year's One Planet Summit in Paris, which covered the financing for climate action and sustainable business, accelerating local and regional climate action and strengthening policies for ecological and inclusive transition.

The speeches of the panellists covered topics such as the connection between energy and environment, the role that the decarbonization policies can have in facilitating business opportunities and foreign investors, the ingredients needed to achieve the internal electricity market, the need to change the current governance

framework of the new energy package, as well as the need to increase the share of low-carbon energy resources, rather than exclusively renewables.

Prof. Monti addressed in his intervention the impact of high RES integration into the grid, the large potential costs for a scenario of up to 100% RES penetration, the increase of network smartness and the relationship between the customer and the grid of the future, issues not properly understood.

#### **2.2.4 Stakeholder Consultation Event "Securing the Smart Grid towards 100% Renewables" RESERVE and SOGNO Projects.**

On 21 and 22 November the Romanian Energy Center CRE organised in Brussels, at the Permanent Representation of Romania to the European Union, the Stakeholders Consultation Event: Securing the Smart Grid towards 100% Renewables", a key Workshop to discuss the main actions and synergies aimed at exploiting the existing and expected results from the RESERVE and SOGNO projects [24].



**Figure 20. RESERVE & SOGNO Stakeholder Consultation.**

The event was opened with the welcome by the Permanent Representation of Romania to the EU, and continued with the speeches from Adrian Volintiru, General director of ROMGAZ, who talked about the Energy Diversity and the Role of ROMGAZ in Regional Development, Antonio Lopez-Nicolas, Deputy Head of Unit Renewables and CCS Policy of the EC, who addressed the topic of the The Global Clean Energy Transition in the EU, and Dan Preoteșcu, Project Manager

at CRE, who spoke about the impact of the new 2030 RES targets on the HV Power System Operation.

These introductory presentations were followed during the first day by two very interesting and lively panel discussions dealing with the following main topics:

- P1 - The role of Regulatory Framework for up to 100% RES
- P2 - The role of TSOs, DSOs and Generators for securing the Smart Grid towards up to 100% Power Electronics

The second day was dedicated to the presentation of the two projects RESERVE and SOGNO, respectively from the technical manager Prof. Antonello Monti (RWTH Aachen University) and from the Projects coordinator Dr. Fiona Williams (Ericsson), and to the discussion, in panels moderated by the two speakers, of specifically related topics:

- P3 - Technical aspects on frequency and voltage control, ancillary services proposed within RESERVE & standardization aspects
- P4 - The impact of Regulatory Framework on new innovative Services for DSOs

The detailed agenda of the event, including the names of the speakers and panellists, is available on the event website page [23].

From the RESERVE side, the main objectives of the consultations were:

- Consultation with stakeholders on the preliminary results of the RESERVE project on regulatory aspects;
- Consultation on other relevant issues including the barriers foreseen in the near future from the regulatory perspective with focus on Network Codes for the transition towards up to 100% RES and on the RESERVE Project Results;
- Assess the impact of adopting the necessary changes in the regulatory framework for electricity transmission and distribution;
- Address the next decades challenges for the potentially new configuration of the electricity grids with increasing role of prosumers, regulation and governance, and provide insights and solutions through consultation.
- During the discussion that followed, the invited experts debated animatedly on issues related with the previously mentioned points. For example, they addressed the need for fast changes in the regulatory framework to cope with future demands in the context of increasing RES, and that for a clearer definition of the role of the aggregators, which although appears to be very necessary, it is not yet well characterised. They talked about the vulnerability of the actual centralised energy system, which would be greatly reduced in a decentralized configuration -bringing moreover economic advantages-, and on topics such as the standardisation in the future RES based systems and the concerns about the simplification of the means of payment for energy services. In the end the discussion got into the network codes (NC) topic, and after addressing the question if these should be market driven or technically required (both aspects should be considered), it moved on the issue of the need for the introduction of a code dedicated to the storage. The answer from the panellist was generally positive because, even if actually there are references about storage in 5 different NC, some services offered by the classical generators today will need to be taken over by storage facilities in the future, because classical generators will no longer exist in a RES-based power system.



**Figure 21. Prof. A. Monti presenting the RESERVE project.**

## 2.2.5 ACER-CRE Bilateral Consultations and Workshops

### 2.2.5.1 Meeting September 2018

On 24 September CRE organized a teleconference with the Head of Electricity Department of ACER in order to start a collaboration for the implementation of the results and findings from the EU funded projects RESERVE in the European regulatory framework.

The meeting started with a brief presentation about CRE involvement in several EU funded projects aiming at increasing the RES penetration up to 100% in the power system with special attention to RESERVE project results and findings and on their potentially significant impact on the regulatory framework. Mr. Uros Gabrijel (ACER) was nominated as contact person for CRE.

The presentations were followed by a discussion moderated by the ACER representative and was concluded with the agreement on the next steps to be followed in order to start a fruitful collaboration between CRE as partner in RESERVE and ACER, i.e. the invitation of CRE members to the next meeting concerning the regulatory framework updates, organized by ACER.

### 2.2.5.2 ACER – CRE meeting in Vienna, December 2018

Following the previous discussion with ACER representatives Mr. Gence-Creux and Uros Gabrijel, on December 5<sup>th</sup> CRE participated in Vienna to one of the regular meetings of the System Operation & Grid Connection Network Codes team.

The purpose of the meeting was to inform the members of ACER team about the results, findings and proposals of the RESERVE project, and to create synergies between the ACER focus and the activity in the project in order to improve the impact on the regulatory framework. The topics discussed during the meeting included, among others, the role of storage and the proposals for new ancillary services and network codes.

The main feed-back received by the hosts can be summarised as follows:

- Storage is already an issue of high interest for both ACER and ENTSO-E and it will be very useful to synchronize the efforts with the existing committees.
- The proposals for new ancillary services and new definitions regarding the frequency regulation have been considered very interesting and they have generated a lot of discussions within the participants.
- The representative of Ireland informed the participants that in her country there are already in force regulation for purchasing synthetic inertia but there are no suppliers for this service.

The meeting was positively concluded with the agreement to continue and develop the collaboration started with this meeting.

## 2.2.6 ANRE-CRE Bilateral Meeting and Workshop

On Tuesday 24 July 2018 more than 20 managers and executives including a delegation of the Romanian Energy Center (CRE) and high-level representatives of the Romanian National Energy Regulatory Authority (ANRE) met in Bucharest in the ANRE premises in order to discuss the scenario of gradually increasing the penetration of renewables into the power system up to 100%, as well as a series of technical and regulatory challenges which may follow in the future.

The bilateral meeting addressed the potential impact on the regulatory frameworks that the results and findings of the RESERVE and SOGNO H2020 projects may have in the near future and created an excellent platform for exploring the future developments that the research activities implemented in the two projects may bring in the future. These developments are expected first of all on the technical aspects of both frequency and voltage control, with the aim of balancing the energy system and targeting the expected and necessary changes in the regulatory framework as well. Actually in this context, in the framework of the two projects not only is being made an assessment of the technical challenges raised by the significant increase of the RES in the power systems, but also an evaluation of the necessary updates of the regulations needed to facilitate the process while keeping or even improving the safety level of power systems in operation.



**Figure 22. CRE-ANRE bilateral meeting**

The discussions about these topics were organized in two sessions, one for each project followed by a common session for conclusions and final remarks. Each project session included a brief description of the project followed by a Q&A session.

Five specific topics were identified and submitted to the audience for discussion:

1. The prospects for updating European and national regulations in the field of electricity storage
2. The importance of the promotion of preventive measures in the electro-energetic systems (EES) field in order to contain costs.
3. The role of ANRE in addressing the need for timely information on the potential future challenges posed by the increase in RES in the EES.
4. How will be the transition up to 100% RES most likely implemented: by switching from concentrated to the distributed production or by replacing the concentrated classical technology production with RES technologies?
5. The importance of a wider use of ICT platforms-based services for the optimization of investments and cost savings in the case of distribution grids.

#### Discussions, Conclusions and Final Remarks – Joint Session

ANRE representatives expressed their support for the activity performed in RESERVE and it was established a programme for a closer collaboration in the near future, including the participation in workshops and other events.

Regarding the upgrades and changings of the regulatory framework, ANRE representatives mentioned that one of their main concerns is to avoid overregulation. During the discussions, both parties agreed on the fact that regulations cannot cover all the possible situations in real life and trying to going this path will lead to a failure. Nevertheless updates and changing of the existing regulatory framework are and will be necessary, but a careful substantiation is needed and the most significant arguments may be provided by the results and conclusion of the field trials.

In the end of the meeting the participants agreed on strengthening the collaboration between the two parties and agreed to develop a schedule for bilateral, informal meetings, organized on a periodical basis, in order to keep alive the exchange of information between ANRE and CRE.

## **2.3 RESERVE Advisory Board Meetings**

An Advisory board for the transition to 100% renewable energy was created in order to disseminate the project results and insights, to discuss implications, to collect feedback regarding the development of processes and definition of test cases and thereby ensure European-wide acceptance and usability of the RESERVE project outcomes.

### **2.3.1 1<sup>st</sup> RESERVE Advisory Board Meeting**

The first RESERVE advisory board meeting took place on 23 January 2018 in the representation offices of the German cooperation centre for the science organisations KoWi in Brussels.

The objective of the meeting was to present and discuss the project progress, enabling the RESERVE advisory board to:

- provide us with feedback on the focus and progress of our work to date, and to
- propose potential changes which would enhance the project results and impact in the second half of the project.



**Figure 23. RESERVE 1<sup>st</sup> Stakeholder Meeting. Impressions from project team (left) and board members (right).**

The members of the advisory board that took part in the meeting were:

- Prof. Goran Andersson - ETH Zürich, Switzerland
- Prof. Francesco Profumo - Compagnia di San Paolo, Italy
- Dr. Georgios Antonopoulos - JRC Directorate C: Energy, Transport and Climate Petten, the Netherlands (in substitution for the official board member Mr. Marcelo Maserà),
- Ing. Chiara Vergine - Terna Rete Italia S.p.A., Italy

During the half-day meeting, a summary of the results obtained so far as well as the plans for the future work were presented by the project partners in front of the board. The board members participated actively in the session, interacting with the speakers by asking questions and making comments about the presentation, thus initiating very vivid and constructive discussions.

Very positive feedback was received from all the advisory board members that praised the good work and the excellent progress made so far.

Moreover, at the meeting, the project team conducted short interviews with the members of the advisory board, asking them questions:

- the role of storage in the definition of a new, dedicated network code, and
- the need to increase the responsibility of DSOs regarding the provision of ancillary services and/or the usage of new data transmission technologies to manage large volumes of data while meeting the requirements for data transfer speed and security.

More details about the 1<sup>st</sup> meeting of the advisory board can be found in Deliverable D7.2 [9]. The interviews made to the Board members are available in the Library section of the RESERVE website [1].

### **2.3.2 2<sup>nd</sup> RESERVE Advisory Board Meeting (2019)**

The 2<sup>nd</sup> RESERVE Advisory Board Meeting took place on the 25<sup>th</sup> of January in Brussels at the liaison office of the Italian national agency for new technologies, energy and sustainable economic development ENEA.



**Figure 24. RESERVE 2<sup>nd</sup> Stakeholder Meeting.**

The members of the advisory board who took part in the meeting were:

- Prof. Goran Andersson - ETH Zürich, Switzerland
- Prof. Francesco Profumo - Compagnia di San Paolo, Italy
- Dr. Marcelo Masera - JRC Directorate C: Energy, Transport and Climate Petten, the Netherlands

After an introduction about the actual status of the project made by the RESERVE technical manager Antonello Monti, the partners responsible for the different work packages presented an update about the work done in the last year as well as the plans for the work to be done until the end of the project. The topics treated were:

- Scenario Presentation (POLITO)
- Impact of RESERVE research issues on up to 100% RES
  - New frequency control techniques (UCD)
  - New voltage control techniques (RWTH)
- 5G for RESERVE. Presentation on test set up and results (EDD)
- Voltage Control Field Trials (ESB)
- RESERVE Project Impact
  - Regulatory, legal issues & CSR/business models for RES (CRE)
  - Creating Impact with RESERVE including exploitation (FEN)

The board members were impressed by the progresses we made in the project and encouraged us to go on in this way until the end and beyond.

## 2.4 Innovation events

### 2.4.1 Global Real-Time Super Laboratory Demo

In occasion of the IEEE PES ISGT Europe conference that took place in Torino, Italy, from 26<sup>th</sup> to 29<sup>th</sup> of September 2017 [25, 26], the demo of the big and innovative project “Global Real-Time (RT) SuperLab” was presented to the audience. More precisely, to the demo-event was dedicated a workshop with a live video stream from the simulation sites. Organiser of this demo was Prof. Ettore Bombard (Politecnico di Torino, Italy), RESERVE partner and leader of the WP1 “System Level Work for RES Integration”..

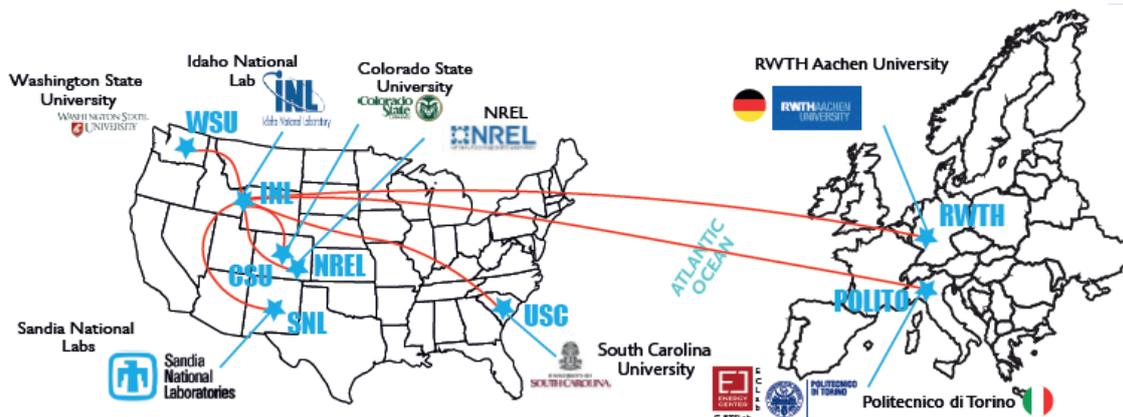


**Figure 25. Prof. Ettore Bompard (POLITO), organiser of the global RT Super-Lab Demo at the ISGT Europe**

Global RT-SuperLab is intended to pool together, across countries and continents, knowledge, simulation tools and lab facilities in one large, interconnected, real time global laboratory. It couples ten simulators located in USA and Europe. In the USA, three national research institutes and three universities are involved (namely INL, WSU, USC, SNL, NREL, and CSU). The European part is undertaken by the RESERVE partners Politecnico di Torino in Italy and the ACS Institute of the E.ON Energy Research Center of the RWTH Aachen.

The demo aimed at demonstrating the conceptual and technical feasibility of multi-site co-simulation across the Atlantic Ocean, highlighting the

opportunities provided by this innovative concept. In a vision of electricity systems “going global”, the demo simulated a High Voltage Direct Current (HVDC) power line interconnecting the transmission systems of EU and USA, considering transmission–distribution system interactions, power electronic converters, RES, HVDC, and emerging microgrids. The robustness of this interconnection is tested considering possible adverse events, in terms of loss of generation, and their impact on the operation of the whole system.



**Figure 26. Map of the Global RT- SuperLab**

The relevance of the Global SuperLab and of its success for RESERVE is due first of all to the fact that the demo was a good chance to showcase the “pan-European simulation infrastructure” realised within RESERVE. Moreover, it highlights the important role played in this project by the RESERVE partners:

- the high voltage (HV) transmission system is modelled and simulated in RWTH-ACS,
- the medium voltage (MV) distribution system is modelled in POLITO’s laboratory.

Moreover, the same infrastructures used in RESERVE (VILLAS node, RTDS and OPAL) were applied for that demonstration, even if applied to a different case study.

In a broad sense, the scenario considered by the Global RT-SuperLab fits with the RESERVE goals because it deals with a transatlantic interconnection that would allow us to make better use of renewable energy sources.

The event had a very big echo and was covered by the media in Europe and USA [27]. Moreover, a paper was published in IEEE Power Electronic Magazine, based on the results obtained in this research work [28].

## 2.5 Conference special sessions and workshops

### 2.5.1 ISGT Europe 2017. Workshop: “Enabling 100% Renewable with new grid codes”

During the IEEE PES ISGT Europe held in Torino, Italy, from 26<sup>th</sup> to 29<sup>th</sup> of September 2017, RESERVE organised a Workshop entitled: “Enabling 100% Renewable with new grid codes” [29], which aimed at presenting the project approach to develop the technical solutions and the regulatory framework necessary to ensure the stability of the grid with up to 100% Renewable Energy Sources was.



**Figure 27. RESERVE workshop within ISGT conference**

The workshop was organized in four presentations addressing the key questions that were successively used as starting points for the discussions:

1. What technics will allow to move to 100% RES?
2. How can we control Voltage for 100% RES?
3. How can we control Frequency for 100% RES?
4. How can we include these new techniques in the Network Codes?

RESERVE technical manager **Antonello Monti** (RWTH) opened the session by presenting a general introduction of the project, and touching subjects such as the research and implementation concepts on which the project is based, the implementation of the field trials, the establishment of the pan-European simulation infrastructure and gave an overview of the results obtained so far.

**Ronan Murphy** (ESB), gave first an overview of the ESB Networks company and work, explained the current “smart status” and provided a prediction of the distribution network in 2030. After this introduction, he presented the concept of the Irish voltage field trials for RESERVE, consisting in heat pump control, LV monitoring at MV/LV substation, domestic battery storage control, RWTH inverter to validate research concepts and V2G charging control.

**Lucian Toma** (UPB) held a speech entitled: „How can we control Frequency for 100% RES?“, in which he, after an excursus on the major grid blackouts in Europe and the actual status of power generation from RES in Europe, addressed the problem of inertia for the frequency control in the future and the issue of the storage systems used in inertial and the primary control. Last but not least, he pointed out, at the end of his presentation, that the use of batteries imply a high social cost that has to be taken into account.

**Dan Preotescu** (CRE) addressed in his presentation the role of RESERVE in updating the network codes for 100% Integration of RES. He explained that existing codes very well fit with the existing situation of up to 20% renewable energy, but will be not anymore valid in a power system with higher level of RES penetration. This is why the gaps between the current situation and the future conditions should be identified, and this is what CRE, supported by all project partners, is doing in RESERVE.

The event was very well attended and the speakers were satisfied by the interest shown by the audience for the RESERVE topics during the following intense discussions.

## 2.5.2 Scientific and industrial conferences attended

In the following table are reported all the scientific and industrial conferences attended by the RESERVE partners in the first 30 months of the project.

	Title	Author(s)	Conference	Place	Year
1	„Die Energiewende aus Sicht der Kommunikationstechnik“	EDD	Energieeffizienz Bauen	Berlin, Germany	30-31 Jan 2017
2	„Netzreaktive Gebäude“	RWTH	Energieeffizienz Bauen	Berlin, Germany	30-31 Jan 2017
3	“Modelling frequency variations in power system models for transient stability analysis”	UCD	International Conference on Future Power Systems and the Energy Transition	Champery, Switzerland	5-9 Feb 2017
4	“DSO Field Trials in Ireland”	ESB	Winter Power Delivery and Utilisation	Los Angeles, USA	13 Feb 2017
5	“Securing the smart grid as we move towards 100% renewables”	EDD	The Sunday Business Post, National Power Summit 2017	Dublin, Ireland	17 Feb 2017
6	“Flexibility, renewables and an active electrical system”	ESB	The Sunday Business Post, National Power Summit 2017	Dublin, Ireland	17 Feb 2017
7	“On the frequency measurement in Wide Area Measurement and Control Systems”	UPB	The 10th international symposium on advanced topics in electrical engineering (ATEE)	Bucharest, Romania	23-25 March 2017
8	RESERVE presentation on the ICT Track (EPRI Information Technology and Cyber Security): “Implementation of the Common Information model in ESB Networks”	ESB, WIT	EPRI Power delivery and Utilization 2017 European Advisory Meeting	London, United Kingdom	17-18 May 2017
9	Session: “How Utilities are using the CIM for Power System Network Model Exchange”  Presentation: “SERVO Modeller: Integrating Distributed Grid Information via CIM”	ESB, WIT	CIM Users Group European Meeting 2017	Erlangen, DE	14-15 June 2017
10	Special Session: “Multi-lab Interconnections for Large-Scale Simulation and Hardware-in-the-Loop”. RWTH contribution: “International Lab-Lab Links	RWTH	IEEE PES PowerTech	Manchester, UK	18-22 June 2017

	with RWTH Aachen University”;				
11	“Frequency Divider”	UCD	IEEE PES PowerTech	Manchester, UK	18-22 June 2017
12	"Modeling, Simulation, and Comparison of Control Techniques for Energy Storage Systems"	UCD	IEEE PES PowerTech	Manchester, UK	18-22 June 2017
13	“Dynamic Phasors to Enable Distributed Real-Time Simulation”	RWTH, POLITO	ICCEP (International Conference on Clean Electrical Power Renewable Energy Resources Impact) 2017	Santa Margherita Ligure, Italy	27-29 June 2017
14	“On the Impact of Microgrid Energy Management Systems on Power System Dynamics”	UCD	IEEE PES General Meeting	Chicago, USA	16-20 Juli 2017
15	“Comparison of the Dynamic Response of Wind Turbine Primary Frequency Controllers Constraints”	UCD	IEEE PES General Meeting	Chicago, USA	16-20 Juli 2017
16	“Frequency Divider”	UCD	IEEE PES General Meeting	Chicago, USA	16-20 Juli 2017
17	“Empowering customers and stimulating Markets in Ireland”	ESB, WIT-TSSG	JRC AUTUMN SEMINAR: World-Class Telecoms for Future Networks,	London, UK	13 Sep 2017
18	Presentation about the impact of microgrid energy management systems on the frequency stability of transmission systems	UCD	IEEE PES ISGT Latin America, plenary panel session on "Smart Grid Recent Advancements and Applications”	Quito, Ecuador	20-22 Sep 2017
19	“Impact of Frequency Estimation for VSC-based Devices with Primary Frequency Control”	UCD	IEEE PES ISGT Europe	Torino, IT	26-29 Sep 2017
20	“Decentralized Stochastic Control of Microgrids to Improve System Frequency Stability”	UCD	IEEE PES ISGT Europe	Torino, IT	26-29 Sep 2017
21	“Network Code on Requirements for Generators” – a Discussion. Resynchronizing with paradigm shifts	UPB, POLITO	IEEE PES ISGT Europe	Torino, Italy	26-29 Sep 2017
22	“5G trials in Europe of Smart Energy Use Cases”	EDD	39th Meeting of the Wireless World Research Forum	Castelldefels (Barcelona), ES	18-20 Oct 2017

			(WWRF39). Theme "Ready 'n' Go - 5G trials and testbeds"		
23	"Energy storage for reaching 100% CO2 free and 100% RES – preliminary case study for Romania"	UPB	8th International Conference on Energy and Environment (CIEM 2017)	Bucharest, RO	19-20 Oct 2017
24	"An Open Solution for Next-generation Real-time Power System Simulation"	RWTH	IEEE-EI <sup>2</sup>	Beijing, China	26 Nov 2017
25	"Comparison of Different PLL Implementations for Frequency Estimation and Control"	UCD	18th International conference on Harmonics and Quality of Power ICHQP 2018	Ljubljana, Slovenia	13-16 May 2018,
26	"RESERVE- Renewables in a Stable Electric Grid. Objectives & Challenges"	TransE	2nd Central European Day of Energy (CEDE)	Brussels, Belgium	11 Dec 2017
27	"Fair, open and transparent energy futures – the integrated grid"	ESB	The Sunday Business Post National Power Summit 2018	Dublin, Ireland	30 Jan 2018
28	"Distributed Real-Time Co-Simulation as a Service"	RWTH	2018 IEEE 1st International Conference on Industrial Electronics for Sustainable Energy Systems (IESES)	Hamilton, New Zealand	31 Jan-2 Feb 2018
29	"A new path for power distribution grid monitoring"	GH	BDEW Fachkongress Treffpunkt Netze	Berlin, Germany	6-7 March 2018
30	"Enabling a Low Carbon Economy"	ESB	IERC Conference 2018	Cork, Ireland	14 March 2018
31	"Grid infrastructure and suitability of distribution system present and future"	ESB	Engineers Ireland Conference: "Ireland's energy security in the context of Brexit and the renewable energy transition"	Dublin, Ireland	15 March 2018
32	"On the Virtual Inertia Provision by BESS in Low Inertia Power Systems"	UPB, RWTH POLITO,	IEEE International Energy Conference (ENERGYCON 2018)	Limassol Cyprus	3-7 June 2018
33	"Service Oriented Grid for the Network of the Future: Enabling near real-time control of the distributed energy network with innovative 5G telecoms networks and intelligence at the network edge"	RWTH	UtiliNet Europe 2018	Brussels, Belgium	15-17 May 2018

34	"Virtual Output Impedance Control for Voltage Stability"	RWTH	CIED 2018 Workshop	Ljubljana, Slovenia	6-8 June 2018
35	Survey paper: "Foundations and Challenges of Low-Inertia Systems"	UCD	20th Power System Computation Conference (PSCC),	Dublin, Ireland	11-15 June 2018
36	"On the Virtual Inertia Provision by BESS in Low Inertia Power Systems"	UPB	5th IEEE International Energy Conference, ENERGYCON 2018	Limassol, Cyprus	3-7 June 2018
37	"Primary frequency control in a power system with battery energy storage systems"	UPB	18th IEEE International Conference on Environment and Electrical Engineering (EEEIC)	Palermo, Italy	12-15 June 2018
38	Evaluation of the Impact of the Size of Storage Devices in Grid-Connected Microgrids,	UCD	18th International Conference on Environmental and Electrical Engineering (EEEIC)	Palermo, Italy	12-15 June 2018
39	Invited talk: "How Smart Energy grids may gain benefits from 5G: SUCCESS, RESERVE and SOGNO projects" at the special session: "Unlocking the 5G potential for smart energy grids"	RWTH	EuCNC 2018 conference: "5G and beyond"	Ljubljana, Slovenia	18-21 June 2018
40	"Power System Dynamics Visualization for Early-Stage Engineering Students and Non-Technical Audience"	ACS-RWTH	EDULEARN 2018	Palma de Mallorca, Spain,	2-4 July 2018
41	"Linear and Uniform System Dynamics of Future Converter-Based Power Systems"	UCD, RWTH	2018 IEEE Power and Energy Society General Meeting	Portland, OR USA	5-9 August 2018
42	"Hardware in the loop validation of the frequency divider formula"	UCD, RWTH	IEEE PES General Meeting 2018	Portland, OR USA	5-9 Aug 2018
43	"Frequency Control of Distributed Energy Resources in Distribution Networks"	UCD	10th Symposium on Control of Power and Energy Systems (IFAC CPES2018)	Tokyo, Japan	4-6 Sept 2018
44	Presentation of RESERVE work	EDD	EUTC Annual Conference 2018	Malmö, Sweden	25-28 September
45	"Development and Stability Analysis of LSD-Based Virtual Synchronous generator for HVDC Systems"	ACS-RWTH	44th Annual Conference of the IEEE Industrial Electronics Society	Washington D.C., USA	21-23 Oct 2018

46	"Smart Transformer for the Provision of Coordinated Voltage and Frequency Support in the Grid"	UCD	44 <sup>th</sup> Annual Conference of the IEEE Industrial Electronics Society	Washington D.C., USA	21-23 Oct 2018
47	"A Generalized Framework for Synthesizing Virtual Output Impedance Control of Grid Integrated Power Electronic Converters"	ACS-RWTH	PEDES 2018	IIT Madras, Chennai, India	Dec 21-23 2018



Figure 28. A. Ortega and F. Milano (UCD) during the awarding ceremony for the best conference paper: "Frequency Control of Distributed Energy Resources in Distribution Networks" (paper 43 in the previous table).

### 2.5.3 Exploitation Strategy Seminar (ESS)

On the 10<sup>th</sup> of October 2018 the RESERVE partners participated to the Exploitation Strategy Seminar (ESS) offered by the Directorate-General (DG) for R&I of the EC. The ESS is one of the six on-demand Support Services for Exploitation of Research Results (SSERR) [30] freely offered to the partners of a research project in the energy field that are interested in maximising the value added and impact of their projects. The seminar was held in Bucharest in conjunction with the regular project meeting.



**Figure 29. ESS Seminar in Bucharest**

In particular, the objective of the ESS is to brainstorm and discuss on how the projects address exploitation opportunities, risks and potential obstacles, enhance the team awareness on the importance of connecting with customers and better communicating project results. It aimed at providing the most appropriate environment to facilitate the followings in an open discussion:

- The identification/grouping of key exploitable results and the definition of the related exploitation strategy,
- The road-mapping of follow-up actions and
- Linkage with relevant stakeholders.

The agenda and the content of the seminar were agreed before the workshop by the project partners together with a consultant that was assigned by the EC to the project in order to act as facilitator during the discussion. The main elements identified in this preliminary work were:

- Key exploitable project results (KERs);
- Project partners that will invest time and effort in each result;
- Conflicts of interest and weaknesses in the exploitation path/plan.

Based on the research concepts and technical solutions developed by the technical work packages, 10 KERs were firstly identified as the main project outcomes, which were further reduced to three main groups and selected as the topics for the seminar activities:

1. Pan-European real-time simulation infrastructure; Spin-off company
2. New structure for Ancillary Services; New set of harmonised network codes
3. Power inverters

The seminar started with a general introduction made by the Commission consultant about the concept of exploitation as seen by the EC, the ESS general objectives and the European Commission expectations. After that, the partners gathered, according to their competences and duties within the project, in three groups according to the main KERs identified and mentioned above.

The group members discussed actively about the specific project results, and had the opportunity to clarify issues, analyse risks and problems connected with the exploitation, suggest solutions and actions, and to set-up a targeted exploitation plan.

The results of the group discussions were finally presented to the whole audience and opened to debate. The outcomes of the seminar were collected and used by the expert for drafting a final report and a Draft Plan for the Exploitation and Dissemination of Results (PEDR), that has been delivered to the project partners. At the same time, the useful exercise done during the ESS seminar gave the project partners the chance to look at this topic under a new perspective, fostering new ideas on how to promote the project result in order to maximise their impact.

#### 2.5.4 RESERVE-MIGRATE Joint Workshop

The collaboration between RESERVE and the H2020 Project MIGRATE (Massive InteGRATION of power Electronic devices) [31] started very early and involved several meetings and discussions on common subjects of interest that produced even the joint submission to Elsevier of a book “Converter-based dynamics and control of modern power systems”, which final draft is expected to be ready by July 2019.

The last of the joint activities of the two projects was a workshop on “Modeling and control of converter-interfaced sources in power systems – revisiting basics”, which took place on the 29<sup>th</sup> and 30<sup>th</sup> of January 2019 at the ENSAM (Ecole Nationale Supérieure des Arts et Métiers) in Lille, France.

Participants to the event were not only RESERVE and MIGRATE representatives, but also external expert and professors not involved in the two projects. In summary, the agenda of the two days included presentations and discussions about the following topics:

- Principles of grid control;
- Modeling aspects;
- Grid services and protections

Prof. Antonello Monti, technical manager of RESERVE, represented the project holding a talk with the title: “Dynamic Phasors: an intermediate approach between phasor-mode and EMT simulations. An approach to inverter control to support frequency.

The participants to the workshop reviewed together some basic principles of grid dynamics and agreed on working on a common paper that will collect and review the main results.

Furthermore, a new meeting was planned in order to synchronize with the IEEE Task Force that is dealing with the same topic.

## 2.6 RESERVE educational activities

Making grids “smart” requires effort which impact on different areas of knowledge, from power system, power electronics, measurement, control and automation technologies through ICT and cyber security to marketing, social science and business aspects. The skill profiles of the positions to be filled in energy companies are changing, with power providers that are now for example focusing on recruiting graduates with ICT skills rather than graduates that understand power production. RESERVE is aware of this need for professionals with new skills to manage RES-based energy networks and for this reason within WP7 and in particular in the framework of the Task 7.4. it developed the interdisciplinary course “Challenges and solutions in Future Power Network”.

### 2.6.1 RESERVE Training Course at the RWTH Aachen University: „Challenges and solutions in Future Power networks”

The RESERVE training course “Challenges and solutions in future power networks” took place on the 11-15 of March 2019 at the RWTH Aachen University.

The target audience of the course were energy system and business professionals, as well as power system engineers and doctoral students in the field of power engineering, automation, control for energy system or ICT for energy systems.

The topics covered during the course addressed the main challenges when it comes to building future power networks with a high share of renewable energy sources, and presented the solutions developed within RESERVE. These challenges include issues such as frequency and voltage control, cyber security and ICT aspects as well as the need for a set of new network codes and ancillary services. As it can be seen in the scheme of the program reported in Figure 30, the 5-days course was organised into two parts: during the first two days it was given an overview of the main topics and actual problems to be addressed by the industry and ICT professionals, while the last three days focused on the related technical insight, giving especially the doctoral students and the researchers the possibility to deepen their knowledge by participating to several workshops and lab exercises on all the related subjects.

Day	Monday	Tuesday	Wednesday	Thursday	Friday
<b>Time</b>	<b>Part I</b>		<b>Part II</b>		
09:00	Welcome session (A. Monti, RWTH Aachen)	Keynote ICT: 5G for Smart Energy (F. Williams, Ericsson)	Cyber Security Workshop (G. Lipari, RWTH)	Monitoring of Power Systems (M. Pau, RWTH Aachen)	ICT for Energy workshop - theory + exercises (Ericsson)
09:30	Keynote Energy: CO2 Neutral Energy Supply Systems – Challenges, Opportunities and the Role of Power Electronics (R. De Doncker, RWTH Aachen)				
09:45		ICT for Smart Grids with Up To 100% Renewables (S. Bretzke, Ericsson)			
10:00					
10:15	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
10:30	Today's electrical Networks (A. Monti, RWTH)	Components for grid connections power electronics (S. Cui, RWTH Aachen)	Frequency Control Workshop Theory (L.Toma, University of Bucharest; A.Mazza, Politecnico di Torino; A.Musa, RWTH Aachen)	Voltage Control Techniques (S. Gurumurthy, RWTH Aachen)	Exam- Multiple choice
11:00					
11:30	Key Concept for future Frequency definition and control (L.Toma, University of Bucharest)				
12:00	Lunch Break	Lunch Break	Lunch Break	Lunch Break	Lunch Break
12:30					
13:30	Linear Swing Dynamic: a new approach to frequency control (D. Raisz, RWTH Aachen)	Business Cases & Corporate Social Responsibility (CSR) (H. Ketteniß, RWTH Aachen)	Frequency Control Workshop Theory (L.Toma, University of Bucharest; A.Mazza, Politecnico di Torino; A.Musa, RWTH Aachen)	Lab session on using “RTDS for Monitoring of Power Systems” (A. Sadu, Marco Pau, RWTH Aachen)	Outlook and feedbacks
14:00					Certificates Handover & Conclusion
14:30	Voltage Control (S. Gurumurthy, RWTH Aachen)	Coffee Break	Coffee Break	Coffee Break	
15:00					
15:30	Coffee Break	Cybersecurity for Sustainable Energy Systems (A. Mantooh, University of Arkansas)	Introduction to real time simulation tools (S. Vogel, RWTH Aachen)	Voltage Control with OPAL RT (S. Gurumurthy, RWTH Aachen)	
16:00	The Role of NETWORK CODES on Future RES Developments in Europe (M.Paun, Romanian Energy Center)				
16:30		Optional E.ON ERC Lab tour: -ACS Lab - EBC/PGS Testhalle			
17:00	Break and poster session preparation				
17:30					
18:00					
18:30	"Academia meets industry"				
19:00	Poster session & Networking / finger food dinner		Optional Get-Together (Aachen tour)		
19:30					
20:00					
20:30					

Figure 30. RESERVE course Program. 11-15 March 2019.

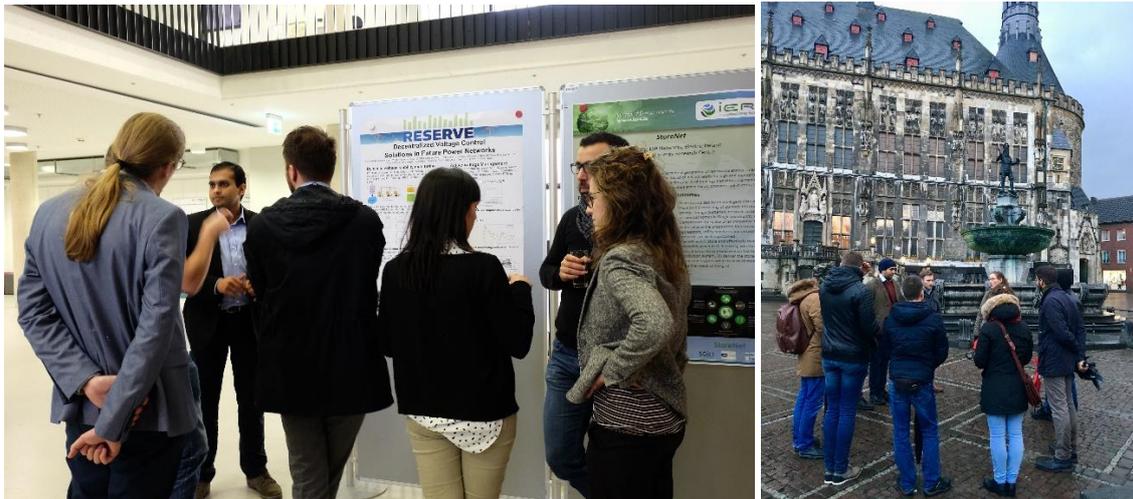
A non-exhaustive list of the RESERVE course speakers included:

- Prof. Rick De Doncker, Director of E.ON Energy Research Center and Institute Power Generation and Storage Systems (PGS), RWTH Aachen University.
- Dr. Fiona Williams, Research Director, Ericsson GmbH and RESERVE coordinator
- Prof. Antonello Monti, Director of the Institute Automation of Complex Power Systems (ACS), RWTH Aachen University, and RESERVE Technical Manager.
- Dr. Mihai Paun, vice-president of the Romanian Energy Center and RESERVE WP6 Leader.
- Prof. Alan Mantooh, distinguished professor from the University of Arkansas

During the course the participants had the possibility to widen their knowledge getting an insight from academic and industry sector expert on the most innovative energy and ICT solutions developed for a power network with up to 100% RES integration. Furthermore, during the networking dinner on the first day, they had the possibility to present a poster and pitch their more significant research results, discuss their interests, and build in this way new relationships and a professional network. On the second day the course participants could visit the lab premises at E.ON Energy Center and on the third day an informal get together consisting in a tour of the city of Aachen and an evening in a typical pub was organised to favor the socialisation between the participants. Last but not least, a certificate of attendance was issued by the RWTH Aachen University by passing an exam at the end of the course.

The full program of the course including the biography of the speakers and the synopsis of their presentations are available on the project web page: [www.re-serve.eu](http://www.re-serve.eu). The full program of the course including the biography of the speakers and the synopsis of their presentations are available on the project web page: [www.re-serve.eu](http://www.re-serve.eu).





**Figure 31. Lectures, networking opportunities around the posters and get together during the RESERVE course week in Aachen.**

### 2.6.2 RESERVE online course: „Challenges and solutions in Future Power networks”

Based on the content of the face-to-face course realised at the RWTH Aachen (chapter 2.6.1) an online course to be shared for free on an online platform (YouTube) will be released before the end of the project.

## 2.7 EU initiatives

Thanks to the participation of some RESERVE partners to the EU Initiatives “BRIDGE” and ETIP-SNET, the project concepts and results are regularly brought to Brussels, creating awareness of the RESERVE ideas and stimulating further discussions and collaboration about the project topics. In the following paragraphs the activities of the BRIDGE and ETIP-SNET working groups, with particular attention to the role of RESERVE in them, are described in detail.

### 2.7.1 BRIDGE

BRIDGE is an initiative from the European Commission which gathers Smart Grid and Energy Storage projects funded under Horizon 2020 since 2014. The goal of this cooperation group is to create a structured view of cross-cutting issues of non-technological nature encountered in the demonstration projects which may constitute an obstacle to innovation.

BRIDGE is composed of four Working Groups addressing different areas of interest: Business Models, Consumer Engagement, Data Management and Regulation. The coordination team consists of the chairs and rapporteurs of these four working groups, and Bridge meetings take place every six months. The aim of Bridge is to share knowledge, experience and best practice, and to allow projects to speak to the European Commission with one voice. Participation in BRIDGE also increases the profile of projects and provides dissemination opportunities.

RESERVE is part of BRIDGE and in particular, through Dr. Mihai Paun, Vice-President of the Romanian Energy Center CRE and leader of the WP “Regulatory, legal issues & business models for RES”, is actively involved in the Regulation Working Group, of which Dr. Paun is the rapporteur, other than in the BRIDGE Coordination activities. The WG Regulation aims at identifying the main current regulation issues hampering innovative projects’ use cases and at suggesting future regulations to facilitate their deployment. Moreover, it will elaborate a set of experience-based recommendations for regulation issues for efficient integration of Storage and Smart Grids in Europe.

More specifically, as it can be read in the BRIDGE Brochure [32], the regulation matters addressed by this WG are the following:

- Regarding **energy storage**, the regulatory framework needs to provide clear rules and responsibilities concerning ownership, competition, technical modalities and financial conditions, for island and mainland cases

• In terms of **smart grids**, regulatory challenges arise regarding the incentives for demand-side response, commercial arrangements, smart meter data, etc.

The work implemented until now by the BRIDGE Regulation WG generated in August 2018 the publication of a document containing recommendations addressing five specific regulatory issues, which are illustrative of the WG's activities. These are:

1. Storage ownership and procurement of storage services
2. Storage valorisation
3. Safety and environment
4. New market design options, leading to new services, business models and roles for system operators
5. Specific regulatory aspects for island cases

This, together with other documents of the Regulation WG as well as with more information about all projects participating in the WG can be found online [33]

RESERVE is represented in the BRIDGE Initiative through CRE direct contribution, and in particular thanks to the presence of Mihai PAUN (leader of the RESERVE WG6), which acts as rapporteur of BRIDGE WG Regulations. The point of view and the constant progresses made within RESERVE are brought in BRIDGE by the project representative by contributing to the following tasks:

- Promotion of RESERVE results on Regulation (resumed in the RESERVE deliverables D6.1 and D6.3 [34])
- Drafting the BRIDGE Report - WG Regulation and ensure that RESERVE key achievements are included
- Drafting / contributing to the BRIDGE Newsletter with articles about RESERVE progresses
- Contribution, with the RESERVE last achievements, to the regular BRIDGE WG Regulations meetings and BRIDGE Coordination meetings
- Direct contribution to gathering other Horizon 2020 Smart Grid and Energy Storage demonstration projects
- Contribution to creating a structured view of obstacles to innovation, fostering continuous knowledge sharing amongst projects
- Contribution and review of conclusions and recommendations of BRIDGE
- Overall contributions to defining and implementing BRIDGE WG Regulation Work Programme and Strategy, in coordination with the other WGs of BRIDGE.

### 2.7.2 European Technology and Innovation Platform Smart Networks for Energy Transition (ETIP-SNET)

The new European Technology and Innovation Platform Smart Networks for Energy Transition (ETIP-SNET) [35] have been created in 2016 by the European Commission in the framework of the new Integrated Roadmap Strategic Energy Technology Plan (SET Plan) by bringing together a multitude of stakeholders and experts from the energy sector.

The ETIP SNET's mission is to guide research, development and innovation (RD&I) activities to support Europe's energy transition. The ETIP SNET aims to set-out a vision for research and innovation for smart networks, storage and integrated energy systems and engage stakeholders in this vision. It identifies barriers and solutions to promote innovation, notably related to regulation and funding. The ETIP SNET aims at elaborating a vision and a Roadmap for R&I activities for smart networks, storage and other sources of flexibility, and integrated energy systems, engaging all stakeholders. It also looks at customer participation and the impact of digitisation.

In order to have a wide representation of stakeholders and offer agile and efficient operation of ETIP SNET, the platform is organised as follows:

- The Governing Board steers the platform where stakeholder associations send representatives
- Working Groups (WGs) are open for experts to participate and provide input to the Governing Board
- A National Stakeholders Coordination Group to liaise with various national actors.

The WGs gather experts representing the widest community of stakeholders related to their area of expertise. Experts acting in the Working Groups aim at providing strategic guidance about RD&I priorities and activities, ensuring the interaction and involvement of the entire expertise needs raised by the integration issues of the electricity system into the wider European energy system. Experts contribute to the WG on a voluntary basis and no reimbursement of expenses is foreseen.

Three members of the RESERVE consortium have been selected as experts for three of the five working groups. The 5 active working groups of the ETIP SNET and the RESERVE experts' members are:

- WG1: Reliable, economic and efficient smart grid systems (for RESERVE J. Sandham, ESB)
- WG2: Storage technologies and sector interfaces
- WG3: Flexible generation
- WG4: Digitisation of the electricity system and customer participation (for RESERVE A. Monti, RWTH, task force leader)
- WG5: Innovation implementation in the business environment (for RESERVE M. Paun, CRE)

**Work Group 1** addresses business and technology trends that are contributing to the overall energy system optimization at affordable investment and operation costs. It focuses on system aspects, addressing the main functionalities, quality, and efficiency of the electricity system as such and consider the benefits of its integration with the other energy vectors.

The role of **Jonathan Sandham** (Electrification and Innovation Delivery Manager at ESB Networks and leader of the RESERVE WP5 "test-beds for validation of research results") within WP1 is to understand and define the new transmission and distribution technologies (power electronics for instance), appreciate the future requirements for setting up interfaces with storage, demand response, flexible generation and synergies with other energy networks (i.e. how to couple the electricity networks with the gas and heat networks). WG1 also follows Set Plan Action 4 related to grid smartening in the sense of grid observability and controllability (i.e. tools for managing the variability and uncertainty of operational conditions at several timescales), increased grid hosting capacity and economic efficiency of the system through the use of ICT.

**Work Group 4** addresses the use and impact of the Information and Communication Technologies as a pervasive tool along the entire value chain of the power generation, transportation and use. The communication layer is one of the pillars of the smart energy system, enabling system observability, monitoring, control and protection, specifically enabling a radical change in the relation between the final user and the energy system. In particular, WG4 follows on:

- The full digitalization of both the transmission and the distribution networks with new ICT infrastructures, Cybersecurity issues linked to Use of big data, IoT and High Performances Computing;
- ICT infrastructures and technologies that will allow the involvement of the end customers and the retail market players;
- The retail electricity markets empowering customers;
- The Improvement of public awareness of long-term energy challenges and the need to build and protect transmission infrastructure in order to increase the social benefit of energy use.

**Prof. Antonello Monti**, technical manager of RESERVE, chaired the Task Force 1 of the Working Group 4. In this position, he coordinated the preparation of a very detailed report on technologies

and standard for digitalization. This report was released in the middle of 2018. After that, a second version of the report has been prepared to bring only the key points.

Right now, WG4 is focusing on identifying disruptive project ideas for future calls.

**Work Group 5** adopts a helicopter view of the activities carried out in the projects within the perimeter of the ETIP about the energy transition in order to:

- Build homogeneity in the analysis of projects, work done and lessons learned Create a common platform for analysing the progress made with technologies through-out the EU and facilitate their scalability;
- 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;
- Review the relevant BRIDGE reports that identify the economic, social, technical, legal, etc. barriers which may slow down business model deployment;
- Search for innovative solutions that will maximize the benefits of the innovation process that the EU achieves through R&I activities in the area of Energy.

**Mihai Paun**– Vice-President of the Romanian Energy Center (CRE) and leader of the Regulatory, Legal issues & Business Models for RES activities within the RESERVE Project is actively involved in the activities of the WG5. He represents and share the views and results of RESERVE Project in terms of innovation, regulation and Business Models.

## 2.8 Plan for future events

In this section are described the events planned until the end of the project, the 30 of September 2019.

### 2.8.1 Irish Field Trial Open Day

An Open Day to demonstrate the deployment of one of Voltage Control Techniques developed in the RESERVE project will take place in Dublin on the 15<sup>th</sup> May 2019. The demonstration will utilise Ireland's first deployed V2G (Vehicle to Grid) charger to provide voltage support to the local network in parallel with its regular operation.

### 2.8.2 Exhibition stands and presentations at industrial and scientific events

#### 2.8.2.1 Innogrid 2020+ 2019

As in the previous edition, RESERVE will participate in the 2019 edition of the Innogrid 2020+, that will take place in Brussel on the 13-14 May 2019. The topic of the 8<sup>th</sup> edition of the InnoGrid Annual Conference is: 'Connecting Physics and Digits: Power Platforms on the Rise'. RESERVE will have a stand in the exhibition hall and has applied for a speaking slot at the policy conference, during Session IV "Advanced grids resilience".

#### 2.8.2.2 EUSEW 2019

##### 2.8.2.2.1 *Networking village.*

Like in the previous editions, RESERVE applied for a stand at the energy fair in the Networking village (Brussel, 18 to 20 June 2019), together with the Horizon 2020 Project SOGNO. At the time of submission of this deliverable the acceptance has yet to be confirmed.

##### 2.8.2.2.2 *Policy conference.*

RESERVE applied, together with the H2020 Project SOGNO, for a session at the policy conference that will take place from 18 to 20 June 2019. The title of the proposed session is "Securing the Smart Grids for up to 100% RES", and it will address, in line with the climate target set by the European Union, the key achievements, challenges to and opportunities for the European Power System with up to 100% RES, bringing the examples of the two projects. The application was successful and RESERVE was allocated a 90-minute slot together with ENTSO-E (lead organiser of the session) and IRENA. At the time of submission of this deliverable the details about the organisation of the session are being discussed.

### **2.8.3 RESERVE Final Event**

RESERVE plans to organise a final event at the end of September 2019 in Brussels. Previous agreement in order to hold it at the European Parliament are already been taken, while the concrete program of the event is, at the time of writing, still ongoing.

### 3. Conclusions

Numerous events were organised in the reporting period in order to communicate and disseminate the most relevant results and conclusions about the ongoing project work. RESERVE target audience include relevant stakeholders and policy makers, the research community as well as student and professionals that need to broaden their knowledge and specialise in the field of energy and ICT.

RESERVE has created awareness of the ongoing work for the definition of a new set of ancillary services and harmonised network codes by sharing the ongoing work and achieved results during informal consultations with representatives of relevant categories (TSOs, DSOs, SDOs, manufacturers ...), as well as by collecting feedbacks and inputs from stakeholders and advisory board members during the organization of dedicated events and from the interaction with representatives of European institutions.

Various RESERVE partners participate actively to high level EU initiatives like the DG Energy meetings, the BRIDGE initiative (a Cooperation group of Smart Grids and Energy Storage H2020 projects of which RESERVE it is part of) and to several working groups of the ETIP-SNET platform (European Technology and Innovation Platform Smart Networks for Energy Transition). This commitment not only helps us to get visibility for the project but enables a fruitful exchange of experiences and ideas between RESERVE and other H2020 projects, institutions and policy makers at European level.

Furthermore, RESERVE has created awareness of the project technical work and has disseminated the results through the organization and participation in numerous targeted events (workshops, scientific and technical conferences, exhibition fairs etc.) and has planned even more aiming at pushing ahead the sharing of knowledge and ideas and at driving the dialog with the different target audiences. Moreover, the results of the projects produced already 14 articles published in peer-reviewed scientific journals.

Last but not least, RESERVE addressed the need for professionals for new skills to manage RES based energy networks by creating a multidisciplinary course (energy and ICT) with the aim to educate the energy sector on the RESERVE approaches and promote the concepts and the use of results internationally.

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## 5. List of Abbreviations

ACER	Agency for the Cooperation of Energy Regulators
ACS	Automation of Complex Power Systems (Institute for)
ANRE	National Regulatory Authority for Energy
CRE	Romanian Energy Center
C&SEE	Central and South-East Europe
CESEC	Central and South Eastern Europe Energy Connectivity
CRE	Centrul Roman al Energiei
CSU	Colorado State University
DG	Directorate General
DSO	Distribution System Operator
EC	European Commission
EDD	Ericsson GmbH
EDSO	European DSO associations
EES	Electro-Energetic System
ENEA	Agenzia Nazionale per le Nuove Tecnologie, l'Energia e lo Sviluppo economico sostenibile
ENTSO-E	European Network on Transmission System Operator in Electricity
EP	European Parliament
ESB	ESB Networks Ltd
ESS	Exploitation Strategy Seminar
ETH	Eidgenössische Technische Hochschule (Zürich)
ETIP-SNET	European Technology and Innovation Platform Smart Networks for Energy Transition
EUSEW	European Sustainable Energy Week
EUW	European Utility Week
FEN	Flexible Elektrische Netze FEN GmbH
H2020	Horizon 2020
ICT	Information and Communications Technology
HVDC	High Voltage Direct Current
IEEE	Institute of Electrical and Electronics Engineers
INL	Idaho National Laboratory
IRENA	International Renewable Energy Agency
IT	Information Technology
JRC	Joint Research Centre
KER	Key Exploitable Results
KoWi	Kooperationstelle EU der Wissenschaftsorganisationen
MV	Medium Voltage
NC	Network Code
NREL	National Renewable Energy Laboratory
PES	Power and Energy Society

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PEDR	Plan for the Exploitation and Dissemination of Results
POLITO	Politecnico di Torino
Q&A	Questions and Answers
RED	Romanian Energy Day
R&I	Research and Innovation
RES	Renewable Energy Sources
RT	Real-Time
RWTH	Rheinisch-Westfälische Technische Hochschule (Aachen)
SDOs	Standards Developing Organisations
Snl	Sandia National Laboratories
SSERR	support Services for Exploitation of Research Results
TSO	Transmission System Operator
UCD	University College Dublin
UPB	Universitatea Politehnica din Bucuresti
USC	University of South Carolina
WG	Working Group
WSU	Washington State University
WP	Work Package

## 6. Figures

Figure 1. Launch event of RESERVE at the EUW 2016 in Barcelona, Spain. ....	8
Figure 2. RESERVE Pod at the EU Project Zone, EUW 2017. ....	9
Figure 3. RESERVE Pod at the European Project Zone, EUW 2018. ....	10
Figure 4. EUSEW conference session. ....	11
Figure 5. RESERVE boot at the Networking Village. ....	11
Figure 6. RESERVE, SUCCESS and SOGNO joint stand at the EUSEW Networking Village. .	12
Figure 7. Panel session at the Innogrid+ 2017 policy conference. ....	12
Figure 8. Networking at the RESERVE stand. ....	13
Figure 9. impressions from the exhibition area at InnoGrid2020+ 2018. ....	13
Figure 10. Mihai Paun (CRE), presenting RESERVE during the session "Customer in the focus". .....	14
Figure 11. The SecuRenewable hero mascot promoting the projects at the e-World 2018. ....	15
Figure 12. RESERVE and SUCCESS partners at the SecuRenewable stand. ....	15
Figure 13. Impressions from the 1 <sup>st</sup> RESERVE Stakeholder Meeting. ....	16
Figure 14. RESERVE 1 <sup>st</sup> Stakeholder Meeting. Press conference. ....	17
Figure 15. Impressions from the event. ....	17
Figure 16. RESERVE Panel discussion. ....	18
Figure 17. the RESERVE representatives at the Romanian Energy Day 2017. ....	19
Figure 18. Location of the 7th Edition of RED. ....	21
Figure 19. Prof. Antonello Monti talking during the Policy panel: " Financing the Transition Costs to a Low-Carbon Economy".....	22
Figure 20. RESERVE & SOGNO Stakeholder Consultation. ....	22
Figure 21. Prof. A. Monti presenting the RESERVE project. ....	23
Figure 22. CRE-ANRE bilateral meeting.....	25
Figure 23. RESERVE 1 <sup>st</sup> Stakeholder Meeting. Impressions from project team (left) and board members (right). ....	26
Figure 24. RESERVE 2 <sup>nd</sup> Stakeholder Meeting. ....	27
Figure 25. Prof. Ettore Bompard (POLITO), organiser of the global RT Super-Lab Demo at the ISGT Europe.....	28
Figure 26. Map of the Global RT- SuperLab .....	28
Figure 27. RESERVE workshop within ISGT conference.....	29
Figure 28. A. Ortega and F. Milano (UPB) during the awarding ceremony for the best conference paper: "Frequency Control of Distributed Energy Resources in Distribution Networks" (paper 43 in the previous table). ....	34
Figure 29. ESS Seminar in Bucharest .....	35
Figure 30. RESERVE course Program. 11-15 March 2019. ....	37
Figure 31. Lectures, networking opportunities around the posters and get together during the RESERVE course week in Aachen. ....	39

