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Work Package WP3

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Deliverable D3.2

D-NA2.2a Progress Report of Project Networking and Collaboration Activities

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29/04/2021	v1.5	T. Strasser (AIT)	Final version

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List of Abbreviations

AC	Alternating Current
COVID-19	Coronavirus Disease 2019
DC	Direct Current
DER	Distributed Energy Resources
DG	Distributed Generation
DSO	Distribution System Operator
EC	European Commission
GA	Grant Agreement
GIS	Geographic Information System
HIL	Hardware-in-the-Loop
HTD	Holistic Test Description
ICT	Information and Communications Technology
IoT	Internet of Things
MooC	Massive Open Online Course
MVDC	Medium Voltage Direct Current
PV	Photo-voltaic
PoC	Person of Contact
RDI	Research, Development and Innovation
RI	Research Infrastructure
ROS	Robot Operating System
RES	Renewable Energy Sources
RTS	Real-Time Simulation
TA	Trans-national Access
TF	Task Force
TRL	Technology Readiness Level
VA	Virtual Access
WP	Work Package

Executive Summary

Being a project strongly focused on integrating Europe's Research Infrastructures (RIs), ERIGrid 2.0 recognises the importance of connecting and networking with other actors. ERIGrid 2.0 consortium members are involved in other relevant projects and networks. This supports the project's objective to establish new connections and continue previous collaborations.

In the current report, a number of collaboration activities of the ERIGrid 2.0 project are presented. The focus areas of these collaboration activities cover the entire scope of ERIGrid 2.0 research topics. Reported here are joint current or potential activities with projects, both national and international, as well as networks and platforms. Having collaborators on both international and national levels allows ERIGrid 2.0 to reach out to a broader audience. Several of the collaboration links were established during the predecessor project ERIGrid.

With initial activities set up during the first project year, the project aims to intensify joint efforts in the next project years. Impacted by Coronavirus Disease 2019 (COVID-19) related regulations, the ERIGrid 2.0 collaboration activities will have virtual focus and format until further notice.

1 Introduction

1.1 Purpose and Scope of the Document

This document reports a wide variety of collaboration activities ERIGrid 2.0 has established in the first project year, or that the consortium considers for the near future. The purpose of this comprehensive overview is to help the consortium to assess whether ERIGrid 2.0 is on track with the collaboration goals and whether the project research scope is reflected in its networking activities. All the presented projects and networks are thematically linked to ERIGrid 2.0, and there is at least one person who is participating in both parties and can act as a Person of Contact (PoC).

The main aspect of collaboration in the context of ERIGrid 2.0 is continuous knowledge and experience exchange. As also reflected in the Grant Agreement (GA) (*ERIGrid 2.0 Grant Agreement*, 2019), the collaborators shall provide feedback to ERIGrid 2.0 activities, stimulating further improvements of the integrated RI. ERIGrid 2.0 in its turn will support the collaborators by sharing methods and experiences on laboratory-based testing and validation of smart grid concepts and by offering free access to the state-of-the-art laboratories in Europe.

Building on the experience and collected connections in the predecessor project, the ERIGrid 2.0 consortium aims to continue previous collaboration initiatives, some of which are listed in this document.

Collaboration activities, and especially knowledge exchange, usually takes the form of email communication, joint web meetings, webinars, and joint physical events. However, following the regulations to diminish the spread of the COVID-19, the consortium agrees that collaboration in form of joint events shall be of virtual nature for the time being.

1.2 Structure of the Document

This document is organised as follows: Section 1 provides general details about the background of collaboration activities and outlines the report's purpose and scope. Section 2 gives an overview of projects on the European and national levels that ERIGrid 2.0 collaborates with. Further on, in Section 3, an overview of collaborative efforts with networks is presented. The deliverable is concluded in Section 4.

2 Collaborations with Projects

The cooperation and information exchange with other European and national projects is an important point for disseminating and exploiting potential project results and to gather feedback about them. Therefore, ERIGrid 2.0 has already identified several of such projects which is worth to collaborate with. The nature and content of the collaboration is described in the following sections.

2.1 European Projects

Table 1 outlines all the European projects which are collaborating with ERIGrid 2.0.

Table 1: Overview of European projects with links to ERIGrid 2.0.

Name	Funding	ERIGrid 2.0 Partners Involved	ERIGrid 2.0 PoC	Project PoC
INTERPLAN	Horizon 2020	yes	Ata Khavari (DERlab)	Giorgio Graditi (ENEA), Helfried Brunner (AIT)
PANTERA	Horizon 2020	yes	Ata Khavari (DERlab)	Mohamed Shalaby (DERlab), Venizelos Efthymiou (FOSS)
eNeuron	Horizon 2020	yes	Ata Khavari (DERlab)	Ata Khavari (DERlab)
GIFT	Horizon 2020	yes	Evangelos Rikos (CRES)	Evangelos Rikos (CRES)
HYPERRIDE	Horizon 2020	yes	Thomas Strasser (AIT)	Thomas Strasser (AIT)
SINERGY	Horizon 2020	yes	Thomas Strasser (AIT)	Thomas Strasser (AIT)
ELECTRA	Integrated Projects – Smart Growth/RIF	yes	George Makrides (FOSS)	George Makrides (FOSS)
BERLIN	ENI CBC MED	yes	Venizelos Efthymiou (FOSS)	Venizelos Efthymiou (FOSS)

In the following sections more details about the cooperation with those projects is provided.

2.1.1 INTERPLAN

Full Name: INTEgrated opeRation PLAnning tool towards the Pan-European Network (INTERPLAN)

Funding Framework: Horizon 2020

Coordinator: Giorgio Graditi (ENEA)

PoC on Behalf of ERIGrid 2.0: Ata Khavari (DERlab)

PoC on Behalf of INTERPLAN: Giorgio Graditi (ENEA), Helfried Brunner (AIT)

Project Duration: 1 November 2017 - 31 January 2021

Description: *INTERPLAN*[1] is a project that provided an INTEgrated opeRation PLANning tool

[1] https://interplan-project.eu/

towards the pan-European network, to support the EU in reaching the expected low-carbon targets, while maintaining network security. INTERPLAN developed a methodology for a proper representation of a “clustered” model of the pan-European network, with the aim to generate grid equivalents as a growing library able to cover all relevant system connectivity possibilities occurring in the real grid, by addressing operational issues at all network levels (transmission, distribution and TSOs-DSOs interfaces).

Collaboration Activities: Several use cases were developed in the INTERPLAN project in order to showcase the INTERPLAN tool, and to test and validate control functions for network operation planning. These use cases will be considered as candidates for the evaluation process in ERIGrid 2.0 as it aims to enhance existing testing methodologies.

2.1.2 PANTERA

Full Name: Pan European Technology Energy Research Approach (PANTERA)

Funding Framework: Horizon 2020

Coordinator: Venizelos Efthymiou (FOSS)

PoC on Behalf of ERIGrid 2.0: Ata Khavari (DERlab)

PoC on Behalf of PANTERA: Mohamed Shalaby (DERlab), Venizelos Efthymiou (FOSS)

Project Duration: 1 September 2019 - 31 December 2022

Description: *PANTERA*[2] will set up a European forum composed of Research & Innovation stakeholders active in the fields of smart grids, storage and local energy systems, including policy makers, standardisation bodies and experts in both research and academia representing the EU energy system. The project will create the corresponding multi-functional collaborative platform EIRIE, which will serve as a reference operational point to unify European activity, incentivise further investments in smart grids and support access to exploitable results.

Collaboration Activities: Having similar target audiences, ERIGrid 2.0 and PANTERA will collaborate for knowledge exchange and networking. As a first joint activity, the two projects, together with DERlab, organised a joint public webinar “Remote Testing & EIRIE Platform” on 8 March 2021. Furthermore, it was agreed that PANTERA’s EIRIE platform will present lab access and virtual services of ERIGrid 2.0.

2.1.3 eNeuron

Full Name: greEN Energy hUbs for local integRated energy cOmmunities optimizatioN (eNeuron)

Funding Framework: Horizon 2020

Coordinator: Marialaura Di Somma (ENEA)

PoC on Behalf of ERIGrid 2.0: Ata Khavari (DERlab)

PoC on Behalf of eNeuron: Ata Khavari (DERlab)

Project Duration: November 2020 - 31 October 2024

[2] https://pantera-platform.eu/

Description: *eNeuron*[3] will set out a practical and evidence-based framework for optimising the design and operation of local energy communities acting as energy hubs. It will draw on pioneering software and hardware solutions and develop new use cases so that local energy communities are able to rise to the challenge of widespread roll-out.

Collaboration Activities: With the topic of multi-energy being in the scope of research both for eNeuron and ERIGrid 2.0, there is potential for collaboration on use cases and testing requirements and methodologies.

2.1.4 GIFT

Full Name: Geographical Islands FlexibiliTy (GIFT)

Funding Framework: Horizon 2020

Coordinator: Zoran Marinsek and Saso Brus (INEA)

PoC on Behalf of ERIGrid 2.0: Evangelos Rikos (CRES)

Poc on Behalf of GIFT: Evangelos Rikos (CRES)

Project Duration: 1 January 2019 - 31 December 2022

Description: *GIFT*[4] is an innovative project that aims to decarbonise the energy mix of European islands through the development of multiple innovative solutions, such as a virtual power system, energy management systems for harbours, factories, homes, better prediction of supply and demand and visualisation of those data through a Geographic Information System (GIS) platform, and innovative storage systems allowing synergy between electrical, heating and transportation networks. GIFT will increase the penetration rate of renewable energy sources into the islands' grid, reducing their needs for diesel generation and thus decreasing the greenhouse gases emissions directly related to it.

Collaboration Activities: The activities of GIFT are highly relevant for the scenarios and focus analysis of ERIGrid 2.0. The areas of interest for GIFT are flexiblity, prosumers, local energy communities, distribution grid management, electric vehicles, and storage technologies. In this respect the GIFT activities cover several of the ERIGrid 2.0 scenarios. In addition to that, Holistic Test Description (HTD) of ERIGrid is planned to be used in the replicability and scalability analysis of GIFT for the description of the selected tests. Therefore, ERIGrid 2.0 will benefit from important feedback from the use of the methodology by GIFT. The PoC between the two projects is also in charge of using the HTD in GIFT, which ensures a more interactive implementation of and feedback on the HTD methodology.

2.1.5 HYPERRIDE

Full Name: HYbrid Provision of Energy based on Reliability and Resiliency via Integration of DC Equipment (HYPERRIDE)

Funding Framework: Horizon 2020

Coordinator: Gerhard Jambrich (AIT)

PoC on Behalf of ERIGrid 2.0: Thomas Strasser (AIT)

[3] https://eneuron.eu
[4] https://www.gift-h2020.eu/

Poc on Behalf of HYPERRIDE: Thomas Strasser (AIT)

Project Duration: October 2020 - September 2024

Description: *HYPERRIDE*[5] will contribute to the field implementation of Direct Current (DC) and hybrid Alternating Current (AC)/DC grids by identifying and providing solutions to overcome barriers for a successful roll-out of new infrastructure concepts throughout Europe. Under the co-ordination of Gerhard Jambrich (AIT), 10 consortium partners from 6 European countries will develop grid planning and operation guidelines and adapt available sizing tools for DC. The Technology Readiness Level (TRL) of enabling technologies will be raised focused on Medium Voltage Direct Current (MVDC) breakers, -sensors and DC measurement units to provide field ready devices for grid automation and protection. During the project lifetime automation algorithms will be created, validated and transferred to demo sites. This involves concepts and solutions for cyber-security and fault mitigation to avoid cascading effects. Pilot sites are planned in Aachen (Germany), Lausanne (Switzerland), and Terni (Italy) to showcase above-mentioned technologies. Finally, the solutions are evaluated, focussing especially on the benefits for the integration potential of renewables. Furthermore, business models will be created for products, services and applications.

Collaboration Activities: With reference to the HYPERRIDE efforts and ambition of developing grid automation and protection concepts (cyber-security concepts) there are numerous interfaces and common research topics. The two projects may also find common grounds when it comes to the validation of results.

2.1.6 SINERGY

Full Name: Capacity building in Smart and Innovative eNERGY management (SINERGY)

Funding Framework: Horizon 2020

Coordinator: Nikola Tomašević (IMP)

PoC on Behalf of ERIGrid 2.0: Thomas Strasser (AIT)

Poc on Behalf of SINERGY: Thomas Strasser (AIT)

Project Duration: January 2021 - December 2023

Description: *SINERGY*[6] The primary objective of the project is to strengthen the research capacity and to further unlock the innovation potential of the Institute Mihajlo Pupin (IMP), transforming it into a regional Centre of Excellence in the smart energy management. Once established, as a novel regional excellence centre, IMP will promote the added value of smart energy management technologies, co-ordinate research efforts and unite scarce research resources in this field in the Southeast European region, but also encourage communication with leading external EU parties, aiming at full integration into the European Research Area (ERA). In this way, IMP will be capable of further disseminating the project outcomes (strategies, policies, training courses, webinars, etc.) and supporting companies and institutions (both research and industrial) in the region to strengthen their EU competitiveness. To reach SINERGY ambitious objectives, a strategic partnership and transfer of multidisciplinary “know-how” from leading EU research institutions, and beyond, will play the main role in gaining and exchanging the re-

[5] https://hyperride.eu/
[6] https://project-sinergy.org/

lated competences needed for the development of high impact innovative energy management solutions suitable for efficient and reliable energy networks of the future.

Collaboration Activities: There are several overlaps between the projects, especially in the areas of validating smart energy systems as well as corresponding educational activities.

2.1.7 ELECTRA

Full Name: Modernising the distribution grid for enabling high penetration of photovoltaic electricity through advanced data analytic operational observability and management (ELECTRA)

Funding Framework: Integrated Projects – Smart Growth/RIF

Coordinator: George Makrides (FOSS)

PoC on Behalf of ERIGrid 2.0: George Makrides (FOSS)

Poc on Behalf of GIFT: George Makrides (FOSS)

Project Duration: June 2020 – June 2023

Description: *ELECTRA* aims to fuse together extensive interdisciplinary scientific research in the field of grid integration of Renewable Energy Sources (RES) and to target the major challenges and barriers to boost the integration of RES, by covering the whole research and innovation spectrum of enabling dynamic, automated and cost-effective management of smart distribution grids.

Essentially, the main aim of the ELECTRA project is to pave the way for increased penetration of Distributed Generation (DG) systems (predominantly solar Photo-voltaic (PV) systems), to be integrated and optimally managed at the distribution grid. Since the strong growth and uptake of the photovoltaic sector (future dominant renewable technology at the distribution system) is also associated with the potential of the grid to accommodate the variability of DG, a key factor that will boost the further increase and uptake of the technology is to enable the efficient and reliable operation of future distribution systems with high DG shares. This can only be achieved by modernising the distribution grid for real-time predictive observability and automated control with the use of advanced data analytics that leverage machine learning principles. An important aspect of this project is also the development of an adaptive multi-service distribution management architecture (end-solution) that will provide and deliver the required bi-directional electricity flow control and flexibility in distribution grids with high RES shares.

Collaboration Activities: ELECTRA and ERIGrid 2.0 have many thematic overlaps that can be used for collaboration. Both projects are engaged with advanced controls of PV and storage systems, centralised control for smart grids and full Distributed Energy Resources (DER) digitalisation for real-time controls.

2.1.8 BERLIN

Full Name: Cost-effective rehabilitation of public buildings into smart and resilient nano-grids using storage (BERLIN)

Funding Framework: ENI CBC MED

Coordinator: George E. Georghiou (FOSS)

PoC on Behalf of ERIGrid 2.0: Venizelos Efthymiou (FOSS)

Poc on Behalf of GIFT: Venizelos Efthymiou (FOSS)

Project Duration: September 2019 - September 2022

Description: *BERLIN*[7] aims to implement cross-border pilot measures to support innovative & cost-effective energy rehabilitations in public buildings based on the nanogrid concept, the building block for smart microgrids. The motivation is multi-fold: a) to address high energy consumption in the building sector that is primarily fossil-fuel based, b) to support areas of weak grids, common in the MENA region and rural areas, as high energy consumption in buildings can compromise electric service reliability, c) to achieve higher grid penetration of RES whilst ensuring grid stability and power quality. To this end BERLIN will focus on increasing PV grid penetration, combined with storage and demand side management, along with the enhancement of energy efficiency in buildings. Utilising these 3 technologies in a cost-effective way, the goal is to reach high levels of self-resilience in public buildings, and to make them green(er), smart, innovative and sustainable.

Collaboration Activities: The activities of BERLIN are relevant for the focus analysis of ERIGrid 2.0. In the scope of research both for BERLIN and ERIGrid 2.0, there is a potential for collaboration on some use cases and testing requirements and methodologies.

2.2 National Projects

Table 2 provides an overview of projects on national levels that cooperate with ERIGrid 2.0.

Table 2: Overview of national projects with links to ERIGrid 2.0.

Name	Funding	ERIGrid 2.0 Partners Involved	ERIGrid 2.0 PoC	Project PoC
PoSyCo	FFG (Austria)	yes	Thomas Strasser (AIT)	Thomas Strasser (AIT)
Project 2.2	RdS (Italy)	yes	Luigi Pellegrino (RSE), Riccardo Lazzari (RSE)	Chiara Gandolfi (RSE), Riccardo Lazzari (RSE)
Project 2.3	RdS (Italy)	yes	Enea Bionda (RSE)	Carlo Tornelli (RSE)

In the following sections more details about the cooperation with those projects is provided.

2.2.1 PoSyCo

Full Name: Power System Cognification (PoSyCo)

Funding Framework: Austrian National Energy Research Programme (4th Call 2017)

Coordinator: Helfried Brunner (AIT)

PoC on Behalf of ERIGrid 2.0: Thomas Strasser (AIT)

PoC on Behalf of PoSyCo: Thomas Strasser (AIT)

Project Duration: January 2019 - December 2021

[7] http://www.enicbcmed.eu/projects/berlin/

Description: The cognification of the power system enabling more intelligence within system operation is the approach of PoSyCo. The Power System Cognification flagship project will extend the state of the art protection system with intelligent add-ons. The envisioned 'SOFT-protection system' will provide intelligent overload prevention functionality and will allow the power system operators to actively integrate information on faults in their operation and planning processes. As the term 'add-on' suggests the system will not replace existing protection systems but rather extend them, leaving the protection system with a fall back variant. In order to achieve such a system, PoSyCo will investigate the technical solution of an innovative Information and Communications Technology (ICT) system for automated operation, the roll-out process, how to deal with malfunctions as well as how to integrate the resulting system in established working processes. This includes the human-to-machine interaction to ensure that Distribution System Operator (DSO) employees are supported by trustful and necessary information at the right time in an intuitive way. In order to realise the envisioned system state of the art technology innovations provided from the field industrial Internet of Things (IoT) will enable a cost efficient and extendable architecture. Expected results of PoSyCo are a blueprint for implementation of advanced smart grid functionalities in general and the SOFTprotection approach, and its validation in a laboratory proof of concept. With this, PoSyCo will increase the level of protection of the future power system to allow the penetration of renewable and volatile energy sources as well as volatile demand loads like e-mobility.

Collaboration Activities: There are several thematic overlaps between the projects, especially in the areas of validation of results and in developing advanced concepts of network safety and security.

2.2.2 Project 2.2

Full Name: Project 2.2 "Architecture and management models of the system and of the electricity grids and the regulation that favour the integration of renewable and non-programmable generation, self-production, storage, energy communities and aggregators and that take into account electrical penetration"

Funding Framework: Italian funds for electrical power system "Piano triennale di realizzazione 2019-2021 della ricerca di sistema elettrico nazionale"

Coordinator: Chiara Gandolfi (RSE)

PoC on Behalf of ERIGrid 2.0: Luigi Pellegrino (RSE), Riccardo Lazzari (RSE)

PoC on Behalf of Project 2.2: Chiara Gandolfi (RSE), Riccardo Lazzari (RSE)

Project Duration: 1 January 2019 - 31 December 2021

Description: *Project 2.2* aims to develop methodologies, studies, software tools, prototypes and demonstrators to optimise electrical transmission and distribution grids by considering new architecture and system management and regulation models to favour the renewable and non-programmable generation integration, the self-production, the storage and the aggregators taking into account the electric penetration. The project addresses the planned issues by ensuring a system approach, supporting institutions and technical standardisation at national and international levels to accelerate the development, testing and availability of the technologies needed for the energy transition. In particular, the project is divided into four research areas: new grid's models, architectures and control logics, flexibility of the electrical system, aggregation of distributed resources and generation and load forecasting.

Collaboration Activities: The project involves participation of research and innovation at national and international levels (EERA, ISGAN, Mission Innovation, CEM) where ERIGrid 2.0 results can be exploited.

2.2.3 Project 2.3

Full Name: Project 2.3 “Application to the electrical system of information technologies, internet of things, peer to peer”

Funding Framework: Italian funds for electrical power system “Piano triennale di realizzazione 2019-2021 della ricerca di sistema elettrico nazionale”

Coordinator: Carlo Tornelli (RSE)

PoC on Behalf of ERIGrid 2.0: Enea Bionda (RSE)

PoC on Behalf of Project 2.3: Carlo Tornelli (RSE)

Project Duration: 1 January 2019 - 31 December 2021

Description: *Project 2.3* develops methods, tools, demonstrators and experiments aimed to evaluate the possible application of the most advanced information and communication technologies for the benefit of the electrical power system. These technologies make it possible to face the growing complexity of system management and control, due to the significant presence of non-programmable RES, by exploiting the flexibility of all available energy resources and also with the involvement of new subjects, including end users. The research aims to promote the interoperability and security of the communication and computing systems used in the processes of the electrical power system in order to achieve a high degree of integration between the management, control and protection systems of the networks. Tools for verifying the resilience of the cyber-physical system are included, that allow the impact assessment of cyber-attacks on the power system processes and, ultimately, on the quality of service to users.

Collaboration Activities: The project provides tools, such as RSE’s Distributed Energy Resources Test Facility shadows and JaNDER, which are used by ERIGrid 2.0.

3 Collaborations with Initiatives

The cooperation and information exchange on a broader scale is also an important point for disseminating and exploiting potential project results and to gather feedback about them. Therefore, ERIGrid 2.0 has already identified several of such initiatives which is worth to collaborate with. Table 3 outlines those networks, platforms, and initiatives where ERIGrid 2.0 already has set-up connections or to plan to do it in the near future.

Table 3: Overview of networks, platforms, and initiatives with links to ERIGrid 2.0.

Name	Type	ERIGrid 2.0 Partners Involved	ERIGrid 2.0 PoC	Network PoC
European Initiatives				
EERA JP Smart Grids	Network (European)	yes	Evangelos Rikos (CRES), Kari Mäki (VTT), and others	Luciano Martini (RSE), Evangelos Rikos (CRES), and others
BRIDGE Energy Communities Task Force	Network (European)	yes	Panos Kotsampopoulos (ICCS-NTUA)	Leen Peeters (Th!nk-E), Ludwig Karg (Baum Group)
ETIP SNET	Technology & Innovation Platform (European)	yes	Nikos Hatziargyriou (ICCS-NTUA), Anna Kulmala (VTT), Kari Mäki (VTT), Venizelos Efthymiou (FOSS), Antonello Monti (RWTH)	Venizelos Efthymiou (FOSS), Mohamed Shalaby (DERlab), Antonello Monti (RWTH)
National Initiatives				
Smart Otaniemi	Network (national)	yes	Kari Mäki (VTT)	Kari Mäki (VTT)
International Initiatives				
IEA ISGAN/SIRFN	Network (international)	yes	Mihai Calin (AIT), Kari Mäki (VTT)	Ron Brandl (DERlab)
Mission Innovation IC#1 Smart Grids	Network (international)	yes	Enea Bionda (RSE), Kari Mäki (VTT)	Mattia Cabiati (RSE)
DERlab	Network (international)	yes	Ata Khavari (DERlab), Maria Sosnina (DERlab), Thomas Strasser (AIT)	Diana Strauss-Mincu (DERlab), Roland Bründlinger (AIT), Graeme Burt (UST)
IEEE PES Teaching Task Force	Task Force (international)	yes	Panos Kotsampopoulos (ICCS-NTUA), Nikos Hatziargyriou (ICCS-NTUA), and others	Panos Kotsampopoulos (ICCS-NTUA), Nikos Hatziargyriou (ICCS-NTUA)
IEEE WG P2004	Working Group (international)	yes	Georg Lauss (AIT), Panos Kotsampopoulos (ICCS-NTUA), Antonello Monti (RWTH), Thomas Strasser (AIT), and others	Michael Steurer (FSU), Georg Lauss (AIT)

In the following sections more details about the cooperation with those initiatives is provided.

3.1 European Initiatives

3.1.1 EERA JP Smart Grids

Full Name: European Energy Research Alliance Joint Programme Smart Grids

Type: European Network

Coordinator: Luciano Martini (RSE, Italy)

PoC on Behalf of ERIGrid 2.0: Evangelos Rikos (CRES), Kari Mäki (VTT), and others

PoC on behalf of EERA JP SG: Luciano Martini (RSE), Evangelos Rikos (CRES), and others

Description: *EERA JP SG*[8] by means of an extended cross-disciplinary cooperation involving many Research and Development participants with different and complementary expertise and facilities, aims at addressing, in a medium to long term research perspective, one of the most critical areas directly relating to the effective acceleration of smart grid deployment: smart grids technology, its application and integration.

Collaboration Activities: Through the link with the EERA JP SG specific collaboration opportunities are offered to ERIGrid 2.0:

- Possibility for joint workshops/events
- Regular information transfer from the ERIGrid 2.0 consortium on the EERA/EU-related activities, publications, etc.
- Promotion of Trans-national Access (TA) and Virtual Access (VA) opportunities through the EERA JP SG activities which engage a substantial number of European and international stakeholders.
- As with its predecessor project, there will be an opportunity for external users related to EERA to access the ERIGrid 2.0 facilities, physically or remotely, and benefit from the harmonised testing procedures on the topics that ERIGrid 2.0 covers.
- EERA JP SG will get insights from ERIGrid 2.0 testing methodology developments and the results of investigations about RI needs.

3.1.2 ETIP SNET

Full Name: European Technology and Innovation Platform Smart Networks for Energy Transition

Type: European Network

Coordinator: Secretariat: Zabala Innovation Consulting (Spain)

PoC on Behalf of ERIGrid 2.0: Nikos Hatziargyriou (ICCS-NTUA), Anna Kulmala (VTT), Kari Mäki (VTT), Venizelos Efthymiou (FOSS), Antonello Monti (RWTH)

PoC on behalf of ETIP SNET: Venizelos Efthymiou (FOSS), Mohamed Shalaby (DERlab), Antonello Monti (RWTH)

[8] https://www.eera-set.eu/component/projects/projects.html?id=53

Description: *ETIP SNET*[9] role is to guide Research, Development and Innovation (RDI) to support Europe's energy transition. More specifically, its mission is to set-out a vision for RDI for Smart Networks for Energy Transition and engage stakeholders in this vision, prepare and update the Strategic Research and Innovation Roadmap, report on the implementation of RDI activities at European, national/regional and industrial levels.

It provides input to the SET Plan action 4 which addresses the technical challenges raised by the transformation of the energy system, identify innovation barriers, notably related to regulation and financing, develop enhanced knowledge-sharing mechanisms that help bring RDI results to deployment and prepare consolidated stakeholder views on Research and Innovation to European Energy Policy initiatives.

The work is organised through six working groups:

- WG1 Reliable, economic and efficient smart grid system,
- WG2 Storage technologies and sector interfaces,
- WG3 Flexible generation,
- WG4 Digitisation of the electricity system and customer participation,
- WG5 Innovation implementation in the business environment, and
- WG6 National stakeholders coordination group.

Collaboration Activities: Through the involvement of ERIGrid 2.0 partners DERlab and FOSS in ETIP SNET WG5, there is continuous information sharing about lab access opportunities in ERIGrid 2.0. There is also potential for further collaboration in dissemination activities.

3.1.3 BRIDGE Energy Communities Task Force

Full Name: BRIDGE Task Force on Energy Communities

Type: European Network

Coordinator: Leen Peeters (Th!nk-E), Ludwig Karg (Baum Group)

Support Leader: Panos Kotsampopoulos (ICCS-NTUA)

PoC on Behalf of ERIGrid 2.0: Panos Kotsampopoulos (ICCS-NTUA)

PoC on behalf of BRIDGE Task Force: Leen Peeters (Th!nk-E), Ludwig Karg (Baum Group)

Description: *BRIDGE Task Force on Energy Communities*[10] was established following BRIDGE General Assembly of 2019 to look into existing and upcoming frameworks in various EU countries and how the development could be further facilitated.

The Task Force (TF) has been in charge of preparing reports and formulating recommendations for the European Commission (EC) on the replicability, upscaling and the need for support, as well as of informing on further research and demonstration needs.

Collaboration Activities: The TF aims to provide an overview of the existing legal developments regarding energy communities in the EU and provide recommendations, highlighting

[9] https://www.etip-snet.eu/

[10] https://www.h2020-bridge.eu/wp-content/uploads/2020/01/D3.12.d_BRIDGE_Energy-Communities-in-the-EU-3.pdf

existing experience of energy communities between countries and specifying the principles of autonomy, effective control, locality, etc. Thus, because in the frame of ERIGrid 2.0 the focus is placed also on energy communities and active engagement of the prosumers, a channel of communication with the TF can be established for mutual knowledge exchange.

3.2 National Initiatives

3.2.1 Smart Otaniemi

Full Name: Smart Otaniemi Innovation Ecosystem

Type: National Network

Coordinator: Ismo Heimonen (VTT, Finland)

PoC on Behalf of ERIGrid 2.0: Kari Mäki (VTT)

PoC on behalf of Smart Otaniemi: Kari Mäki (VTT)

Description: *Smart Otaniemi*[11] is an innovation ecosystem connecting experts, organisations, technologies and pilot projects bringing together building blocks of a smart future. The aim is to renew the way research and development is done and push the boundaries of new energy technology with a Finnish hi-tech excellence. The focus areas are:

- Local flexibility,
- Building level intelligence,
- Smart mobility, and
- Platforms, connectivity and enabling technologies.

Collaboration Activities: There is a potential to collaborate through involvement of ERIGrid 2.0 partner VTT in Smart Otaniemi on knowledge sharing and piloting via the lab access program of ERIGrid 2.0.

3.3 International Initiatives

3.3.1 IEA ISGAN/SIRFN

Full Name: IEA ISGAN (International Smart Grid Action Network) Annex 5 SIRFN (Smart Grid International Research Facility Network)

Type: International network

Coordinator: Russel Conkling (DOE, USA)

PoC on behalf of ERIGrid 2.0: Mihai Calin (AIT), Kari Mäki (VTT)

PoC on behalf of SIRFN: Ron Brandl (DERlab)

Description: *SIRFN*[12] gives participating countries the ability to evaluate pre-competitive technologies and systems approaches in a wide range of smart grid implementation use cases

[11] https://smartotaniemi.fi/
[12] http://www.sirfn.net

and geographies using common testing procedures. Research test-bed facilities will be selected based on their complementary capabilities to conduct specialised, controlled laboratory evaluations of integrated smart grid technologies including cyber-security, plug-in hybrid integration, load management, automated metering infrastructure, protection, network sensing, energy management, renewable energy integration and similar applications.

In this way, research within each individual member country will derive the value of the unique capabilities and environments of the other partner nations. Data from these tests will be made available to all SIRFN participants to accelerate the development of smart grid technologies and systems, and enabling policies.

Collaboration Activities: There is potential for SIRFN and ERIGrid 2.0 to collaborate in RI improvement, knowledge exchange and through the lab access programme of ERIGrid 2.0.

3.3.2 Mission Innovation IC#1 Smart Grids

Full Name: Mission Innovation Challenge IC#1: Smart Grids

Type: International network

Coordinator: Luciano Martini (RSE, Italy), Yibo Wang (CAS, China), JBV Reddy (DST, India)

PoC on behalf of ERIGrid 2.0: Enea Bionda (RSE), Kari Mäki (VTT)

PoC on behalf of Mission Innovation: Mattia Cabiati (RSE)

Description: *Mission Innovation Challenge IC#1 on Smart Grids*[13] aims to accelerate the development and demonstration of smart grid technologies in a variety of grid applications, including demonstrating the robust, efficient, and reliable operation of regional grids and distribution grids as well as microgrids in diverse geographic conditions, in order to facilitate the cost-effective uptake of renewable energy. Generally, Mission Innovation (MI) Innovation Challenges (IC) are global calls to action aimed at catalysing global research efforts in areas that could provide significant benefits in reducing greenhouse gas emissions, increasing energy security, and creating new opportunities for clean economic growth.

Collaboration Activities: Within the IC1 on Smart Grids Italy proposed and coordinated the development of the Smart Grid Innovation Accelerator (SGIA) platform [14]. SGIA is a cloud-based semantic platform for sharing information regarding smart grid and, on a more general level, the energy sector. The platform offers an advanced search experience on a database of key documents globally selected and shared by international experts from MI member countries. Several documents of the ERIGrid project are already available through this platform and in the near future the key documents of ERIGrid 2.0 project will also be included.

[13] https://www.mi-ic1smartgrids.net/
[14] https://www.mi-sgiaplatform.net/

3.3.3 DERlab

Full Name: European Distributed Energy Resources Laboratories e.V.

Type: Network (international)

Coordinator: Diana Strauss-Mincu

PoC on behalf of ERIGrid 2.0: Ata Khavari (DERlab), Maria Sosnina (DERlab), Thomas Strasser (AIT)

PoC on behalf of DERlab: Diana Strauss-Mincu (DERlab), Roland Bründlinger (AIT), Graeme Burt (UST)

Description: *DERlab*[15] is an association of leading laboratories and research institutes in the field of DER equipment and systems. The association develops joint requirements and quality criteria for the connection and operation of DER and strongly supports the consistent development of DER technologies. DERlab offers testing and consulting services for DG to support the transition towards more decentralised power systems.

Collaboration activities: Involved in the ERIGrid 2.0 consortium are representatives of both the DERlab Office and the DERlab member network, which consists of over 30 research centres in Europe and the US. DERlab provides possibilities for the project to reach out to these stakeholders. Through the numerous promotion channels of its network, at events, in the *Database of DER and Smart Grid Research Infrastructure*[16], and through other relevant communication channels, DERlab ensures consistent project visibility to the member network.

Furthermore, as the Operating Agent of ISGAN Annex 5 SIRFN, DERlab supports the transfer of ERIGrid 2.0 outcomes within the SIRFN context.

3.3.4 IEEE PES Teaching Task Force

Full Name: IEEE PES Task Force on Innovative Teaching Methods of Modern Power and Energy Systems

Type: International Network

Coordinator: Panos Kotsampopoulos (ICCS-NTUA, Greece), Nikos Hatziargyriou (ICCS-NTUA, Greece)

PoC on Behalf of ERIGrid 2.0: Panos Kotsampopoulos (ICCS-NTUA), Nikos Hatziargyriou (ICCS-NTUA), and others

PoC on behalf of IEEE PES Task Force: Panos Kotsampopoulos (ICCS-NTUA), Nikos Hatziargyriou (ICCS-NTUA)

Description: *IEEE PES Task Force on innovative teaching methods for modern power and energy systems*[17] successfully kicked off during the virtual IEEE PES General Meeting 2020. The Task Force operates in the framework of the University Education Activities Subcommittee of the IEEE PES Power and Energy Education Committee (PEEC) and will investigate, create, and promote the use of innovative teaching methods and material in modern power

[15] http://der-lab.net

[16] https://infrastructure.der-lab.net/

[17] https://smartgrid.ieee.org/newsletters/october-2020/the-ieee-pes-task-force-on-innovative-teaching-methods-for-modern-power-and-energy-systems

and energy systems. Blended learning, innovative laboratory exercises, and e-learning tools will be in particular focus, complemented with interdisciplinary and efficient teaching methods based on engineering educational research. Moreover, the Task Force will serve as a forum for sharing and disseminating educational content, tools, and best practices, while exploring the cooperation with other PES Committees.

In more detail the Task Force will address:

- New trends in laboratory education for modern power and energy systems: remote/virtual labs, hardware-in-the-loop simulation, and augmented/virtual reality.
- Transforming the power and energy classroom: blended learning and e-learning tools (e.g. interactive notebooks, animations, Massive Open Online Course (MooC), etc.)
- Advanced teaching methods for power and energy systems: problem-based learning, active learning, interdisciplinary approaches, while addressing different skill levels. Moreover, metrics to evaluate the educational outcomes will be addressed.
- Identification of gaps between the current skill/competence needs of the industry and the output of universities.

Collaboration Activities: Considering the scope of the network and the focus of ERIGrid 2.0 NA3 Education and Training of Professionals, Researchers and Students, there is a lot of collaboration potential. As one of the first activities, a *Panel Session "Education in the digital era for digitalization" at the IEEE International Forum on Smart Grids for Smart Cities 2021*[18] was organised in the framework of the IEEE PES Task Force on Innovative Teaching Methods for Modern Power and Energy Systems.

3.3.5 IEEE WG P2004

Full Name: IEEE WG P2004 - Hardware-in-the-Loop Simulation Based Testing of Electric Power Apparatus and Controls

Type: International Network

Coordinator: Michael Steurer (FSU, USA), Georg Lauss (AIT)

PoC on Behalf of ERIGrid 2.0: Georg Lauss (AIT), Panos Kotsampopoulos (ICCS-NTUA), Anto Monti (RWTH), Thomas Strasser (AIT), and others

PoC on behalf of IEEE WG P2004: Michael Steurer (FSU), Georg Lauss (AIT)

Description: *IEEE WG P2004*[19] is a recommended practice that provides established practices for the use of Hardware-in-the-Loop (HIL) simulation based testing of electric power apparatus and controls. It is intended to be generically applicable in conjunction with any specific testing standard (if applicable).

The intent of WG P2004 is to remain agnostic to the specific real-time simulation and power amplifier technologies but focus on the structures, models, and procedures specific to conducting HIL based testing. P2004 will:

- Establish practices for Robot Operating System (ROS) model development,
- Discuss HIL specific documentation, verification and validation,

[18] https://ieeesg4sc.org/tech-session-8/
[19] https://standards.ieee.org/project/2004.html#Working

- Provide guidance on requirements for power amplifiers, Real-Time Simulation (RTS), and HIL, and interface algorithms for classes of HIL testing needs.

Collaboration Activities: ERIGrid 2.0 focuses and promotes advanced laboratory validation methods for smart grid applications, like HIL simulation based testing. So, various HIL related developments are planned in the project, thus efforts will be made to integrate the most relevant in the IEEE P2004 document.

4 Conclusions

In conclusion, we can look on a number of excellent collaborations that have already been established during the project and on a particularly wide network of experts in Europe and beyond.

With several collaboration connections established already during the predecessor project ERIGrid, the ERIGrid 2.0 consortium strives to build on previous joint efforts and broaden the network further.

In the next project years, ERIGrid 2.0 aims to enhance the collaboration effort, especially when the outcomes from the technical Work Packages (WPs) are available. These efforts will include joint events, knowledge transfer and education for the next generation of power engineers and laboratory staff, and obtaining feedback on ERIGrid 2.0 outcomes.

With members of the ERIGrid 2.0 consortium active in many other relevant initiatives, the project ensures various points of connection with the smart energy domain. Furthermore, the fact that the entire scope of ERIGrid 2.0 research topics is covered in its collaboration activities ensures a high level of quality and the integrated nature of the joint research and dissemination efforts between the project and the other initiatives. These topics are:

- Advanced power and energy systems technology development and innovation (technology development),
- Multi-domain and cyber-physical based system validation and testing (system validation),
- Integrating pan-European smart energy systems RI (RI Integration),
- Structuring the European smart grid, smart energy systems, and renewables research area (smart energy research),
- RTS, HIL testing, and co-simulation,
- Multi-lab testing, coupling, and automation (multi-lab testing), and
- Assisting the new generation of educated power and energy systems researchers and engineers (education).

The spectrum of collaboration on these topics is presented in Table 4.

Table 4: Summary of topics of collaborations.

Name / Topic	Technology Development	System Validation	RI Integration	Smart Energy Research	RTS, HIL, Co-Simulation	Multi-lab	Education
European Projects							
INTERPLAN	✓		✓	✓	✓		
PANTERA				✓			✓
eNeuron	✓	✓		✓	✓		✓
GIFT	✓	✓		✓			
HYPERRIDE	✓	✓		✓			
SINERGY							✓
ELECTRA	✓	✓		✓	✓	✓	
BERLIN				✓			
National Projects							
PoSyCo		✓		✓			
Project 2.2				✓			
Project 2.3				✓			
European Initiatives							
EERA JP Smart Grids			✓	✓			
BRIDGE Energy Communities Task Force		✓					
ETIP SNET			✓	✓			
National Initiatives							
Smart Otaniemi			✓				
International Initiatives							
IEA ISGAN/SIRFN		✓	✓		✓	✓	
Mission Innovation IC#1 Smart Grids							✓
DERlab	✓	✓		✓			✓
IEEE PES Teaching Task Force							✓
IEEE WG P2004					✓		

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Consortium

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