D7.3 - Initial Project Advertising Materials and Results

Deliverable ID	**D7.3**
Deliverable Title	**Initial Project Advertising Materials and Results**
Work Package	**WP7**
Dissemination Level	**PUBLIC**
Version	**1.0**
Date	**03/12/2018**
Status	**final**
Type	**Report**
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Published by the Storage4Grid Consortium

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731155.

Document History

Version	Date	Author(s)	Description
0.1	2018-11-16	UNINOVA	TOC and first draft
0.2	2018-11-19	ALPERIA and EDYNA	ALPERIA and EDYNA inputs
0.3	2018-11-20	ISMB	ISMB events
0.4	2018-11-23	FRAUNHOFER FIT	FRAUNHOFER FIT events
0.5	2018-11-23	UNINOVA	Flyer update and minor formatting corrections
0.6	2018-11-26	UPB	Participants number and abstract updates. Competition inputs.
0.7	2018-11-28	UNINOVA	Version ready for internal review
1.0	2018-12-03	UNINOVA	Final version, ready for submission to the EC

Internal Review History

Review Date	Reviewer	Summary of Comments
2018-11-30 (v0.7)	Gitte Wad Thybo (ENIIG)	Approved: • General minor corrections
2018-11-29 (v0.7)	Marco Baldini (EDYNA)	Approved: • General minor corrections

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Executive Summary

D7.3 – "Initial Project Advertising Materials and Results" presents the activities carried out by the S4G consortium to increase the project impact and relevance, and to disseminate the achieved results among different stakeholders.

As shown in this document, the S4G partners have participated and organized approximately 60 different actions during the initial 2-year period of the project. These actions included organization of conferences and workshops, participation in conferences and workshops, social media dissemination, newsletters and flyer preparation, peer-reviewed articles, amongst others; and had heterogeneous audience and objectives. Moreover, these activities involved sometimes not only cooperation between the partners of the consortium but also liaisons with other projects and European initiatives, creating new synergies and networking.

Moreover, some advertising material were performed, namely:

- Project website
- Project official presentation
- Newsletters
- Flyer
- Poster

The S4G consortium will continue to disseminate the project outcomes to relevant stakeholders during the remaining of the project, creating or updating the dissemination material when necessary.

1 Introduction

This document describes the materials and dissemination activities performed by the S4G project consortium during the first 2 years of the project, in order to increase its impact and disseminate the achieved project results.

1.1 Scope

This document shows the detailed activities that the partners from the S4G consortium have organized or participated in order to increase the project impact and relevance, and to disseminate the S4G outputs among different stakeholders.

This deliverable documents the results generated by WP7 - "Dissemination, Exploitation and Standardization", and more specifically by Task 7.2 - "Dissemination". One update of this deliverable is expected to be released as D7.4 – "Final Project Advertising Materials and Results" (M36).

1.2 Related documents

ID	Title	Reference	Version	Date
D7.1	Communication and Dissemination Strategy	[S4G-D7.1]	1.0	2017-02-23
D7.2	Project Website	[S4G-D7.2]	1.0	2017-02-28

2 S4G Dissemination Activities

This chapter details all the S4G dissemination activities performed by the S4G consortium during the initial 24-months of the project, sorted for the oldest to the most recent event.

2.1 Fur Newsletter 2016

- **Date:** December 21, 2016; June 30, 2017; December 13, 2017; May 30, 2018; August 30 2018
- **Location:** Fur, Denmark
- **Type of dissemination and communication activity**: Non-scientific and non-peer-reviewed publication (popularised publication)
- **Estimated audience:** 5 (S4G participants)

2.1.1 Non-scientific and non-peer-reviewed publication (popularised publication)

- **Organisers:** ENIIG
- **Objective:** S4G project dissemination to the Fur citizens
- **Target attendees:** Fur citizens having already batteries

2.2 Energi Press Release 2017

- **Date:** February 21, 2017
- **Location:** Skive, Denmark
- **Type of dissemination and communication activity**: Press release
- **Estimated audience:** 40.000+

2.2.1 Press release

- **Organisers:** ENIIG
- **Objective:** S4G project dissemination to the Skive citizens
- **Target attendees:** Skive citizens
- **Press release:** Figure 1

ENERGI

Fur er endnu engang med i et EU projekt, og denne gang handler det om at teste nye batterisystemer.

Endnu et nyt EU-projekt skal demonstreres på Fur

Fur er endnu engang med i et EU projekt, og denne gang handler det om at teste nye batterisystemer.

En fortsat udbygning af den vedvarende energi i det danske energisystem er et væsentligt element i den danske klimastrategi. Vedvarende energikilder som sol og vind giver udfordringer i forhold til at balancere produktion og forbrug, men også varmepumper, batterier og elektriske køretøjer udfordrer en effektiv, stabil drift af el-nettet. Batterilagringssystemer - Energy Storage Systems, ESS, - kan være den værdifulde løsning på disse udfordringer. Eniig har netop påbegyndt et stort projekt under EU-programmet Horizon 2020, hvor der er fokus på denne problemstilling. Projektet hedder Storage4Grid, S4G, og har som målsætning at give forsyningsselskaber og slutbrugere nye værktøjer til optimal planlægning, anvendelse og evaluering af batteriteknologier i elnettet. S4G designer nye styringsmodeller og grænseflader bygget på eksisterende standarder, som er egnede til at understøtte skalerbar og omkostningseffektiv koordinering af batterilagringssystemer. S4G kan, ved hjælp af en algoritme, beregne hvor i el-nettet det vil være mest optimalt at placere stationære batterier, samt hvor det er mest hensigtsmæssigt at placere store ladestationer til el-biler.

S4G-projektet undersøger tre scenarier, som har hvert sit demonstrationssted. Det første er et scenarie for avanceret batterilagring på andelsbasis, som udnytter en Energy Router og DC bus vil blive udviklet og demonstreret i laboratoriefaciliteter i Bukarest i Rumænien, mens det andet skal fokusere på brugen af batterilagre til understøttelse af store installationer af elbil-ladestationer. Dette scenarie vil blive demonstreret i et levende laboratorium i Bolzano i Italien. Det tredje scenarie handler om batterikoordination og fokuserer på, hvor i elnettet det vil være mest optimalt at placere batterier i forhold til den lokale produktion og forbrug. Dette vil blive udviklet og demonstreret på Fur.

Fem huse tester

Det sidste scenarie involverer fem husstande på Fur, som allerede har batterier installeret. Boligerne er af forskellig størrelse med solcelleanlæg varierende fra fem til 12 kW. Der vil blive installeret nyt udstyr, så der kan koordineres mellem husets batteritilstand og behov i det lokale elnet. Der vil blive udviklet et interface, som energiselskabet Eniig kan styre og kontrollere batterierne fra. Desuden vil man studere nye modeller for, hvor det kan være mest optimalt at placere større batterier, og man vil belyse, hvordan forretningsmodellen kan se ud for henholdsvis forsyningsselskabet og husstanden.

Boligerne på Fur har tidligere været med i demonstrationsprojektet GreenCom, som viste hvordan fremtidens el-net kunne fungere med store andele af varmepumper og solceller installeret. Formålet i dette projekt var at reducere max-belastningen i døgnet og undersøge adfærd og mulige forretningsmodeller, når energiselskabet havde behov for at afbryde anlæg i kortere eller længere perioder. Kombinationen batterier/solcelleanlæg gav mulighed for at studere, hvordan forbrugsprofilerne udviklede sig og i hvor høj grad det var muligt at bruge den egenproducerede energi. I dag styres batterierne således autonomt efter hvornår solcelle anlægget producerer strøm og hvordan forbruget er I boligen – og helt uafhængig af behov i elnettet.

Storage4Grid er således en fortsættelse af EU-projektet Greencom og en del af Innovation Fur, som er et udviklings- og forskningssamarbejde mellem Fur, Skive Kommune og Eniig.

Skal du have en varmepumpe?

En varmepumpe henter varmeenergi direkte fra jorden eller luften udenfor og omsætter den til miljøvenlig, økonomisk varme i din bolig. Men hvad skal du egentlig vide, inden du vælger, om du overhovedet skal have en varmepumpe og i så fald hvilken? Din varmepumpe skal tilpasse sig dine behov – og ikke omvendt.

Her er en række gode råd:

1. Find ud af, hvor meget du kan spare ved at gå over til varmepumpe
2. Vælg en varmepumpe med høj energimærkning
3. Vælg en varmepumpe, der er bygget til også de kolde danske vintre
4. Vælg en varmepumpe, der kan overvåges og betjenes online
5. Vælg en lydsvag varmepumpe
6. Husk at registrere varmepumpen i BBR

Din VVS-installatør kan hjælpe dig med at lave en nøjagtig beregning for dig, så du kan se, hvor meget du sparer hvert år og i det lange løb.

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Figure 1. ENIIG's press release 2017.

2.3 Generalforsamling Fur Sogneforening 2017

- **Date:** December 27, 2017
- **Location:** Fur, Denmark
- **Type of dissemination and communication activity**: Brokerage Event
- **Organisers**: Fur Sogneforerning
- **Estimated audience:** 60+
- **Website:** https://furnyt.dk/

2.3.1 Brokerage Event

- **Organisers:** ENIIG
- **Objective:** S4G project dissemination to the Fur citizens
- **Target attendees:** Fur citizens having already batteries

2.4 Danish Energi Intelligent Energy: The intelligent grid 2017

- **Date:** March 10, 2017
- **Location:** Ballerup, Denmark
- **Type of dissemination and communication activity**: Pitch Event
- **Organisers**: IEnergy
- **Estimated audience:** 50+
- **Website:** https://ienergi.dk/

2.4.1 Pitch Event

- **S4G participant:** ENIIG
- **Objective:** S4G project dissemination
- **Target attendees:** Specialists from Danish DSO, industry vendors, and universities

2.5 Innovation and Networking Days 2017

- **Date:** May 22-23, 2017
- **Location:** Sankt Augustin, Bonn, Germany
- **Type of dissemination and communication activity**: Organisation of a Workshop and Participation to a Workshop
- **Organisers:** FRAUNHOFER FIT and ISMB
- **Estimated participants:** 70
- **Website:** https://www.fit.fraunhofer.de/en/events/fraunhofer-iot-innovation-and-networking-days.html

2.5.1 Organisation of a Workshop

- **S4G participants:** FRAUNHOFER FIT and ISMB
- **Objective:** The IoT Innovation and Networking Days at Fraunhofer FIT give participants from research and industry the opportunity to meet face to face, exchange experience and discuss about ideas in a relaxed and open environment. Representatives from the European Commission, stakeholders from industry and research organizations provide insights to their working area and current research questions
- **Target attendees:** Research and industry community

2.5.2 Participation to a Workshop

- **S4G participant:** UPB
- **Presentation title:** Embedding intelligence in future grid: Conflicting visions, common perspective
- **Presentation abstract:** Emerging power systems require significant changes on all layers - planning, operation, markets. Modern control algorithms need to process information acquired from distributed, synchronized measurement systems, and embedded in data streams with high degree of correlation. Smart grids operation, including control of the energy flow in active distribution grids (and microgrids) adds more challenges to the control layer. Moreover, multiple measurement approaches are used: on one side, the inherited time-aggregation based measurements offered by currently deployed IEDs (SCADA framework), smart meters and other emerging units; while on the other side, large data streams reported by the high-resolution waveform-based monitoring devices like PMUs with fault-recorder functionality. For example, presently the state estimator constitutes the cornerstone of SCADA since it provides the power system operating situation in consecutive time intervals. The sources of errors that deteriorate the accuracy of a state estimator, beyond the inherent measurement uncertainty, are the limited knowledge of the network model and the energy transfer simplified paradigm in a.c. grids. To cope with these errors is a difficult task: one has firstly to recognize the limits of the approximations, in use for decades and strongly embedded in the standards and regulations, and then to adopt technology already available in the presently ICT-immersed societies. The presentation made a short journey on the path of re-thinking the future grids.
- **Photo:** Figure 2

Figure 2. UPB presentation at Innovation and Networking Days 2017.

2.5.3 Participation to a Workshop

- **S4G participant:** ISMB
- **Presentation title:** The Storage4Grid Project
- **Presentation abstract:** Future energy systems will be characterized by growing shares of intermittent power generation from Renewable Energy Sources (RES) while facing increasing diffusion of Electrical Vehicles (EVs). Such scenarios are creating new challenges for efficient management and grid stability. Energy Storage Systems (ESS) will provide a valuable solution to such challenges. Storage4Grid is a 36-month, 3,6 million € Research and Innovation action funded by the European Commission under the H2020 framework. The Storage4Grid vision is to foster the uptake of ESS, by providing utilities and end-users with new tools for optimal grid planning, use and evaluation of storage technologies. Storage4Grid pre-designs new storage control models and interfaces built upon existing standards and suitable to support scalable and cost-efficient coordination of heterogeneous ESS. Storage4Grid will consider three scenarios, each associated to a different test site and focusing on: "Advanced Cooperative ESS", "ESS Coordination" and "Cooperative EV Charging". This talk gave an overview of the project goals, methodology and expected outcomes.
- **Photo:** Figure 3

Figure 3. ISMB presentation at Innovation and Networking Days 2017.

2.5.4 Participation to a Workshop

- **S4G participant:** ENIIG
- **Presentation title:** Future Smart Grids: the DSO perspective
- **Presentation abstract:** Status on the green transition in Denmark and the challenges to come. How do we as a DSO expect the future challenges to be in the grid and how do we overcome them? Presentation of results from projects focusing on issues in the low voltage grid. Smart home, heat-pumps, PV-systems and batteries in private households.
- **Photo:** Figure 4

Figure 4. ENIIG presentation at Innovation and Networking Days 2017.

2.6 EEEIC / I&CPS 2017, 17th International Conference on Environment and Electrical Engineering and 1st Industrial and Commercial Power System Europe

- **Date:** June 6-9, 2017
- **Location:** Milan, Italy
- **Type of dissemination and communication activity**: Participation to a Conference and Other
- **Organisers:** IEEE and EMCS
- **Estimated participants:** 500
- **Website:** https://www.eeeic.net/eeeic/

2.6.1 Participation to a Conference

- **S4G participant:** ISMB
- **Type of participation:** Paper presentation

2.6.2 Other

- **Type:** Conference scientific peer-reviewed publication
- **S4G participant:** ISMB
- **Publication title:** Fostering innovation cooperative energy storage systems: The Storage4Grid project
- **Publication authors:** Riccardo Tomasi, Jinyong Fu, Maurizio Fantino, Maurizio A. Spirito, Mihai Sanduleac, Veronika Krauß, João F. Martins, Massimo Minighini, Rasmus Rode Mosbæk
- **Publication abstract:** Storage4Grid is a 36-months project funded by the European Commission under call LCE-01-2016, Area 1 (Storage). Storage4Grid aims at boosting the uptake of storage technologies between the distribution grid level and the end-user level, by developing a novel, holistic methodology for modelling, planning, integrating, operating and evaluating distributed Energy Storage Systems (ESS) including storage at user premises and storage at substation level, Electrical Vehicles (EVs), innovative energy metering and energy routing technologies. This paper shortly outlines the challenges tackled by the project, its goals, the chosen methodology and its reference scenarios and test sites.
- **DOI:** 10.1109/EEEIC.2017.7977558
- **Green open-access link:** https://zenodo.org/record/1319624

2.7 H2020 Energy Storage projects clustering workshop 2017

- **Date:** June 16, 2017
- **Location:** Brussels, Belgium
- **Type of dissemination and communication activity**: Participation in activities organized jointly with other H2020 projects
- **Organisers:** Innovation & Networks Executive Agency (INEA)
- **Estimated participants:** 50
- **Website:** https://ec.europa.eu/inea/
- **Photo:** Figure 5

Figure 5. Energy4Europe opening the H2020 Energy Storage projects clustering workshop 2017.

2.7.1 Participation in activities organized jointly with other H2020 projects

- **S4G participants:** ISMB and UPB
- **Presentation title:** The Storage4Grid project
- **Presentation goal:** Dissemination of the S4G project

2.8 ICE ITMC 2017, 23rd International Conference on Engineering, Technology and Innovation

- **Date:** June 27-29, 2017
- **Location:** Madeira Island, Portugal
- **Type of dissemination and communication activity**: Organisation of a Conference, Organisation of a Workshop, Participation to a Conference, Participation to a Workshop, and Other

2.8.1 Organization of a Conference

- **Organisers:** FCT NOVA, UNINOVA, and IEEE
- **Conference scope:** Engineering, Technology & Innovation Management Beyond 2020: New Challenges, New Approaches
- **Estimated participants:** 450
- **Website:** http://www.ice-conference.org/
- **Photo:** Figure 6

Figure 6. Opening session at ICE ITMC 2017.

2.8.2 Organisation of a Workshop and Participation to a Workshop

- **Workshop title:** Clean Integrated Energy System for all European
- **Organisers:** UNINOVA
- **S4G participants:** ISMB, UPB, and UNINOVA
- **Objective:** The goal of this workshop is to present the objectives and preliminary results of four H2020 projects in the area of Smart Grids and Storage. Specifically, they presented a set of solutions, technologies and business models to increase the smartness, stability and security of an open, consumer-centric European energy grid and provide cleaner and more affordable energy for European citizens, through an enhanced use of storage share of Renewable Energy Sources.
- **Target attendees:** Research and industry community
- **Participants:** 20
- **Photo:** Figure 7

Figure 7. Clean Integrated Energy System for all European workshop at ICE ITMC 2017.

2.8.3 Participation to a Conference

- **S4G participants:** ISMB, UPB, and UNINOVA
- **Type of participation:** Paper presentation (UPB and ISMB) and conference attendance (UNINOVA)
- **Photos:** Figure 8 and Figure 9

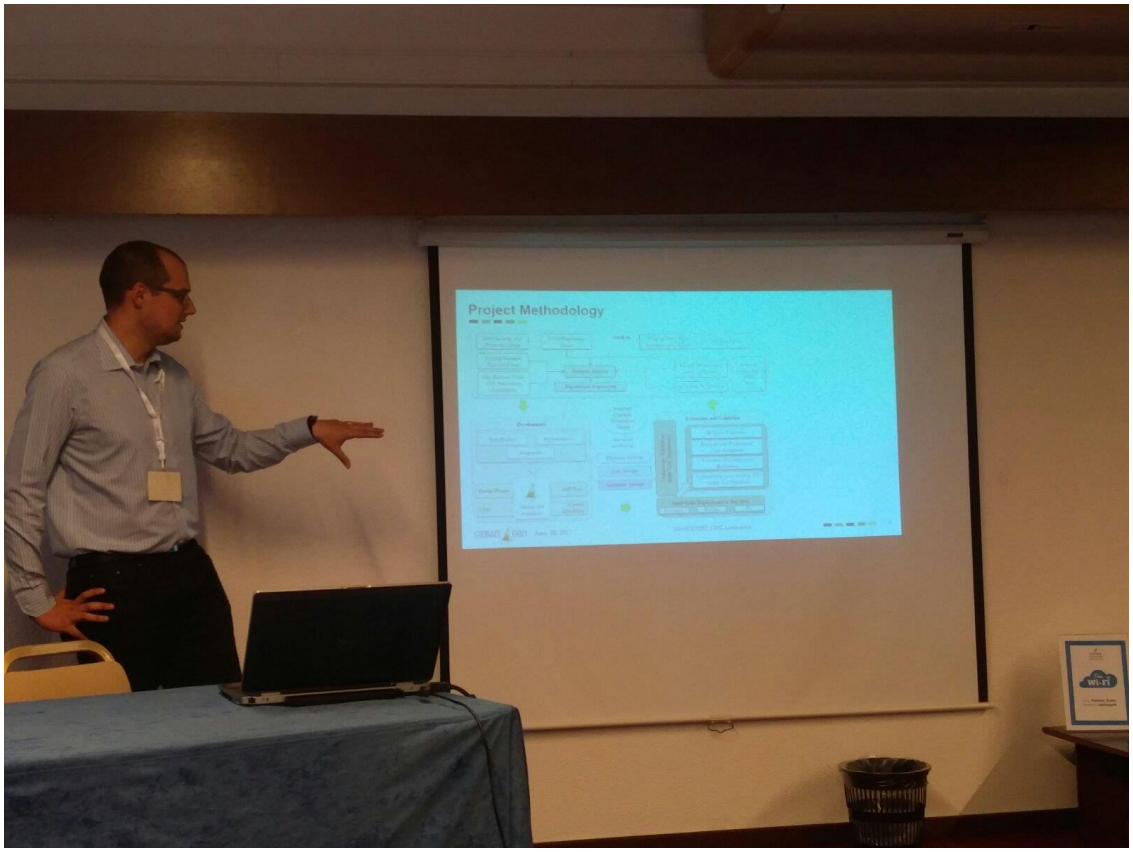

Figure 8. ISMB paper presentation at ICE ITMC 2017.

Figure 9. UPB paper presentation at ICE ITMC 2017.

2.8.4 Other

- **Type:** Conference scientific peer-reviewed publication
- **S4G participant:** ISMB
- **Publication title:** Towards cooperative ESS for distribution systems with high penetration of RES and EV: The Storage4Grid vision
- **Publication authors:** Jinyong Fu, Riccardo Tomasi, Maurizio Fantino, Maurizio A. Spirito, Veronika Krauß, Otilia Werner-Kytölä, Mihai Sanduleac, Gitte Wad Thybo, Giovanni Paolucci
- **Publication abstract:** Storage4Grid (S4G) is a 36-months project funded by the European Commission under the call LCE-01-2016, area 1 (Storage). S4G proposes an innovative holistic methodology for modelling, planning, integrating, operating and evaluating distributed Energy Storage Systems (ESS) including storage at user premises and storage at substation level, Electrical Vehicles (EV), innovative energy metering and energy routing technologies. This paper presents a systematic strategy used by S4G to generate the use cases for two scenarios related to two test sites: in Bolzano focused on cooperative EV charging and in Fur addressing the impact of user and grid side storage coordination to the medium and low voltage distribution network. The paper summarizes the S4G vision, solutions, and approaches for evolving the cooperative and coordinated ESS scenarios into use-cases and related requirements.
- **DOI:** 10.1109/ICE.2017.8279961
- **Green open-access link:** https://zenodo.org/record/1312194

2.8.5 Other

- **Type:** Conference scientific peer-reviewed publication
- **S4G participant:** UPB
- **Publication title:** Hybrid AC and DC smart home resilient architecture: Transforming prosumers in UniRCons
- **Publication authors:** Mihai Sanduleac, Mihaela Albu, Lucian Toma, João F. Martins, Anabela Gonçalves Pronto, Vasco Delgado-Gomes
- **Publication abstract:** Todays technological developments are drivers for new solutions towards massive renewables deployments resulting in increased network challenges. The paper presents a new approach for prosumers having such a local PV production and storage devices which allows, with adequate design, the user to change from classic prosumer to consumer-only from grid perspective, with enhanced efficiency and resilience based on a hybrid (AC and DC) architecture. Three use-cases are presented: PV behind the meter, PV and storage behind the meter and a newly proposed UniRCon (Unidirectional Resilient Consumer) architecture. This use-cases analysis considers four timeline horizons (2018, 2020, 2022, and 2025). It is shown for the selected profiles of consumption and production that PV plus storage behind the meter bring savings, as recognized and expected by today trend of business-cases, and that the complete UniRCon architecture steps in even with more savings together with higher resilience against the grid outages. The UniRCon solution gives also better ramp behaviour during the evening period, compared with the duck curve expected to challenge power systems with high PV penetration.
- **DOI:** 10.1109/ICE.2017.8280070
- **Green open-access link:** https://zenodo.org/record/1312185

2.9 ISGT Europe 2017, 7th IEEE PES Innovative Smart Grid Technologies Conference Europe

- **Date:** September 26-29, 2017
- **Location:** Torino, Italy
- **Type of dissemination and communication activity**: Participation to a Conference and Other
- **Organisers:** Polytechnic University of Turin, and IEEE
- **Estimated participants:** 500
- **Website:** http://sites.ieee.org/isgt-europe-2017/

2.9.1 Participation to a Conference

- **S4G participant:** UPB
- **Type of participation:** Paper presentation
- **Photo:** Figure 10

Figure 10. UPB paper presentation at ISGT Europe 2017.

2.9.2 Other

- **Type:** Conference scientific peer-reviewed publication
- **S4G participant:** UPB
- **Publication title:** Network code on requirements for generators — A discussion. Resynchronizing with paradigm shifts
- **Publication authors:** Mihai Sanduleac, Lucian Toma, Gianfranco Chicco, Mihaela Albu
- **Publication abstract:** The Network Code on Requirements for Generators, known also as RfG, is the most recent document approved by the European Commission that recommends the technical conditions for connection and operation of all types of generators in the ENTSO-E zone. Although RfG was published in the Official EU Journal in 2016, each EU member country is responsible to adopt it in the form that best suits to its characteristics. Therefore, the latest achievements in deployment of

storage and renewables technologies should be also considered. Moreover, the new concepts included in the EU winter package (2016) for empowering the citizen and encouraging prosumer's self-consumption, resilience and efficiency requires careful analysis of the document. This paper aims at identifying some shortcomings of the proposed document, based on latest technology advancements and societal aspirations, and proposes a new approach that allows synchronizing the new network codes with the smart grids paradigm shift.

- **DOI:** 10.1109/ISGTEurope.2017.8260326
- **Green open-access link:** https://zenodo.org/record/1306837

2.10 CIEM 2017, 8th International Conference on Energy and Environment

- **Date:** October 19-20, 2017
- **Location:** Bucharest, Romania
- **Type of dissemination and communication activity**: Participation to a Conference and Other
- **Organisers:** UPB, and IEEE
- **Estimated participants:** 250
- **Website:** http://ciem2017.energ.pub.ro/

2.10.1 Participation to a Conference

- **S4G participant:** UPB
- **Type of participation:** Paper presentation

2.10.2 Other

- **Type:** Conference scientific peer-reviewed publication
- **S4G participant:** UPB
- **Publication title:** Energy storage for reaching 100% CO2 free and 100% RES — preliminary case study for Romania
- **Publication authors:** Mihai Sanduleac, Lucian Toma, Constantin Bulac, Mircea Eremia, Nicolae Golovanov, Radu Porumb, Mihaela Albu, Stefan Gheorghe, Catalin Chimirel
- **Publication abstract:** The paper analyses energy production and consumption recorded for the Romanian power system in selected days and shows how storage resources can mitigate situations with 100% CO2 free and 100% RES respectively, by simulating through scaling the production based on these new scenarios. The study assumes a similar power exchange with neighbours, to avoid drastic network reinforcement and to improve regional auto-consumption, thus improving resilience. Based on the studied days, the storage level, needed to maintain acceptable tie-lines cumulated power exchanges, is analysed in terms of KPIs such as the total need of storage capacity in GWh, the power to energy ratio, and PV power to storage energy ratio. The results suggest similar requirements with the today trends in PV and storage pairing, thus inferring the feasibility of 100% CO2 as well as 100% RES in the Romanian power system as being possible from the energy balancing point of view.
- **DOI:** 10.1109/CIEM.2017.8120771
- **Green open-access link:** https://zenodo.org/record/1306825

2.11 Smart Metering 2017 International Symposium

- **Date:** November 15-17, 2017
- **Location:** Sibiu. Romania
- **Type of dissemination and communication activity**: Participation to an Event other than a Conference or a Workshop
- **Organisers:** Electrica SA
- **Estimated participants:** 130
- **Website:** https://www.electrica.ro/en/media-en/the-8th-edition-of-the-smart-metering-2017-international-symposium/

2.11.1 Participation to an Event other than a Conference or a Workshop

- **S4G participant:** UPB
- **Presentation title:** USM application for energy communities with prosumers
- **Presentation abstract:** This presentation targeted the main applications of smart metering, using Unbundled Smart Meters in prosumers communities. It was also addressed the subjects of prosumers and how the Storage4Grid project treats them using the concept of resilience. Hybrid microgrids was also debated, underlining that communities with such structures will become future energy cells.
- **Photo:** Figure 11

Figure 11. UPB presentation at Smart Metering 2017.

2.12 Tyndall Technology Days 2017

- **Date:** October 25, 2017
- **Location:** Cork, Ireland
- **Type of dissemination and communication activity**: Participation to a Conference
- **Organisers:** Tyndall National Institute
- **Estimated participants:** 300
- **Website:** https://www.tyndall.ie/tyndall-technology-days-2017

2.12.1 Participation to a Conference

- **S4G participant:** ALPERIA
- **Presentation title:** The Storage4Grid project
- **Objective:** S4G project dissemination

2.13 Energies Journal 2017

- **Date:** November 23, 2017
- **Type of dissemination and communication activity**: Other
- **Publisher:** Multidisciplinary Digital Publishing Institute
- **ISSN:** 19961073
- **Impact Factor (2017):** 2.676
- **5-Year Impact Factor (2017):** 3.045
- **Website:** https://www.mdpi.com/journal/energies

2.13.1 Other

- **Date:** November 23, 2017
- **Type:** Journal scientific peer-reviewed publication
- **S4G participant:** UPB
- **Publication title:** Resilient Prosumer Scenario in a Changing Regulatory Environment—The UniRCon Solution
- **Publication authors:** Mihai Sanduleac, Irina Ciornei, Mihaela Albu, Lucian Toma, Marta Sturzeanu, João F. Martins
- **Publication abstract:** Technological developments are pushing for new solutions based upon massive integration of renewable electricity generation in networks already facing many challenges. This paper presents a novel approach to managing the energy transfer towards prosumers making use of smart management of local energy storage. The proposed design (including storage dimensioning) is based on several operating scenarios in which the prosumer might operate as: (i) a "load only" entity (from a grid perspective), thus exhibiting investment resiliency against regulatory changes and high energy efficiency; or (ii) a prosumer, in case regulatory opportunistic profit might be available. This can be realized within a newly proposed Uni-directional Resilient Consumer (UniRCon) architecture. The major aim of the proposed architecture is to achieve optimal self-consumption while avoiding curtailment even in a changing regulatory environment like, for example, the total lack of incentives for generation based on renewable energy sources (RES). One of the major advantages of the proposed architecture consists in the adaptability to changes in the regulatory and market environment. The term resilience is used with multiple meanings: (a) the prosumer's financial resilience against regulatory changes when investment calculations assume no-grid injections; (b) the prosumer's technical resilience, with electrical design based on standalone operation; (c) the resilience of clusters of interconnected end-user installations with enabled community-level electricity exchange, independent of the existing main

grid supply; (d) the contribution to grid resilience, by enabling AC microgrid (MG) operation in island mode when large portions of the grid are formed by clusters of UniRCon prosumers (the ease of islanding segmentation of the local grid in case of emergencies). For proof of concept, three use-cases are detailed: (i) photovoltaic (PV) installations connected behind the meter; (ii) PV and storage available and controllable behind the meter; and (iii) the UniRCon architecture. The three use-cases are then compared and assessed for four near-future timelines as starting points for the investment. Numerical simulations show the attractiveness of the UniRCon solution in what concerns both system operation costs and supply resilience. Savings are expressed as opportunity savings arising from difference in tariffs while charging and discharging the storage unit and due to the avoidance of curtailment, as well as special taxes for the connection of PV (depending on regulatory environment). An extension of the UniRCon concept is presented also at community scale, with neighbourhood energy exchange inside a resilient cluster.

- **DOI:** 10.3390/en10121941

2.14 SAET & Partners Meeting 2018

- **Date:** February 1-2, 2018
- **Location:** Padua, Italy
- **Type of dissemination and communication activity**: Participation to an Event other than a Conference or a Workshop
- **Organisers:** SAET Padova
- **Estimated participants:** 100
- **Website:** http://www.saetpd.it/

2.14.1 Participation to an Event other than a Conference or a Workshop

- **S4G participant:** EDYNA
- **Presentation title:** E2V & Solar Battery with the new DSO
- **Objective:** S4G project dissemination
- **Photo:** Figure 12

Figure 12. EDYNA presenting the S4G project at SAET & Partners Meeting 2018.

2.15 IREC 2018, 9th International Renewable Energy Congress

- **Date:** March 20-22, 2018
- **Location:** Hammamet, Tunisia
- **Type of dissemination and communication activity**: Participation to a Conference and Other
- **Organisers:** University of Sfax, ENET'COM, University of Valladolid, IEEE
- **Estimated participants:** 200
- **Website:** http://www.irec-conference.com/

2.15.1 Participation to a Conference

- **S4G participant:** UPB
- **Type of participation:** Paper presentation

2.15.2 Other

- **Type:** Conference scientific peer-reviewed publication
- **S4G participant:** UPB
- **Publication title:** A perspective on 50% solar power evolution to support 100% CO_2 free electrical energy production
- **Publication authors** Mihai Sanduleac
- **Publication abstract:** The 100% CO_2 free electrical energy production is a new national and international goal for mitigating climate change. In this race towards achieving this goal till year 2050,

solar photovoltaic production is one of the important variable of the equation. But is it feasible in terms of scaling up in this short period the today world production of photovoltaic equipment? How far we are with today achievements and what effort is needed worldwide to accomplish this challenge? The paper presents a possible evolution of solar equipment manufacturing and gives an image of the effort needed to accomplish the goal in different scenarios of having 50% PV production in a mix of energy production targeting 100% CO2 free electrical energy production until 2035, 2040, 2045 or 2050. The scenario results endorse that the Paris Agreement targets are feasible in terms of panel production capacity and that there are options for earlier deployments, specifically applicable until 2040 or 2045, with lower CO_2 emissions till 2050, to better address climate concerns.

- **DOI:** 10.1109/IREC.2018.8362451
- **Green open-access link:** https://zenodo.org/record/1574658

2.16 ADCGS 2018, Aachen DC Grid Summit

- **Date:** April 19-20, 2018
- **Location:** Aachen, Germany
- **Type of dissemination and communication activity**: Participation to an Event other than a Conference or a Workshop
- **Organisers:** FEN Research Campus
- **Estimated participants:** 120
- **Website:** https://adcgs.org/

2.16.1 Participation to an Event other than a Conference or a Workshop

- **S4G participant:** UPB
- **Poster title:** Business models for a campus-scale demonstrator for DC resilient communities
- **Publication authors:**
- **Poster abstract:** This work analyses a number of business models that are exemplified for a lab/campus-scale demonstrator for DC-resilient communities in Bucharest, Romania. The aim of this study is to pave the path that could unlock some of the above-mentioned challenges and barriers, and help such networks to flourish in the near future. The analysis is carried out using the Business Model Generation Framework (BMGF), one of the most popular and systematized industry's state of the art (SoA) tools for developing and creating innovative business models and tools.
- **Photo:** Figure 13

Figure 13. UPB poster presentation at ADCGS 2018.

2.17 MELECON 2018, 19th IEEE Mediterranean Electrotechnical Conference

- **Date:** May 2-7, 2018
- **Location:** Marrakech, Morocco
- **Type of dissemination and communication activity**: Participation to a Conference and Other
- **Organisers:** IEEE Morocco Section
- **Estimated participants:** 200
- **Website:** http://www.ieee.ma/melecon18/

2.17.1 Participation to a Conference

- **S4G participant:** UPB
- **Type of participation:** Paper presentation
- **Photo:** Figure 14

Figure 14. UPB paper presentation at MELECON 2018.

2.17.2 Other

- **Type:** Conference scientific peer-reviewed publication
- **S4G participant:** UPB
- **Publication title:** Unbundled Smart meters in the new smart grid era: Assessment on compatibility with European standardisation efforts and with IoT features
- **Publication author:** Mihai Sanduleac
- **Publication abstract:** With the new active distribution network where distributed energy resources are increasingly present and where Smart meters will become the most ubiquitous equipment in low voltage (LV) networks, the paper presents a new Smart Meter solution and a corresponding MV/LV dispatch centre to contribute to both new energy market challenges as well as to Smart Grid services and evolving requirements. We are addressing some specific aspects of observability in LV network, based on wide-spread IP communication solutions, such as Synchro-SCADA and data anonymization, and presenting network services to assist dispatch, using also background network programs in LV such as power flow and state estimator. Moreover, the paper is analysing and proposing a unifying approach for both Smart Meters and Smart Grid architectures, to allow a complex Smart Grid functionality and with Internet if Things features. The concepts are in progress to be implemented in the European R&D project NOBEL GRID and developed also in the project Storage4Grid, showing the potential for generality.
- **DOI:** 10.1109/MELCON.2018.8379064
- **Green open-access link:** https://zenodo.org/record/1573342

2.18 DAS 2018, 14th International Conference on Development and Application Systems

- **Date:** May 24-26, 2018
- **Location:** Suceava, Romania
- **Type of dissemination and communication activity**: Participation to a Conference and Other
- **Organisers:** Suceava University "Ştefan cel Mare" and IEEE
- **Estimated participants:** 80
- **Website:** http://www.dasconference.ro/

2.18.1 Participation to a Conference

- **S4G participant:** UPB
- **Type of participation:** Paper presentation

2.18.2 Other

- **Type:** Conference scientific peer-reviewed publication
- **S4G participant:** UPB
- **Publication title:** Microgrid primary control and continuous-time operation
- **Publication authors:** Andrei Horhoianu, Mircea Eremia, Mihai Sanduleac
- **Publication abstract:** This paper details the primary control of a microgrid in islanded mode of operation. More specifically, specific droop control curve settings are developed for the energy storage system acting as the isochronous resource to maintain a desired state of charge for sufficient reserve for future provisions, as well as a means to instantaneously request more or less power from other distributed resources without using the communication infrastructure.
- **DOI:** 10.1109/DAAS.2018.8396067
- **Green open-access link:** https://zenodo.org/record/1572077

2.19 ENERGYCON 2018, 5th IEEE International Energy Conference

- **Date:** June 3-7, 2018
- **Location:** Limassol, Cyprus
- **Type of dissemination and communication activity**: Participation to a Conference and Other
- **Organisers:** KIOS Research and Innovation Centre of Excellence of the University of Cyprus, and IEEE
- **Estimated participants:** 400
- **Website:** http://www.energycon2018.org/

2.19.1 Participation to a Conference

- **S4G participant:** UPB
- **Type of participation:** Paper presentation

2.19.2 Other

- **Type:** Conference scientific peer-reviewed publication
- **S4G participant:** UPB
- **Publication title:** On the virtual inertia provision by BESS in low inertia power systems
- **Publication authors:** Lucian Toma, Mihai Sanduleac, Stefan Andrei Baltac, Francesco Arrigo, Andrea Mazza, Ettore Bompard, Aysar Musa, Antonello Monti
- **Publication abstract:** This paper emphasizes the importance of battery energy storage systems (BESS) for frequency stability in low inertia power systems. A mixed input signal is considered for the BESS

control, consisting of the frequency variation and the rate of change of frequency, as a solution to deploy the BESS for providing both inertia and primary frequency control. A sensitivity analysis on the influence of each input signal and the reaction time of the BESS on the frequency control, as well as on the frequency stabilization was performed. Simulation are conducted on a two-area interconnected power system to study and validate the capability of BESS to provide virtual inertia and contribute to system frequency regulation.

- **DOI:** 10.1109/ENERGYCON.2018.8398755
- **Green open-access link:** https://zenodo.org/record/1305343

2.19.3 Other

- **Type:** Conference scientific peer-reviewed publication
- **S4G participant:** UPB
- **Publication title:** Real-time optimal scheduling for prosumers resilient to regulatory changes
- **Publication authors:** Irina Ciornei, Mihaela Albu, Mihai Sanduleac, Enrique Rodriguez-Diaz, Josep Guerrero, Juan C. Vásquez
- **Publication abstract:** The last decade marked an exponential increase in photovoltaic (PV) systems installed on the rooftop of domestic residences within Europe. This situation was basically favoured by generous financial schemes such as Feed-in-Tariff and the market of green certificates. However, such governmental incentives drastically reduced, or they were already replaced with net-metering schemes which favour different scenarios: increase of self-consumption and decrease of grid-back injections. This unstable regulatory environment puts both new and old owners of PV systems under a regulatory financial risk. Recently, a regulatory resilient architecture, called UniRCon, was proposed, to overcome both financial and technical regulation uncertainties, where local battery energy storage system plays a key role. Besides the architecture we propose a real-time energy management system (EMS) that could be used for the daily operation of such systems. The real-time EMS is needed to prove the feasibility of this solution in short and long run and it could be also used as the main subroutine in the financial risk analysis. The EMS is based on a mixed-integer linear programming energy management tool that considers possible arbitrage benefits due to price difference in the energy purchased from the grid, while explicitly considering the efficiency of the power electronic interfaces (converters) according to the operation point. We prove our approach using a lab-scale experimental setup of a DC residential microgrid. The results are analysed under realistic operation scenarios derived from one-year load and PV power output measurements.
- **DOI:** 10.1109/ENERGYCON.2018.8398788
- **Green open-access link:** https://zenodo.org/record/1633440

2.20 IoT Week 2018, 9th International Renewable Energy Congress

- **Date:** June 04-07, 2018
- **Location:** Bilbao, Spain
- **Type of dissemination and communication activity**: Participation to a Conference
- **Organisers:** IK4-TEKNIKER; IoT FORUM
- **Estimated participants:** 850
- **Website:** https://iotweek.org/iot-week-2018-bilbao/

2.20.1 Participation to a Conference

- **S4G participant:** ISMB
- **Presentation title:** The Storage4Grid and GreenCom Projects | Session: Enabling next Generation of Energy Services with IoT
- **Presentation goal:** Dissemination of the S4G project

2.21 EEEIC / I&CPS 2018, 18th International Conference on Environment and Electrical Engineering and 2nd Industrial and Commercial Power System Europe

- **Date:** June 12-15, 2018
- **Location:** Palermo, Italy
- **Type of dissemination and communication activity**: Participation to a Conference and Other
- **Organisers:** IEEE and EMCS
- **Estimated participants:** 250
- **Website:** https://www.eeeic.net/eeeic/

2.21.1 Participation to a Conference

- **S4G participant:** UPB
- **Type of participation:** Paper presentation

2.21.2 Other

- **Type:** Conference scientific peer-reviewed publication
- **S4G participant:** UPB
- **Publication title:** Primary frequency control in a power system with Battery Energy Storage Systems
- **Publication authors:** Mihai Sanduleac, Lucian Toma, Mircea Eremia, Valentin A. Boicea, Dorian Sidea, Alexandru Mandis
- **Publication abstract:** This paper addresses the feasibility of a battery energy storage system (BESS) contribution to primary frequency control by simulating its state of charge over several days and by using frequency measurements in the Romanian power system. A BESS correction algorithm has been developed to overcome the average frequency asymmetry which may bring the state of charge to zero or 100%, thus not allowing further primary frequency control due to total discharge or total charge of the storage resource. It is demonstrated that for a number of selected days the algorithm provides good results, the primary frequency control is delivered over entire days, and that a reserve of energy remains in the battery for eventual disturbances in the system, for both over and under frequency needs.
- **DOI:** 10.1109/EEEIC.2018.8494490
- **Green open-access link:** https://zenodo.org/record/1306864

2.21.3 Other

- **Type:** Conference scientific peer-reviewed publication
- **S4G participant:** UPB
- **Publication title:** Adaptive Distributed EMS for Small Clusters of Resilient LVDC Microgrids
- **Publication authors:** Irina Ciornei, Mihaela Albu, Mihai Sanduleac, Enrique Rodriguez-Diaz, Remus Teodorescu, Josep Guerrero
- **Publication abstract:** Microgrids, storage technologies and renewables are cited as viable options to address resilience challenges faced by the power grids due to natural or man-made disasters. They are

also cited as enablers for the recent research interest in low voltage DC microgrids. In this work, an architecture of a resilient small community of microgrids is presented. Furthermore, a distributed and adaptive energy management system is proposed for the tertiary power flow control of a small cluster of DC microgrids, that operate in a cooperative manner to achieve a high level of independence and resilience. To do this, each microgrid accepts to share its storage and generation resources either for economic reasons or for security in case of emergency situations. The proposed EMS replaces the conventional tertiary control that adjusts the power set points of the microgrids' cluster with a cooperative-based power exchange regulator. The model is based on a general-consensus problem and by making use of modern stochastic optimization techniques, such as stochastic-adaptive mixed integer programming. On the physical layer, where the actual commands are sent from the EMS layer to each power flow converter, an exchange of data occurs only with its neighbouring converters (adjacent nodes). This is modelled as a sparse communication graph spanned across the microgrids' cluster.

- **DOI:** 10.1109/EEEIC.2018.8494529
- **Green open-access link:** https://zenodo.org/record/1564763

2.22 IS 2018, 9th International Conference on Intelligent Systems

- **Date:** September 25-27, 2018
- **Location:** Madeira Island, Portugal
- **Type of dissemination and communication activity**: Organisation of a Conference, Organization of a Workshop, Participation to a Workshop, and Other

2.22.1 Organization of a Conference

- **Organisers:** FCT NOVA, UNINOVA, and IEEE
- **Conference scope:** Intelligent Systems: Theory, Research and Innovation in Applications
- **Estimated participants:** 350
- **Website:** http://www.ieee-is2018.com/
- **Photo:** Figure 15

Figure 15. Opening session at IS 2018.

2.22.2 Organisation of a Workshop and Participation to a Workshop

- **Workshop title:** Storage for Grid
- **Organisers:** UNINOVA and ISMB
- **S4G participant:** UNINOVA
- **Objective:** The goal of this workshop is to share experiences and lessons learned in the field of storage systems. The participants of this workshop will share experiences and lessons learned (drivers and barriers) in the field of storage systems as a way to achieve the future grid and citizens empowering. Distinct objectives will be considered (Technical, Economical and Social) leading from inputs to results.
- **Target attendees:** Research and industry community
- **Participants:** 20
- **Website:** http://www.ieee-is2018.com/programme1/workshops
- **Photo:** Figure 16

Figure 16. Storage for Grid workshop at IS 2018.

2.22.3 Participation to a Conference

- **S4G participant:** UNINOVA
- **Type of participation:** Paper presentation

2.22.4 Other

- **Type:** Conference scientific peer-reviewed publication
- **S4G participant:** UNINOVA
- **Publication title:** On the use of IEC 61850-90-7 for Smart Inverters Integration
- **Publication authors:** Tiago Miranda, Vasco Delgado-Gomes, João F. Martins
- **Publication abstract:** Currently, there is a big correlation between the exponential technological development (verified in the last decades) and the increasing energy dependence in industrial and residential environments. A growing number of Distributed Energy Resources (DERs) led the utility operators to explore new methods of network planning and management. New approaches and concepts have emerged, such as the smart grid, showing exciting results in increasing the hosting capacity for DERs and Renewable Energy Sources (RES). Standardized automation, control, and communication systems have shown to be important keys to perform intelligent methods to manage energy efficiently. Smart inverters have proven to be a helpful tool in minimize adverse effects on the performance of electrical power system, so that the DERs can play an active role in supporting operations and remain connected during short-term voltage and frequency anomalies. This paper shows how to control and monitor an inverter using the IEC TR 61850-90-7 standard. A comparative analysis between the IEC TR 61850-90-7 and UL 1741 standards is presented. These standards are specific inverters standards, showing differences in performance and in the advantages of using them. The importance of smart inverters in the smart grid and its role is also discussed.
- **DOI:** *(not available yet)*
- **Green open-access link:** *(will be available after the publisher assigns the publication DOI)*

2.23 H2020 Low TRL Smart Grids and Storage Projects clustering event 2018

- **Date:** October 16, 2018
- **Location:** Brussels, Belgium
- **Type of dissemination and communication activity**: Participation in activities organized jointly with other H2020 projects
- **Organisers:** Innovation & Networks Executive Agency (INEA)
- **Estimated participants:** 65
- **Website:** https://ec.europa.eu/inea/

2.23.1 Participation in activities organized jointly with other H2020 projects

- **S4G participants:** ISMB, UPB, and UNINOVA
- **Presentation title:** The Storage4Grid project
- **Presentation goal:** Dissemination of the S4G project
- **Photo:** Figure 17 and Figure 18

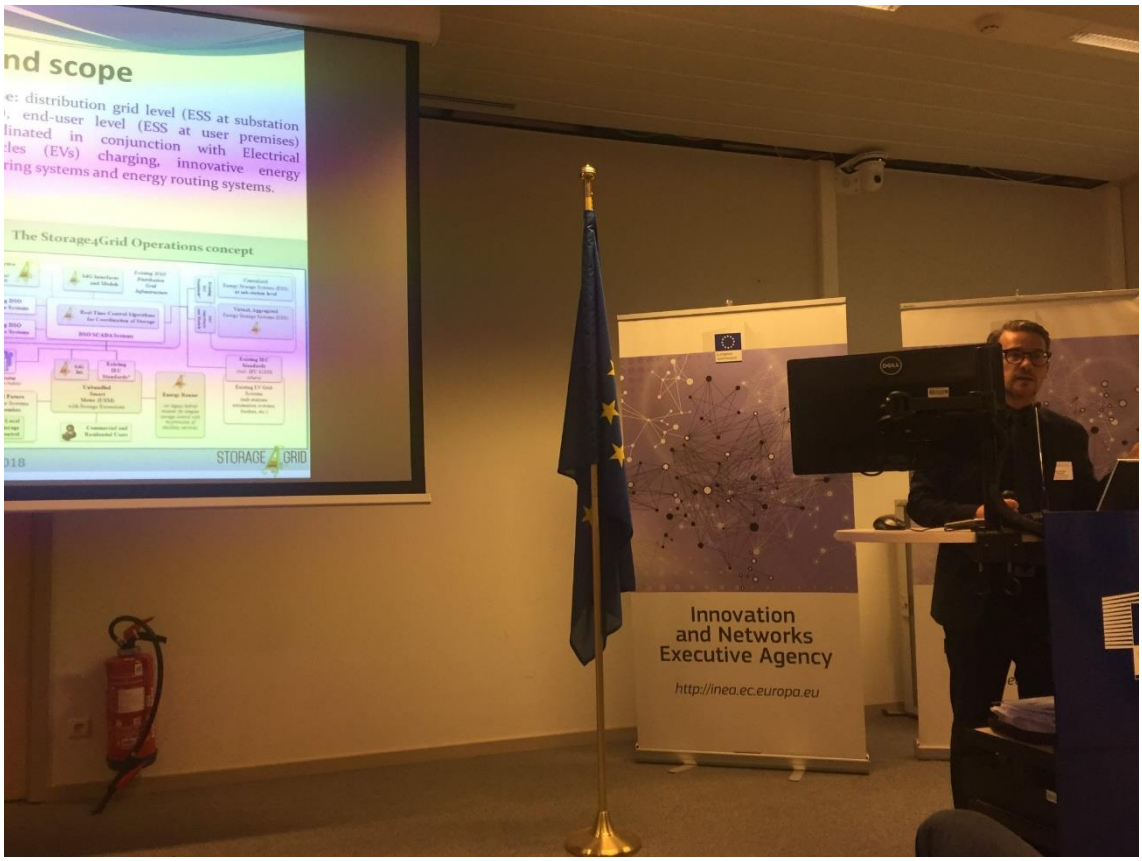

Figure 17. ISMB presenting the S4G project at H2020 Low TRL Smart Grids and Storage Projects clustering event 2018.

Figure 18. S4G partners participating in the H2020 Low TRL Smart Grids and Storage Projects clustering event 2018

2.24 IECON 2018, 44th Annual Conference of the IEEE Industrial Electronics Society

- **Date:** October 21-23, 2018
- **Location:** Washington D.C., USA
- **Type of dissemination and communication activity**: Participation to a Conference and Other
- **Organisers:** Virginia Commonwealth University and IEEE
- **Estimated participants:** 1000
- **Website:** http://www.iecon2018.org/

2.24.1 Participation to a Conference

- **S4G participant:** UNINOVA
- **Type of participation:** Paper presentation

2.24.2 Other

- **Type:** Conference scientific peer-reviewed publication
- **S4G participant:** UNINOVA
- **Publication title:** Intelligent Energy Storage Management System for Smart Grid Integration
- **Publication authors:** Rodrigo Francisco, Rui Amaral Lopes, Carlos Roncero-Clemente, João F. Martins
- **Publication abstract:** This paper presents an intelligent energy storage system for Nearly Zero Energy Buildings (NZEB) integrated in a smart grid context. The proposed methodology is suitable for NZEB buildings that include integrated renewable generation and storage capabilities, aiming at high load matching and low grid interaction, acting as a prosumer. The considered energy storage system is electrochemical storage (batteries) and the renewable production is based on PV panels. The energy

storage management is based on a genetic algorithm approach that aims to increase the energy storage system return of investment by, at the same time, minimizing the grid energy consumption, on higher DSO tariff periods, and reducing the number of battery operating cycles. In this way the management system will increase the life time of the energy storage system and reduce the amount of money that the prosumer has to pay to the DSO operator.

- **DOI:** *(not available yet)*
- **Green open-access link:** *(will be available after the publisher assigns the publication DOI)*

2.24.3 Other

- **Type:** Conference scientific peer-reviewed publication
- **S4G participant:** UNINOVA
- **Publication title:** Energy Storage Systems to prevent distribution transformers overload with high NZEB penetration
- **Publication authors:** Renato Veríssimo, Rui Amaral Lopes, João F. Martins
- **Publication abstract:** This paper studies and analyses the impacts introduced on Distribution Transformer (DT) overload due to the integration of Nearly Zero-Energy Buildings (NZEBs) into existing distribution Low Voltage Grids (LVG). The negative impacts on the DT are studied and explained. For high NZEB integration levels, this study reveals that the subsequent reverse power flows can achieve higher values, especially around noon, than the DT rated (and overload limit) power thus accelerating its aging. A power electronics-based Energy Storage System (ESS) is considered to mitigate these negative effects. The paper also analysis the mitigation of the negative DTs impact by considering this ESS solution. The established control laws prevent the transformer to be exposed to excessive reverse power flow levels.
- **DOI:** *(not available yet)*
- **Green open-access link:** *(will be available after the publisher assigns the publication DOI)*

2.25 ISGT Europe 2018, 8th IEEE PES Innovative Smart Grid Technologies Conference Europe

- **Date:** October 21-25, 2018
- **Location:** Sarajevo, Bosnia and Herzegovina
- **Type of dissemination and communication activity**: Participation to a Conference and Other
- **Organisers:** Faculty of Electrical Engineering Sarajevo, University of Sarajevo, and IEEE
- **Estimated participants:** 200
- **Website:** http://sites.ieee.org/isgt-europe-2018/

2.25.1 Participation to a Conference

- **S4G participant:** FRAUNHOFER FIT
- **Type of participation:** Paper presentation

2.25.2 Other

- **Type:** Conference scientific peer-reviewed publication
- **S4G participant:** FRAUNHOFER FIT
- **Publication title:** Optimization framework for short-term control of Energy Storage Systems
- **Publication authors:** Gustavo Aragón, Erdem Gümrükcü, José Ángel Carvajal Soto
- **Publication abstract:** Short-term control of energy storage systems (ESS) aims to find the optimal control action for the next time step in a demand management system. Several optimization models and solution strategies are presented in literature for accomplishing this task. However, there is no framework available, which enables prototyping and flexible definition of optimization problems

according to changing conditions and constellation of components in real time applications and that is deployable in different embedded systems. The present work analyses the requirements imposed by the EU project Storage4Grid (S4G) and uses them as a basis for the design of an optimization framework to combine data from various sources and offer a flexible optimization-setting environment. The architecture includes modules for management and signal processing of sensor data, linking of predictive algorithms to deliver inputs to the optimization model, optimization modelling, linking of a solver, an optimization controller and a post-processer module for formatting the results or creating events. The framework is tested on three scenarios of a deterministic optimization problem and its output interface was linked to an open source power flow simulator OpenDSS to validate the results.

- **DOI:** *(not available yet)*
- **Green open-access link:** *(will be available after the publisher assigns the publication DOI)*

2.26 Energy storage and its efficient use in systems operating at low voltage: Competition 2018

- **Date:** October 2018
- **Location:** Bucharest, Romania
- **Type of dissemination and communication activity**: Pitch Event
- **Organisers:** MicroDERLab and UPB
- **Estimated participants:** 6
- **Website:** http://microderlab.pub.ro/students-competition-energy-storage-and-its-efficient-use-in-systems-operating-at-low-voltage/

2.26.1 Pitch Event

- **Objective:** National level competition, where the students needed to create a short video in English (maximum 3 minutes) or an infographic (.pdf) with the following structure: context, needs, solution, benefits, risks, and other competitive solutions.
- **Target attendees:** Students of all engineering programmes (bachelor, master or PhD)
- **Photo:** Figure 19

Figure 19. Infographics received in the competition.

2.27 Innovation and Networking Days 2018

- **Date:** November 21-22, 2018
- **Location:** Torino, Italy
- **Type of dissemination and communication activity**: Organisation of a Workshop and Participation to a Workshop
- **Organisers:** FRAUNHOFER FIT and ISMB
- **Estimated participants:** 70
- **Website:** http://www.ismb.it/en/IND2018
- **Photo:** Figure 20

Figure 20. Opening session at Innovation and Networking Days 2018.

2.27.1 Organisation of a Workshop

- **S4G participants:** ISMB and FRAUNHOFER FIT
- **Objective:** The Innovation and Networking Days allow Innovators from industry, research and public administrations to meet, share, network and discuss different facets of a broad topic that, in this edition, will be *How Information and Communication Technologies can support environmental sustainability of production, products and services*.
- **Target attendees:** Research and industry community
- **Photo:** Figure 21

Figure 21. ISMB at Innovation and Networking Days 2018.

2.27.2 Participation to a Workshop

- **S4G participant:** UNINOVA
- **Presentation title:** Smart Electricity Grids: from flexibility to smart transformers
- **Presentation abstract:** The growing share of renewable sources goes hand in hand with the extensive electrification of demand. Flexible energy systems (particularly buildings), which deviate from the traditional production response by integrating decentralized storage and demand response, are an important part of the solution. Additional use of Solid State Transformers (Smart Transformers) is also expected to become a key enabler while integrating micro grids into the main grid, increasing immunity and resiliency.
- **Photo:** Figure 22

Figure 22. UNINOVA presentation at Innovation and Networking Days 2018.

3 S4G Advertising Materials

Several S4G were prepared to disseminate the S4G project amongst the different stakeholders. The main dissemination channel is the S4G project website (Appendix A). The project presentation is also available for the partners which present the S4G project in the events that they attend (Appendix B), where they can also distribute the project flyer (Appendix D). The S4G poster can also be show and presented in dedicated events (Appendix E). Moreover, a biannual newsletter is prepared and distributed (Appendix C).

4 Summary of the S4G consortium dissemination activities and advertising material

Table 1 summarises the S4G dissemination activities and advertising material. Table 2 shows the reached stakeholder during the dissemination activities.

Table 1. Dissemination and communication activities.

	ISMB	UPB	FRAUNHOFER FIT	UNINOVA	EDYNA	LIBAL	ALPERIA	ASM	ENIIG	Total
Organization of a conference	0	0	0	2	0	0	0	0	0	**2**
Organization of a workshop	2	0	2	2	0	0	0	0	0	**6**
Press Release	0	0	0	0	0	0	0	0	1	**1**
Non-scientific and non-peer-reviewed publication (popularised publication)	0	0	0	3	0	0	0	0	1	**4**
Exhibition	0	0	0	0	0	0	0	0	0	**0**
Flyer	0	0	0	1	0	0	0	0	0	**1**
Training	0	0	0	0	0	0	0	0	0	**0**
Social Media	1	0	0	1	0	0	0	0	0	**2**
Website	1	0	0	0	0	0	0	0	0	**1**
Communication Campaign (e.g. Radio, TV)	0	0	0	0	0	0	0	0	0	**0**
Participation to a Conference	3	8	1	3	1	0	1	0	0	**17**
Participation to a Workshop	1	1	0	2	0	0	0	0	1	**5**
Participation to an Event other than a Conference or a Workshop	0	2	0	0	0	0	0	0	0	**2**
Video/Film	0	0	0	0	0	0	0	0	0	**0**
Brokerage Event	0	0	0	0	0	0	0	0	1	**1**
Pitch Event	0	1	0	0	0	0	0	0	1	**2**
Trade Fair	0	0	0	0	0	0	0	0	0	**0**
Participation in activities	2	2	0	1	0	0	0	0	0	**5**

organized jointly with other H2020 projects										
Other	2	11	1	3	0	0	0	0	0	**17**

Table 2. Estimation of persons reached in the dissemination and communication activities.

Stakeholders	**Total**
Scientific Community (Higher Education, Research)	**4500**
Industry	**500**
Civil Society	**100**
General Public	**2000**
Policy Makers	**15**
Media	**0**
Investors	**0**
Customers	**0**
Other	**100**

5 Conclusions

As shown in this document, the S4G partners have participated and organized approximately 60 different actions during the initial 2-year period of the project. These actions included organization of conferences and workshops, participation in conferences and workshops, social media dissemination, newsletters and flyer preparation, peer-reviewed articles, amongst others; and had heterogeneous audience and objectives.

Moreover, some advertising material were performed, namely:

- Project website
- Project official presentation
- Newsletters
- Flyer
- Poster

The S4G project will continue to disseminate the project outcomes to relevant stakeholders during the remaining of the project, creating or updating the dissemination material when necessary.

Acronyms

Acronym	Explanation
BESS	Battery Energy Management System
BMGF	Business Model Generation Framework
DER	Distributed Energy Resources
DOI	Digital Object Identifier
DSO	Distribution System Operator
DT	Distribution Transformer
EMS	Energy Management System
EV	Electric Vehicle
ICT	Information and Communications Technology
IED	Intelligent Electronic Device
INEA	Innovation & Networks Executive Agency
ISSN	International Standard Serial Number
KPI	Key Performance Indicators
PV	Photovoltaic
RES	Renewable Energy Resources
S4G	Storage4Grid
SCADA	Supervisory Control and Data Acquisition
SoA	State of the Art
TRL	Technology Readiness Level
UniRCon	Unidirectional Resilient Consumer
USM	Unbundled Smart Meter

List of figures

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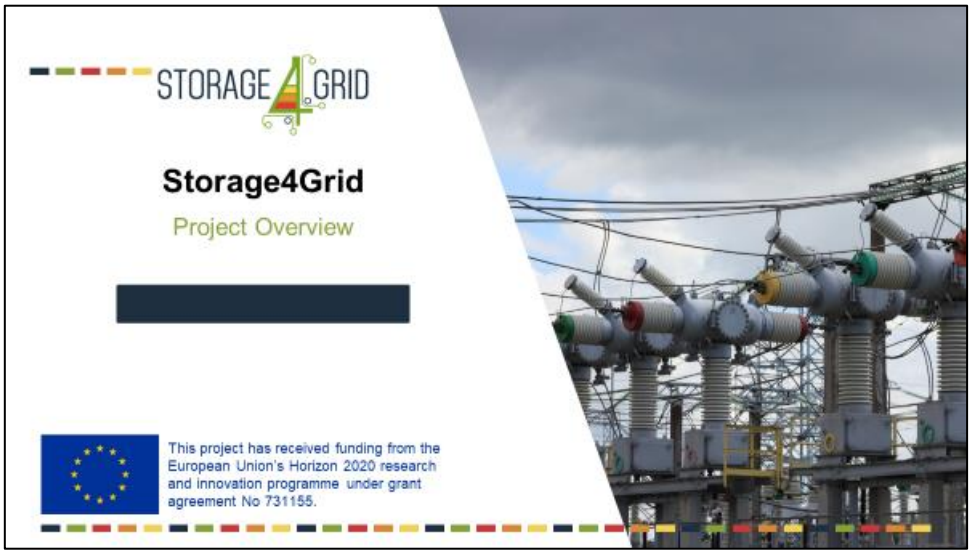
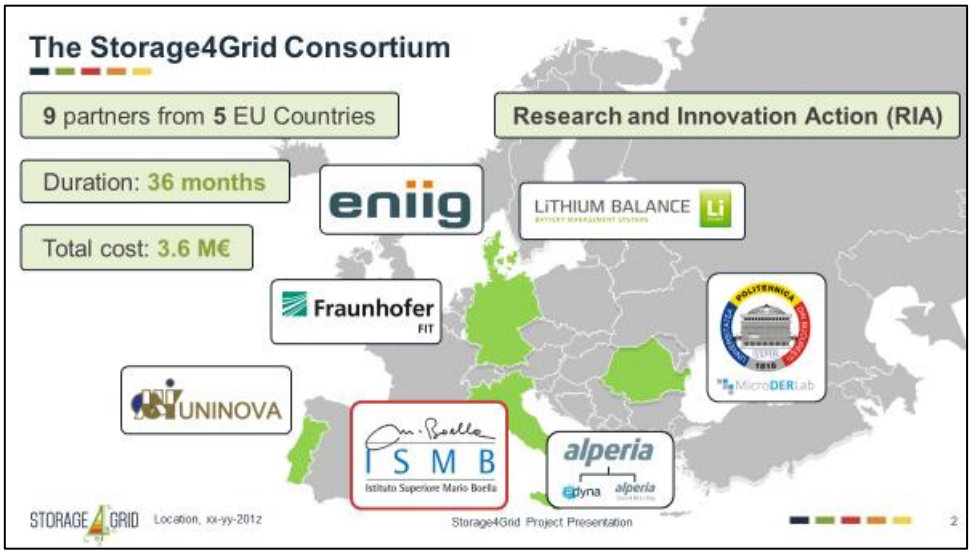
Appendix A Project website (www.storage4grid.eu)

Appendix B Project official presentation





Storage4Grid at a glance

Aim: avoid or reduce network reinforcement:

- by enabling the coordination of local, grid-connected and mixed Energy Storage Systems (ESS)
- by providing a new ICT framework for planning and optimizing ESS-based services

Scope: distribution grid level (ESS at substation level), end-user level (ESS at user premises) coordinated in conjunction with Electrical Vehicles (EVs) charging, innovative energy metering systems and energy routing systems.

STORAGE4GRID Location, xx-yy-201z

Storage4Grid: driving challenges

EU is reaching (and exceeding) its ambitious goal of reaching **high share of RES** (27% by 2030), but we need to do more to exploit RES in **more efficient and cost-effective way.**

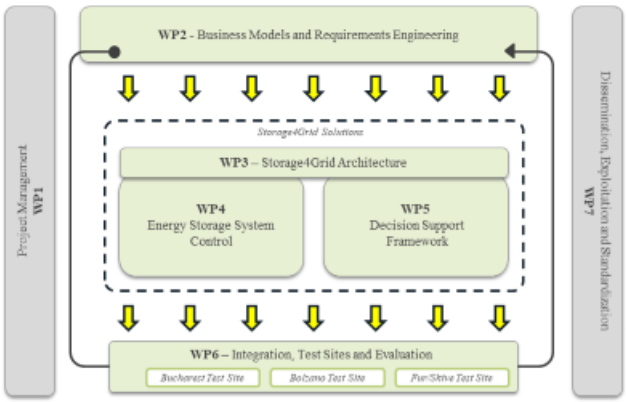
Large predictable loads (e.g. from high-consuming, heavy industry) is globally decreasing. **More distributed, less predictable loads** (e.g. EV fast-charging stations) are taking their place.

Energy Storage Systems (ESS) are quickly emerging as a valuable solution, but **reliable forecast and evaluation is needed** for properly planning ESS investments.

In order to draw all the benefits of controllable ESS, their deployment in Distribution Grids must be **interoperable with open Smart Grid models and standards.**

STORAGE4GRID Location, xx-yy-201z Storage4Grid Project Presentation 4

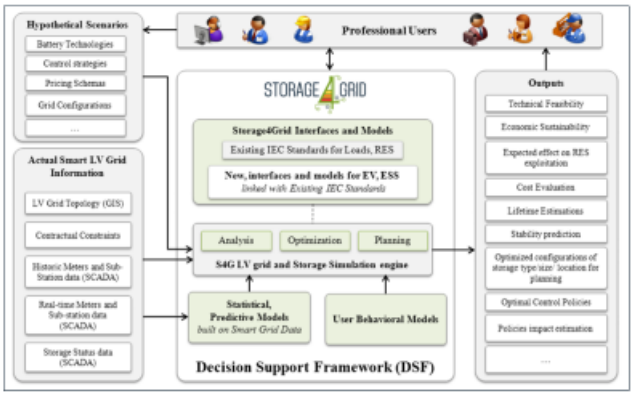
Storage4Grid Work Breakdown Structure



STORAGE4GRID Location, xx-yy-201z Storage4Grid Project Presentation 5

The Storage4Grid Decision Support (DS) concept

- The Decision Support concept looks at **Feasibility Evaluation** and **Planning** aspects.
- It aims at answering questions such as:
  - *Is it convenient to deploy ESSs in this scenario ?*
  - *Which type ?*
  - *Which size ?*
  - ....

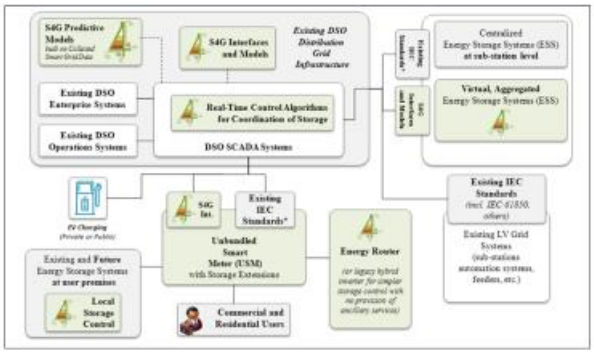


The Storage4Grid Operations concept

- The Storage4Grid Operations concept looks at **Control** aspects.

It aims at answering to questions such as:

- How should we control storage to maximize investment, RES utilization, etc. ?
- What is the best technical infrastructure for ESS control ?
  - *(best = most reliable, most convenient, more efficient,etc.)*
- How can we ensure interoperable operations despite all the different types of storage available ?
- ....



Tangible Outcomes (1/2)

Tangible Outcome #1

Pre-design the **S4G interfaces**, namely a set of interfaces and a joint Common Information Model (CIM) suitable for monitoring and control of heterogeneous storage systems.

Tangible Outcome #2

Develop a set of **predictive control algorithms** suitable to perform real-time optimization of distributed storage system in existing low and medium voltage grids.

Tangible Outcome #3

Establish an **Unbundled Smart Meter (USM)** extending existing AMI standards in open fashion to allow local "plug-in" integration of interfaces providing information about storage control, EV charging and local user interfaces to enable interaction with user.

Tangible Outcomes (2/2)

Tangible Outcome #4

Establish a fully integrated **Energy Router** allowing an easier integration of DC home grid, renewables and EVs in a Smart Grid ready approach.

Tangible Outcome #5

Develop a **decision-support framework** for analysing, planning, forecasting and optimizing the use of distributed storage in the low and medium voltage grid.

Tangible Outcome #6

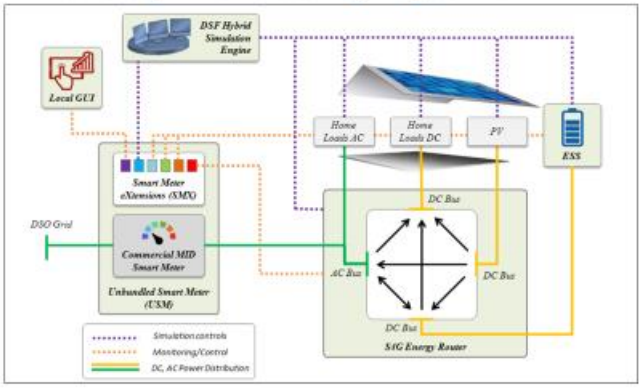
To **propose and apply an evaluation methodology** that assesses the technical feasibility of the developed technologies & solutions and as well as evaluates the user acceptance while considering the multiple actors and stakeholders within a Smart Grid.

STORAGE4GRID Location, xx-yy-201z Storage4Grid Project Presentation 9

S4G Test Sites: *Advanced Cooperative Storage Systems*

Test-site:
Bucharest (Romania)

Scope:
Low-TRL technologies, analyzed in controlled conditions

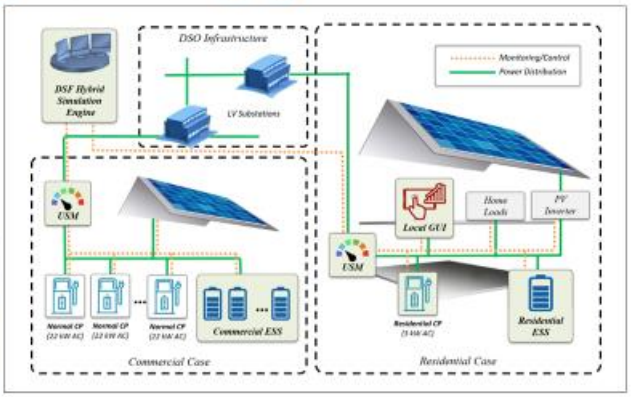


STORAGE4GRID Location, xx-yy-201z Storage4Grid Project Presentation 10

S4G Test Sites: *Cooperative EV charging*

Test-site:
Bolzano (Italy)

Scope:
Coordination of ESS with the EV charging infrastructure

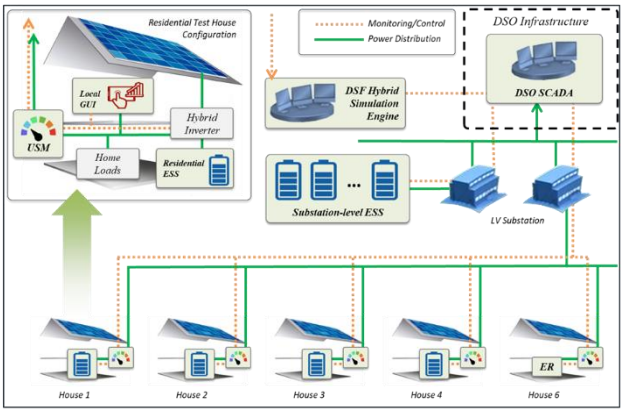


STORAGE4GRID Location, xx-yy-201z Storage4Grid Project Presentation 11

S4G Test Sites: *Storage Coordination*

Test-site:
Fur/Skive (Denmark)
(leveraging GreenCom Pilot)

Scope:
Grid-side storage and coordination among ESS at user level



Location, xx-yy-201z

Storage4Grid Project Presentation 12

The Storage4Grid External Stakeholders Group

- The **External Stakeholder Group (ESG)** is a group of external, independent experts of recognized knowledge in different kind of background and area of expertise including market, technological trends and standards.

- ESG established through an open call on project web site
- On-line interviews with each ESG member performed
- First ESG workshop held on August 3rd, 2018

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STORAGE4GRID Location, xx-yy-201z Storage4Grid Project Presentation 13

Thanks for your attention!

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Partner Institution

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731155.

Appendix C Newsletters (http://www.storage4grid.eu/pages/newsletter.html)

Newsletter 1 (May 2017)

STORAGE4GRID

NEWSLETTER 1 · May 2017

Storage4Grid VISION

The Storage4Grid vision is to provide utilities and end-users with **new tools for optimal grid planning, use and evaluation of storage technologies**. S4G pre-designs new storage control models and interfaces built upon existing standards and suitable to support scalable and cost-efficient coordination of heterogeneous ESS.

Plenary meeting in Torino: Storage4Grid Kick-off meeting

On 11 and 12 of January 2017, the 7 partners involved in the Storage4Grid project gathered in Torino (Italy) to have the 1st plenary meeting and get acquainted with all project members. In the first day, the initial uses cases per pilot site were discussed in workshops. It was defined the best approach to reach the full potential of Storage4Grid concepts and solutions. In the second day, the work packages objectives and timeline were presented, discussing the necessary steps for a successful Storage4Grid project development.

Plenary Meeting in Bucharest: Defining Storage4Grid General Architecture

On the 3 and 4 of May 2017, the partners gathered in Bucharest (Romania) to work on the Storage4Grid General Architecture. With the initial use cases and requirements in mind, partners were able to plan the demonstration activities in each pilot site. Since the meeting was in the Universitatea Politehnica din Bucuresti (UPB) facilities, all the partners visited the MicroDERLab pilot site. Here it will be demonstrated the advanced scenario of "Advanced Cooperative Storage Systems".

STORAGE 4 GRID

NEWSLETTER 1 · May 2017

Do you know...?

Maurizio Spirito, Storage4Grid Project Manager

Dr. Maurizio A. Spiritio is the Head of the EMerging Trends and Opportunities (EMTO) Function at ISMB. He has a degree in Electronics and Telecommunications Engineering from Politecnico di Torino and worked in Nokia Research Centre and he was the Head of the Radio Technologies for Multimedia Lab at ISMB. He has an extensive experience in developing and managing international multicultural research and development projects in the context of European Commission Framework Programs, especially in the area of Internet of Things technologies and Energy Efficiency.

ENIIG, the Danish pilot site of Storage4Grid

The Island of Fur is placed in the Northern part of Denmark in a fjord. At Fur there are approximately 800 people in 400 houses. Additionally, there are app. 500 holiday houses and app. 200.000 tourists visiting each year. Fur is part of the Municipality of Skive. Skive has a target of being CO2-neutral in 2029, which is also the goal of Fur.
During the last years, the island adopted more biomass boilers, heat-pumps and PV. The share of distributed energy resources is now more than 4% (this seems low, but because of the heavy clay industry, it is quite impressive). In the residential sector, more than 15% of all houses have PV-systems.

The Fur test site features 5 residential houses which are already provided with storage units paired with PV installations of various sizes (ranging from 3 to 6 kW sizes). The houses have an energy consumption of 4,5-6,3 MWh/year, their self-supply with PV and batteries installed ranges from 20-50%. The residents are both families and couples.
In this pilot site, it will be implemented the "Storage Coordination" scenario. The vison for this scenario is to use at highest grade the power grid, with minimal or no reinforcement, in order to accommodate the integration of highest renewable energy sources production, to cover up to 100% of local consumption, by using storage coordination of combined energy storage devices at end-user and grid level.

STORAGE 4 GRID

NEWSLETTER 1 · May 2017

Facts and figures

Budget: 3.617.900 €

Duration: 36 months

Partners: 7

Countries: 5

Coordinator: Maurizio A Spirito

Website: www.storage4grid.eu

Next events

- **Storage4Grid organised a special session named "Trends in Energy Storage for Future Grids" at the 23rd ICE/IEEE ITMC Conference (http://www.ice-conference.org/)**
- **The First ESG Meeting will take place in Bonn, Germany in August 3rd, 2017**

Newsletter 2 (November 2017)

STORAGE 4 GRID

NEWSLETTER 2 · November 2017

Storage4Grid VISION

The Storage4Grid vision is to provide utilities and end-users with **new tools for optimal grid planning, use and evaluation of storage technologies**. Storage4Grid pre-designs new storage control models and interfaces built upon existing standards and suitable to support scalable and cost-efficient coordination of heterogeneous ESS.

Meeting in Bonn: Storage4Grid Business models, architecture and ESG Workshop

From August 1st to 3rd 2017, the Storage4Grid consortium gathered in Bonn (Germany) to discuss about the business models and the general architecture to be developed during the project. On the 3rd day, the External Stakeholder Group (ESG) workshop allowed the consortium to get acquaintance with the ESG members and get early valuable feedback about the Storage4Grid approach and initial developments.

Meeting in Bolzano: Storage4Grid Italian pilot site and SMX hands-on training

Storage4Grid partners met in Bolzano (Italy) from November 14th to 16th 2017 for the last plenary meeting of year 1. The partners had the opportunity to visit the Italian pilot site and drive EVs. A hands-on training on one of the project developments (SMX) was organised.

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731155

NEWSLETTER 2 · November 2017

The Italian pilot site of Storage4Grid

Alto Adige – Südtirol is an alpine region in northern Italy, characterized by a high share of Renewable Energy Sources (RES), mainly hydropower, but the last decade showed a large increase in the amount of small, distributed PV plants connected to the low voltage grid. Edyna, the main DSO of the area, connects to its MV and LV grid more than 4.5 thousand PV plants with an overall installed power of 146 MW.

On the other hand, large predictable loads (e.g. from high-consuming, heavy industry) are quickly decreasing in the area. Distributed, less predictable loads (e.g. EV fast-charging stations) are taking their place. As of today, around 250 EVs are already active in Alto Adige - Südtirol, using a network of 35 public charging stations operated by the local utility Alperia, but the diffusion of EVs is currently growing significantly. Therefore, Alperia has already scheduled high investments to activate a larger number of charging stations within the next years.

In order to allow European utilities, such as Alperia, to pursue their ambitious development plan regarding the EV charging infrastructure, while avoiding heavy investments in strengthening the grid, Storage4Grid will study methodologies for planning, evaluating and controlling storage installations communicating and cooperating with EV charging systems. This scenario, called "Cooperative EV charging" will be tested in Bolzano, the capital of Alto Adige – Südtirol. The Bolzano test site will investigate the following two classes of EV charging systems:

1. **Residential case** - individual charging systems in use in private houses: private EV users mostly charge their vehicles at home, using a dedicated 3 kW charging box. Although many EV users also own PV installations, cars are mostly charged in non-working hours, causing a peak of demand during night.
2. **Commercial case** - large charging installations for EV company fleets: a number of companies are investing in fleets of EVs to support company operators. This causes the necessity to deploy charging parks characterized by significant load capacity, which is currently not possible in all LV radial grids.

The residential case will be tested in a private house provided with a PV roof plant of 9.6 kW, and 1 plug for classic charging of the EV. The house was provided by Alperia with an Energy Storage System (ESS) of 12 kWh.

The commercial case will be tested in the fleet garage of Edyna. The garage is provided with 10 charging stations (wall boxes) of different sizes. The ESS for this test site will be implemented within 2018.

Figure 1. The test site for the residential case - house of a prosumer with EV and ESS

Figure 2. The test site for the commercial case - EV fleet garage of Edyna

NEWSLETTER 2 · November 2017

Learning more about Storage4Grid components /developments

Towards the optimal integration of storage - The unbundled smart meter approach

Smart grids are being implemented around the world with the aim of improving the efficiency of power networks. Smart electricity meters, which are an integral part of smart grids, are thus being adopted globally. Electricity meters are the most widely used smart meters, with over 82% of the market share in 2016.

Most countries are following emission control regulations to tackle the environmental effects caused by pollution. Policies that promote energy efficient practices are a part of these regulations. However, the use of smart meters in emerging applications, which indirectly support a higher share of RES-based electricity at the end-user level, is still at the beginning in many countries.

The unbundled smart meter (USM) with enhanced functionalities proposed by the Storage4Grid project will allow the optimal integration of storage in emerging intelligent distribution networks.

Smart meter extensions (SMX) are an essential part of this project, being used in all the demonstrators as a communication channel and a place to run basic applications, i.e. software agents. SMX is a cost effective and powerful Linux machine, capable of handling multiple connections and protocols, data security and data privacy.

The Raspberry Pi 3 single board computer has been chosen due to its quad-core architecture running at 900 MHz, its memory capacity of 1 GB of RAM and its storage capacity of up to 32 GB on SD-Card. Figure 3 shows the SMX Box, hosting the SMX Core and one or more SMX extensions i.e. a modular software, running on a dedicated small-form PC, namely the SMX hardware, which can host plug-in components providing added-value services.

Figure 3. The SMX Box.

Modelling the Smart Grid – How simulation supports the integration of renewable energy sources

Energy systems have to be increasingly flexible towards growing integration rates of renewable energy sources and rising numbers of electrical vehicles (EVs). They are foreseen to stress the existing grid infrastructures to a level where reinforcement becomes necessary. However, classic grid strengthening methods, (e.g. using thicker cables or different tap changer settings) are expensive and inflexible.

Recent technological developments make alternative solutions possible and attractive. The Storage4Grid project aims to take advantage of storage installations both at residential and grid-side levels to improve power quality by mitigating voltage flicker and effect of unexpected load peaks.

NEWSLETTER 2 · November 2017

Storage4Grid's Decision Support Framework (DSF) plays a key role in an end-to-end solution for modelling, planning, integrating, operating, and evaluating distributed storage systems as a mean to enable renewable energy sources integration in large scale.

The DSF allows professional end-users like grid planners to investigate the effects of different scenarios by varying penetration levels of renewables, storage, and EVs. Furthermore, the framework supports the random or manual placement of batteries and renewables in the grid topology, and calculates the best possible positioning of storage. Additionally, professional end-users have the option of manually place and dimension storage units as well as testing different control strategies. Different control levels and deployment solutions will be emulated in the DSF as well, such as a central energy storage system controller at grid level, a local storage controller, and an energy router (power electronics device that manages the energy flow from/to different sources, loads, and storage systems).

The DSF simulation engine is developed based on open-source simulation software tools, and offers adapters for software integration of tools which are already used by the Distribution System Operators (DSO), for example PowerFactory or GridLab. External services like weather forecast providers, load profiles, and grid topology, will be integrated using standard connectors. To allow for seamless integration with the Storage4Grid system, the DSF will be interfacing with the central storage module DSF Data Warehouse (DSF-DWH) as well as the Grid Side Energy Storage System Controller (GESSCon), which calculates and distributes the global control profile for local energy storage systems.

Hereby, the goal is not only to show that additional storage at grid or end-user level can successfully solve stability and power quality issues in the grid, but also to allow a more detailed analysis of storage with respect to cost efficiency, technical feasibility, lifetime, and optimal control policies.

From the powerful features offered by the DSF a challenging task emerges: creating an intuitive graphical user interface (GUI) to interact with such a complex software tool. User expertise as well as feasible workflows, system behaviour, and recommendations need to be implemented and visualized in a naturally understandable way. Simulation state displays should be logical and comprehensible, the interface needs to be highly interactive to allow end-user intervention and a flawless interaction. Enjoyable user experience and task suitability are of high priority for the Storage4Grid development team. Therefore, the user interfaces are being developed in close collaboration with professional end-users.

Handling Data in Storage4Grid: many challenges, a full stack of solutions!

While Smart Grid solutions start to pervade also the distribution grid, controllable devices in the user's domain are also increasingly integrated with control and monitoring solutions, also thanks to the emergence of the Internet of Things (IoT) paradigm. In such a context, choosing the right ICT infrastructure and data management solutions becomes more and more critical and challenging.

Innovative Smart Grid Scenarios as the ones considered by Storage4Grid pose strong requirements supporting ICT, data management and control infrastructure:

- **Security**: to ensure that collected data can only be accessed by authorized parties, and control features are protected, therefore protecting privacy, and safety of users and equipment.
- **Scalability**: to keep solutions affordable as the number of users increase.
- **Modularity**: to facilitate the future introduction of new add-value features (e.g. intelligent algorithms, machine learning features, new business features) and controllable devices (e.g. new storage systems, new flexible loads) as they become available across the whole system.

- **Flexibility**: to allow monitor and control features to be spatially distributed, therefore allowing both scenarios where the system can be both controlled by one or more central entities (e.g. DSOs, aggregators) or used in fully decentralized scenarios where users are more autonomous and interact with each other with little or no mediation by traditional utilities e.g. leveraging block chain-based systems.

In research projects, teams are often tempted to re-invent the wheel and develop their own, ad-hoc data management solution, sometimes also featuring closed/commercial components. While this solution could be ideal in the short term, it does not pay off in the longer term – as it poses threats to how effectively such solutions can be adopted beyond the project.

In order to cope with this challenge, the Storage4Grid project has decided to adopt fully open solutions as depicted in Figure 4.

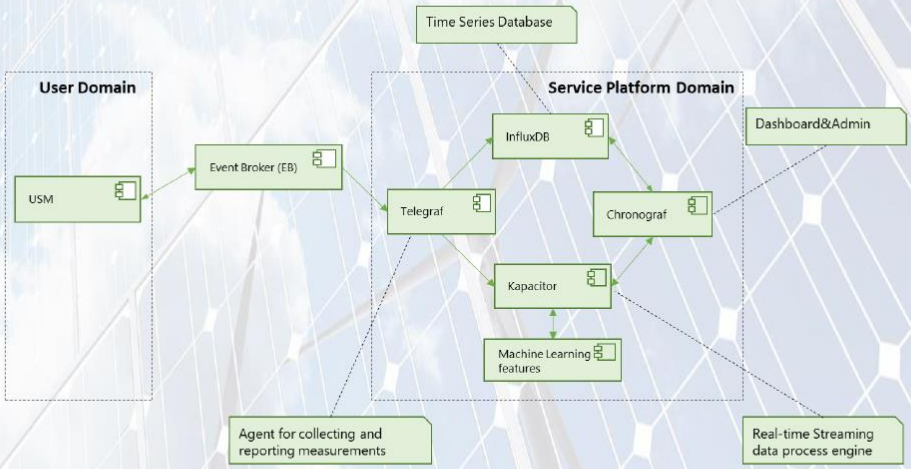

Figure 4. DSF-DWH Architecture.

In the user domain, the key component handling data collection and site-wide control aspect is a software agent running in a local field device, i.e. the SMX which is part of the USM. From this agent, data is transported to a project-wide central Data Warehouse (DSF-DWH), deployed in the utility or aggregator domain. Data transport occurs in event-oriented fashion, through an Internet-based communication link, secured through state-of-the-art security solutions namely Transport-Layer Security (TLS) and Open Virtual Private Network (OpenVPN). The Storage4Grid data collection approach is *fine-grained*: while the local USM can access all data available on the field (e.g. power, voltage, energy consumption, devices status) it is possible to control which properties are transported (and stored) in the central DSF-DWH.

The project team has chosen the tools to realize the DSF-DWH among well-established, open data storage solutions optimized to handle time-series data, keeping in mind the project requirements in terms of security, extensibility, scalability. More specifically, the well-known TICK stack has been adopted to realize the main

distinguishing features of the DSF-DWH, namely the time-series database (InfluxDB), a data collection agent (Telegraf), data processing component (Kapacitor) and a data virtualization dashboard (Chronograf).

At the time of writing, the TICK stack is integrated with a number of Storage4Grid solutions and it is currently being used to collect ESS status data from the Fur and Bolzano pilot, leveraging a secure VPN connection. During the project, the number and type of data sources integrated will be progressively increased, turning the DSF-DWH a useful tool for supporting operations and research activities in the project.

Dissemination activities

Storage4Grid session at the IoT Innovation and Networking Days

Presentations about:

1) The Storage4Grid Project (Riccardo Tomasi – ISMB)
2) Embedding Intelligence in Future Grids: Conflicting visions, common perspective (Mihaela Albu - UPB)
3) Future Smart Grids: the DSO Perspective (Gitte Thybo – ENIIG)

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Presenting the USM / SMX

The USM/SMX was presented on 28th September 2017 at the Energy Day in Romania. Mihaela Albu (Professor at UPB) has been invited to a debate on regulatory and legal issues hindering a larger uptake of PV installations at household level. The meeting has been hosted by the non-governmental organization EFDEN, and was attended by TSO and DSO representatives, energy regulator, policy makers and individuals interested in PV and storage installations at household level.

NEWSLETTER 2 · November 2017

Storage4Grid organised a special session named "Trends in Energy Storage for Future Grids" at the 23rd ICE/IEEE ITMC Conference (http://www.ice-conference.org/) at Madeira Island, Portugal

Mihai Sănduleac (UPB) and Riccardo Tomasi (ISMB) presenting Storage4Grid papers at ICE/IEEE ITMC 2017.

Promoting the USM / SMX solution

The USM/SMX was presented at the 8th edition of the "Smart metering 2017" International Symposium, where representatives from the major companies in the metering industry relevant for the energy networks operators, both from Romania and abroad reunites. Mihaela Albu (Professor at UPB) has been invited to speak about smart metering systems in the global context of the energy sector transformations. Her presentation (co-authored with Mihai Sanduleac, the Storage4Grid Technical Manager) has been devoted to the Universal Smart Meters' applications for energy communities with prosumers and examples from the Storage4Grid project use cases. Mihaela Albu has been also invited to the discussions organized as part of the round table: *New challenges for DSOs – The Digital Transformation*, where the Storage4Grid solutions enabled by smart metering have been promoted.

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731155

Newsletter 3 (May 2018)

STORAGE 4 GRID

NEWSLETTER 3 · May 2018

Storage4Grid VISION

The Storage4Grid vision is to provide utilities and end-users with **new tools for optimal grid planning, use and evaluation of storage technologies**. S4G pre-designs new storage control models and interfaces built upon existing standards and suitable to support scalable and cost-efficient coordination of heterogeneous ESS.

Plenary meeting in Lisbon: Storage4Grid Business models and data model

On March 7th and 8th 2018 the Storage4Grid consortium gathered in Lisbon (Portugal) to discuss the common data model to be used in the project. The business models were refined after some previous users' interviews. The partners had the opportunity to visit the UNIINOVA laboratory, where the energy router is being assembled and tested. The energy router is a power electronics device that manages the energy transfer from/to different sources, loads, electricity storage system and supporting DC-link connection between houses.

Plenary Meeting in Bolzano: Period 1 Storage4Grid achievements

From May 28th to 30th 2018, the partners gathered in Bolzano (Italy) to discuss the Storage4Grid period 1 achievements and draft the phase 2 test site plans In Bolzano, the technical partners had to possibility to do some deployment activities and test their developments on-site. The Cooperative EV Charging scenario will be demonstrated in a residential and commercial case.

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NEWSLETTER 3 · May 2018

UPB, the Romanian pilot site of Storage4Grid

The Bucharest test site is using the infrastructure of a laboratory at Politehnica University of Bucharest, used both for teaching students enrolled in the Faculty of Electrical Engineering and research objectives by MicroDERLab team.

In order to demonstrate the advantages of using the LV DC technologies, the laboratory setting has been developed over the time in this direction. The set-up is modular in order to allow validation of proposed solutions and includes a DC bus (220V) where AC appliances are directly connected to the DC ring (Figure 1 and Figure 2); two PV modules of 1 kW peak power each (Figure 3), lead-acid batteries, various DC/DC converters and other control equipment. The energy exchange with the university' distribution grid is continuously monitored using an Unbundled Smart Meter (USM). The control equipment is based on a smart meter extension (SMX), an Energy Router, and communication devices (e.g. local Wi-Fi router) which is intended to be further developed to allow black-start support for isolated grids. To ensure that the local DC grid will be able to supply its critical (local) loads also during small duration (minutes) AC grid unavailability, it needs to be compatible with a microgrid paradigm.

Figure 1. DC bus with local loads.

Figure 2. DC plugs.

Figure 3. PV panels.

STORAGE 4 GRID

NEWSLETTER 3 · May 2018

In this context, UPB is responsible for demonstrating the feasibility of the Advanced Cooperative Storage Systems in the Storage4Grid project, i.e. enabling energy communities. For this, a 400V DC link with a Smart Grid laboratory placed at approximately 300 meters away, is installed in the Faculty of Power Engineering.

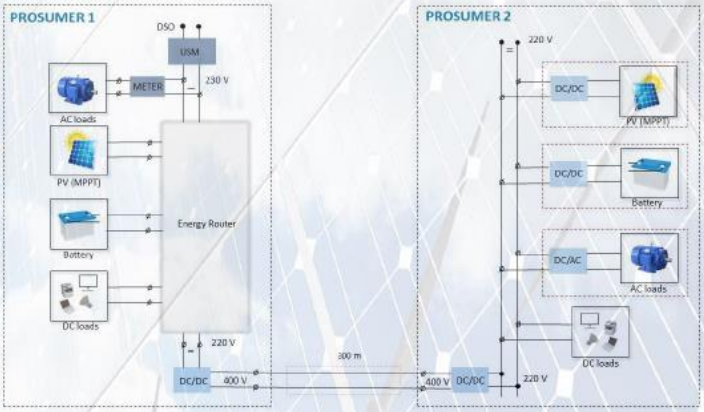

Figure 4. DC link between laboratories.

Making intelligent use of the Energy Router, the PV energy production can be controlled and the distribution (including consumption) optimized. The energy community issued in this way will behave as a resilient cluster against different types of grid outages. Storage4Grid project develops the local intelligence of the Energy Management Systems (EMS) in the SMX platform, to control energy production, storage and consumption for local needs, as well as to provide energy services to neighbour prosumers.

Dissemination activities

Storage4Grid presentation at SAET & Partners 2018 Meeting Report

STORAGE 4 GRID

NEWSLETTER 3 · May 2018

Poster presentation at the Aachen DC Grid Summit

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731155

Newsletter 4 (November 2018)

STORAGE4GRID

NEWSLETTER 4 · November 2018

Storage4Grid VISION

The Storage4Grid vision is to provide utilities and end-users with **new tools for optimal grid planning, use and evaluation of storage technologies**. Storage4Grid pre-designs new storage control models and interfaces built upon existing standards and suitable to support scalable and cost-efficient coordination of heterogeneous ESS.

Review meeting in Turin: The Storage4Grid project under evaluation

On September 5th, the Storage4Grid consortium gathered in Turin (Italy) with INEA representatives for the Storage4Grid project evaluation. The project review analysed the work done and the achievements of the consortium in the first 18-months of the project. The overall assessment was that the project has achieved its objectives and milestones. During the next reporting period, the Storage4Grid project will have a stronger focus on the exploitation of its results.

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NEWSLETTER 4 · November 2018

Storage4Grid and the young generation

As a dissemination activity, UPB partner launched a competition for all students enrolled in the Electrical Engineering program. They were encouraged to create content on the subject of Energy storage and its efficient use in systems operating at low voltage, using video or infographic format.

Shortly after competition announcement, it became obvious that the students are much more interested in designing a graphic structure, then using the movie option. Submissions have been received from both undergraduate as PhD students. The Storage4Grid team in UPB has analysed the infographics and decided for 3 awards. Some excerpts of the work received is shown below.

First awardee, Claudia Ianosi, bachelor student in the 4th year of Power Electronics and Electrical Drives specialization will have waived the participation fee to the International Conference ATEE 2019 (http://atee.upb.ro/), to be held in Bucharest.

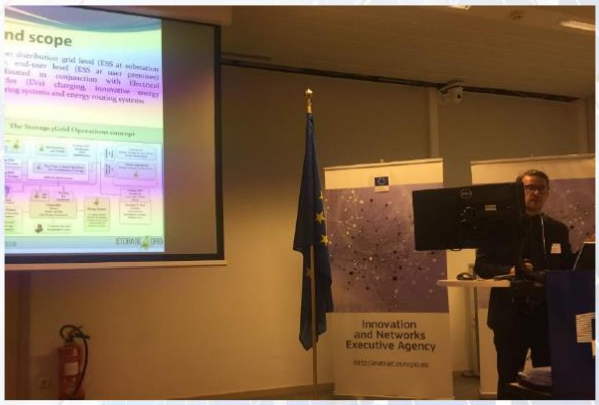
It was surprising how well the students managed to merge the knowledge obtained during the lectures and laboratories with the information and tools available online, in order to create the infographics, which will be used to increase awareness on Storage4Grid and storage technologies. The competition showed that students are very open to new technologies and to the concept of sustainability and green energy, willing to support local initiatives and to embrace projects related to the emerging power systems.

STORAGE 4 GRID

NEWSLETTER 4 · November 2018

Dissemination activities

H2020 Low TRL Smart Grids and Storage Projects clustering event in Brussels (Belgium)



Storage for Grid workshop at IEEE Intelligent Systems 2018 in Madeira Island (Portugal)

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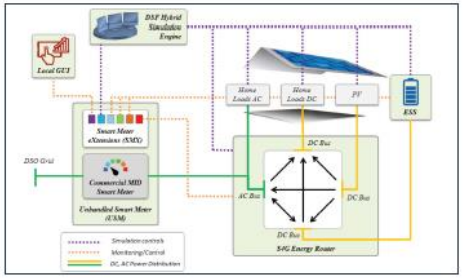
Appendix D Flyer

S4G Test Sites

Advanced Cooperative Storage Systems

TEST-SITE
Bucharest (Romania)

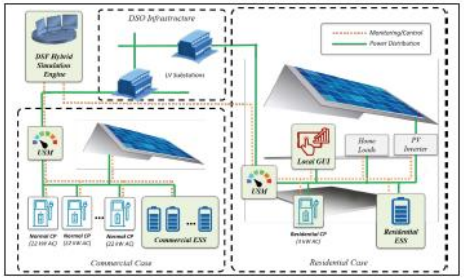
SCOPE
Low-TRL technologies, analyzed in controlled conditions



Cooperative EV charging

TEST-SITE
Bolzano (Italy)

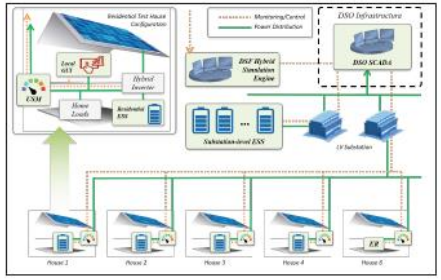
SCOPE
Coordination of ESS with the EV charging infrastructure



Storage Coordination

TEST-SITE
Fur/Skive (Denmark)

SCOPE
Grid-side storage and coordination among ESS at user level



Appendix E Poster