Capacity building in Smart and Innovative eNERGY management

WP5

Organization of Joint SINERGY Events for Expertise Exchange and Hands-on Experience

D5.1 The First SINERGY Workshop – Smart Grid Technologies

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CO	Confidential, only for members of the consortium including the Commission	

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V1.0 (final)	28/12/2021	IMP	Valentina Janev

Executive Summary

In the SINERGY WP5 framework, three workshops as a combination of training courses and lectures, hands-on experience, social and networking activities are foreseen. The goal is to increase the competence level of PhD students and other interested stakeholders in the domain of the SINERGY project.

This deliverable focuses on the organizational aspects and specific sessions of the first SINERGY workshop, coordinated by AIT (Vienna, Austria) from November 23rd to 25th, 2021.

Section 2 describes the timeline of events that led to the organizational changes of the workshop (hybrid event, due to a local lockdown in Austria).

Section 3 follows with a presentation of the day 1 activities and consists of the administrative event (SINERGY Plenary), as well as a more detailed description of the young researchers' workshop.

Section 4 briefly summarizes the lecture activities of day 2 while Section 5 closes with the lecture of day 3 and the description of the open SINERGY event.

The open event was hosted in a joint organization with the IEEE Austria section and involved researchers from the consortium, the Technical University of Vienna and other stakeholders.

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Abbreviations and Acronyms

CA	Consortium Agreement
CO	Coordinator
DSO	Distribution System Operator
EMS	Energy Management System
ERDF	European Regional Development Fund
EU	European Union
IEEE	Institute of Electrical and Electronics *Engineers*
ICT	Information and Communications Technology
R&D	Research and Development
WP	Work Package

1. Introduction

The primary objective of SINERGY is to strengthen the research capacity and further unlock the innovation potential of IMP, transforming it into a regional Centre of Excellence in the smart energy management. This will be achieved via a set of actions that range from (1) exploring the synergies between the partners; via (2) exchange of personnel and early-stage researchers' involvement in joint research and development; to (3) organizing joint events for knowledge transfer, expertise exchange, awareness raising and stakeholders networking.

Workshops and conferences are seen as the most efficient way to get an insight into the state-of-the-art in selected research topics. Therefore, work package 5 focuses on the organization of joint project events that will enable know-how exchange and provide with a "hands-on" experience in the domain of smart energy management.

1.1. Deliverable Scope

The main objectives of WP5 include the following:

- Organizing three international workshops and one conference in research area of smart energy management technologies, with emphasis on their applications;
- Increasing the competence level of local and regional experts in the selected research domain;
- Facilitating networking between regional and EU experts in the field;
- Presenting the latest research results of distinguished experts from strategic partner organizations and providing "hands-on" experience.

In the project framework, three workshops as combination of training courses and lectures, hands-on experience, social and networking activities are foreseen:

- 1st Workshop coordinated by AIT, November 2021;
- 2nd Workshop, coordinated by NUIG, May/June 2022;
- 3rd Workshop, coordinated by IMP, November 2022.

This deliverable focuses on the organizational aspects and specific sessions of the first Sinergy workshop, coordinated by AIT (Vienna, Austria) from November 23rd to 25th, 2021.

1.2. Structure of the Deliverable

This Deliverable is structured as follows.

Section 2 describes the timeline of events which led to the organizational changes of the workshop (hybrid event, due to a local lockdown in Austria).

Section 3 follows with a presentation of the day 1 activities and consists of the administrative event (SINERGY Plenary), as well as a more detailed description of the young researchers' workshop.

Section 4 briefly summarizes the lecture activities of day 2 while Section 5 closes with the lecture of day 3 and the description of the open Sinergy event.

The open event was hosted in a joint organization with the IEEE Austria section and involved researchers from the consortium and the Technical University of Vienna.

2. Organization of the 1st Workshop

The workshop has been originally planned to be hosted at AIT premises in Vienna/Austria with participation of delegations from the other SINERGY project partners from Nov. 23rd to Nov. 25th, 2021. It was announced well in advance via the SINERGY website, see Figure 1.

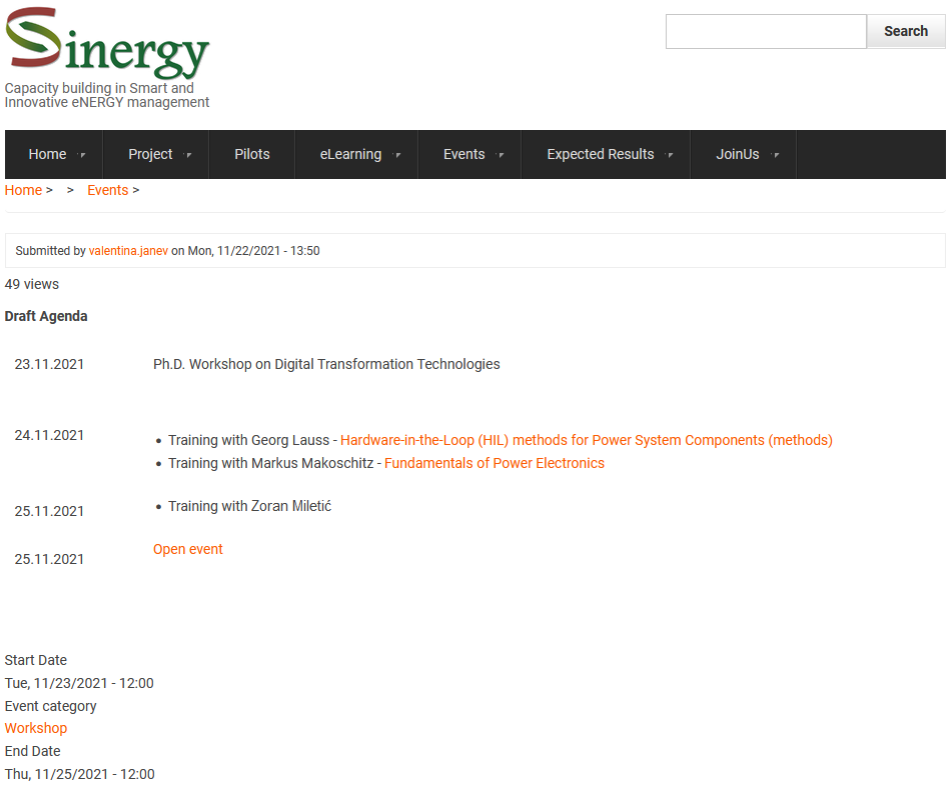

Figure 1. Workshop Announcement

While the preparation work was progressing, the 4th Covid-19 wave caused rapid deterioration of the situation (raising infections) in the host country. Hence, a backup scenario was needed in order to be able to still accomplish the foreseen work. The lockdown was announced by the Austrian government in a press conference on Nov. 19th, triggering the fall back of online workshops (see Figure 2).

Therefore, the SINERGY core team decided to change the mode of the event and to organize as a hybrid event.

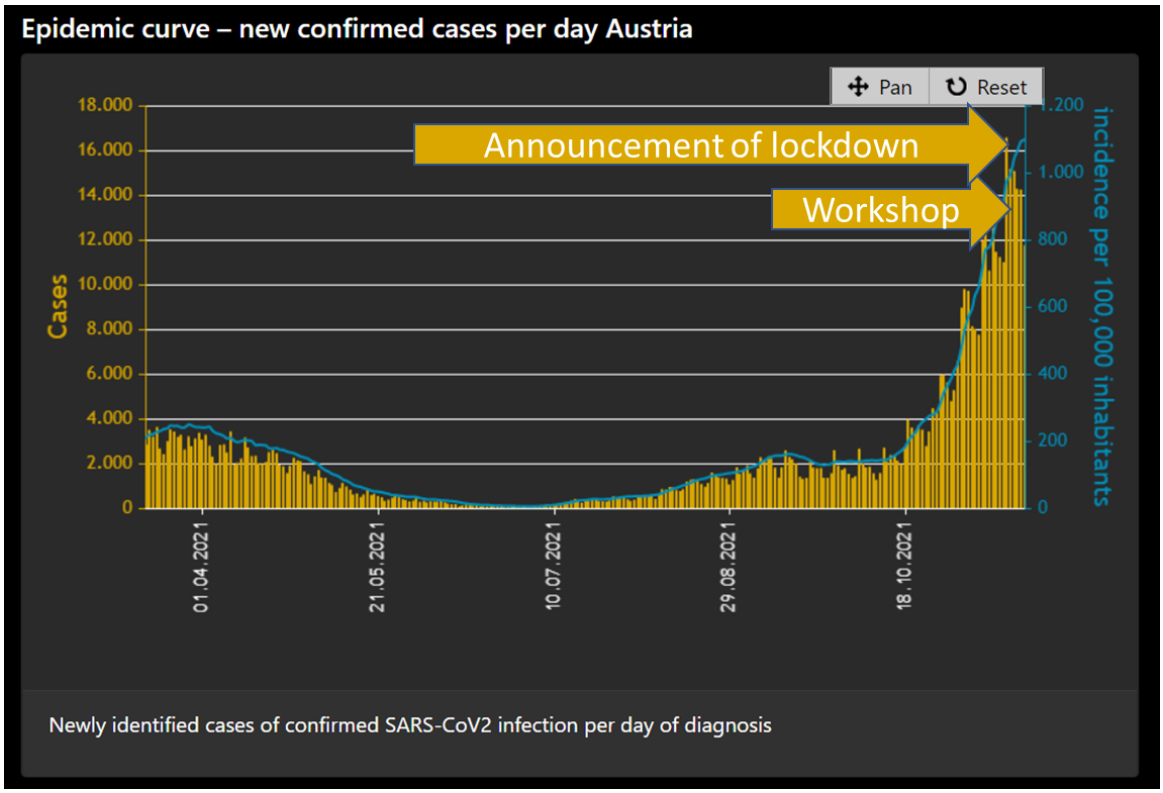

Figure 2. Covid-19 infection rates with workshop related times of events

The agenda was kept as originally planned and the content was revised, where necessary, to offset potential limitations of online participation.

Two participants from NUIG managed to come to Vienna for workshop participation (see Figure 3).

Figure 3. On-site participation by NUIG team at AIT; left to right: J. Stöckl (AIT), L. Blanes Restoy (NUIG), D. Peretti Correa (NUIG)

3. Day 1 – Nov. 23rd, 2021

The agenda for day 1 consisted of two main blocks with administrative Sinergy topics in the morning and a young researcher's workshop with networking opportunities in the afternoon.

Agenda for Day 1:

9.30	Opening (Johannes Stöckl AIT)
9.40	AIT presentation (Johannes Stöckl AIT)
10.00	Sinergy WP 1: Coordination and Deliverables (Valentina Janev IMP)
10.30	Sinergy WP 3: Deliverables for March 2022 (NUIG, AIT)
11.00	Sinergy WP 4: Deliverables - Discussion and Planning (March 2022)
11.30	Sinergy WP 5: Deliverables - Discussion and Planning (December 2021 and June 2022)
12.00	Lunch
12.30	Start Young Researchers Workshop: Coming together
13.00	Welcome and introduction
13.15	Individual presentations on research topics
14.30	Coffee and networking
15.00	Group workshop on future energy topics
16.00	Discussion on group outcomes
16.00	Networking
17.00	End of workshop

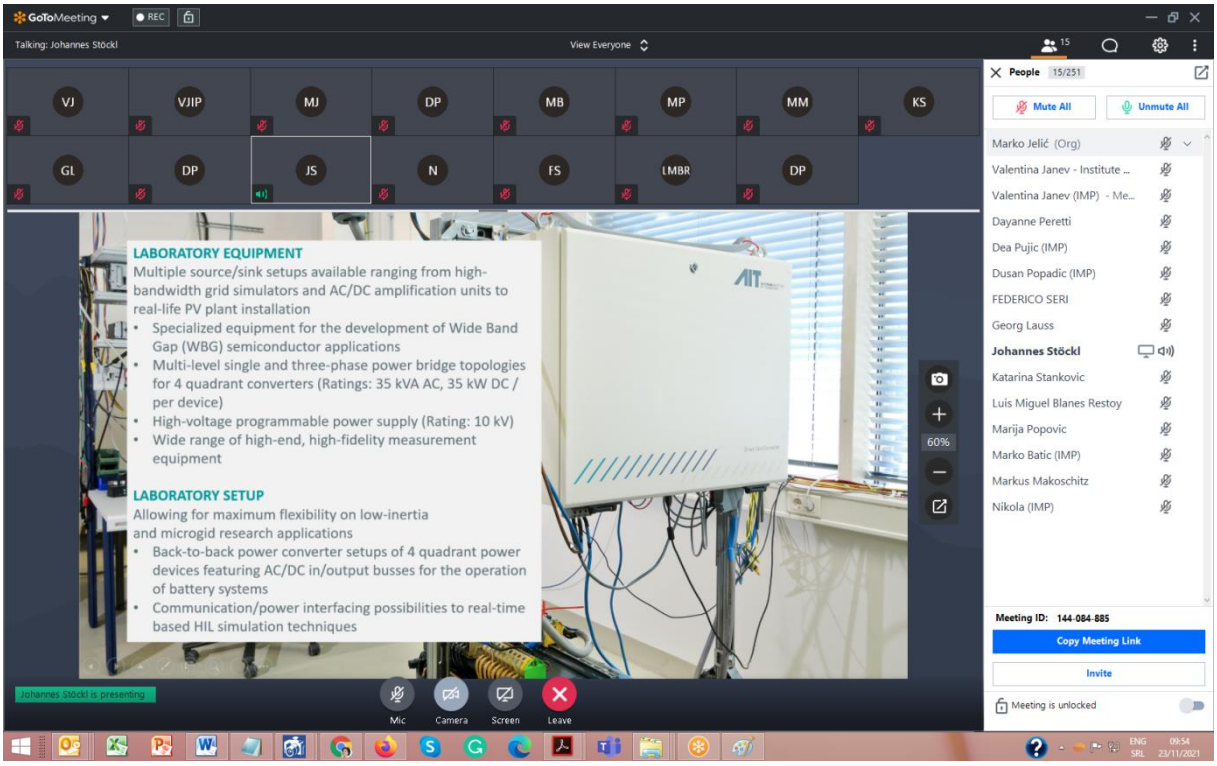

Figure 4. Opening (AIT Presentation)

SmartEST laboratory

High Current laboratory

High Voltage laboratory

Power Electronics laboratory

Figure 5. AIT Infrastructure

3.1 Administrative Workshop

Besides the monthly meeting that are organized regularly on the 2nd week in the month (Monday, from 1pm to 3pm Brussels time), plenary meetings have been scheduled with key researchers in SINERGY (see Table 1) in order to discuss internal issues and the SINERGY management plan.

Table 1. SINERGY Key Researchers

IMP team	AIT Team	NUIG Team
Valentina Janev Nikola Tomašević Marko Batić Dušan Popadić Dea Pujić Katarina Stanković Marko Jelić Marija Popović	Johannes Stöckl Georg Lauss Markus Makoschitz Thomas Strasser	Luis Miguel Blanes Restoy Federico Seri Dayanne Peretti Paulo Lissa Marcus Keane

Topics for discussion at the Plenary meeting were as follows:

- Preparation of M12, M15 and M18 deliverables;
- Preparation of the Periodic Report related to 1st Reporting Period (M1-M15);
- List of Lectures to be delivered by M15 (D3.1 and D3.3) and M30 (D3.2 and D3.4);
- Organization of mentoring sessions (starting from December 2021);
- Proposal writing and compilation of a list of potential calls;
- Organization of the 2nd SINERGY Workshop, see https://project-sinergy.org/2nd-Workshop;
- The list of publications, see https://project-sinergy.org/Results/Publications.

SINERGY Plenary, 23.11.2021

Hybrid

- **SINERGY Plenary 23.11.2021**
  Tue, Nov 23, 2021 9:30 AM - 12:30 PM (CET)

  Please join my meeting from your computer, tablet or smartphone.
  https://global.gotomeeting.com/join/144084885

Session 1: Tuesday, November 23, 9:30pm-12:30pm		
9:30	Opening	Johannes Stöckl
9:40	**About AIT**	Joannes Stöckl
10:00	**WP1 Coordination** - **Deliverables** - **1st Periodic Report** - **Use of Resources**	Valentina Janev, ALL
10:30	**WP3 Deliverables - Discussion and Planning (March 2022)**	- NUIG - AIT
11:00	**WP4 Deliverables - Discussion and Planning (March 2022)**	All
11:30	**WP5 Deliverables - Discussion and Planning (December 2021 and June 2022)** • **Tuesday - Internal Meeting** • **Tuesday - PhD WS -** • **Wednesday - Training** • **Joint Event on 2nd of June 2022 (Thursday)**	All
12:00	**Lunch**	All
Session 1: Tuesday, November 23,13:30pm-16:00pm		
13:30	**WP4 - Proposal Writing**	All
15:00	**WP6 - Dissemination**	All
16:00	End of the Meeting	

3.2 Young Researchers Workshop

This part of the workshop was especially designed for the participation of young researchers from Serbia, Ireland, and Austria and with the prime objective to start the creation of a network for future collaborations between the three Sinergy institutions.

Hence, the agenda of the workshop consisted of an introduction phase and a group work phase.

3.2.1 Introduction phase

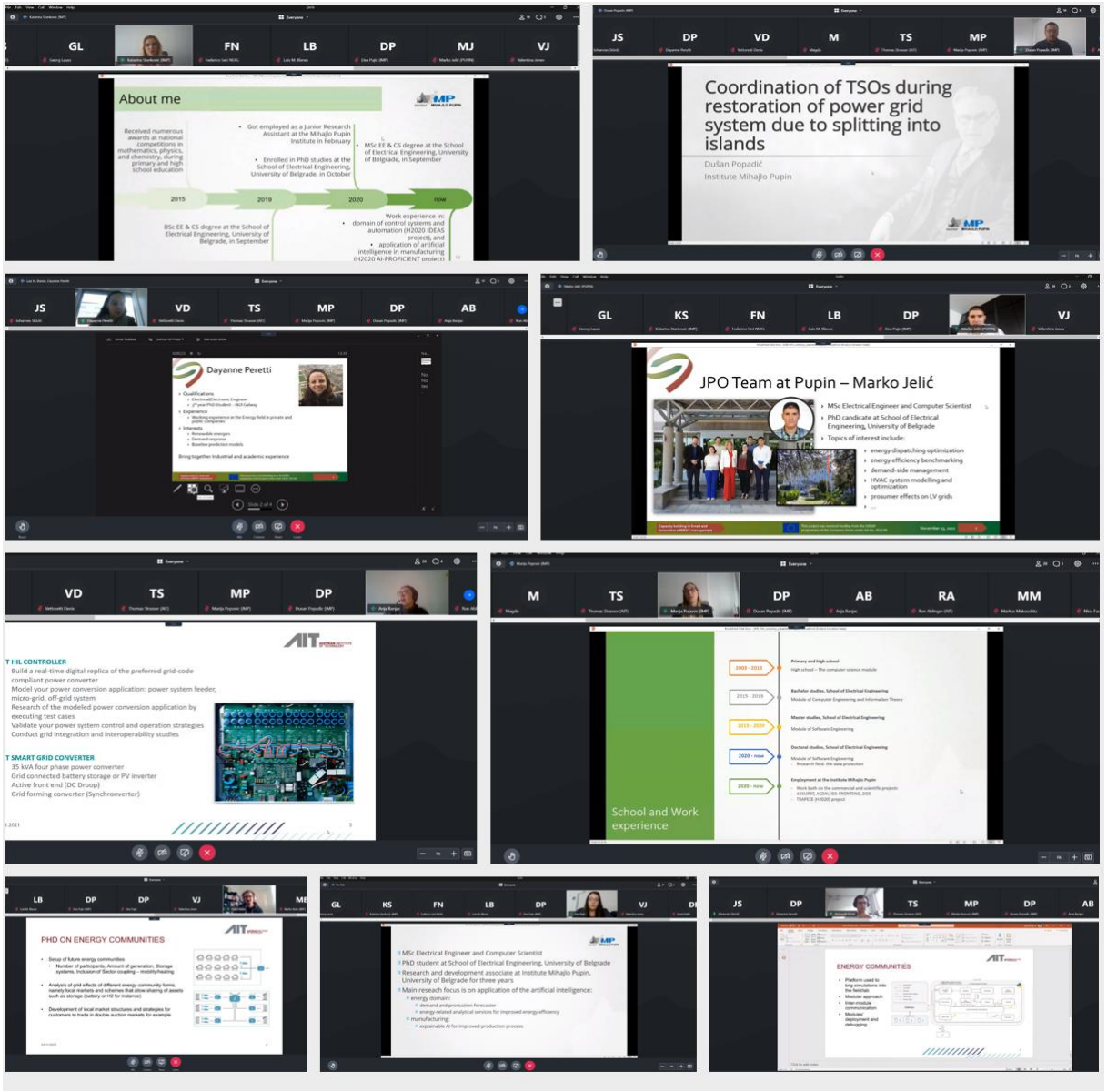

Figure 6. Selection of young researcher presentations

Each of the 16 participants presented three slides within a maximum of 5 minutes, where one slide should provide personal information and two slides consisted of current research interests. A selection of the presentations can be seen in Figure 6. The main objective was to provide base information of the participants as they have never met before in this constellation and further to provide an entry point experience to the presenting researchers as preparation for subsequent group work discussions.

Attendees:

- IMP Ph.D. students: Dea Pujić, Marko Jelić, Katarina Stanković, Marija Popović, Dušan Popadić;
- AIT Ph.D. students: Nina Fuchs, Michael Spiegel, Ron Ablinger, Denis Vettoretti, David Reihs;
- NUIG Ph.D. students: Alessandro Piccinini, Letizia D'Angelo, Dayanne Peretti Correa, Shima Yousefigarjan, Raquel de Castro Rodrigues Lima, Desiree Arias.

This part of the event was also an opportunity to reflect on the previous collaboration between the SINERGY partners and identify common topics of interest, see Figure 7.

The list of topics introduced is available at https://project-sinergy.org/PhD-Workshop-2021.

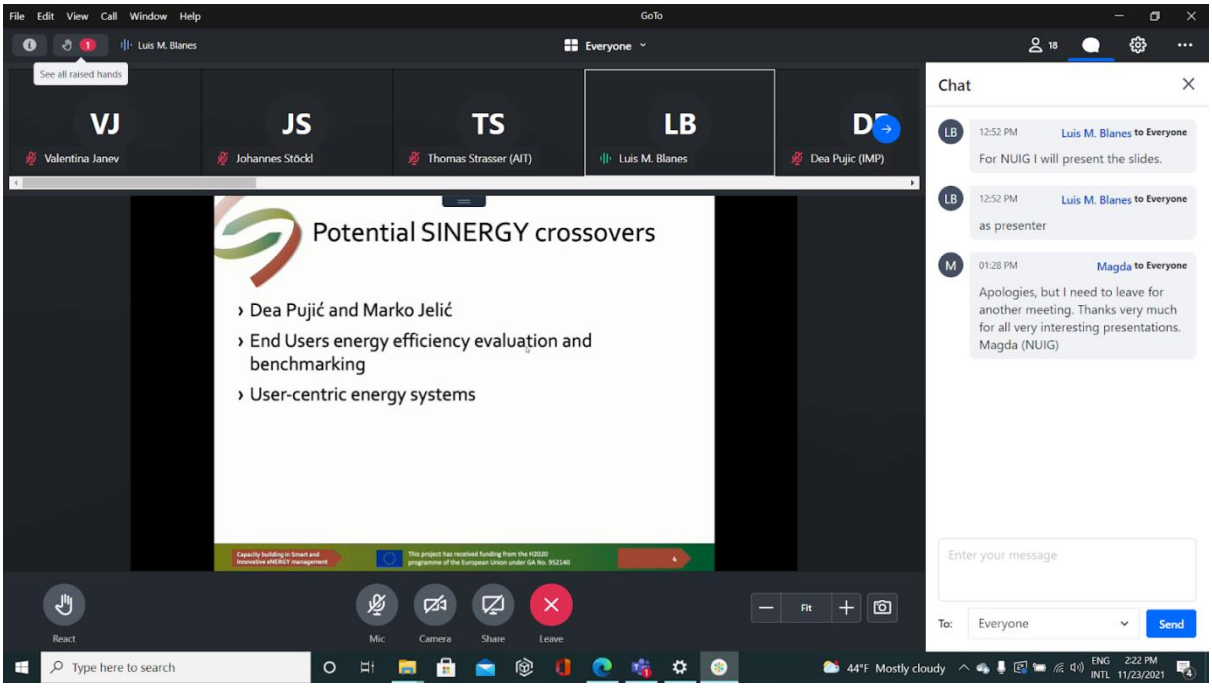

Figure 7. Potential SINERGY crossovers

3.2.2 Group work phase

As a second phase group work has been designed which followed an AIT methodology based on innovation concepts as described e.g., by Jean-Philippe Hagmann [1].

Generally, using this method, the participants are divided into three groups and will last for three steps. In the first step, the groups define a problem which needs to be solved and the stakeholder, which is interested in the solution. The problems are presented in the forum afterwards with the goal that all groups understand the problem statement. In a second step, the problem is handed over to another group (1 to 2, 2 to 3, 3 to 1). Here, the groups are asked to think about a solution which would be a consequence of an incremental development of the existing system setup. This excludes all paradigm shifts. Afterwards, the solutions are presented to the forum again, kicking off the last group work. The objective in this step is to think about a radical innovation, which is (almost) excluding the current system setup and everything is allowed which solves the problem.

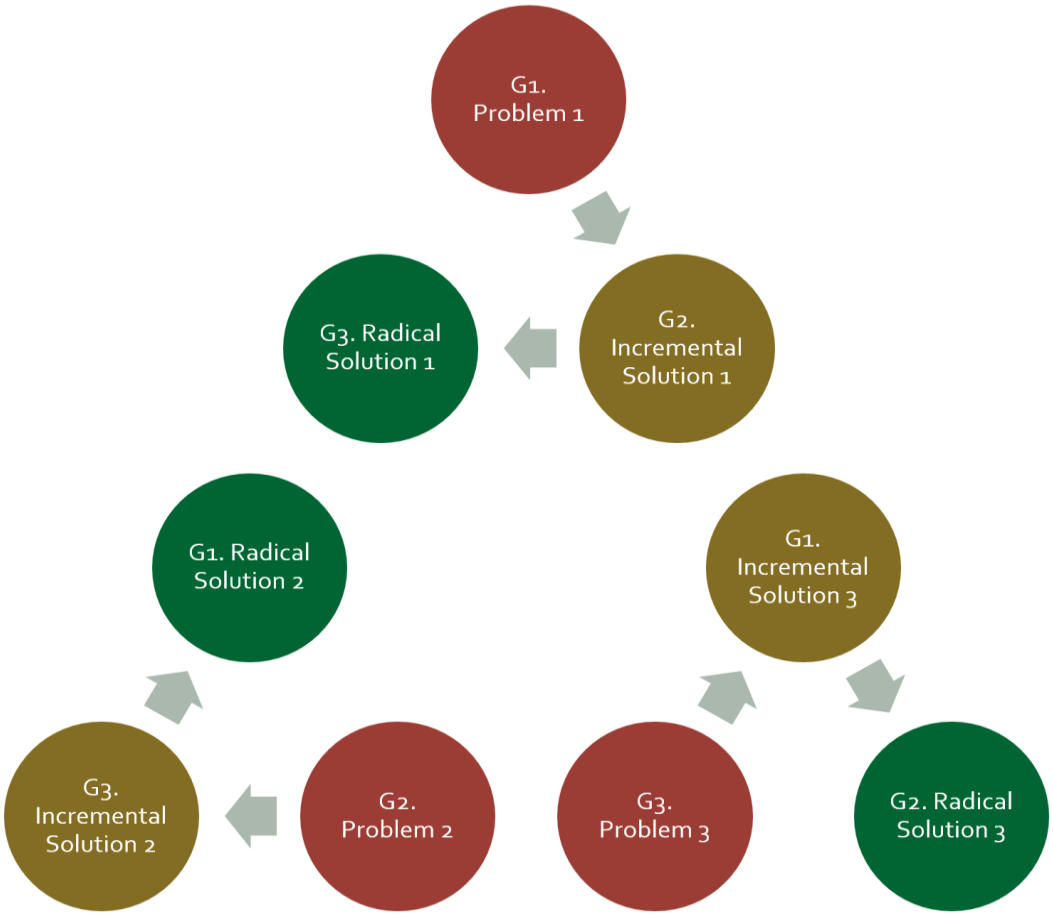

Figure 8. Schematic process of group work

Problem example:

Problem: Energy balancing

Topic overview: With the increase of RES share on the production side, matching production and demand becomes more challenging. How can this be solved?

Motivation: Grid stability, cost minimization, Enabling consumers to become prosumers

Relevant stakeholders: DSO, ESCO, TSO, prosumers

Energy needs to be balanced with low cost with increasing RES share on production side

Solution 1 (incremental):

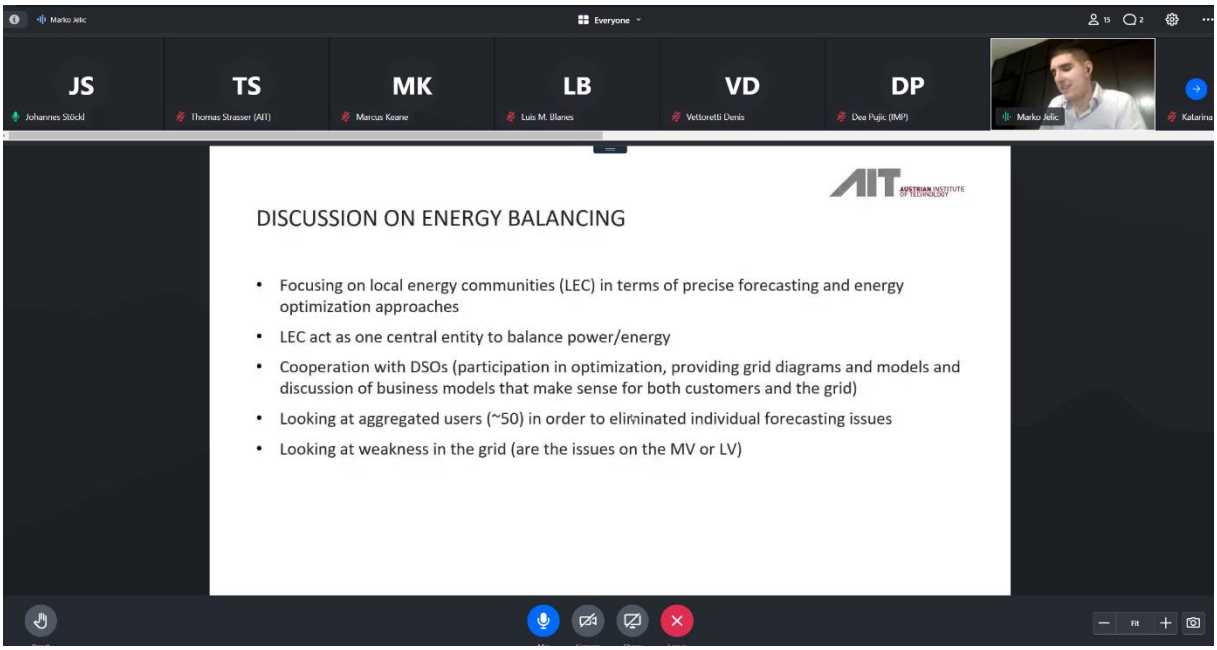

Figure 9. Workshop presentation on incremental problem solution

Solution 2 (radical):

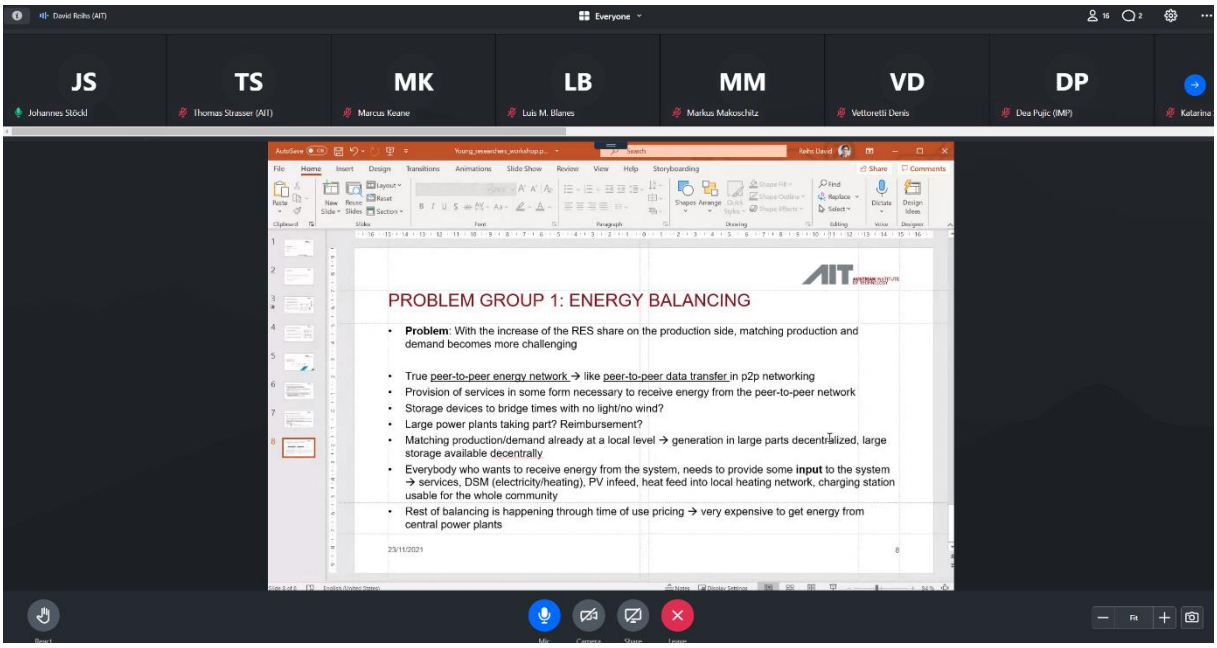

Figure 10. Presentation of radical innovation

The workshop concluded with a feedback round.

4. Day 2 – Nov. 24th, 2021

Day two has focused on an educational lecture workshop where students from IMP, NUIG and AIT were able to participate. The two topics covered were hardware-in-the-loop (HIL) methods for electric systems and fundamentals of power electronics.

Agenda for Day 2:

09.00 am	Welcome, Introduction,
09.30 am	Seminar 1 (Georg Lauss)
12.00 pm	Lunch break
01.00 pm	Seminar 2 (Markus Makoschitz)
04:00 pm	Summary and final discussion
04.30 pm	End of Day

4.1 Training: Real-time based HIL Simulation for Electric Systems

Georg Lauss (AIT)[1] provided a lecture on HIL methods, theory and application for electric power systems (Figure 11). Details of the training are part of Deliverable 4.1 according to the project plan.

Figure 11. Online lecture of Georg Lauss (AIT)

[1] https://info.typhoon-hil.com/champions/ait-georg-lauss-austrian-institute-of-technology-using-controller-hardware-in-the-loop

4.2 Training: Fundamentals of Power Electronics

Markus Makoschitz (AIT)[2] presented fundamentals of power electronics as a starter course which also served as a prerequisite for the upcoming trainings by Markus Makoschitz, Zoran Miletić[3], and Roland Bründlinger[4].

Details of the training are part of Deliverable 4.1 according to the project plan.

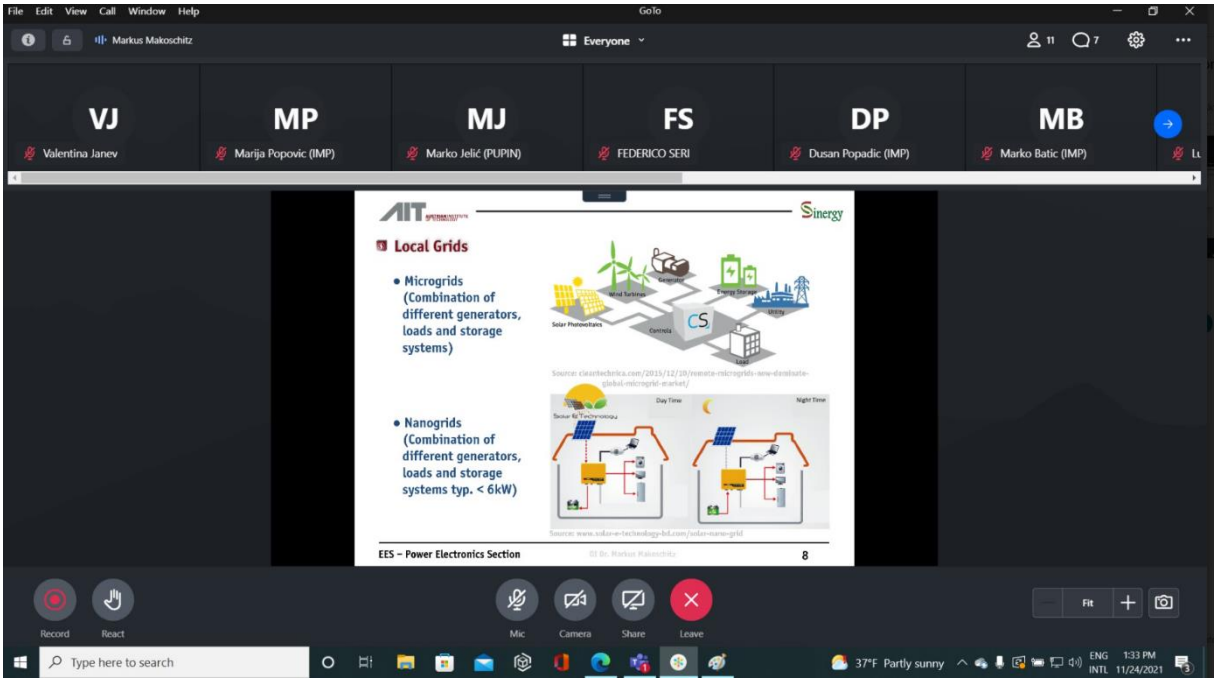

Figure 12. Online lecture of Markus Makoschitz (AIT)

[2] https://www.ait.ac.at/en/about-the-ait/researcher-profiles?tx_aitprofile_pi1%5Bname%5D=Makoschitz%20Markus&cHash=7b42f68f8824101872af10ab3a4eb031

[3] https://www.ait.ac.at/en/about-the-ait/researcher-profiles?tx_aitprofile_pi1%5Bname%5D=Miletic%20Zoran&cHash=889c5d6c284a76337d520748cd7f92c9

[4] https://www.ait.ac.at/en/about-the-ait/researcher-profiles?tx_aitprofile_pi1%5Bname%5D=Br%C3%BCndlinger%20Roland&cHash=69d2afa70968006d5043da99dc9b8c48

5. Day 3 – Nov. 25th, 2021

Agenda for Day 3:

09.00 am	Welcome, Introduction,
09.30 am	Seminar 3 (Zoran Miletić)
12.00 pm	Lunch break
01.00 pm	Start of joint Sinergy – IEEE Austria event
01.15 pm	Opening (DI Dr. Johannes Stöckl - AIT)
01.20 pm	Integrated Energy Value Chains (DI Dr. Valentina Janev – Mihajlo Pupin Institute)
01.45 pm	Context Aware Monitoring (Prof. Axel Jantsch – TU Vienna)
02.30 pm	Coffee break
02.45 pm	Knowledge Graphs for Energy - Challenges and Opportunities (Prof. Emanuel Sallinger – TU Vienna)
03.30 pm	Hidden Malware Communication in Critical Infrastructures (Prof. Tanja Zseby – TU Vienna)
04.15 pm	End of online event

5.1 Training: Control of Grid Power Converters and Power Conversion Systems

Zoran Miletić provided a lecture on power converter controls to connect previous lectures on fundamentals with today's grid topics (Figure 13).

Details of the training are part of Deliverable 4.1 according to the project plan. This training was also recorded for future reference.

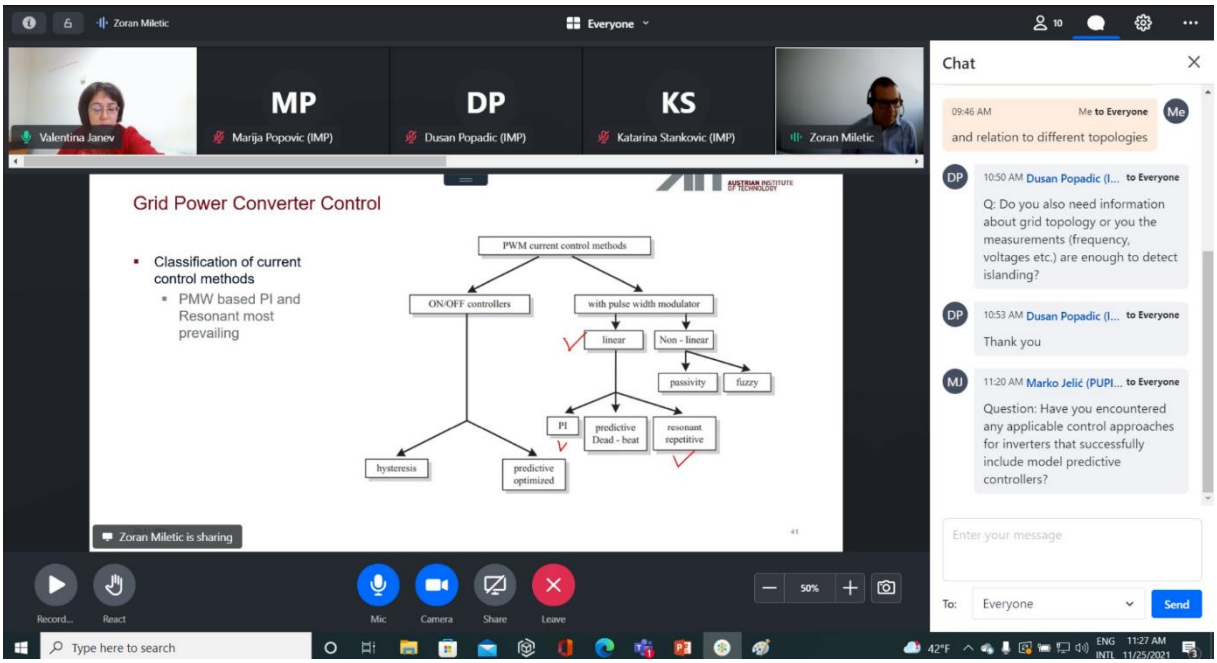

Figure 13. Online lecture of Zoran Miletić (AIT)

5.2 Open Webinar on Digital Transformation Technology

To introduce new related topics into the Sinergy consortium as well as a way to disseminate the project work outside if the consortium a joint workshop with external speakers and participants has been organized. Here, the consortium was also supported by various chapters of the IEEE Austria section, namely IAS (Industry Applications Society), PELS (Power Electronics Society), IES (Industrial Electronics Society). See Figure 14 to Figure 20.

Webinar Series

Invitation to Attend the Digital Transformation Technology Webinar

Date: Thursday, November 25th, 2021, Time: 1:10 PM – 4:15 PM CEST (UTC+1)
Location: Hybrid – ONLINE OR AT 1210 VIENNA, GIEFINGGASSE 2

Registration: To register for the event (FREE) please visit the IEEE registration page https://events.vtools.ieee.org/event/register/289193 or contact markus.makoschitz@ait.ac.at.
Login information for joining the online event will be provided right before the event starts!

Workshop Moderator: Johannes Stöckl (AIT Austrian Institute of Technology GmbH)

Agenda

13:10 – 13:15: Welcome
13:15 – 13:20: Opening (DI Dr. Johannes Stöckl - AIT)
13:20 – 13:45: Integrated Energy Value Chains (DI Dr. Valentina Janev – Mihajlo Pupin Institute)
13:45 – 14:30: Context Aware Monitoring (Prof. Axel Jantsch – TU Vienna)
14:30 – 14:45: Coffe break
14:45 – 15:30: Knowledge Graphs for Energy - Challenges and Opportunities (Prof. Emanuel Sallinger – TU Vienna)
15:30 – 16:15: Hidden Malware Communication in Critical Infrastructures (Prof. Tanja Zseby – TU Vienna)
16:15: End of Online Event

Note: There will be an AIT EES lab tour and a Horizon Europe round table right after the event, for those participants who attended the workshop physically.

Organizers:

This event is jointly organized by the IEEE IAS/PELS/IES Joint Chapter Austria, the IEEE PES Chapter Austria, **AIT Austrian Institute of Technolgy GmbH** and the **Mihajlo Pupin Institute**. The workshop is also supported via the project Sinergy (https://project-sinergy.org/). This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 952140.

Speaker Information:

Title: Integrated Energy value Chains – Research Perspective

Abstract: The European electricity system undergoes significant changes driven by the European Union (EU) common rules for the internal market for electricity, as well as by the climate action agenda. In this context, the challenges that result from penetration of variable renewable energy sources) in the electricity value chain and the need for future innovative solutions are discussed. Results from currently running EU projects will be presented.

Speaker: Dr. Valentina Janev is a Senior Researcher at the Mihajlo Pupin Institute, University of Belgrade, Serbia and Associated Professor at the Belgrade Metropolitan University. She was a Coordinator of recently finished EU project LAMBDA Learning, Applying, Multiplying Big Data Analytics. Currently, she is in the coordination team of EU project SINERGY Capacity building in Smart and Innovative eNERGY and leads the implementation of the Serbian Pilot in the EU project PLATOON - Digital PLAtform and analytic TOOls for eNergy.

This event is supported by **AIT Austrian Institute of Technology Gmbh** and **Graz University of Technology**.
If you are looking for more information about **IEEE Austria IAS/PELS/IES Joint Chapter**, please visit our webpage: http://www.ieee-austria.org/index.php/chapters/41-ias-pels-ies
For **further information** please contact **JC chair** markus.makoschitz@ait.ac.at or **vice-chair** s.leitner@tugraz.at

Figure 14. Announcement on IEEE - Austria Section website

The Open Event was an opportunity to present results from other projects and to discuss the possibilities for elaboration of results further in the SINERGY framework.

Dr. Valentina Janev, thus presented results from currently running projects **PLATOON** – Digital **PLA**tform and analytical **TOO**ls for e**N**ergy[5] and ARTEMIS - ARTificial Intelligence in Energy Management Innovative Services[6].

[5] https://platoon-project.eu/
[6] https://projekat-artemis.rs/

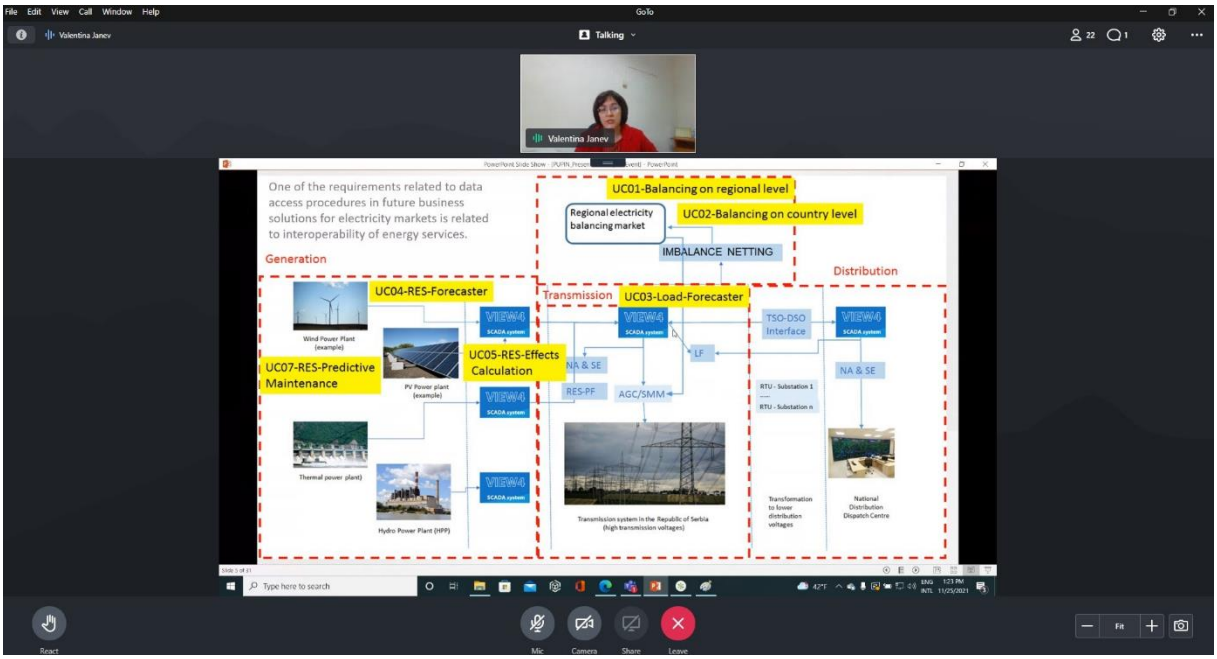

Figure 15. Presentation by Valentina Janev (IMP) [2]

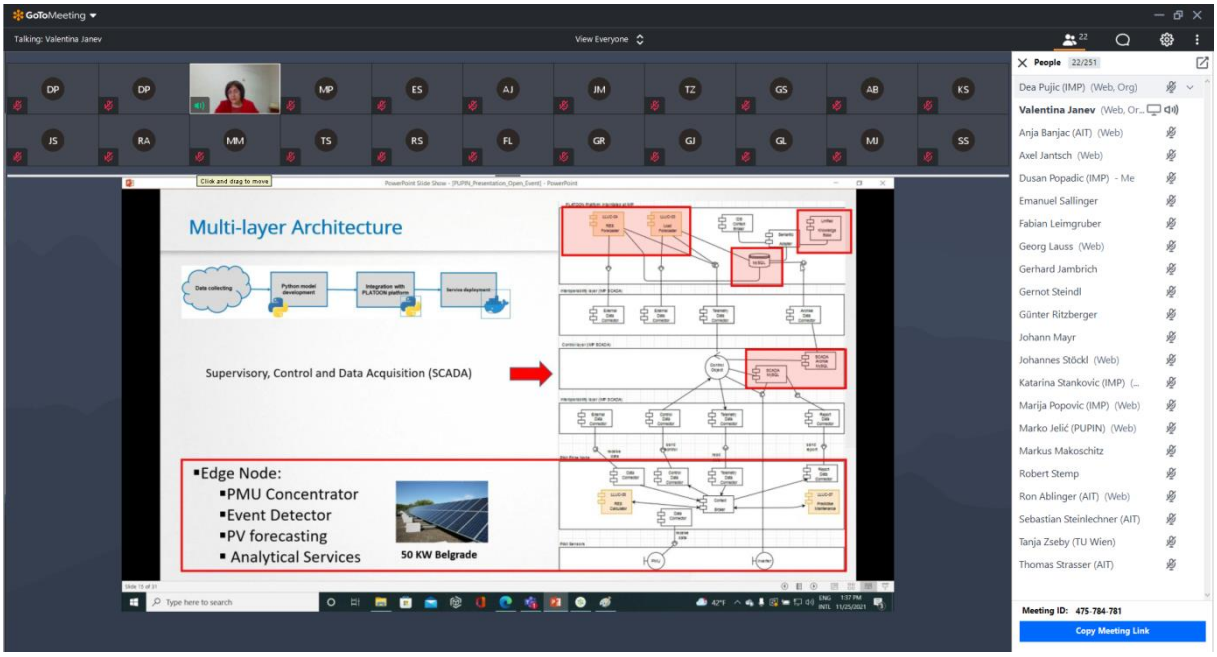

Figure 16. Presentation of Valentina Janev (IMP) [3]

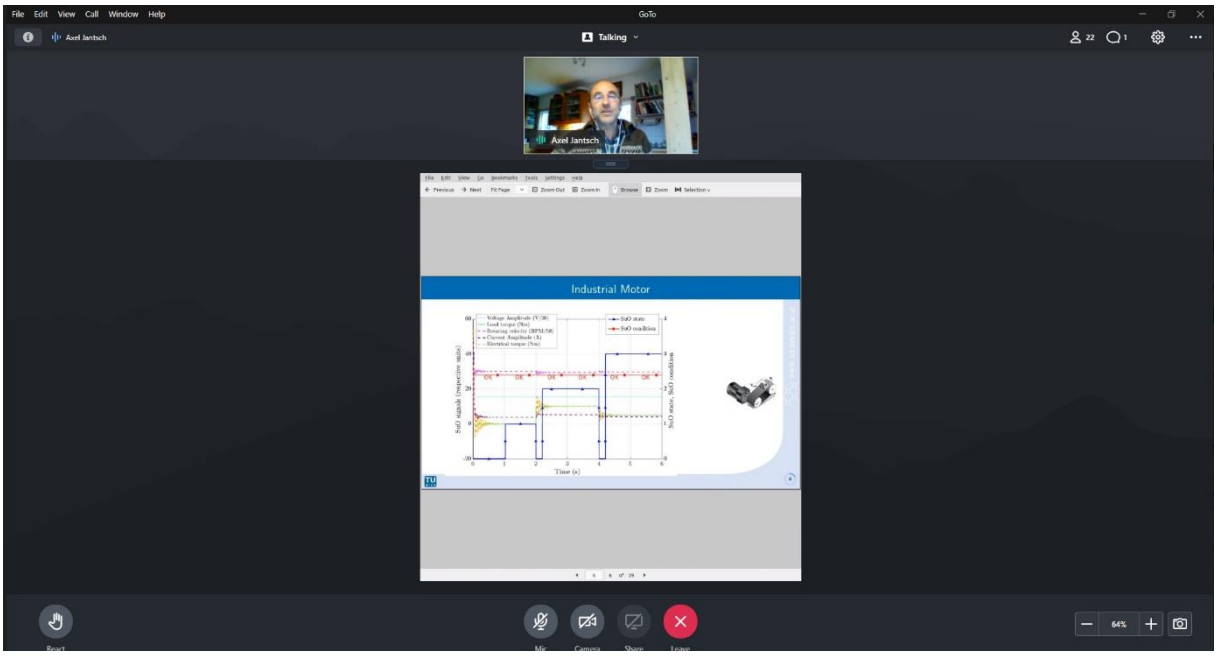

Figure 17. Presentation of Axel Jantsch (TU Vienna)

Ph.D. students had an opportunity to discuss topics of interest with the distinguished invited professors, see Figure

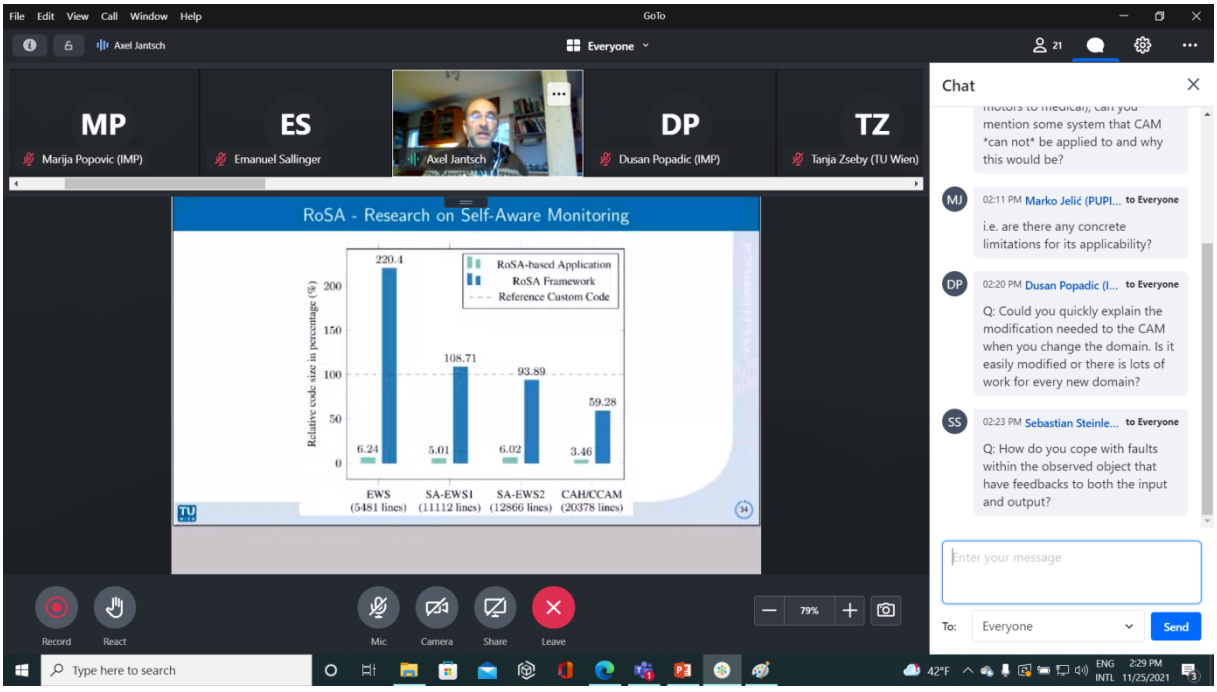

Figure 18. Axel Jantsch answering questions from IMP Ph.D. students

Prof. Emanuel Sallinger, jointly appointed at the TU Vienna and Oxford University initiated a discussion of application of knowledge graphs for the energy sector.

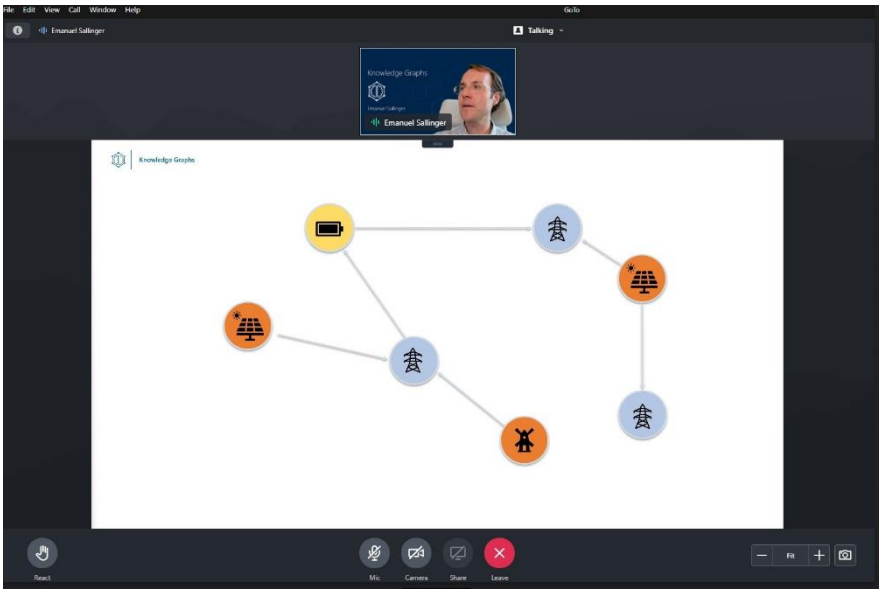

Figure 19. Presentation of Emanuel Sallinger (TU Vienna) [4]

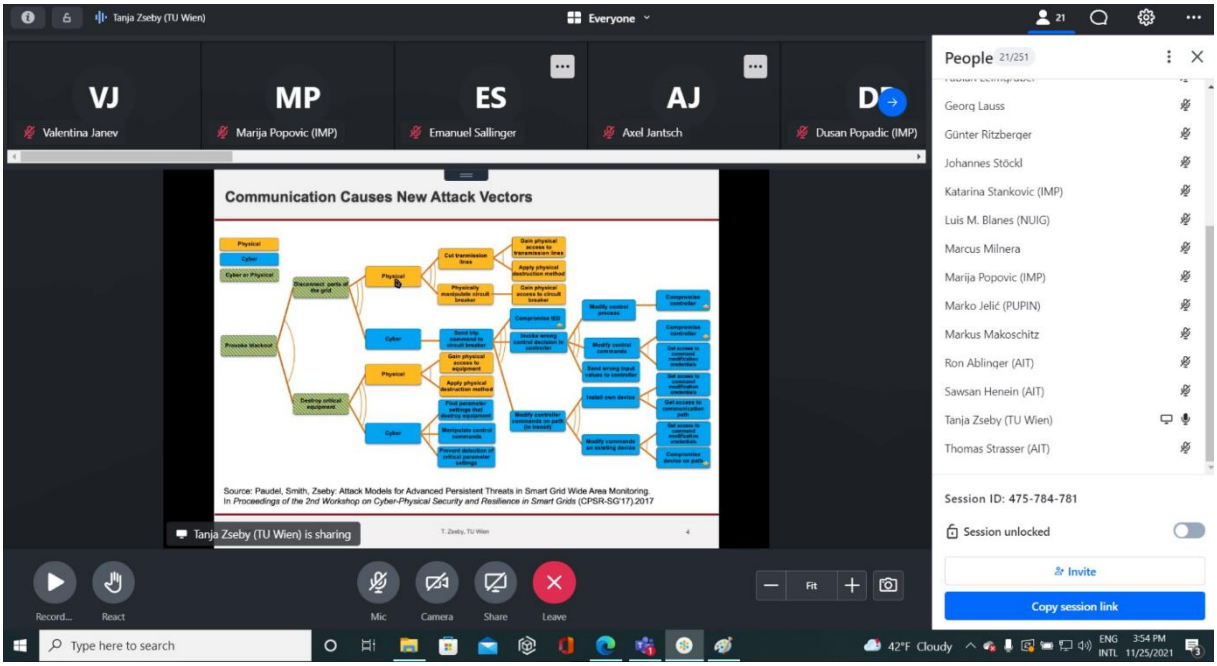

Figure 20. Presentation of Tania Zseby (TU Vienna)

5.3 Closing Session and Impressions from the 1st Workshop

The final session of the 3-day event was devoted to presenting a summary of the SINERGY activities in the first project year, discussing the overall goals of the project until the project end and planning the future collaboration with relevant stakeholders.

The core consortium team concluded that there are a plenty of opportunities for collaboration on different levels e.g., by enhancing Ph.D. students' collaboration, by specifying new research and innovation directions in the Horizon Europe framework

(Cluster 5: Climate, Energy and Mobility[7] and Cluster 4: Digital, Industry and Space[8]) and by involving the partners' technology transfer offices in direct acquisition of commercial projects.

Participants were invited to provide feedbacks about the 3-day event and suggestions for the forthcoming 2nd SINERGY Workshop[9].

Table 2. Impressions from the 1st SINERGY Workshop

Organization	Feedback collected
NUIG	"The workshop was very well organized and informative. During the first day, there were fruitful discussions about the SINERGY project deliverables where ongoing research and future plans were presented (e.g., the second workshop to be held in Ireland in 2022). Also, there were presentations from each PhD student about their projects, which was very interesting not only due to the opportunity to present the PhD's projects but also to know better the projects from AIT and Pupin, with the possibility of finding collaboration opportunities between the partners. During the first afternoon, a problem-solving method was presented, where all the Ph.D. students were asked to define a problem related to the energy field and asked to solve it in different approaches. This was very interesting to gather knowledge from different fields of study for solving the same problem in a collaborative manner. On the second and third days, there were technical workshops about the AIT expertise. Markus Makoschitz, on the first day, presented an introduction about DC/DC converters (Buck, Boost and Buck-Boost), standard applications and the implementation characteristics of different converters. Georg Lauss also during the second day, presented topics about real-time/ non-real-time simulation and Hardware-in-the-loop (HIL) systems, focusing on where these systems are used with Use Cases about Anti Islanding Testing, Ride Through Testing and Advanced Grid Support Functions. Zoran Miletić on the third day presented about PV inverters, focusing on classification (per type, per technology and per isolation). During the second day, Johannes Stöckl showed us the complete AIT installation. The SmartEST laboratory, High Current laboratory, High Voltage laboratory and Power Electronics Laboratory for instance. During the visit, he explained the tests performed in each of them with details about the most common equipment tested in each laboratory. From NUIG participants' view, the workshop was a very important

[7] https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/cluster-5-climate-energy-and-mobility_en

[8] https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/cluster-4-digital-industry-and-space_en

[9] https://project-sinergy.org/2nd-Workshop

	experience. Visiting another country and being able to share knowledge is always a very good opportunity. Unfortunately, due to the COVID-19 restrictions, not all the partners were able to participate in person. However, we would say that being there, visiting the AIT installations, laboratories and being able to ask questions about each equipment in person was a very important opportunity.”
IMP Ph.D. student	*"Professor Jantsch's presentation on "Control Aware Monitoring for Smart Grids" was a great opportunity for expanding my own research scope, although it does not have anything to do with smart grid. Namely, it was a showcase that lectures like this could have a stunning impact on your career due to the multidisciplinary applicability and universal geniality of the conceptual ideas we can hear. That's why I have found the event startlingly great! "*
IMP Ph.D. student	“The presentations from researchers and professors from AIT were very interesting and detailed. Although technical, they have provided in-depth analyses and interesting demonstrations of different aspects related to power electronics and renewable energy systems in general. I believe that this knowledge can be highly beneficial for electrical engineers working on various energy assets that are essential in the transition towards greener power sources.”
IMP Ph.D. student	*"The event was excellently organized and has given me the opportunity to find out a lot about research from other PhD students. The PhD workshop initiated fruitful discussion between young researches on various energy related topics such as Energy balancing, Application of block chain platform in the energy domain, Energy dispatching etc."*

6. Conclusion

Overall, the experience gained from organizing the 1st Workshop on Smart grid technologies is very positive. We see not only a clear benefit for the IMP researchers, but also for Ph.D. students from AIT and NUIG. The preparations for 2nd Workshop on Energy efficient building operation have already started and we anticipate that travel restrictions due to COVID-19 will be released and/or simplified.

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