



WP4  
Mutual Exchange of Personnel and Early Stage Researcher  
Involvement

# D4.2 Updated Report on Mutual Exchange of Personnel and Training Activities

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## Executive Summary

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The work package 4 is specifically dedicated to ensuring the involvement of IMP's early-stage researchers in terms of providing adequate support by strategic partners as part of their training and (co-)mentoring activities. Hence, different staff exchange activities were conducted in the project framework. While in the first reporting period, this WP was affected by the COVID measures, in the years 2022 and 2023 the staff exchange activities continued as planned in the GA.

Besides organizing the staff exchanges of IMP personnel in the premises of strategic partners (AIT, NUIG), within this work package other staff exchanges were conducted such as

- hosting of distinguished foreign researchers (from AIT and NUIG) and their participation in the expert group meetings and training of IMP researchers;
- hosting of distinguished foreign researchers at IMP to participate at SINERGY events (Advisory Board meeting, SINERGY Conference, training, thematic meetings);
- travel of researchers from other organizations from Serbia e.g. from the Institute Nikola Tesla (INT) to AIT, Austria).

The only staff exchange that occurred in the first project year was the visit of NUIG staff to AIT in November 2021, please check D4.1 [Report on Mutual Exchange of Personnel and Training Activities](#).

Starting from March 2022, many knowledge transfer and joint activities were conducted on premises (at IMP, AIT and NUIG) as is summarized in Section 2 of this report. Having in mind that deliverables that were previously submitted in WP3, WP4 and WP5 framework already documented the activities, Section 3 and Section 4 point to few examples from the years 2022 and 2023, while further details can be found on the SINERGY website at the following link [Staff Exchange | Project Sinergy \(project-sinergy.org\)](#).

Examples of online training events are given in Section 5.



## Table of Contents

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1	Introduction.....	8
1.1	Main Objectives and Deliverable Scope.....	8
1.2	Structure of the Deliverable .....	9
2	Overview of Staff Exchange Activities.....	10
3	Year 2022 Activities (Examples).....	14
3.1	AIT representatives visit to IMP (Staff exchange #8) .....	14
3.2	NUIG representative visit to IMP (Staff exchange #5) .....	16
4	Year 2023 Activities - IMP visit to NUIG (Example) .....	17
4.1	Day 1 - Visit to NUIG facilities .....	18
4.2	Day 2 - Aran Islands visit (day one).....	22
4.3	Day 3 - Aran Islands visit (day two) .....	24
4.4	Day 4 - Visit to Boston Scientific.....	27
4.5	Day 5 - Visit to Insight.....	28
5	Examples of online training events (2nd reporting period) .....	29
5.1	Methods and Future Scenarios for Strategic Grid Development of Full Low and Medium Voltage DSO Supply Areas .....	29
5.2	Emerging Technologies for Power Grid Electronics Systems in Smart Grids.....	30
5.3	Buildings Grid Readiness - Technology Assessment .....	32
6	Conclusion.....	34
7	Annex I: Visit of AIT premises and training for INT staff .....	35
7.1	Participants .....	35
7.2	Agenda - day 1 .....	35
7.3	Agenda - day 2 .....	37
7.4	Conclusion .....	39



## List of Figures

Figure 1. Staff exchange in the 2nd reporting period .....	8
Figure 2. AIT Training, December 2022.....	14
Figure 3. AIT Training, December 2023.....	15
Figure 4. AIT Testbed, December 2023.....	15
Figure 5. AIT Testbed (experimental results), December 2023 .....	15
Figure 6. NUIG staff exchange to IMP, July 2022.....	16
Figure 7. Initial agenda for the Galway visit in late November, 2023 .....	17
Figure 8. Second presentation by Raquel Lima.....	19
Figure 9. BMS presentation by Luis Miguel Blanes Restoy.....	19
Figure 10. Alice Perry building's BMS system presentation.....	20
Figure 11. Alice Perry building's renewable installations (PVs and PVTs on the left and AHX on the right) .....	20
Figure 12. Heat pump plant with data demo from in Alice Perry building (with boreholes as the primary energy source) .....	21
Figure 13. NUIG's Mathematics building heat pump installation (buffer tank and flow pipes on the left and AHX on the right with PVs in the background).....	22
Figure 14. Meeting in the Inis Mor community office.....	23
Figure 15. Visit to the child care facility.....	23
Figure 16. Innovative CTS-H2 system at the recycling center showing the fuel cell on the left and inverters and control unit on the right.....	24
Figure 17. Electrolizers on the left and hydrogen storage on the right within the CTS-H2 unit .....	25
Figure 18. Various processes in the recycling center (cut cardboard and paper used for composting on the left and waste press on the right).....	25
Figure 19. A meeting discussing an upcoming joint publication at the community center .	26
Figure 20. Arrival at Boston Scientific .....	27
Figure 21. Insight Institute on the left and communication museum on the right .....	28
Figure 22. AIT Online Training, December 2023.....	30
Figure 23. AIT Online Training, November 2023.....	31
Figure 24. NUIG Online Training, October 2022 .....	32
Figure 25. NUIG Online Training (hands-on session), October 2022 .....	33
Figure 26. SiC-MOSFET based, watercooled inverter in Smart Grid laboratory .....	36
Figure 27. SmartEST laboratory visit.....	36
Figure 28. uGrid setup demo.....	37
Figure 29. INT associates attending the PV Home Storage System demo.....	38



**List of Tables**

Table 1. Staff exchange - Summary for 2022 ..... 11  
Table 2. Staff exchange - Summary for 2023 ..... 13



## Abbreviations and Acronyms

<b>AHUs</b>	Air Handling Units
<b>AIT</b>	Austrian Institute of Technology
<b>CA</b>	Consortium Agreement
<b>CO</b>	Coordinator
<b>CPH</b>	Combined Heat and Power
<b>DSO</b>	Distribution System Operator
<b>EMS</b>	Energy Management System
<b>ERDF</b>	European Regional Development Fund
<b>EU</b>	European Union
<b>GaN</b>	Gallium Nitride
<b>HIL</b>	Hardware in the Loop
<b>HVAC</b>	Heating, Ventilation, and Air conditioning
<b>IEEE</b>	Institute of Electrical and Electronics Engineers
<b>ICT</b>	Information and Communications Technology
<b>IMP</b>	Institute Mihajlo Pupin
<b>INT</b>	Institute Nikola Tesla
<b>NUIG</b>	University of Galway
<b>PV</b>	<b>Photovoltaic</b>
<b>RCP</b>	Rapid Control Prototyping
<b>R&amp;D</b>	Research and Development
<b>SiC</b>	Silicon Carbide
<b>STCs</b>	Solar Thermal Collectors
<b>WP</b>	Work Package



## 1 Introduction

### 1.1 Main Objectives and Deliverable Scope

The aim of work package 4 is to coordinate the Sinergy activities on staff exchange and training. WP4 is organized as follows:

- Task 4.1: Hosting of distinguished foreign researchers (for training lectures);
- Task 4.2: Organization of short-term and long-term stays (for all Sinergy staff);
- Task 4.3: Engagement of IMP's early stage researchers (to involve young researchers in projects).



AIT and NUIG representatives at IMP, November 2023



INT team staff exchange with AIT, March 2023



IMP and AIT visit to NUIG, May 2023



Promotion of Institute Mihajlo Pupin at the 2nd Open Event at NUIG, May 2023

Figure 1. Staff exchange in the 2nd reporting period

Though the first half of the project was heavily affected by the COVID-19 pandemic the project team managed to fulfill the training plan using webinar technologies.

Activities in the first reporting period were described in

- D4.1 [Report on Mutual Exchange of Personnel and Training Activities](#); and





- D4.3 [Report on Early Stage Researcher Engagement and Mentoring](#).

This deliverable summarizes the activities conducted in Tasks 4.1 and 4.2 in the year 2022 and year 2023, while further details can be found on the SINERGY website at the following link [Staff Exchange | Project Sinergy \(project-sinergy.org\)](#).

## 1.2 Structure of the Deliverable

In the project framework fourteen on-premises staff exchange activities have been organized as has been listed in Table 1 in Section 2.

Section 3 and Section 4 point to example activities from the year 2022 and year 2023. Examples of online training events are given in Section 5.



## 2 Overview of Staff Exchange Activities

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The staff exchange activities organized in the SINERGY framework on-premises (Belgrade, Vienna, Galway) contributed to the following SINERGY objectives:

- To improve the know-how and excellence capacity of the IMP staff through training (see for instance **Staff exchange #2**, **Staff exchange #8**, **Staff exchange #14**) and hands-on sessions (**Staff exchange #2**, **Staff exchange #5**);
- To improve the creativity by exposing IMP researchers to new research areas from AIT and NUIG domains (see for instance **Staff exchange #9**, Vienna and **Staff exchange #13**, Galway);
- To enhance the reputation by positioning IMP as a leader and promoting the IMP Center of Excellence in Vienna (**Staff exchange #3**) and Galway (**Staff exchange #4**);
- To increase the mobility of early stage researchers and further supports the development of innovative solutions (services/prototypes/products) (see **Staff exchange #4**, **Staff exchange #7**, **Staff exchange #12**, **Staff exchange #13**);
- To network with stakeholders from Serbia and the Region and further mobilize the Serbian industry (**Staff exchange #6** and **Staff exchange #11**).

The list of researchers (including professors and senior researchers) who were involved in the staff exchange activities in the first reporting period was given in D4.1 [Report on Mutual Exchange of Personnel and Training Activities](#), see Section 4.

Additionally, in D4.4 [Updated report on Early Stage Researcher Engagement and Mentoring](#), we have documented the early-stage researchers who were involved in the events organized during the stay of senior researchers on premises because of open events, Ph.D. workshops or training.



Table 1. Staff exchange - Summary for 2022

Year	Quarter	Events	Host	Researchers who travel
2022	1	<b>Staff exchange #2</b> <u>Staff exchange (AIT) and Training, Pilot 3 (IMP), March 2022</u>	IMP	Zoran Miletić, Anja Banjac
		<b>Staff exchange #3</b> (IMP), SINERGY Training and Project Meeting (Vienna) <u>Staff exchange (IMP), Pilot 1 (AIT), March 2022</u>	AIT	Valentina Janev Dea Pujić Marko Jelić
	2	<b>Staff exchange #4</b> (AIT, IMP), 2nd SINERGY Workshop, a Ph.D. Training and Open Event (Galway, hybrid) <u>Second SINERGY Workshop - Energy Efficient Building Operation, May 2022</u>  <u>Staff exchange (AIT, IMP), Pilot 2 (NUIG), June 2022</u>	NUIG	Valentina Janev Dušan Popadić
	3	Knowledge transfer (SmartEST SimLab)	AIT	online
		<b>Staff exchange #5</b> (NUIG), Preparation of a joint conference and journal paper <u>Staff exchange (NUIG), Pilot 3 (IMP), July 2022</u>	IMP	Dayanne Peretti Correa
		Staff exchange (IMP), Training, Preparation of a joint journal paper	AIT	online
		<b>Staff exchange #6</b> <u>SINERGY Meeting with Typhon HIL, July 2022</u>	IMP	AIT (Mr. Zoran Miletić)
	4	<b>Staff exchange #7</b> (AIT, NUIG), 3rd SINERGY Workshop, Ph.D. Training and Open Event (Belgrade) <u>Third SINERGY Workshop - Smart Energy Management, November 2022</u>	IMP	AIT (Johannes Stöckl, Bharath-Varsh Rao, PhD students) NUIG (Marcus M. Keane, Luis M. Blanes)



		<b>Staff exchange #8</b> AIT Training, Stakeholders event and Workshop <u>Grid Connected Inverter Rapid Control Prototyping (RCP) Workshop, December 2022</u>	IMP	AIT (Mr. Zoran Miletić and Mr. Roland Bründlinger)
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Table 2. Staff exchange - Summary for 2023

Year	Quarter	Events	Host	Researchers who travel
2023	1	<b>Staff exchange #9</b> <u>Staff exchange (IMP, NUIG), Pilot 1 (AIT), February 2023</u>	AIT	IMP (Valentina Janev, Valentina Timčenko), NUIG (Marcus M. Keane, PhD students)
		<b>Staff exchange #10</b> <u>Staff Exchange (INT) and Training, Pilot 1 (AIT), March 2023</u>	AIT	Representatives of the Institute Nikola Tesla
	2	<b>Staff exchange #11</b> Summer exchange NUIG, AIT to IMP, stakeholders event <u>Serbia Smart Energy Mobilization Workshop, July 2023</u>	IMP	AIT (Johannes Stöckl,
	3	Staff Exchange IMP to AIT for training purposes and to develop pilot-based activities	AIT	online
		<b>Staff exchange #12</b> Staff Exchange NUIG to AIT to IMP for the SINERGY International Conference	IMP	NUIG (Marcus M. Keane, Dayanne Peretti Correa), AIT (Johannes Stöckl, Bharath-Varsh Rao, PhD students)
	4	<b>Staff exchange #13</b> Staff Exchange IMP to NUIG to develop pilot-based activities focusing on building simulation <u>Staff exchange (IMP), Pilot 2 (NUIG), November 2023</u>	NUIG	Dea Pujić Marko Jelić
		<b>Staff exchange #14</b> <u>Integrating DER in Smart Grids and High penetration of PV in Electricity Grids, December 2023</u>	IMP	AIT (Mr. Zoran Miletić and Mr. Roland Bründlinger)



## 3 Year 2022 Activities (Examples)

### 3.1 AIT representatives visit to IMP (Staff exchange #8)

AIT staff travelled to Serbia mainly for training of IMP staff in Smart Grid topics, please check

- D3.1 [Training Courses and Learning Material on Smart Grid Technologies \(v1\)](#)
- D3.2 [Training Courses and Learning Material on Smart Grid Technologies \(v2\)](#)

For instance, we point here to the event organized in December 2022, promoted via the SINERGY webpage as follows, see [Grid Connected Inverter Rapid Control Prototyping \(RCP\) Workshop, December 2022 | Project Sinergy \(project-sinergy.org\)](#):

On 15<sup>th</sup> of December, the **Grid Connected Inverter Rapid Control Prototyping (RCP) Workshop** was organized as a hybrid knowledge transfer and training event for researchers from Serbia. The AIT Team (Zoran Miletić, Dr. Tarraso-Martinez Andres, Roland Bründlinger) presented AIT activities as follows:

- 10.00 - 12.15 **Rapid Controls Development for the Grid Connected/Forming Power Converters**, presented by Zoran Miletić, Dr. Tarraso-Martinez Andres

*This presentation is the 3rd part of lectures on the Control of Grid Connected Power Converters with emphasis of actual implementation of the controls on AIT's Rapid Controls Development Platform with live demonstrations on Typhoon C-HIL Real Time simulator, [see more info here](#)*

- 13.00 - 15.00 **Grid Interconnection Codes and Requirements - Review of Today's codes and requirements and future trends**, presented by Roland Bründlinger

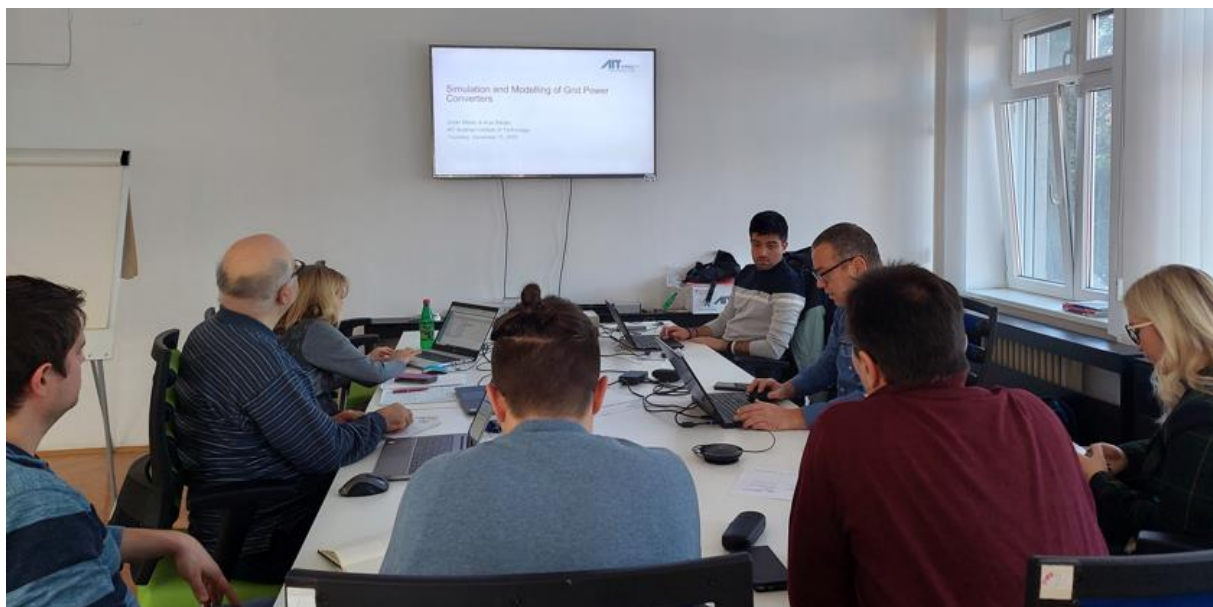


Figure 2. AIT Training, December 2022

Roland Bründlinger, accompanied by Zoran Miletić and Anja Banjac presented a state of the art analysis related to Smart Grid Forming Converters, and results from testing within the AIT testbed, during the training event in December 2023 (**Staff exchange #14**).



Figure 3. AIT Training, December 2023



Figure 4. AIT Testbed, December 2023



Figure 5. AIT Testbed (experimental results), December 2023



### 3.2 NUIG representative visit to IMP (Staff exchange #5)

Besides other visits of the NUIG staff to IMP, in July 2022, a staff exchange was organized for Ms. Dayanne Peretti Correa, PhD Candidate at the National University of Ireland, Galway to the Institute Mihajlo Pupin. In this short term visit, Ms. Dayanne worked with IMP colleagues on the elaboration of scenarios for Demand Response Applications via Optimized Heat Pump Operation.



Figure 6. NUIG staff exchange to IMP, July 2022

**Dayanne's testimony:** *At the beginning of 2019, I started to collaborate with the Institute Mihajlo Pupin in joint European Projects under the H2020 program. After three years of online meetings and collaboration, I went on behalf of NUI Galway to the Institute for a summer exchange, where I was welcomed not only by colleagues that I've been working with but also by those I didn't have contacted before. It was a great experience in terms of sharing not only technical knowledge but also creating connections for future joint opportunities. In this exchange, I had the opportunity to present my own research, network with other young researchers in the same stage of my career and learn about technical and personal improvement. I had the opportunity during these days to also visit the whole installation of the institute, departments such as robotics and automation, where their focus is on research and commercial products. They provided detailed explanations about the technical aspects of the product, and they were happy to share their knowledge by answering theoretical questions. I would like to thank very much all those who helped me these days. This was an amazing experience that enhanced me as a professional and helped me in my career development.*



## 4 Year 2023 Activities - IMP visit to NUIG (Example)

During the summer visit of NUIG researchers in Belgrade, a tentative plan was made for IMP young researchers to visit NUIG during the early or late fall of 2023 before the project comes to an end (**Staff exchange #13**) thus making the most use of the opportunity provided by the SINERGY project. With this unique opportunity in mind, the visit was scheduled for the final week of November 2023 as a 5-day-long stay in Galway, Ireland, as presented in Figure 7.

### SINERGY PROJECT | Staff Exchange - Ireland 2023

Draft agenda for the event

Day of the week	Time	Description
Monday - 27th November	09 - 12	Welcome + Technical visit to Alice Perry Building
	12 - 13	Lunch
	13 - 16	Technical visit Aras de Brun Building BMS presentation
	19h	Official Dinner
Tuesday - 28th November	09 - 12	Ferry to Aran + Welcome
	12 - 13	Lunch
	13 - 16	Visit to the public buildings installations: <ul style="list-style-type: none"> <li>- Community Hall</li> <li>- ChildCare Facility</li> <li>- Secondary School</li> </ul> Presentation about the Island Visit to the Island
Wednesday - 29th November	09 - 12	Visit to the public buildings installations: <ul style="list-style-type: none"> <li>- Recycling centre - Hydrogen</li> <li>- Community Building</li> </ul>
	12 - 13	Lunch
	13 - 16	Talk to the REACT participants Ferry back to Galway
Thursday - 30th November	09 - 12	Presentation about GEMS project
	12 - 13	Lunch
	13 - 16	Visit to Boston Scientific
Friday - 01st December	09 - 12	IRUSE group presentation
	12 - 13	Lunch
	13 - 16	Visit to the Campus of the University

Figure 7. Initial agenda for the Galway visit in late November, 2023

Overall, the Agenda proposal outlines 4 key activities. The first one was an on-sight visit to the National University of Ireland, Galway, now named only University of Galway. This visit



included first a meeting in one of the university's conference rooms followed by a guided tour of several energy-related facilities that power buildings in the university's campus. Days 2 and 3 were reserved for a visit to a nearby Aran Islands archipelago, concretely Inis Mor island where several facilities like private homes, commercial buildings and some industry facilities were the subject of recent renewable installation (photovoltaic arrays, batteries and heat pumps) on which IMP and NUIG collaborated to bring novel control concepts that allow for remote management with the goal of achieving self-sustainable island communities.

After coming back from the Aran Islands, the meetings continued with a visit to Boston Scientific factory and office space located just outside of Galway where NUIG have been actively, and for several years, working on improving energy efficiency of HVAC systems as well as design processes. Finally, the meeting was to conclude with a visit to Insight Institute, affiliated with the University of Galway, and focusing on various AI applications, in line with the main workflow of IMP researchers.

Once the dates were fixed, the team from IMP comprised of Dea Jelić (formerly Pujić) and Marko Jelić, two researchers with several years of experience, has undertaken the necessary administrative tasks (primarily visa acquisition for Ireland) and arrived in Galway on November 26th, in time for the meeting, in spite of some uncertainty regarding the visa approval timeline.

#### 4.1 Day 1 - Visit to NUIG facilities

The first day of the visit started with a set of presentations by the NUIG staff. First in the line was Luis Miguel Blanes Restoy who introduced the healthy/sick building concept and presenting the WELL standard (<https://www.wellcertified.com>) for building certification that was designed to establish a necessary level and drive improvements in several concepts such as air and water quality, movement, nourishment, sound propagation, etc. Several practical examples from Serbia as well as general concerns were also discussed. Several aspects that were considered when the NUIG's Alice Perry building was designed were also mentioned.

Following this, Raquel Lima, currently working on her Ph.D. at the University of Galway, presented her research into user-integrated energy management frameworks. Concretely, her presentation summarized various survey results particularly concerning user perspectives and the way various organizations handle energy management systems.

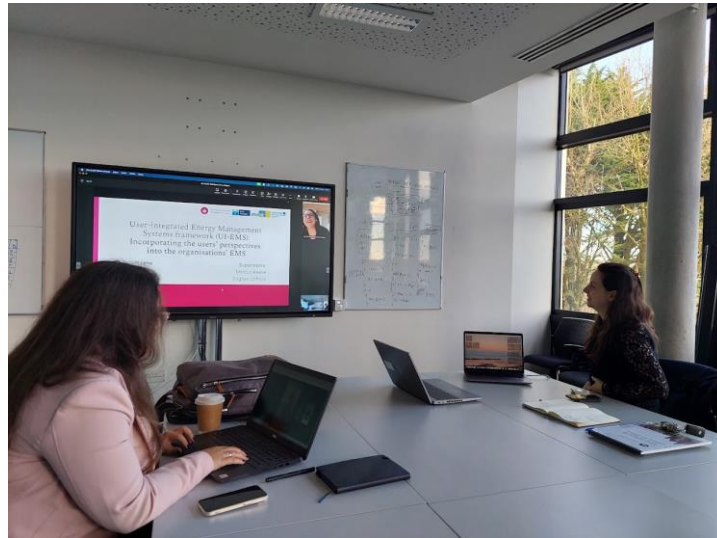


Figure 8. Second presentation by Raquel Lima

Afterwards, Luis Miguel Blanes Restoy returned as presenter to showcase the building management system (often abbreviated as BMS) that is actively in use in the Alice Perry building. Several challenges were discussed in terms of building automation and the necessary labor force that is needed to make full use of such a system. Since the system collects a lot of data, it was noted how a person must be fully dedicated to monitoring the building status and measurements in order to provide timely reactions. However, as this is a mundane task, the willingness to commit to such work is rarely expected.



Figure 9. BMS presentation by Luis Miguel Blanes Restoy

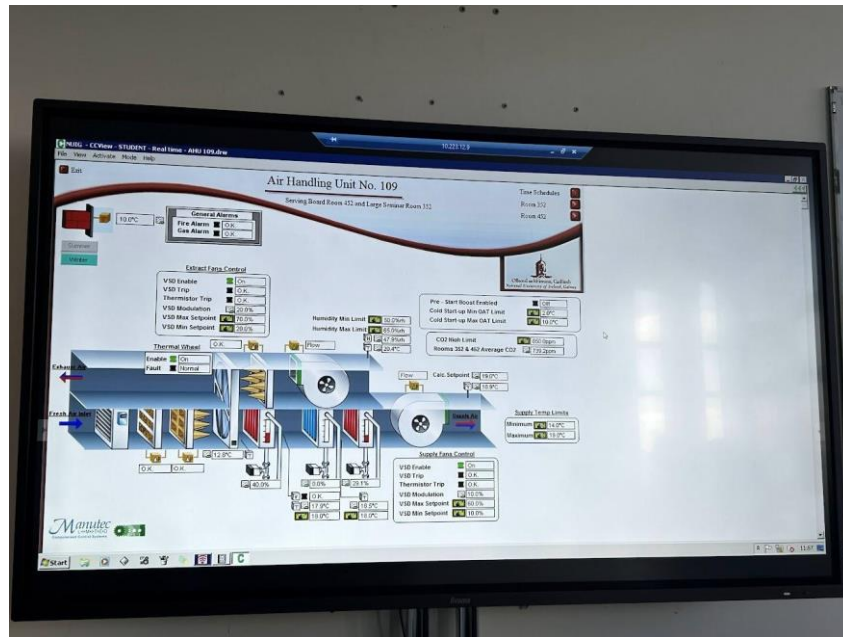


Figure 10. Alice Perry building's BMS system presentation

Once the presentation slot had concluded, the group started a tour of the energy infrastructure powering the Alice Perry building, previously discussed and visualized in the BMS system. The first stop on this tour was the ground level facility containing gas boilers and a combined heat and power (CPH, diesel engine) plant, assisted by NUIG staff working daily on maintaining these devices. Following this, the group continued to the roof of the Alice Perry building where several PV installations, solar thermal collectors (STCs), air handling units (AHUs) and air-source heat exchangers (AHXs, dry coolers) are located.



Figure 11. Alice Perry building's renewable installations (PVs and PVTs on the left and AHX on the right)



The tour of the energy infrastructure continued with a presentation of the two heat pump systems making use of ground energy via a set of boreholes located outside Alice Perry building, at a nearby field next to the basketball court. The heat pump installation is, conveniently, following the same design principles for the rest of the building, uncovered in order to serve as an educational tool. This concept entails that several key building features such as constructional elements, foundations, rebar, etc., shown in key places outlining how the building setup is designed and built.



Figure 12. Heat pump plant with data demo from in Alice Perry building (with boreholes as the primary energy source)

The presentations were followed by a brief stop to a celebration of newly graduated MSc students at NUIG's Computer Science department that was, by chance, on the same day as this visit, with a lunch break afterwards. After the lunch break, the visit continued with a tour of the Mathematics building at NUIG with commentary from Luis Miguel Blanes Restoy regarding the various architectural aspects of that building, as well as other campus facilities that were along the way. A particular focus was placed on the building's energy system and HVAC system layout. The tour finished with a visit to the top floor that houses the HP installation along with another PV panel array and an air-source heat exchanger, connected to the heat pump, and further to radiators in individual offices. Also, several wireless monitoring devices such as temperature and humidity sensors were mentioned as they feed the necessary data to the BMS system.



Figure 13. NUIG's Mathematics building heat pump installation (buffer tank and flow pipes on the left and AHX on the right with PVs in the background)

#### 4.2 Day 2 - Aran Islands visit (day one)

The second day of the visit was reserved for a trip to Inis Mor, the largest of the Aran Islands. The island is accessible from Galway via a relatively short ferry boat ride. The ferry operates in different ways in summer and winter, taking different routes. Since the visit occurred during the winter season, a bus first takes passengers from the center of Galway to Rossaveal which takes about 45 minutes, followed by a ferry boat ride of a similar length.

The four-person party from NUIG and IMP met up with Cathy Ni Ghoill who greeted the group on behalf of the Inis Mor community office. The first facility that was visited was the community hall near the port where the team took a look at the renewable installation powered by a PV array and containing an inverter and set of batteries, while also discussing the ways in which the building serves the community, as reflected in the energy demand profile.

After a brief stop at the local catholic church, the visit continued in the community offices where the team discussed, in general, the impacts that recent projects bringing renewables and more advanced control systems had on the local community, residents' lives and their daily habits. Also, particular focus had been placed on the achieved savings and how the systems can be maintained to ensure no interruptions to its operation. Afterwards, the team discussed the local heat pump installation powered by Mitsubishi Electric and analyzed the control workflow that was designed to govern the way these devices operate and provide heat even in cold winter days in Aran.



Figure 14. Meeting in the Inis Mor community office

After the stay at the community building, the team continued the tour to one of the installations which also incorporates a PV system coupled with a Mitsubishi Electric heat pump installation shown in the figures provided. This facility serves as the child care center of the island primarily for kids that are not yet of the age for primary school.



Figure 15. Visit to the child care facility



After finishing the scheduled visits, the team went for a quick visit to the Dún Aonghasa cliff and afterwards spent the night in one of the local houses offering bed & breakfast services to tourists.

### 4.3 Day 3 - Aran Islands visit (day two)

The second day of the visit to Aran Islands began with a visit to the local recycling center. This site has been the focus of one of the most innovative installations within the REACT Horizon 2020 project (<https://react2020.eu/>) as the typical PV-inverter-battery electrical installations was augmented with an very innovative hydrogen system by CTS-H2 (<https://www.ctsh2.com/>). Namely, this system utilizes rainwater and electrical energy (either sourced by locally installed PV or bought from the grid at low prices) to provide an alternative means of storage to typical batteries. Through the use of the installed electrolyzer and fuel cell, this unit can effectively provide bi-directional energy transformation between hydrogen and electric.

The renewable installation was discussed as a key driver for increasing the sustainability of the energy portfolio of the facility as a large portion of the energy needs can be locally sourced without the need for additional grid imports. Particular issues regarding the 10 kWp limit for production without having to go through a lengthy registration procedure for grid-connected PV installations pertaining to local legislative as well as somewhat difficult maintenance procedures that require involvement and on-site visits from Italian partners due to specific and innovative characteristics were also discussed.



Figure 16. Innovative CTS-H2 system at the recycling center showing the fuel cell on the left and inverters and control unit on the right





Figure 17. Electrolizers on the left and hydrogen storage on the right within the CTS-H2 unit

Once the analysis of the local renewable installations had concluded, the team went on a guided tour, facilitated by kind and professional local staff, of several recycling processes that are done on a daily basis in the recycling center. Some of these include composting from food and paper waste, recycling crushed glass into concrete blocks and repurposing old parts and devices, thus aiding in achieving circular economy goals.



Figure 18. Various processes in the recycling center (cut cardboard and paper used for composting on the left and waste press on the right)



After visiting the recycling center, the team continued the visit to one of the private homes of one of the islanders who was kind enough to host the researchers and showcase the system he uses in his daily life. This installation incorporates solar panels, an inverter and two batteries. Through another project supported by NUIG focusing on smart home systems, this house was also equipped with a set of smart plugs. The resident also talked about how all of these devices influence his energy use and allow him to maximize savings and lower reliance on the grid, particularly when the use of different appliances and particularly heating can be aligned with energy availability from the battery.

After finishing the scheduled visits, the team returned to the community center where another meeting was held summarizing the results from the automated and semi-automated energy management system for the island. With this in mind, several use cases were discussed as showcases of this system that is planned to be published in a joint paper in the following months. Special attention was given to the thermal use case and the alignment of the given control actions with the energy use profile previously computed by an optimization solution. Further integration and potential expansions of this system were also discussed in a wider context, also touching the topic of grid-level integration and overall community impacts.

After finishing the visits and meetings, the team returned to Galway via the ferry boat service.

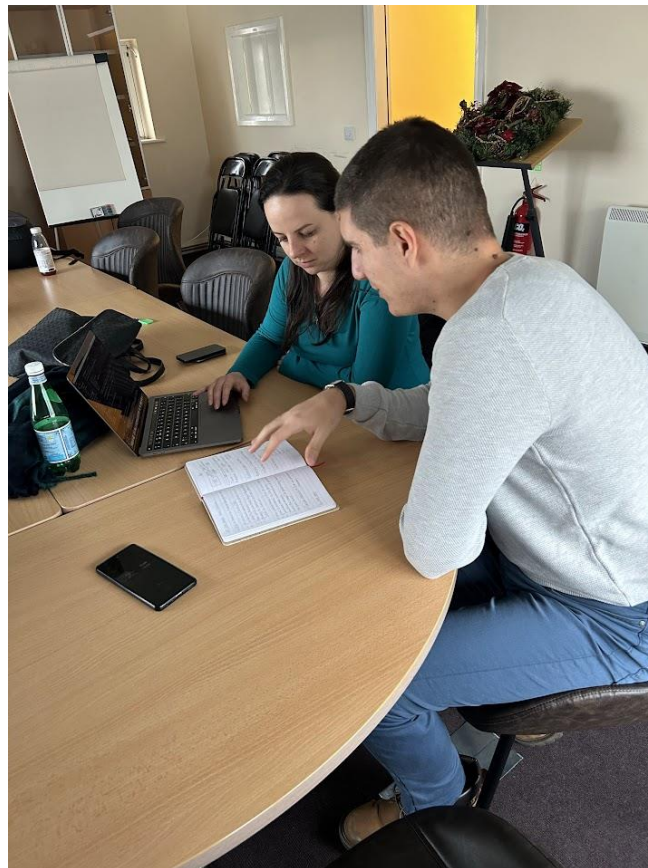


Figure 19. A meeting discussing an upcoming joint publication at the community center



#### 4.4 Day 4 - Visit to Boston Scientific

Upon returning to Galway, the next day was reserved for a visit to the Boston Scientific (<https://www.bostonscientific.com/en-US/Home.html>) factory in the company of prof. Marcus Martin Keane from NUIG. Here, the team met with Boston Scientific's employees in charge of sustainability and process design and one of the engineers from Insight Institute (<https://www.insight-centre.org/>) affiliated with NUIG who is also working on joint projects.

The meeting revolved around the joint GEMS project between Boston Scientific and NUIG where the initial idea of basic HVAC monitoring was extended to minimize redundancies, quickly detect and resolve parallel operation of heating and cooling devices, and improve overall air preparation for specific processes and storage while also achieving significant energy savings. These ideas were extended into the product and process design space, with ongoing efforts to incorporate energy efficient and sustainable design in various aspects of the factory.

The presentation also mentioned the organization behind these efforts to achieve sustainability, ranging from machine design and production to modeling and various software implementations. A noteworthy aspect from these discussions was also the main motivation in large-scale multinational companies such is Boston Scientific for achieving sustainability, as well as the means that this goal is propagated vertically through such a complex organization.

Following the meeting, a brief tour through the factory was organized so the group from NUIG and IMP had the pleasure and opportunity to see not only how various medical devices are produced, but also how the machines used to produce these devices are made. Once finished, the team also visited the main open-office space in Boston Scientific.



Figure 20. Arrival at Boston Scientific



#### 4.5 Day 5 - Visit to Insight

The plan for the final day of IMP's visit to Galway and NUIG included the visit to the previously mentioned Insight Institute. As Insight's building is located on the far side of the campus, the walk took a bit longer, but once there the team first visited the unique communications history museum located within the Institute. Here, the team could see various levels of developments of communication device through the ages, particularly from the late 60s, early 70s onwards. This museum provides a one-of-a-kind experience as it incorporates many "nostalgic" devices that today's youth may not even be acquainted with, but that have been the cornerstones of that day's technology.

After finishing with the museum visit and a short walk through the Institute, the team met up with Insight's employees for one final meeting. Here, the topic of various AI-powered projects that Insight is working on were presented, along with a discussion placing a particular focus of ethical and trustworthy AI in contemporary projects.

In the end, several future proposal ideas were discussed including Insight, NUIG as well as IMP with further talks to continue once the team from IMP arrives back at their home offices.



Figure 21. Insight Institute on the left and communication museum on the right



## 5 Examples of online training events (2nd reporting period)

Training events for the second reporting period have been documented along with the lectures in these two deliverables:

- D3.2 [Training Courses and Learning Material on Smart Grid Technologies \(v2\)](#); and
- D3.4 [Training Courses and Learning Material on Energy Efficient Building Operation \(v2\)](#).

In the last six months of the project AIT and NUIG teams organized several webinars for the IMP staff. Herein, we point to

- The AIT online training in December with Ms. Barbara Herndler;
- The AIT online training in November 2023 with Mr. Markus Makoschitz;
- The NUIG online training in October 2022 with Mr. Luis M. Blanes and Ms. Dayanne Peretti Correa.

### 5.1 Methods and Future Scenarios for Strategic Grid Development of Full Low and Medium Voltage DSO Supply Areas

On 11<sup>th</sup> of December, Ms. Barbara Herndler, Research Engineer at the Electric Energy Systems Department, Center for Energy, AIT, delivered a training for the IMP staff via the GoTo platform.

#### Summary

Due to the expansion of distributed generation systems (especially photovoltaics) and the increasing electrification of the demand side (especially electric vehicles, heat pumps), a visibly increasing load on the distribution networks can be expected over the next 30 years. Along with this, there will be a corresponding need for network expansion in the distribution networks in the coming years and decades.

**The aim of the webinar is to provide a comprehensive statement about the future need for network expansion. Additionally the effectiveness of various measures to upgrade the network and to assist network operators in developing strategic plans based on the outcomes recent project in Austria.**

1) Forecasting the future development or rollout of relevant technologies in the distribution networks. This primarily includes distributed generation systems (especially photovoltaics), essential electrical consumers (especially electromobility and heat pumps) and storage systems.

2) Assessment of the medium and long-term network expansion needs in the medium and low voltage network infrastructure of different distribution network operators with the defined expansion forecasts based on comprehensive, area-wide network simulations.

3) Definition and technical analysis of various strategies for upgrading the distribution networks to cope with the expected expansion of systems. This includes, among other things, line reinforcements, new station construction, reactive and active power controls on distributed systems, power compounding, use of controllable local network transformers, increasing system voltages and other measures.

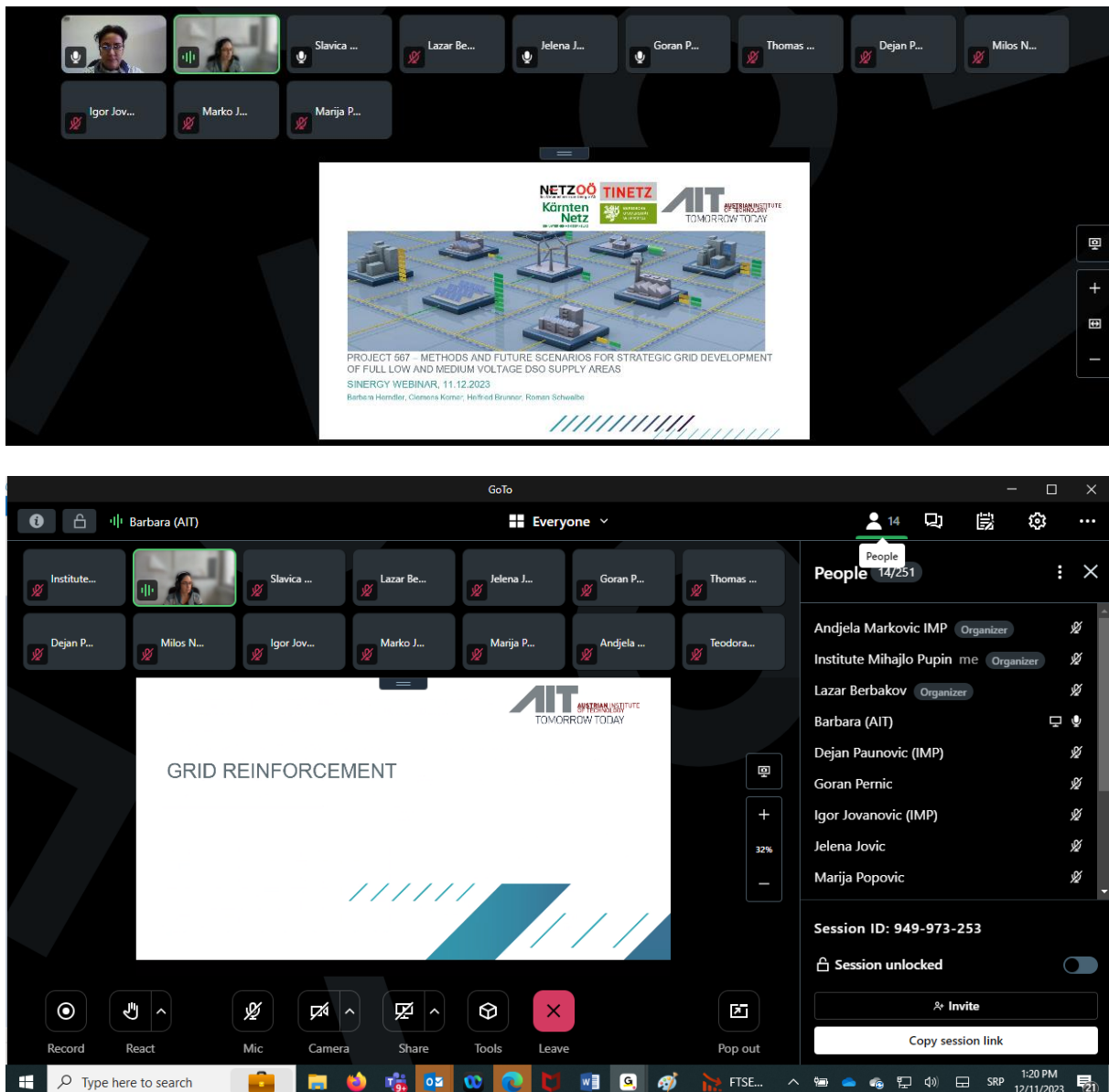


Figure 22. AIT Online Training, December 2023

## 5.2 Emerging Technologies for Power Grid Electronics Systems in Smart Grids

On 13<sup>th</sup> of November, DI Dr. Markus Makoschitz, Center for Energy, AIT, delivered a training for the IMP staff via the GoTo platform.

In 2016 he joined the AIT Austrian Institute of Technology GmbH where he is currently working in a senior scientist position and responsible for national/international co-funded R&D projects and research activities, mainly in the fields of medium- and low-voltage single/three-phase power systems and integration of wideband-gap devices (SiC, GaN) for ultra-high efficient and volume optimized applications.

Dr. Markus Makoschitz is holding the position of IAS/PELS/IES Chapter Chair, see <https://www.ieee-austria.org/index.php/chapters/41-ias-pels-ies/29-ias-chair>.

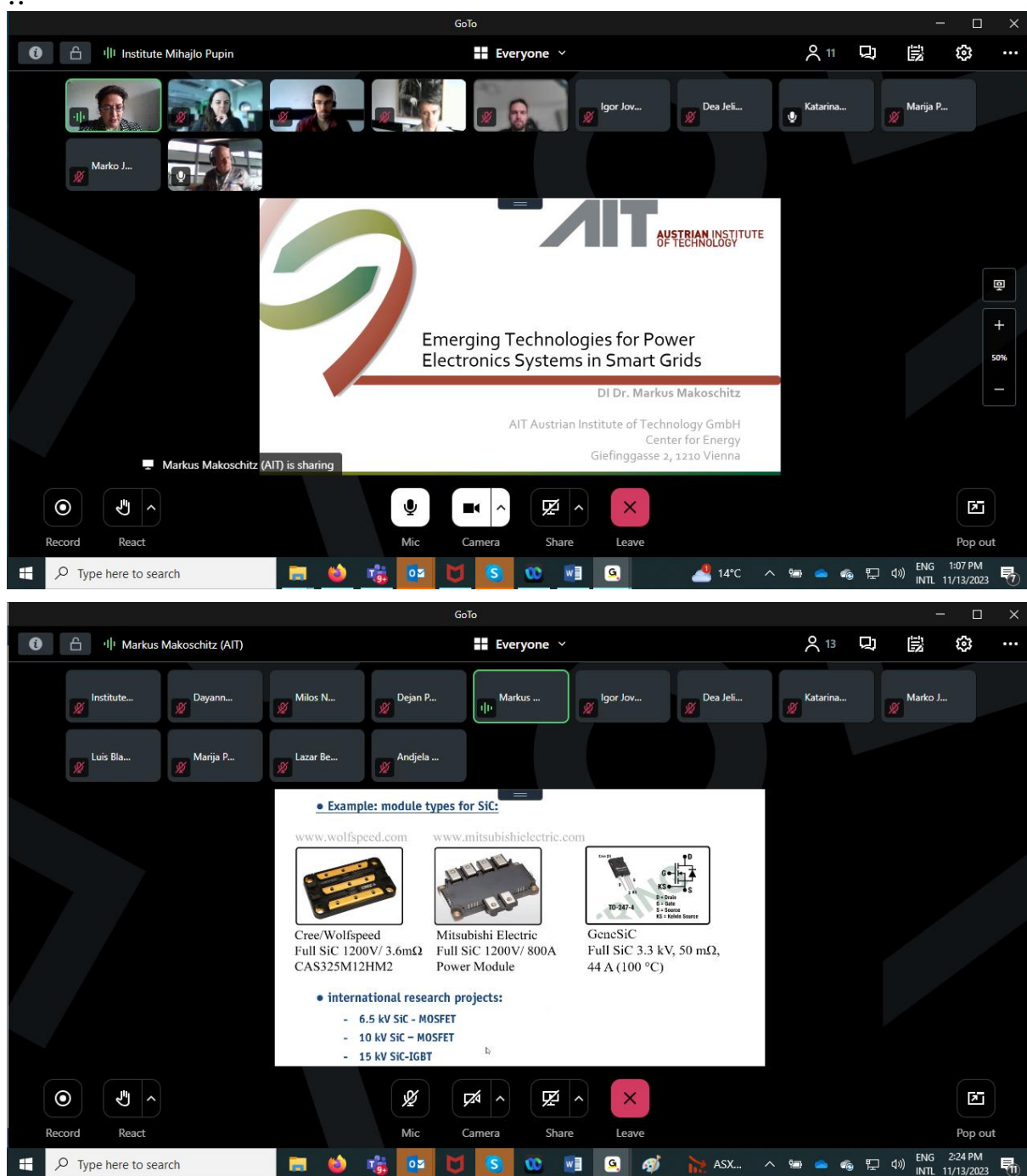


Figure 23. AIT Online Training, November 2023



### 5.3 Buildings Grid Readiness - Technology Assessment

On 13<sup>th</sup> on October 2022, the NUIG team organized an online training event for the IMP staff with the following Agenda:

- Module 03 - Buildings Grid Readiness - Technology Assessment
- Module 11 - Simulink for Building Energy Modelling

The figure consists of two screenshots of a Zoom meeting interface. The top screenshot shows a 'BREAK' slide with a schedule for 10:00 h (CET) and 12:00 h (CET). The bottom screenshot shows a slide titled 'SRI - Technical Domains' with icons for Heating, Cooling, Domestic hot water, Ventilation, Lighting, Dynamic building envelope, Electricity, Electric vehicle charging, and Monitoring and control.

Figure 24. NUIG Online Training, October 2022



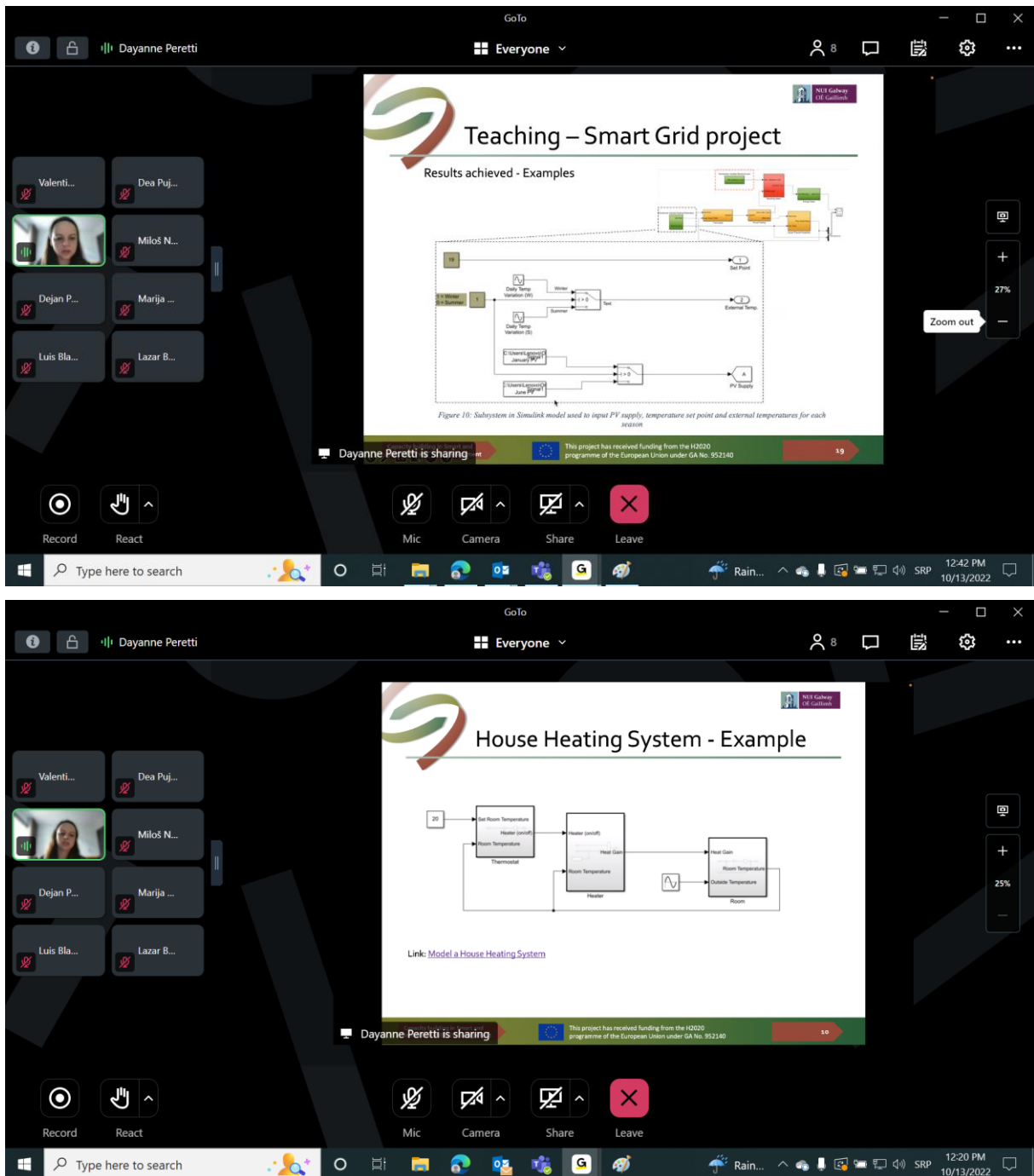


Figure 25. NUIG Online Training (hands-on session), October 2022



## 6 Conclusion

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The staff exchange activities organized in the SINERGY framework on-premises (Belgrade, Vienna, Galway) contributed to the following SINERGY objectives:

- To improve the know-how and excellence capacity of the IMP staff through training (see for instance **Staff exchange #2**, **Staff exchange #8**, **Staff exchange #14**) and hands-on sessions (**Staff exchange #2**, **Staff exchange #5**);
- To improve the creativity by exposing IMP researchers to new research areas from AIT and NUIG domains (see for instance **Staff exchange #9**, Vienna and **Staff exchange #13**, Galway);
- To enhance the reputation by positioning IMP as a leader and promoting the IMP Center of Excellence in Vienna (**Staff exchange #3**) and Galway (**Staff exchange #4**);
- To increase the mobility of early stage researchers and further supports the development of innovative solutions (services/prototypes/products) (see **Staff exchange #4**, **Staff exchange #7**, **Staff exchange #12**, **Staff exchange #13**);
- To network with stakeholders from Serbia and the Region and further mobilize the Serbian industry (**Staff exchange #6** and **Staff exchange #11**).

In addition to the travel of the SINERGY staff,

Besides staff from the SINERGY partner institutions, other researchers were invited to take part in SINERGY activities, for instance, the keynote speakers from Germany and Greece, the Advisory Board members from Bosnia and Herzegovina and North Macedonia. Researchers from the Institute Nikola Tesla, University of Belgrade (School of Electrical Engineering) and University of Novi Sad (Faculty of Technical Sciences) also took part in SINERGY activities, see for instance Annex I.



## 7 Annex I: Visit of AIT premises and training for INT staff

### 7.1 Participants

Partner	Person
INT	Mr. Luka Ivanović
	Mr. Predrag Ninković
	Dr. Jasna Dragosavac
	Dr. Maja Grbić
	Mr. Ivan Kuraj
	Mr. Ilija Klasnić
AIT	Dr. Tarraso-Martinez Andres
	Mr. Zoran Miletić
	Mr. Roland Bründlinger

### 7.2 Agenda - day 1

Day 1: Monday, March 20, 10:00 - 15:00		
10:00 - 11:00	Short AIT EES & INT corporate presentation with emphasis on joined research topics	AIT: Antony Zeger, Rao Bharath- Varsh INT: Maja Grbić, Predrag Ninković, Jasna Dragosavac, Ilija Klasnić
11:00 - 11:30	Touch base on cooperation opportunities in South East Central Europe and Balkans	Antony Zeger
12:30 - 13:30	Discussion on possible joined research initiatives and funded projects	Rao Bharath-Varsh
13:30 - 14:00	SmarTEST and High Power Lab tours	Roland Bründlinger
14:00 - 15:00	Power Electronics Lab tour with uGrid setup demo	Zoran Miletić, Andres Tarraso-Marinez and Anja Banjac

Staff exchange that was organized at AIT premises for INT associates lasted for two days. On the first day, 10 attendees were present: Johannes Stöckl (via Microsoft Teams), Zoran Miletić, Antony Zeger and Rao Bharath-Varsh (AIT) and Maja Grbić, Jasna Dragosavac, Predrag Ninković, Ilija Klasnić, Luka Ivanović and Ivan Kuraj (INT). The focus was on introduction of the activities of both institutes, presenting Horizon Europe projects to INT and presenting the AIT facilities including SmartEST and Power Electronics Lab laboratories.

In Power Electronics Lab AIT presented a uGrid setup demo which included: two current controlled inverters (controlled by AIT control card), resistive load, two AC/DC sources



emulating batteries for inverters. Demo presented the efficiency of newly developed algorithm for current controlled inverters regarding power injection during synchronization inverters on the grid.

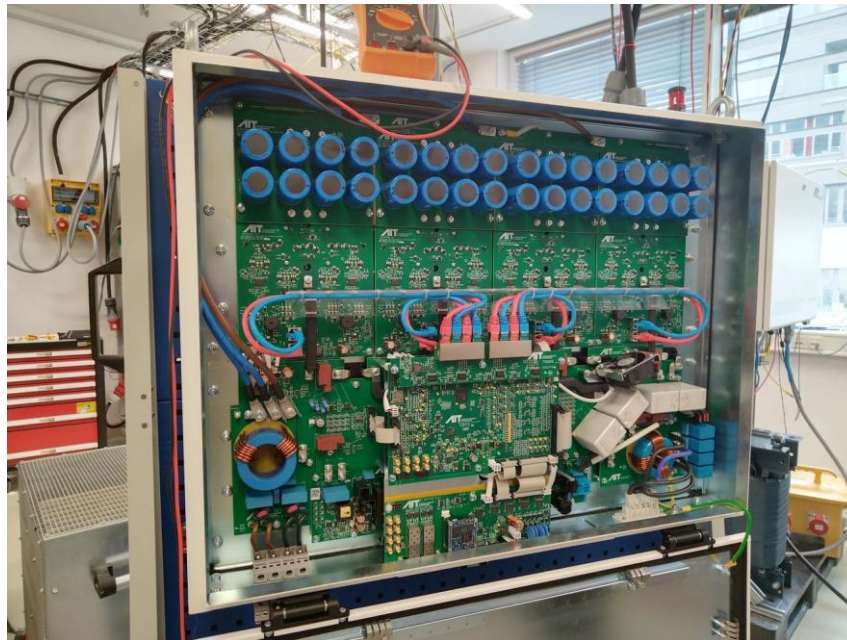


Figure 26. SiC-MOSFET based, watercooled inverter in Smart Grid laboratory



Figure 27. SmartEST laboratory visit

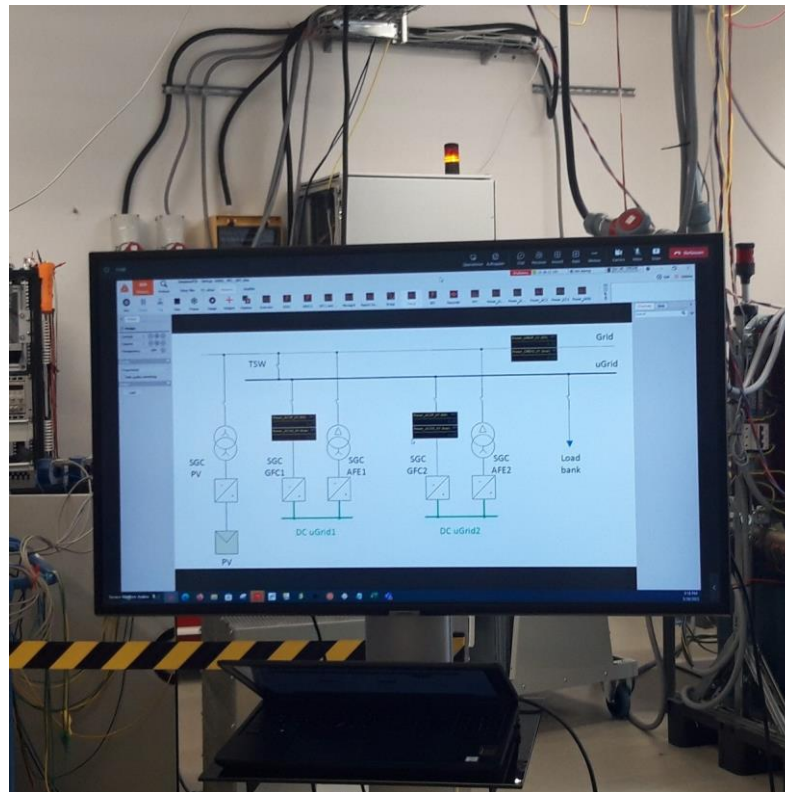


Figure 28. uGrid setup demo

### 7.3 Agenda - day 2

Day 2: Tuesday, March 21		
Before lunch	<ul style="list-style-type: none"> <li>• PV Home Storage Systems</li> <li>• System Overview and different topologies</li> <li>• Control System</li> <li>• Efficiency</li> <li>• Live Demos</li> </ul>	Messner Christian
After lunch	<ul style="list-style-type: none"> <li>• Ancillary Grid Services</li> <li>• Power Factor <math>\cos\Phi(P)</math></li> <li>• Voltage / VAR Q(U)</li> <li>• Voltage / WATT P(U)</li> <li>• Frequency WATT f(P)</li> <li>• Live Demos</li> </ul>	Messner Christian

On the second day, a workshop for PV Home Storage Systems was held. There was an introductory presentation on PV Home Storage Systems by Christian Messner. Later, the operation of the "Sunny Boy" 10kVA single-phase inverter with DC sources emulating PV panels and 3kWh battery storage was also shown, where basic operations and auxiliary functions for supporting the grid were demonstrated.

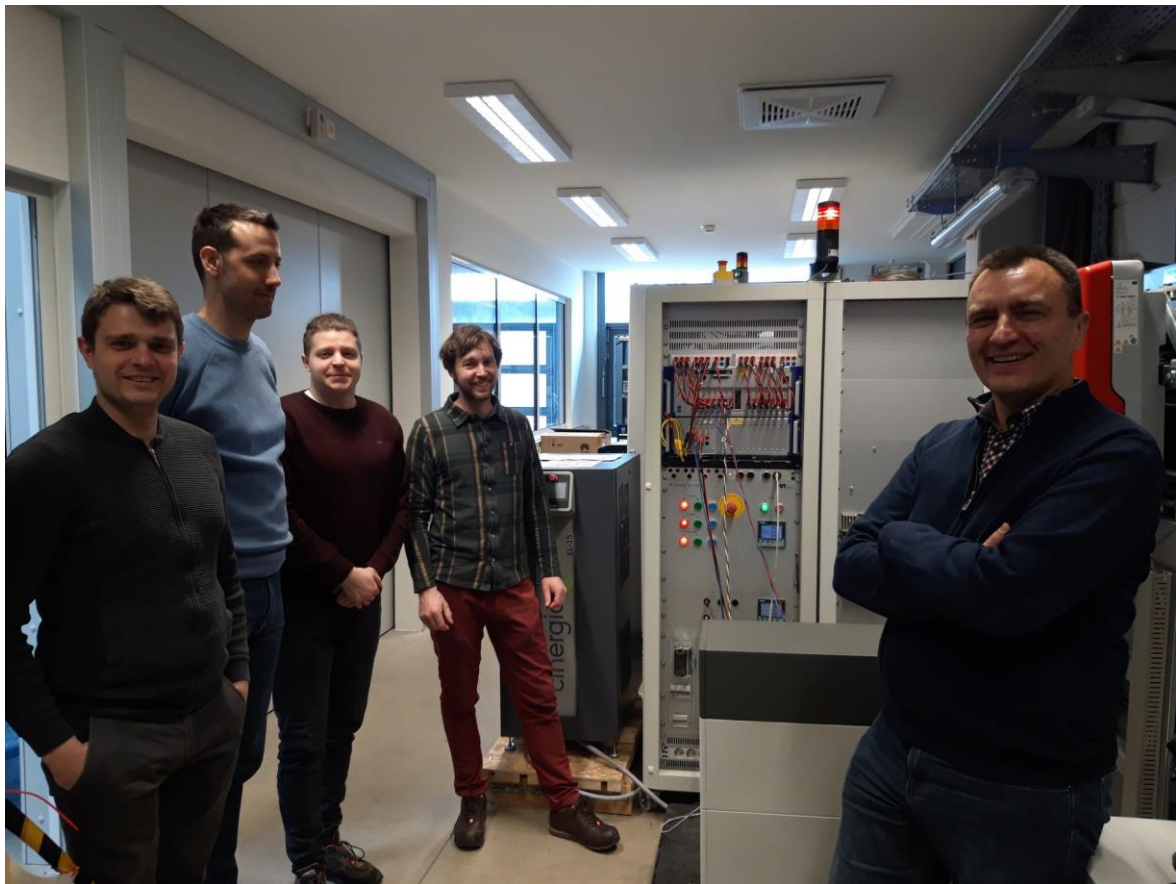
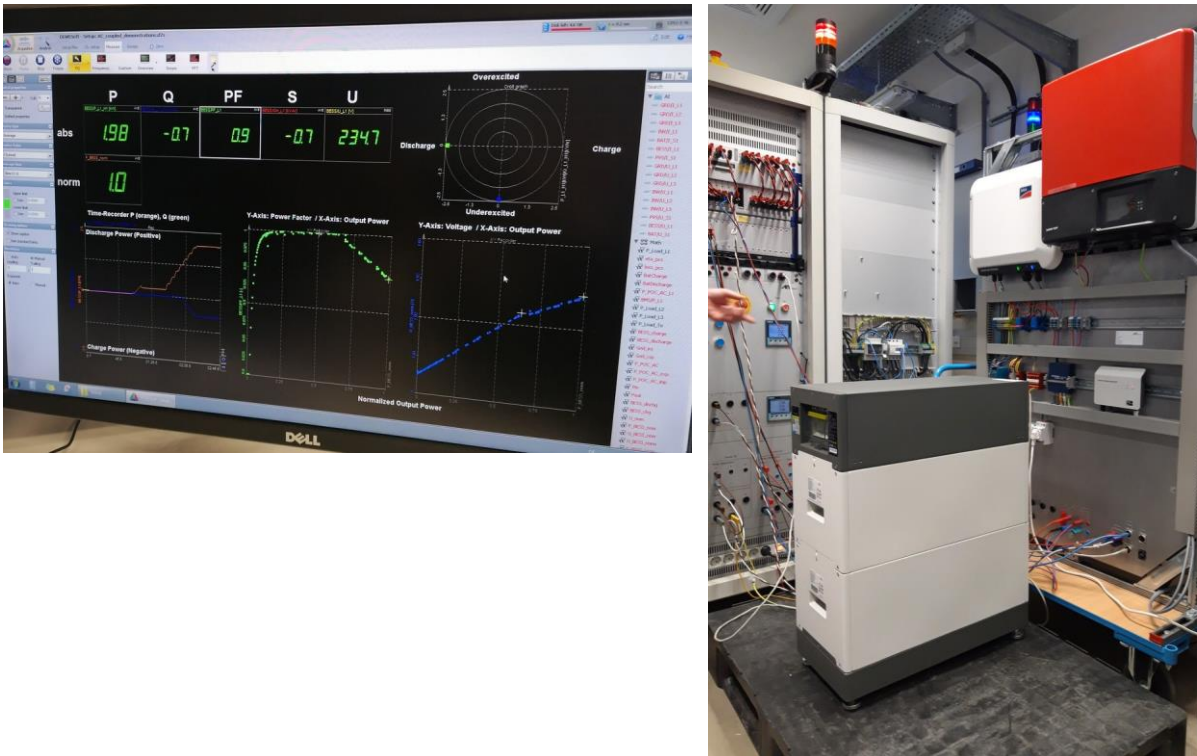


Figure 29. INT associates attending the PV Home Storage System demo



## 7.4 Conclusion

Organized workshops and visits contributed to introduction of associates from the INT and AIT and provided an opportunity for mutual cooperation in the future.

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