

Training the Trainer Workshop at RWTH Aachen University

Event type	Training Workshop
WP Number	3
WP Leader	NTUA
Event date	07.11.2022-11.11.2022
Number of Participants	19
Total number of pages	9

Project Coordinator

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1 Event Description

The training workshop in Aachen was focused on the fundamentals and the application of batteries for electro-mobility. Knowledge of RWTH Aachen Members was transferred to the participants via lectures, informal discussions, and lab visits.

During the first day, the participants were introduced to the week's program and the fundamentals of lithium-ion batteries. The day was closed with a guided city tour through Aachen to allow for informal discussions and intercultural exchange.

The second day started with a lecture on electric vehicles, which focused on the climate goals, the subsequent evolution of the (H)EV market in Europe, and the dimensioning of battery systems for different applications. Based on this, the implications for other markets were discussed. Afterward, the laboratories of ISEA focused on the characterization of batteries and power electronics systems were presented in a lab tour. The techniques used for digital lectures at RWTH-ISEA were presented in the afternoon. Finally, the day closed with a presentation on the interaction between charging infrastructure and the electric grid.

On the third day, a large-scale 5 MWh battery storage (M5Bat) was visited, and the participants could get an insight into the challenges of the operation of large battery systems. Afterward, a lecture on future battery technologies, such as solid-state or sodium-ion batteries, was held. During the rest of the day, the participants had time to deepen their knowledge via self-study.

The fourth day was focused on lab visits, so the participants could get information on the infrastructure required for conducting research and teaching on different aspects of electro-mobility. Different institutes of RWTH Aachen University operate all visited labs. Institute for Automotive Engineering (IKA) focuses on driving dynamics and overall vehicle dimensioning. The Electro Mobility Laboratory (eLab) is cooperating with small and medium enterprises in batteries, inverters, and motors. The Center for Mobile Propulsion (CMP) focuses on different drivetrain components, such as combustion engines and fuel cells, and has an extensive infrastructure to characterize these components. Finally, a lecture on digitalization in teaching and digital assessments was held. The day was closed with a joint dinner to allow for an informal exchange between the participants.

On the last day, one lecture on the dimensioning and design of battery packs and a second lecture on algorithms for battery management systems was held. Finally, the workshop ended with the distribution of the participation certificates.

2 Agenda

Below, the agenda of the workshop can be found. Different lecturers held talks on different topics.



Date	Time	Content
07.11.2022	09:00-09:30	Welcome
07.11.2022	09:30-12:00	Presentation of the Institute and of the City
07.11.2022	12:00-13:00	Lunch
07.11.2022	13:00-14:30	Lecture on Battery Fundamentals I
07.11.2022	14:30-14:45	Coffee Break
07.11.2022	14:45-16:30	Lecture on Battery Fundamentals II
07.11.2022	16:30-17:30	Bus to the city center
07.11.2022	17:30-19:00	Aachen Guided City Tour
08.11.2022	09:00-11:00	Lecture on Electric Vehicles
08.11.2022	11:00-12:30	Tour in the laboratories and battery testing facilities of ISEA
08.11.2022	12:30-13:30	Lunch
08.11.2022	13:30-15:00	Lecture on Teaching Techniques: Digital Lectures
08.11.2022	15:00-15:15	Coffee Break
08.11.2022	15:15-17:00	Lecture on Charging Infrastructure and the Grid
09.11.2022	09:30 – 10:30	Visit of a large-scale 5 MW/ 5MWh Battery Storage
09.11.2022	10:30 – 11:15	Lecture on Future Battery Systems
09.11.2022		Self study
10.11.2022	09:00-10:30	Lab visit Institute for Automotive Engineering (IKA)
10.11.2022	10:30-11:00	Transfer
10.11.2022	11:00-12:00	Lab visit Electro Mobility Laboratory (eLab)
10.11.2022	12:00-12:15	Transfer
10.11.2022	12:15-12:45	Lunch
10.11.2022	13:00-14:30	Lab visit Center for Mobile Propulsion (CMP)
10.11.2022	14:30-14:45	Transfer
10.11.2022	14:45-15:00	Coffee Break
10.11.2022	15:00-17:00	Lecture on Teaching Techniques II: Digitalization Fuelling the Variety of Learning & Lecture on Teaching Techniques III: Digital Assessments
10.11.2022	19:00	Joint Dinner
11.11.2022	09:00-10:45	Lecture on Battery System Design
11.11.2022	10:45-11:00	Coffee Break
11.11.2022	11:00-13:00	Lecture on Battery Management Systems
11.11.2022	13:00-13:15	Certificate Distribution

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3 Attendance sheet

Below the attendance sheet for the workshop can be found:

Attendance Sheet

ECO-CAR Training of Trainers Workshop at RWTH Aachen University

Name	7.11.22	8.11.22	9.11.22	10.11.22	11.11.22
Prof. Ahmed S. A. Al-Salaymeh					
Prof. Mohammad Ahmad Saleh Hamdan					
Eng. Mohamad Abdelhafed Mohamad Al Masad					
Dr. Ahmad Malkawi					
Prof. Saud Abdelaziz Othman Khashan					
Dr. Qais Azzam Ibrahim Khasawneh					
Mamoun Ahmad Husein Khdaif					
Prof. Suhil M. M. Kiwan					
Dr. Wail Murtada Faraj Adayleh					
HESHAM IBRAHIM AHMED AL SALEM					
AHMAD FALAH MSFOUH ALJA'AFREH					
Eng. Radi Khaled Yousef Al-Rashed					
Eng. Yousef Jamal Yousef Okour					
Dr. Loal Dabbour					

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Dr. Nabeel Abu Shaban					
Eng. Eman Abdelhafez					
Eng. Waseem Zeyad Mohammad Shaban					
Eng. Ayham Abed Alhakim Hasan Alraoush					
Ahmed Abd Al Lateef Abdalla Hussien					
Ala'eddin Abdel Karim Mohammad Masadeh					
Madalah Mhamad Abdrhem Altrawnh					
Ra'd Fathi Awwad Marabbeh					

4 PPTs for training material

The presentation slides were provided to the participants via a sciebo share (<https://rwth-aachen.sciebo.de/s/U0PJqZUjK9YwrZM>).

5 Evaluation Results

For evaluation results, please refer to the QUALITY AND MONITORING SHORT REPORT.
The weighted average of all items is above 82 %, indicating a good workshop quality.

6 Photos

All photos can be found on the following sciebo share. Below, an excerpt of photos is shown.
<https://rwth-aachen.sciebo.de/s/UOPJqZUjk9YwrZM>

Visit of large-scale 5MWh storage:



Visit of ISEA laboratories:



Visit of eLab:



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Visit of CMP:



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Lectures:

