EUROPEAN COMMISSION

HORIZON 2020 PROGRAMME - TOPIC H2020-LC-BAT-2019
Affordable High-Performance Green Redox Flow Batteries

GRANT AGREEMENT No. 875613

HIGREEW – Deliverable Report

D7.4 – HIGREEW I Workshop

Deliverable No.	HIGREEW D7.4	
Related WP	WP 7	
Deliverable Title	HIGREEW I Workshop	
Deliverable Date	2022-03-31	
Deliverable Type	OTHER	
Dissemination level	Public (PU)	
Written By	Miloš Svoboda (UWB), Jiří Vrána (PFES)	2022-03-24
Checked by	Estibaliz Crespo (CICe)	2022-03-30
Reviewed by (if applicable)	Anna Molinari (UNR) Irene Lamme (UNR)	2022-03-29
Approved by	Estibaliz Crespo (CICe)	2022-03-30
Status	Final version	2022-03-30

Disclaimer/ Acknowledgment

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 875613. The information and views set out in this publication does not necessarily reflect the official opinion of the European Commission. Neither the European Union institutions and bodies nor any person acting on their behalf, may be held responsible for the use which may be made of the information contained therein.

Summary

As stated in the Description of Work (under task 7.1), workshops will be addressed to the energy sector, battery manufacturers, and material developers; for central- and local governments and for other relevant stakeholders.

Officially two workshops have been planned and linked to two project deliverables: the first project workshop at M29 (March 2022) and a second one in the final stage of the project at M42 (April 2023).

This document reports on the programme and attendance of the first official project workshop organized by UWB in Pilsen (Czech Republic) the 2nd and 3rd of March.

Contents

1 Introduction

The 1st HIGREEW Workshop was organized by New Technologies Research Centre under the University of West Bohemia with support from Uniresearch, CIC energiGUNE and Pinflow energy storage in Pilsen, Czech Republic on 2nd and 3rd March 2022. The University of West Bohemia is one of the youngest but one of the most successful Czech universities. In total, 9 faculties and 62 departments together with four excellent research centres assures education and professional growth for 11 thousand students. The university started with merging of College of Mechanical and Electrical Engineering and the Faculty of Education (both schools with a forty-year tradition) in September 1991. In the year 2000, the new institute, New Technologies – Research Centre (NTC), was launched. The mission of NTC is to bring solutions of the challenges in the area of advanced materials, ecological energy sources, smart transportations means and the quality of human life. NTC is a respected partner of recognized global companies. The NTC is an attractive place where the most talented researchers make progress for the sustainable development of individuals, industry and society as a whole. The main areas of focus are infrared technologies, research of advanced materials, biomechanical human body models, chemical processes and biomaterials, modelling and simulations in technical systems and engineering of electrochemical processes.

Pilsen is literally surrounded and incorporated with elements of technological and industrial history and presence of the city. With respect to HIGREEW project, one of the world most known organic-based electrolytes was already invented in 1842 here, Pilsner Urquell. Although the electrolyte is probably not suitable for redox flow battery application, it excels with organoleptic properties so significantly, that its name “pilsner” was settled for this unique beer kind that can be classified as light bottom-fermented lager. Our 1st HIGREEW Workshop was held in historical conference centre Pilsner Urquell Hall (Figure 1), directly in the brewery complex. The workshop was held as a hybrid event. The programme was broadcasted on-line, and on-line attendees had also the chance to interact with the on-site audience. The workshop was organized as one-and-half-day event that was followed by the Sixth HIGREEW General Assembly (also hybrid event).

Figure 1: Pilsner Urquell Hall (left) and the historical gate to the Pilsner Urquell brewery (right), the venue of 1st HIGREEW Workshop.

2 First official project workshop

Beside of HIGREEW consortium members, not only the scientific but also the general public was targeted as audience for our workshop. The programme was assembled to cover all important topics that are related to organic redox flow batteries. The content of the first day was more general and answered why the role of energy storage is essential in energy transition. The activities and opportunities that European Union

offers within this field were also introduced by two policy officers from European Commission. The role and application of redox flow batteries were well explained and several case studies and ongoing activities were introduced. Vanadium-based systems serves as good benchmark of redox flow battery deployment. More detailed focus was put on the progress in organic redox flow batteries. The topical programme of the first day was concluded with Pilsner Urquell brewery tour and dinner after short walk in the city centre. During the second day, HIGREEW consortium members took floor and focused on challenges within the development of organic redox flow batteries. The advances and key successes within HIGREEW project were well clarified and presented. After formal termination of the 1st HIGREEW Workshop the consortium members attended the Sixth HIGREEW General Assembly together with project advisory board members. Before the dinner excursion to NTC facilities and Pinflow energy storage manufacturing hall took place.

2.1 Agenda and programme

The scope of the workshop was carefully discussed within consortium during regular HIGREEW meetings. The full agenda and programme are listed in Table 1 and

Table 2. While the lectures from Day 1 provided more general information that are closely related to redox flow batteries, the Day 2 was directly focused on dissemination of HIGREEW activities. The content of lectures from invited experts is deeply analysed together with impact and overall big picture in session 2.3 Presentations. During Day 1, 7 speakers were on-site and 8 were online while during Day 2, 9 speakers were present and only 1 was connected at remote basis.

The programme was available on the project website prior the workshop[1]. The invitations were provided to consortium members and important contacts around HIGREEW, important institutional contacts, policy makers, press, associations and clusters (e.g., Flow Batteries Europe, Flores, AKU-BAT, Czech battery cluster, German RFB network, Spanish energy storage associations, and others). The event was advertised through project webpages and social networks of most consortium members.

The 1st HIGREEW Workshop started with warm greetings and welcome session of Petr Kavalíř (director of NTC UWB). The topical programme was chaired by Petr Mazúr (senior researcher in field of redox flow batteries at NTC UWB) during Day 1 and by Juraj Kosek (professor of chemical engineering at UCT Prague and NTC UWB) during Day 2. Jiří Charvát (researcher in field of redox flow batteries at NTC UWB and PFES) was actively contributing to chat and also helped to connect chairpersons with on-line attendees mainly in discussions after the lectures. It should be also noted that audio-video system together with recording and broadcasting was assured by experts from UWB. ZOOM platform was selected for online connection to the Workshop.

The topical programme was interspaced with breaks that offered not only traditional Czech refreshments but also the opportunities for networking. Excursions to the Pilsner Urquell brewery (where the workshop took place), Pinflow energy storage manufacture of redox flow batteries from laboratory to pilot scale and New Technologies Research Centre (i.e., laboratories with SARPES – spin-resolved photoemission spectroscopy, transmission electron microscopy and engineering of electrochemical processes) revived the programme. The expert discussion and networking continued at dinner in city centre on both days of workshop.

From the organizational point of view, the workshop run smoothly. The proposed timeline was strictly maintained, only the excursion to UWB and PFES was slightly prolonged by on-site interest of participants. There were just two short and minor issues in online broadcasting.

[1] https://higreew-project.eu/wp-content/uploads/2022/02/HIGREEW_Workshop-I_full-programme_final_24022022.pdf

Table 1: Day 1 at-a-glance.

Slot	Name	Position and institution	Agenda	Attendance
8:20	Registration			
8:45	Petr Kavalíř	Director of New Technologies - Research Centre, University of West Bohemia	Welcome session	On-site
9:00	Vladimír Karas	Product Manager, Innovations&SBD, innogy Energie, s.r.o., member of MVM Group	The Supplier´s new role in energy transition	On-site
9:30	Karl-Heinz Pettinger	Scientific director of the Energy technology center in Ruhstorf a.d. Rott under the University of Applied Sciences Landshut	Batteries Fast Charging and V2H	On-site
10:00	Aleksandra Kronberga	Policy Officer, DG Energy, Storage policy officer at R&I, Digitalisation, Competitiveness Unit	Policy background and prospects for energy storage	Online
10:15	Johan Blondelle	Policy Officer, DG Research & Innovation C2 – Future Urban & Mobility Systems	R&I Support for stationary energy storage with the Batteries Partnership Batt4EU	Online
10:30	Coffee & electrolyte break			
11:00	Peter Fischer	Group Leader of the Redox Flow Battery Group at the Applied Electrochemistry Department at Fraunhofer Institute for Chemical Technology (ICT)	Redox-Flow-Batteries – from research to application	On-site
11:20	Anthony Price	Secretary-General, Flow Batteries Europe	Opportunities and challenges for energy storage using flow batteries.	Online
11:40	Adam Whitehead	Head of Research, Invinity Energy Systems	Invinity Energy Systems, company introduction and case studies	Online
12:00	Pavel Mardilovich	Senior Researcher at CellCube/Enerox	Case studies of CellCube batteries	On-site
12:30	Lunch break			
13:30	Petr Mazúr	Principal Researcher of Laboratory of Energy Storage, NTC UWB and UCT Prague	Overview of organic redox flow batteries	On-site
13:50	Eduardo Sánchez Díez	Associate Researcher in CIC energiGUNE and coordinator of HIGREEW	HIGREEW: achievements and hurdles in the deployment of AORFB	On-site
14:10	Vicente Vert Belenguer	Researcher from the Construction and Renewable Energies Group at AIMPLAS – Plastics Technology Centre	BALIHT project – upgrading components for novel oRFB working under heavy multicycling and warm environments	Online
14:30	Michael J. Aziz	Gene and Tracy Sykes Professor of Materials and Energy Technologies at the Harvard John	Recent Progress in Organic Aqueous Flow Batteries	Online

		A. Paulson School of Engineering and Applied Sciences		
14:50	Thomas Nann	Founder of Allegro Energy	Great opportunities for utility scale storage down under	Online
15:10	Pekka Peljo	Associate Professor of Materials Engineering, University of Turku	Computational screening of organic molecules for flow battery applications	Online
15:30	Coffee & electrolyte break, ending workshop online			
16:15	Excursion: Pilsner Urquell brewery tour - people with red dot on name badge			
16:30	Excursion: Pilsner Urquell brewery tour - people with green dot on name badge			
17:50	End of the tour, break			
19:30	Meeting by the main entrance to the Cathedral of St. Bartholomew on the Main square			
20:00	Dinner in the city centre - U Salzmannů			

Table 2: Day 2 at-a-glance.

Slot	Name	Partner within HIGREEW consortium	Agenda	Attendance
8:20	Registration			
8:45	Juraj Kosek	UWB	Welcome to the second day of the Workshop	On-site
8:55	Eduardo Sánchez Díez	CIC energiGUNE	HIGREEW: achievements and hurdles in the deployment of AORFB	On-site
9:15	Ivan Salmeron	UAM	Membranes developments for RFB: Towards modified membranes	On-site
9:35	Mathieu Etienne	CNRS	Activated vs non-activate: quantitative assessment of reactivity for optimizing RFB electrodes - CNR	On-site
9:55	Václav Čmolík	UWB	Optimization of cell efficiency for aqueous organic electrolyte	On-site
10:15	Jiří Charvát	PFES	How to design and validate efficient aqueous organic RFB cells	On-site
10:35	Coffee & electrolyte break			
11:05	John Collins	C-TECH	RFB scale up experience from cell to stack	Online
11:25	Michael Schäffer	FRAUNHOFER	Building a new battery system (like jigsaw)	On-site
11:45	Eid Maraqah	GAMESA	Techno-economic analysis	On-site
12:05	Antonio Riesco	SGRE	La Plana Hybrid Facility	On-site
12:25	Juraj Kosek	Closing remarks		
12:40	Lunch break and end of the 1st HIGREEW Workshop			
13:30	6th General Assembly - meeting of the consortium members + HIGREEW advisory board			
16:00	Departure to Pinflow energy storage, s.r.o.			
16:20	Excursion: Pinflow energy storage – manufacture			
16:50	Departure to NTC UW			
17:00	Excursion: NTC – SARPES, TEM, Eng. of El. Chem. Proc.			

17:30	Departure to the city centre, break
19:00	Meeting by the main entrance to the Cathedral of St. Bartholomew on the Main square, diner in the city centre - Potrefená Husa

2.2 Participants

During the COVID-19, all conferences must be shifted from real to online world. Of course, personal interactions and networking were missing but the online events had also advantages. They allow to reach the audience without barriers smoothly. Hybrid concept was selected as an optimal format for the 1st HIGREEW Workshop as it preserves all advantages. It should be also noted that during the time when the registration to the workshop was opened, the omicron wave of COVID-19 was already behind culmination and the number of new cases in Czech Republic was slowly declining. The local restrictive measures related to COVID-19 were also slowly softening. On-site, all hygiene and safety measures were followed.

In the registration form attendees had the option to select between online and on-site attendance. The registration was opened without any limitations and the registration form was available on HIGREEW project web pages. Those participants that selected on-site attendance obtained confirmation with soft landing instructions (i.e., how to get to Pilsen and accommodation references). Attendees that were connecting on a remote basis obtained confirmation including ZOOM link into their calendars. The registrations grown consequently with a dynamic showed in Figure 2 to 56 registered on-site and 151 online attendees.

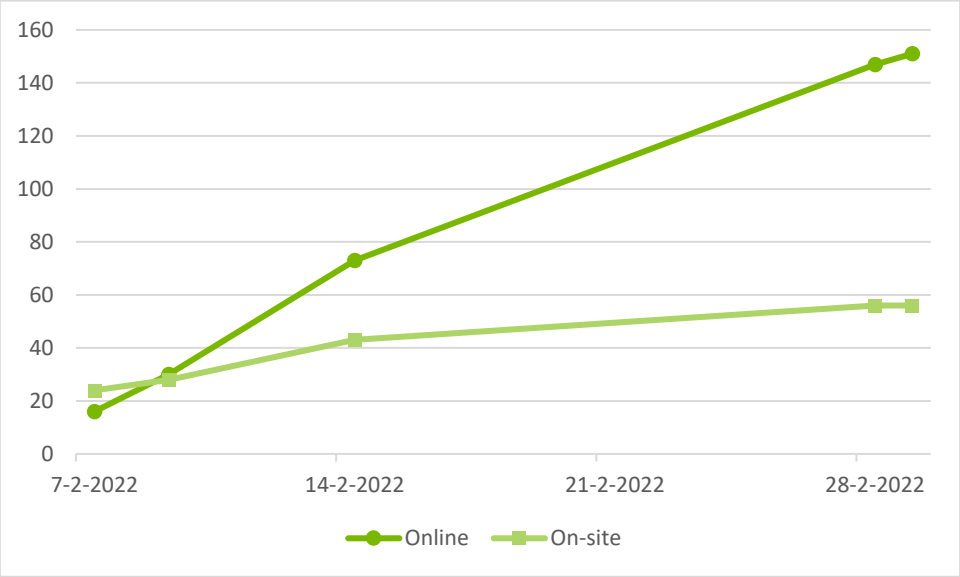

Figure 2: Evolution of number of registered attendees.

We have obtained registrations from different countries over the whole world (Figure 3 and Table 3). The most frequent countries of on-site registered attendees were Czech Republic, Spain and Germany while registrations of remote participants came mainly from Spain, Germany, Czech Republic, Netherlands and USA. It should be noted that the link for connection to the event was publicly available few days prior the workshop. On our workshop we had the opportunity to welcome 58 participants in person. During Day 1, 161 unique user accounts were connected, and 97 ZOOM accounts were connected during the Day 2. During workshop breaks, the promotional materials obtained from consortium members were broadcasted. The duration of broadcasting was 520 minutes on Day 1 and 288 minutes on Day 2. The histogram showing the duration of connection of individual online attendees is showed in Figure 4. Most of the online attendees was connected longer than 50 % of broadcasted time.

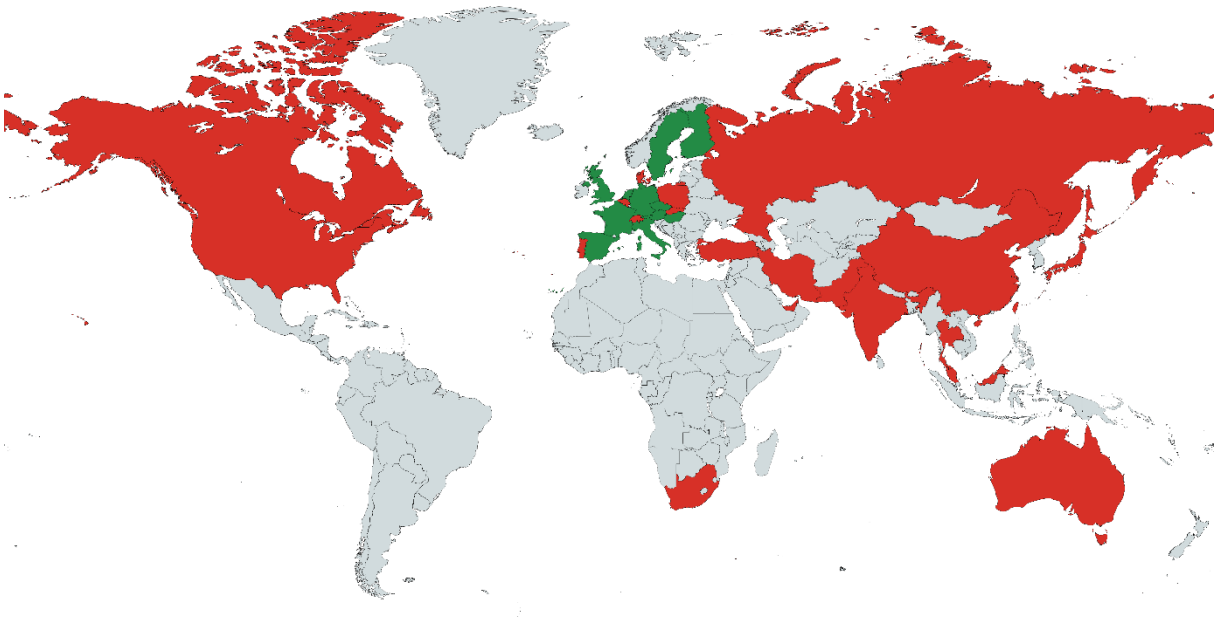

Figure 3: Highlighted countries of on-site (green) and online (red) registered attendees.

Table 3: Registered attendees by countries.

On-site		Online					
Czechia	25	Spain	38	Thailand	4	Iran	1
Spain	11	Germany	18	Belgium	3	Japan	1
Germany	5	Czechia	16	Russia	3	Malaysia	1
Austria	4	United Kingdom	10	Sweden	3	Pakistan	1
Netherlands	3	Netherlands	7	Hungary	2	Poland	1
Sweden	2	United States of America	7	India	2	Slovakia	1
United Kingdom	2	France	5	Portugal	2	South Africa	1
Finland	1	United Arab Emirates	5	Switzerland	2	Taiwan	1
France	1	Denmark	4	Australia	1	Turkey	1
Hungary	1	Finland	4	Canada	1		
Italy	1	Italy	4	China	1		
Total	**56**					**Total**	**151**

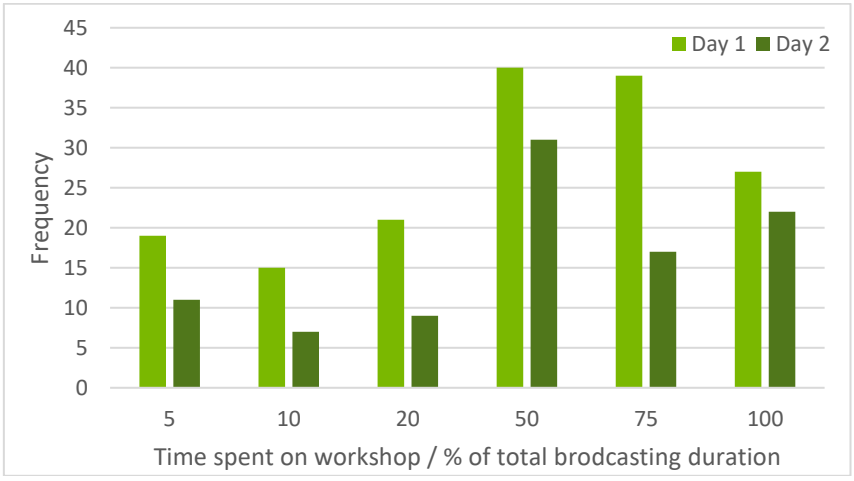

Figure 4: Histogram of presence of online attendees.