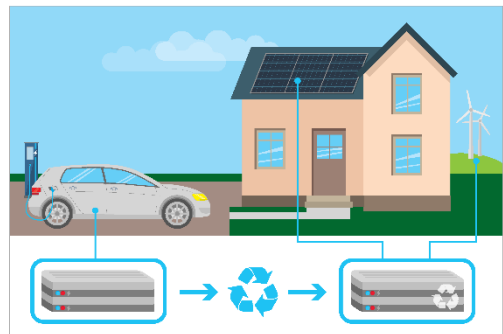


Invitation to the final LibforSecUse Workshop

16 & 17 February 2022 (online)

Li-ion batteries can still be used as low-cost energy storage systems after dismantling and repurposing from their first use in electric vehicles. However, the uptake of second life applications is hampered by the lack of accurate and cost-effective characterisation techniques for state of health determination. The European metrology research project [LibforSecUse](#) has developed measurement and evaluation procedures to determine the residual capacity of Li-ion battery cells using fast and non-destructive impedance-based methods. The procedures have been established on the basis of a series of life cycle tests of various battery cells measured under specifically defined reproducibility conditions. They have been supported by the development of low-impedance standards and the investigation of respective calibration procedures. Several additional activities have been conducted to support and extend the outcome of the project. Results of post-mortem analysis of fresh and cycled cells were linked with physicochemical models of measured impedances. A life cycle test of modules and measurements of further battery cell types and varying cycling conditions have been conducted and the feasibility to predict accelerated aging from impedance data has been investigated. Evaluations of those additional investigations have unfortunately remained in a preliminary stage, since they have suffered from delays caused by the Corona pandemic. Nevertheless, the project has provided promising tools for efficient testing of second-use Li-ion batteries.



After a run-time of three and a half years, the project will now be concluded with a final workshop. The involved partners will present the main outcomes and the consortium will be happy to discuss the results and potential uptake and further steps with all interested parties.

Program

Day 1

10:00	Welcome & Overview	Steffen Seitz	PTB
	<i>The LiBforSecUse project and its objectives and main achievements</i>		
10:15	Low-impedance standards for calibration of impedance measurement devices		
	<i>Impedance simulator for the calibration of LCR-meter in its low impedance range</i>	Frédéric Overney	METAS
	<i>Current shunt defined in a four-terminal-pair configuration</i>	Mohamed Ouameur	LNE

	<i>Passive reactance standards with fixed phase angles</i>	Hans He	RISE
	<i>Reference sampling setup for low impedance calibrations.</i>	Stanislav Mašláň	CMI
	<i>Comparison measurement of impedance standards</i>	Stanislav Mašláň, Steffen Seitz	CMI, PTB
12:30	Lunch break		
13:30	Prediction of residual capacity of LiB cells from impedance-based measurements I		
	<i>Reproducibility conditions of EIS & LCTs</i>	Steffen Seitz	PTB
	<i>Identifying and evaluating impedance-based parameters for residual capacity determination</i>	Chan Hoon Seng	KIT
	<i>Predictive model for battery state-of-health by direct inspection of impedance data</i>	Chan Hoon Seng	KIT
	<i>Predictive model for battery state-of-health using distribution of relaxation times (DRT) analysis on impedance data</i>	Tom Heins	PTB
14:45	Break		
15:00	Prediction of residual capacity of LiB cells from impedance-based measurements II		
	<i>Predictive model for battery state-of-health using equivalent circuit fit coefficients to impedance data</i>	Edmund Dickinson	NPL
	<i>Predictive model for battery state-of-health and aging rate using nonlinear frequency response analysis (NFRA)</i>	Chan Hoon Seng	KIT
	<i>Assessing lithium-ion battery condition for second use using impedance data: summary and outlook on data-led methods</i>	Edmund Dickinson	NPL
16:15	Expected end of first day		

Day 2

09:30	Validation of predictive procedures I		
	<i>Post-mortem measurements: FIB-SEM analysis of aged electrodes</i>	Joze Moskon	NIC
	<i>Post-mortem measurements: Disassembling commercial 18650 cells</i>	Emilio Napolitano	JRC
	<i>Post-mortem measurements at Aalto University</i>	Ekaterina Federovskaja	Aalto
10:45	Break		

11:00	Validation of predictive procedures II		
	<i>Physical modelling of impedance spectra</i>	Edmund Dickinson	NPL
	<i>Physical modelling of NFRA spectra</i>	Chan Hoon Seng	KIT
	<i>Preliminary results of module measurements</i>	Tom Heins	PTB
	<i>Preliminary results of accelerated aging study</i>	Chan Hoon Seng, Tom Heins	KIT, PTB
12:20	Conclusion	Steffen Seitz	PTB
12:30	End of Workshop		

Note: times are in CET

The workshop is free of charge. It will be conducted with MS-Teams. It is required to register to receive the link to the MS-Teams meeting. To this end, please confirm your participation with an informal email to beatrice.sander@ptb.de and steffen.seitz@ptb.de, stating your name and affiliation.