The HELIOS project aims at developing and integrating innovative materials, designs, technologies and processes to create a new concept of smart, modular and scalable battery pack for a wide range of electric vehicles used in urban electromobility services, from mid-size electric vehicles to electric buses, with improved performance, energy density, safety, lifetime and LCoS (Levelized Cost of Storage).

Novel developments that integrate hardware and software solutions for the smart control of electrical and thermal management systems that exploit advanced materials, power electronics, sensors and cutting-edge ICT, such as cloud-based Big Data Analysis, Artificial Intelligence and IoT (Internet of Things) technologies running in the cloud are investigated and implemented within the HELIOS action.

These combined approaches enable to:

i) increase energy and power density;
ii) enhance key characteristics like ultra-high power charging;
iii) improve safety;
iv) improve E fleet control and health management strategies to extend lifetime;
v) create optimised EV charge and discharge procedures and predictive maintenance schedules;
vi) monitor SOC (State of Charge), SOH (State of Health) and carbon footprint for each battery pack throughout its entire life cycle, which allows an effective integrated supply chain for the manufacture, reuse and recycling of Li-ion battery packs to be established;
vii) improve battery pack design and performance with reduced LCoS, based on a circular economy approach where the modular battery packs can be easily re-used in a range of 2nd life applications prior to EoL recycling and
viii) assessment of HELIOS solution effectiveness in different urban electromobility models such as car-fleets and e-bus fleets.

Project page in Cordis
https://cordis.europa.eu/project/id/963646

Project web
https://helios-h2020project.eu/

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HELIOS

High-performance modular battery packs for sustainable urban electromobility services

Project Coordinator:
AARHUS UNIVERSITET (Denmark)
Overall project budget:
€ 11.476.356,25
EC contribution:
€ 9.993.975,25
Call:
H2020-LC-BAT-2020
Topic:
LC-BAT-10-2020 - Next generation and realisation of battery packs for BEV and PHEV
Funding Scheme:
IA - Innovation action
Duration:
01/01/2021 - 31/12/2024 (48 months)

The Helios project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 963646

Parameters	Mitsubishi i-MiEV	HELIOS PHEV tech	S10 E-BUS	HELIOS E-BUS tech
Traction Battery	20 kWh Li-ion	20 kWh HELIOS battery packs	225 kWh LFP	225 kWh HELIOS battery packs
Output power	50 kW	50 kW	250 kW	250 kW
Charging time	30 min	< 6 min	From 3 h to 7 h	< 45 min
Charging power	Chademo (max 62.5 kW, up to 125A@)	180-360 kWh with HELIOS charging technologies	Up to 80 - 180 kWh	Up to 360 kWh with HELIOS charging technologies
HVAC-system	Forced air cooling system	HELIOS Hybrid thermal management system		HELIOS Hybrid thermal management system

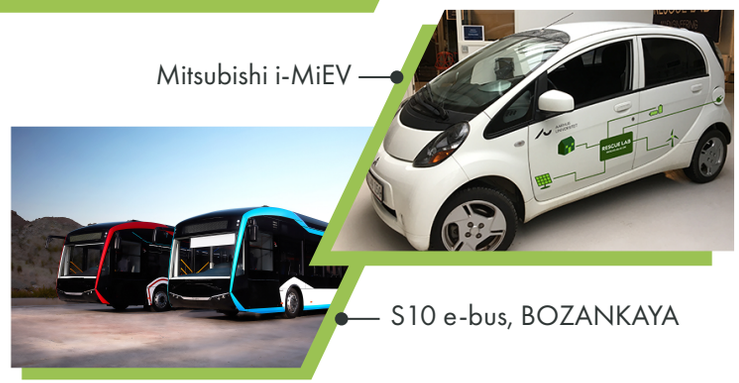
Demonstrating the effectiveness and innovation of the HELIOS solution in two relevant use cases

HELIOS paves the path of EV by enhancing and demonstrating innovative, modular, lighter and eco-friendly hybrid Li-Ion-based battery packs through a holistic development of the whole required technologies and designs.

The HELIOS project aims at:

creating new eco-designs and processes, which facilitate its reuse in second life applications and further recycling at its EoL, contributing to a circular and integrated supply chain in the EU for the fabrication of battery packs, as well as effective and sustainable models for urban electromobility.

The HELIOS use cases:



Mitsubishi i-MiEV

S10 e-bus, BOZANKAYA

Technologies involved in HELIOS	Technology Readiness Level M0	M48
Hybrid module configuration battery packs, integrating LFP and NMC cells	4	7
Advanced polymers and composite material for structural components, housing and insulation	5	7
Hybrid thermal management system integrating tab and surface cooling with PCMs	4	7
Multilevel converters for the efficient management of energy and power	5	7
Multilevel converters for modularity, scalability and adaptability to the powertrain	4	6
In-vehicle AC-DC converters for ultra-fast charge	5	7
Improved charging protocols and communications	4	7
Improved state estimation methodologies, SOC and SOH	4	6
Improved control and health management strategies	4	6
Development of BMS with enhanced functionalities for state estimation and connectivity	5	7
DC-DC converter for cell balancing	4	7
AI algorithms for improved PHM embedded in the datAssistTM IoT software platform	4	6
Digital twins for performance and process circularity optimisation	4	6
LCCA tool for circular economy of Li-ion battery packs	5	7
V2G communication protocols for 1st and 2nd life battery pack utilisation	5	7
Big data analysis and IoTs applied to the management of performance and carbon footprint of EV fleets	4	6
Multisensing units integrated in the BMS for measurement of multiple parameters	5	7
Gas sensors for early detection of CO, VOCs, etc	3	5