



CONSORTIUM FOR
BATTERY
INNOVATION

September 2024

ILZSG, LISBON, PORTUGAL

LEAD BATTERY MARKET OPPORTUNITIES



PRESENTED BY

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CONSORTIUM FOR BATTERY INNOVATION

LEAD BATTERIES ELECTRIFYING THE FUTURE

→ CBI

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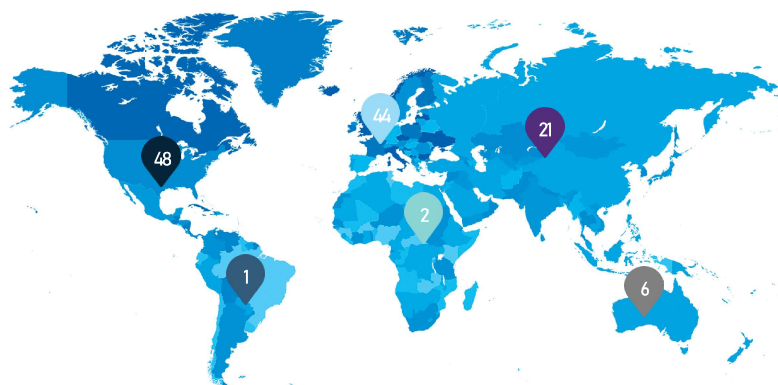


CBI MEMBERS





MAP OF MEMBERS AND PARTNERS



North America

Europe

Asia

South America

Africa

Australasia



Battery Manufacturers

Industry Suppliers

Research & Testing Institutes,
Universities, End-users

Lead Producers

End-users





CONSORTIUM FOR BATTERY INNOVATION

LEAD BATTERIES ELECTRIFYING THE FUTURE

→ CBI

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CBI AREAS OF WORK

RESEARCH

Better batteries

Facilitate improvements in battery and systems performance

- NEW Market analysis
- SOW
- New Projects-core research program
- Technical exchange

COMMS / MARKETING

Better recognition

Promoting innovation in lead battery performance and applications

- Demonstrate lead batteries technology of future
- Direct stakeholder engagement
- Media Narrative (Social Media, articles, videos, PRs, blogs etc.)
- Lead battery information hub (website-technical data, market information.)
- Workshops
- Interactive Map
- Case studies and videos
- Battery Match
- Target industry media
- Conferences and exhibitions

RESEARCH

TESTING/
STANDARDS

STAKEHOLDER
FUNDING

TESTING / STANDARDS

Better recognition

(industry/legislative standards)

Tests and standards that recognize lead battery benefits

- ALBA and SSOF initiatives
- Test method development
- Technical exchange on testing
- Linking research to standards
- Coordination of industry input into standards committees

STAKEHOLDER FUNDING

Securing investment in lead battery projects

- Preparing and submitting bids
- LOCELH2
- AFTRAC
- MESH
- US Military Project
- ANL Project
- US FOA
- Multiple other bids in preparation

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2021 TECHNICAL ROADMAP



Automotive

(start-stop/micro-hybrid)

Ensure that recent improvements in Dynamic Charge Acceptance (DCA) are maintained, whilst improving high-temperature performance and ensuring no trade-offs in key parameters such as Cold Crank Amps (CCA) and water loss.



Automotive

(low-voltage EV)

Improve DCA and charge acceptance, whilst increasing charging efficiency and lifetime.



Energy Storage Systems

Improving cycle life, calendar life and round-trip efficiency whilst reducing acquisition and operating costs.



Industrial applications

Improving cycle and calendar life, whilst reducing battery costs.



Motive Power

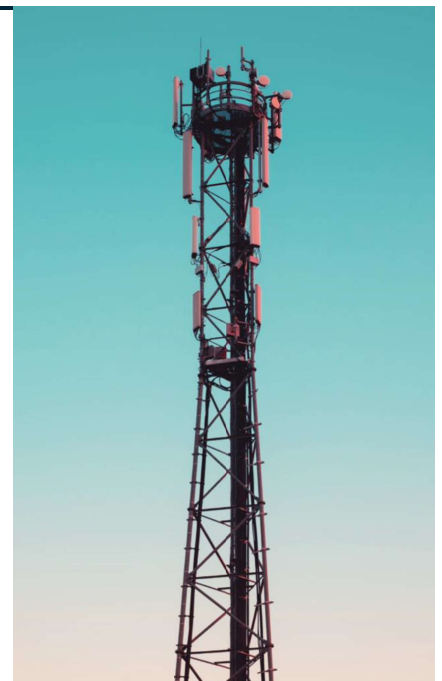
Lowering TCO by increasing cycle life, recharge time, and producing maintenance-free batteries.



Other applications

(including e-bikes)

Improving gravimetric energy density, recharge capability and service life.





FUTURE FOR LEAD BATTERIES



“BATTERIES THE FASTEST GROWING ENERGY STORAGE OPTION AND WILL PLAY A VITAL ROLE IN DELIVERING ON GOALS.”

— EC

Governments looking to reduce greenhouse gas emissions by

→ **50-55% by 2030**

→ Many regions looking to be **net zero by 2050**



These goals cannot be met without **massive increase battery energy storage**



HUGE MARKET OPPORTUNITIES FOR BATTERIES IN ESS

“BATTERY DEMAND FORECASTS TYPICALLY UNDERESTIMATE MARKET SIZE AND ARE REGULARLY CORRECTED UPWARDS.”

— MCKINSEY

PROJECTION
SOURCE: IEA

Conservatively, BESS
predicted to grow to

**550 GWh
BY 2030**

PROJECTION

**CAGR OF 42%
2025-2030**

PROJECTION

Market predicted to
be worth over

**\$30 BILLION
GLOBALLY BY 2030**

PROJECTION
SOURCE: EASE

ESS market predicted to grow
3 FOLD POST 2030



NEED ALL BATTERY CHEMESTRIES TO MEET THE DEMAND

- GROWTH UNPRECEDENTED
- LITHIUM CANNOT SCALE TO MEET ALL DEMAND
- HUGE OPPORTUNITY FOR LEAD BATTERIES

PROJECTION

**42.5% CAGR,
550 GWh
BY 2030**

CURRENT MARKET

**Li AND Pb
REPRESENT 97%**
of rechargeable battery market

PROJECTION

Other technologies less than
2% predicted to remain case
to 2030

OTHERS 2%

SCALE

Lead is **ONLY OTHER
TECHNOLOGY**

that can meet technical
requirements on a mass
market scale

00.0000 - 00.0000



- ↑ PERFORMANCE
- ↑ PRODUCTISATION
- ↑ GOVERNMENT
PARTNERSHIPS
- ↑ COMMUNICATIONS

Global Energy Storage Report – Executive Summary

Battery Energy Storage Systems (BESS) 2035 Market Outlook and Opportunities

Report commissioned by the Consortium for Battery Innovation (CBI) and the International Lead Association (ILA)

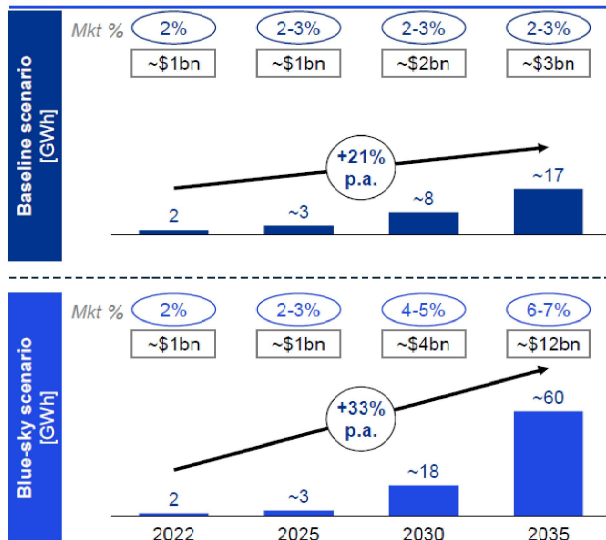
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Battery Energy Storage Systems (BESS) | 2035 opportunities

Based on lead battery manufacturers' ability to improve LCoS, we forecasted two future trajectories for lead batteries

Forecasts of lead sales



KPMG Insights

- We estimate that lead batteries can outpace the market by securing the right positioning on key markets:
 - Behind-the-Meter**, particularly in **EV infrastructure**, lead batteries can take their place as genuine market competitors. By 2035, lead batteries could secure up to 30% of the EV infrastructure market, and has the potential to secure more than 30% of yearly new additions in other BTM applications in emerging economies
 - In **emerging economies**, particularly India, lead batteries can be adopted to support the deployment of **utility-scale RE** against a backdrop of rising temperatures
- The blue-sky scenario presupposes these prerequisites across the entire lead industry:
 - Secure R&D investment to achieve Long-Duration Energy Storage systems
 - Secure R&D investment to achieve extended cycle life, with deep discharge cycles
 - Deploy demonstrator projects to prove lead's viability to project developers

Sources: expert interviews, KPMG analyses



MARKETING-ESS PUSH

- Conducted KPMG ESS study
- Launch study with round table in Europe, and global ESS webinar
- Hold Lead battery ESS workshops/seminars
- Develop ESS investor pack
- CASE STUDIES
- Continue to work with analysts to encourage tracking of lead
- Gather further data on economic benefits on using lead batteries in ESS
- Further communications collateral



STAKEHOLDER FUNDING-CONTINUED SUCCESS



WE ARE SEEING GREAT SUCCESS IN OUR FUNDING BIDS, AND A GROWING UNDERSTANDING BY KEY STAKEHOLDERS OF THE ROLE OF LEAD BATTERIES IN THE FUTURE

- LOCELH2
- MESH
- AFTRAC
- MILITARY MICROGRID
- US FOA 3020
- MILIKEN MOTESPE



ERY MOST
GROWTH



LoCEL-H2 EUROPREAN FUNDING PROJECT

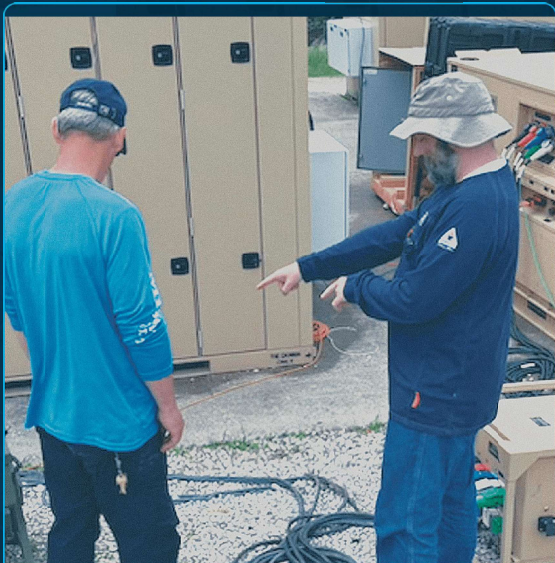
→ LEAD BATTERY
MICRO-GRID PROJECT

LEAD BATTERY
PROJECTED
650 GWh

150,000 MWh



PROJECTED GROWTH
650 GWh



US MILITARY MICROGRID PROJECT

→ TACTICAL MICROGRID
PROJECT

51.5201333, -0.3416798
50.8333, 4.4167
35.905329, -78.094683



51.5301339, -0.1406333
50.9333, 4.4167
35.905329, -78.894583



ADVANCED LEAD BATTERY RESEARCH:

US SYNCHROTRON AT ANL ARGONNE NATIONAL LABORATORY

→ X-RAY DIFFRACTION
PROJECT

150,000 PWh



Electric
Applications
Incorporated



Argonne
National Laboratory

Advanced
Battery Concepts
Better Batteries, Better World



CABOT



CLARIOS

THE
DOE RUN
COMPANY

EASTPENN

EnerSys

EXIDE
TECHNOLOGIES



NorthStar
BATTERY

PSR
CORPORATION

SUPERIOR
GRAPHITE

TROJAN
BATTERY

PROJECTED BSW/H
650 GWh

+

Coming
soon to
a field
near
you...



Prototype being built
now for testing in 2023!

Designed to improve farmer livelihoods

- Helping to break the hardpan and build contour ridges
- Facilitation conversion of fields to Deep Bed Farming
- Electricity for lighting, cooking or charging your phone

aftrak
AFRICA TRACTOR

Partner & sponsor



Ti/eni

Funded by



ENERGY
CATALYST



AFTRAK

AN INNOVATE UK FUNDED PROTOTYPE FOR
A POTENTIALLY REVOLUTIONARY TRACTOR
DESIGN, USING SOLAR AND LEAD BATTERIES

→ AFTRAK SYSTEM IS A MICRO ELECTRIC TRACTOR
CAPABLE OF MECHANISING LAND PREPARATION
IN LINE WITH TYENI'S DEEP BED FARMING TO
PREPARE SOIL TO A DEPTH OF 400MM.

51.5301339, -0.1406333
50.9333, 4.4167
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CLARIOS

Loughborough
University

UKRI
Innovate
UK

CBI’S AFTRAK WINS \$1MILLION MILKEN-MOTSEPE PRIZE IN GREEN ENERGY



AFTRAK ASSEMBLES SOLAR MICROGRID AND CUSTOM-DESIGNED TRACTORS

CBI’S partnership with Loughborough University and Tiyeni demonstrates how advanced lead batteries integrate with solar panels to provide affordable, safe and stable energy for off-grid rural communities.

HUNDREDS OF ENTRIES FROM 79 COUNTRIES + ONLY ONE MILLION DOLLAR WINNER

The Milken-Motsepe Prize in Green Energy is an innovation competition to reward entrepreneurs working to expand access to reliable, affordable, and sustainable off-grid electricity in Africa.



STAKEHOLDER SUPPORT

NAME	AWARD BODY	KEY INDUSTRY PARTNERS	DATE STARTED	DURATION	VALUE	APPLICATION AREAS
LBSRP	US DoE	17 US Battery and Supplier members of CBI	2018	5 years	\$2 million	Fundamental Science (DCA, Lifetimes)
US Military Microgrid	US Military	Energys, ABC, EAST PENN	2021	3 years	\$3.5 million	Tactical microgrids
Smart Grid System	Ameren	GS Yuasa	2021	2 years	\$1.3 million	ESS; EV Charge backup
LOCELH2	HORIZON EUROPE	Hoppecke, H&V, CEA, Loughborough Uni	2023	4 years	€10 million	microgrid coupled with hydrogen technology
Aftrak	INNOVATE UK	Clarios, Loughborough Uni	2023	1 year	£300,000	Solar powered tractor coupled with remote ESS
MESCH	INNOVATE UK	MONBAT	2024	2 year	£1.4 million	Containerised ESS solution
FOA 3020	US Department of Energy	The US Lead Battery Industry, ANL, ORNL, PNNL	Bid submitted Dec 2024 Start Q1/Q2 2025	3 years	\$5 million	Fundamental research
Milken-Motespe Prize	INNOVATE UK	Loughborough, Clarios	2023	1 year	\$1 million	Continuation of MESCH
Circular ESS battery						Closed loop batteries for ESS
BEV Charging Station						EV charging station
Second gen Plug and Play (CERL)						Hybrid ESS
Solar/Diesel Based Microgrid (CERL)						Microgrid; Resiliency
OCED Rural program – DOE 3036						Microgrid; Resiliency



CASE STUDIES DEMONSTRATING LEAD BATTERY ESS VIABILITY



Tianning Lead-carbon BESS installation

Lead-carbon batteries feature in Chinese BESS



Huw Roberts
Director at CHR Metals Limited

October 4, 2023

14 articles [Following](#)



Advanced energy storage system: Poland's Wind Farm using the best of both worlds

Lead and lithium batteries provide up to 4.5 hours of power and help integrate wind power into Poland's energy matrix

ABOUT THE CASE STUDY

This hybrid energy storage (ESS) system made advanced lead and lithium batteries is currently the largest of its kind in Poland.

Strategically situated to enhance the Bytów Wind Farm in Northern Poland this facility maximizes renewable energy usage and stabilizes local energy supplies.

Through efficient energy time-shifting, the system provides a reliable power source during peak demand periods, lowering energy costs for industries and residents. It focuses on low-carbon technologies and high recycling rates, setting a new standard for energy solutions in the region.



Poland's largest hybrid battery storage system. Source: Consortium for Battery Innovation

TECHNICAL SUMMARY

Project launch	October 2019
Construction time	6 months
Size of the system	Advanced lead batteries: 20.5 MWh energy, 1.5 MWh power Lithium batteries: 10.5 MWh energy, 1.5 MWh power, 45-hour backup
Battery type	20 advanced lead-carbon AGM batteries and 10 lithium batteries
Battery provider	Shouke Industrial Assets
Owner	NEKO, Minister of Energy of the Republic of Poland
Application	Self-discharge, time-shifting, power storage, load balancing

*Data: Consortium for Battery Innovation

MARKET OPPORTUNITY

Advanced lead batteries are well suited for applications such as this, demonstrating significant enhancements in energy density, charge acceptance, depth of discharge and cycle life.

Hybrid ESS systems are reshaping the energy storage landscape. Market opportunities for front-of-the-meter (FTM) applications are expected to exceed 600 GWh by 2025.

Successful chemistry systems are yet to be commonplace, making this project a pioneering effort in the energy sector. Comparable energy storage technologies are expected to experience significant growth in the coming years, with the potential for market expansion in response to growing demand.

SUSTAINABILITY AND IMPACT

The hybrid system combines the performance strengths of two different battery technologies, resulting in highly efficient and cost-optimized solutions.

With around 70% of electricity still produced by coal in Poland, investments are turning up towards renewable energy and energy storage deployment. The successful demonstration of this FTM system contributes to the further integration of renewable energy in Poland by ensuring the stable operation of the electricity grid and minimizing investment in transmission infrastructure.

Huach (distributor, control system provider) and Shouke (battery manufacturer) followed best practices in battery manufacturing. In Japan (battery manufacturer) and Europe (space of use), over 90% of lead batteries are collected and recycled. Over 90% of the content in these lead battery products is from recycled elements. Furthermore, these batteries are made in state-of-the-art facilities with the lowest carbon footprint for battery production.

LOCATION

Gdansk County, Poland



Consortium for Battery Innovation

Find out more

More information on the case study and other case studies is available at www.batteryinnovation.org

Contact information

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www.batteryinnovation.org



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Thank you!

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