



CONSORTIUM FOR
BATTERY
INNOVATION

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ILZSG, LISBON, PORTUGAL

LEAD BATTERY MARKET OPPORTUNITIES



PRESENTED BY

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EXECUTIVE DIRECTOR, INTERNATIONAL LEAD ASSOCIATION

CONSORTIUM FOR BATTERY INNOVATION

LEAD BATTERIES ELECTRIFYING THE FUTURE

→ CBI

→ 51.1205331, -0.2458798
50.8332, 4.4167
36.005379, -76.948683

CBI MEMBERS






Argonne
NATIONAL LABORATORY



CEN
CENELEC



EUROBAT



Imperial College
London



Loughborough
University

LUMS
A Not-for-Profit University



NUVATION
ENERGY



TiEni

UCLA





North America
South America

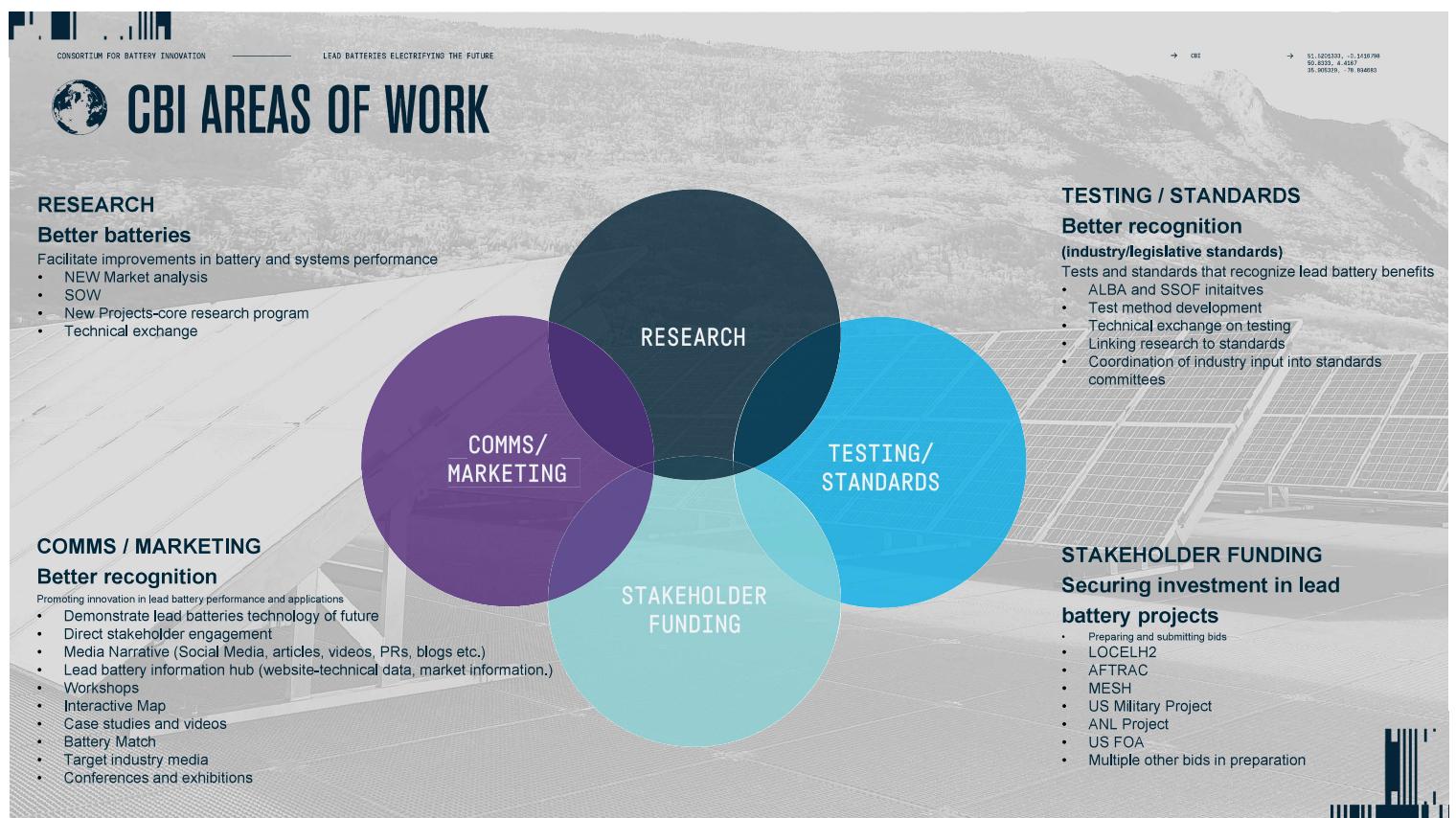
Europe
Africa

Asia
Australasia



- Battery Manufacturers
- Industry Suppliers
- Research & Testing Institutes,
Universities, End-users
- Lead Producers
- End-users





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

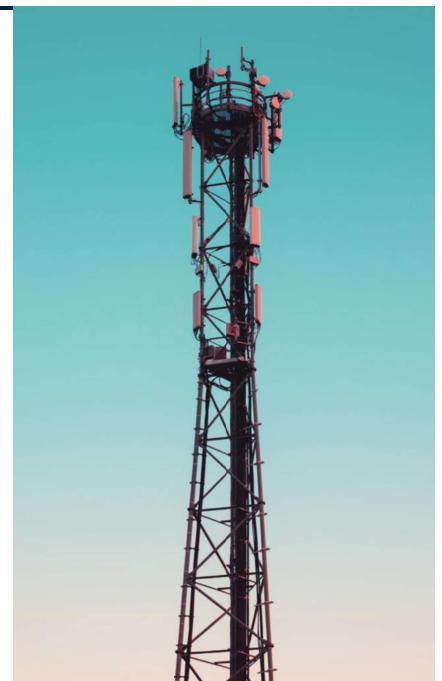
Improving cycle and calendar life, whilst reducing battery costs.

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 predicated 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 CHEMISTRIES 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

↑ PERFORMANCE

↑ PRODUCTISATION

↑ GOVERNMENT
PARTNERSHIPS

↑ COMMUNICATIONS



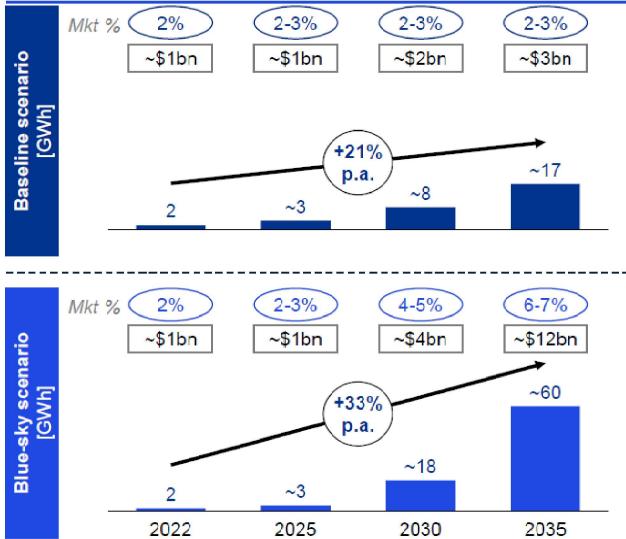


Battery Energy Storage Systems (BESS) | 2035 opportunities



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



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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

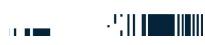


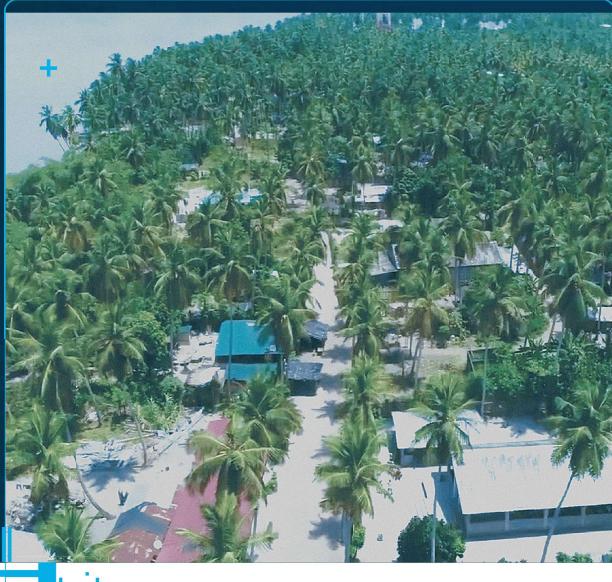
STAKEHOLDER FUNDING-CONTINUED SUCCESS



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 MOTESP





LoCEL-H2 EUROPREAN FUNDING PROJECT

LEAD BATTERY
PROJECTED
650 GWh

150,000 MWh

→ LEAD BATTERY
MICRO-GRID PROJECT



PROJECTED GROWTH
650 GWh

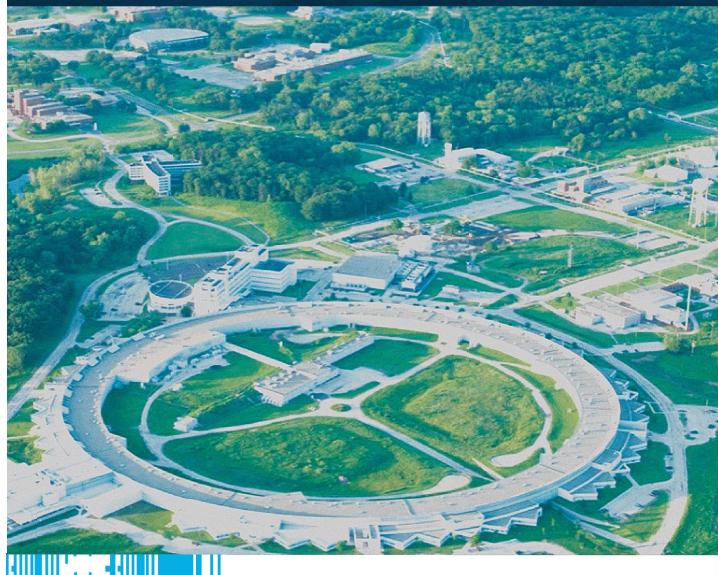


US MILITARY MICROGRID PROJECT

→ TACTICAL MICROGRID
PROJECT

51.820133, -0.1416798
50.8333, 4.4167
35.805329, -78.894683





ADVANCED LEAD BATTERY RESEARCH:

US SYNCHROTRON AT ANL ARGONNE NATIONAL LABORATORY

150,000 MWh

→ X-RAY DIFFRACTION
PROJECT



Electric
Applications
Incorporated

CONSORTIUM FOR
BATTERY INNOVATION

Argonne
National Laboratory

Advanced
Battery Concepts
Better Batteries, Better World®

Borregaard
LignoTech

CABOT

CROWN
BATTERY

CLARIOS

THE
DOE RUN
COMPANY

EASTPENN

EnerSys

EXIDE
TECHNOLOGIES

HYDROKINETIC

NorthStar
BATTERY

PST
CORPORATION

SUPERIOR
GRAPHITE

TROJAN
BATTERY COMPANY

PROJECT ID: DMR-II
650 GWh

150,000 MWh



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

Partners & supporters
Loughborough University
CONSORTIUM FOR
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CLARIOS
ENERGY CATALYST

AFTRAK

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

51.520133, -0.1418
50.8333, 4.4167
50.805329, -78.894883

→ 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.



Tyeni

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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	Enersys, 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-Motsepe 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



Tianeng Lead-carbon BESS installation

Lead-carbon batteries feature in Chinese BESS



Huw Roberts
Director at CHR Metals Limited

October 4, 2023

14 articles 



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

Lead and lithium batteries provide up to 4.6 hours of power and help integrate wind power into Poland's energy matrix

ABOUT THE CASE STUDY

This hybrid energy storage (HES) system made of advanced lead and lithium batteries is the first of its kind in Europe.

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

Through efficient energy flow control, the system provides reliable power to the local demand and can be levering energy costs for industries and residents. It features low-carbon technologies and high recycling rates, setting a new standard for energy solutions in the region.



Poland's largest hybrid battery energy storage system. Source: Sumitomo Mitsui Banking Corporation

TECHNICAL SUMMARY

Project launch	Q3 2018
Construction time	12 months
Size of Peaking	silver-cobalt batteries 26.8 MWh energy, 5.4 MWh power lithium batteries 0.7 MWh energy, 1.0 MWh power, 48-hour system
Battery type	24 kW vented lead-carbon ASB batteries™ and lithium batteries
Battery provider	Sumitomo Mitsubishi
Owner	NEOO, Minister of Energy of the Republic of Poland
Operator	http://www.energo.ner.gov.pl/strony/energo/ksiazki/ksiazka_01.htm

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LOCATION



© Consortium for Battery Innovation 2020. Technical Update
24 MWh 2018: Global energy storage market executive summary

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 durability.

Hybrid BESS systems are reshaping the energy storage landscape. Market opportunities for front-of-the-meter (FTM) applications are expected to exceed 400 GWh by 2029.

Battery chemistry systems are yet to be commercialized, making this project a pioneering effort in the energy sector. Comparable systems illustrate the growing acceptance and implementation of these large-capacity hybrid systems. The potential for market expansion is promising and significant returns on investment as these technologies become more mainstream.

SUSTAINABILITY AND IMPACT

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

With around 70% of electricity still produced by coal in Poland, investments are increasing to support the transition to a more sustainable energy system. 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.

Hydro distribution control systems provided by Gdansk Energy Materials followed best practices in lead battery manufacturing. In Japan (place of manufacturing) and Europe (place of use), over 99% of lead batteries are collected and recycled. One third of the lead in these lead battery products is from recycled sources. Furthermore, significant improvements made in state-of-the-art batteries with the lowest carbon footprint for battery production.



Find out more

More information about the case study and the latest news of 200 studies on our [WEBSITE](#)

Contact information

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