

**Battery Innovation 2021 |
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**« EUROBAT 2030
Battery Innovation Roadmap »**

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Introduction EUROBAT

- **EUROBAT** represents industry- **manufacturers and supply chain** of automotive and industrial **batteries** - at **EU** and **national** levels
- All battery technologies – lead, lithium, sodium, nickel



MORE THAN

50

Manufacturers
and Associate
members from
across the
value chain



MORE THAN

30

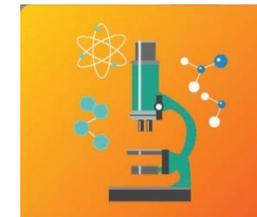
battery
manufacturing
plants



OVER €

6.5

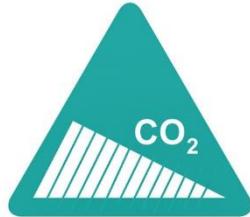
BN annual
turnover



16

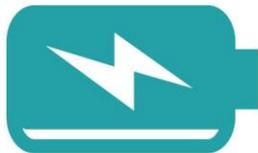
research
centers

What drives battery manufacturers?



- Batteries are the cornerstone for **decarbonising power and mobility.**

- Automotive and industrial battery market worth **€ 15 bn in Europe and € 75 bn worldwide** (2019). Forecasted to rise to **€ 35 bn and € 130 bn respectively by 2030.**



- Today's key battery technologies – **lead-based and lithium-ion** – will remain the most important and will both undergo growth as we head towards 2030.

- Changes to the legislative framework on batteries required and under preparation – need to deliver fast on the new framework of **Batteries Regulation, ELV Directive and REACH.**



Battery Innovation Roadmap 2030: Purpose & Scope

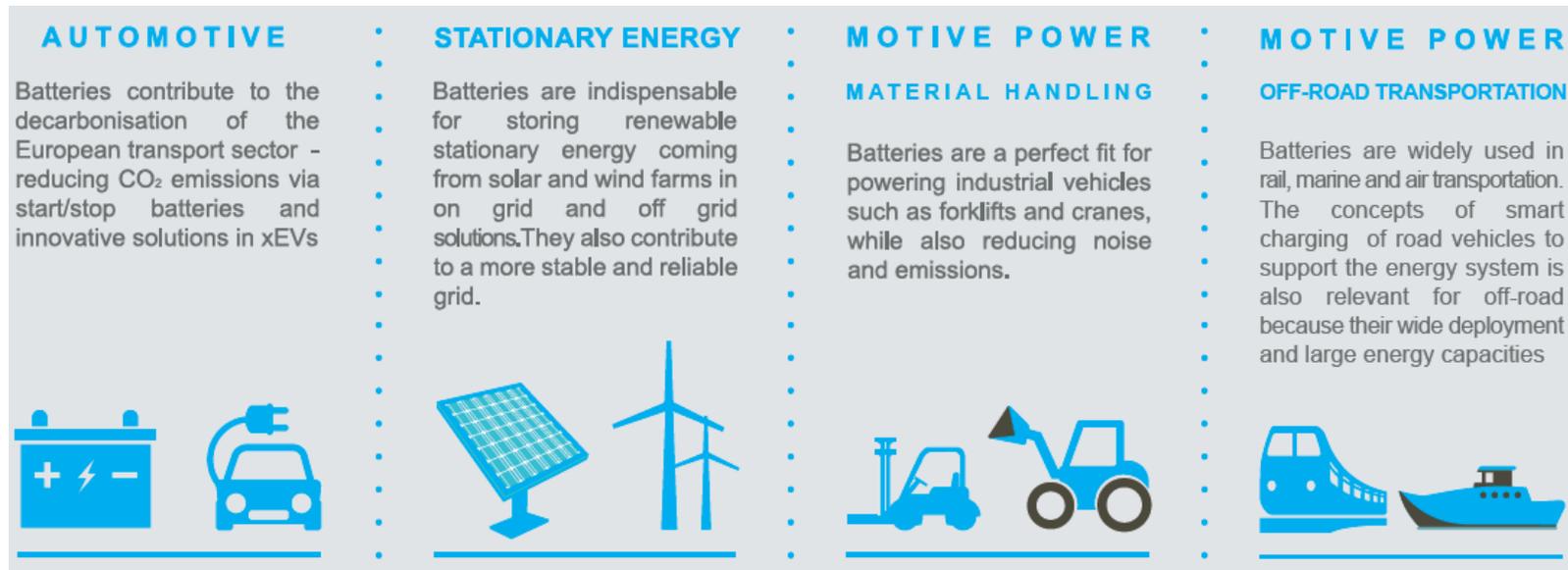
Purpose

- Highlights the **strong innovation potential** of all battery technologies, looking forward to 2030.
- Shows how different technologies **contribute to EU decarbonisation** and « **Green Recovery** » net-zero pollution targets.
- Makes **recommendations to EU policy-makers** on the **Batteries Regulation**, based on the **EUROBAT Election Manifesto**, aiming to:
 - ✓ Secure future **EU investment**
 - ✓ Enhance **growth, skills and jobs in the EU**
 - ✓ Create a **level playing field for all technologies**



EUROBAT Battery Innovation Roadmap: Purpose & Scope

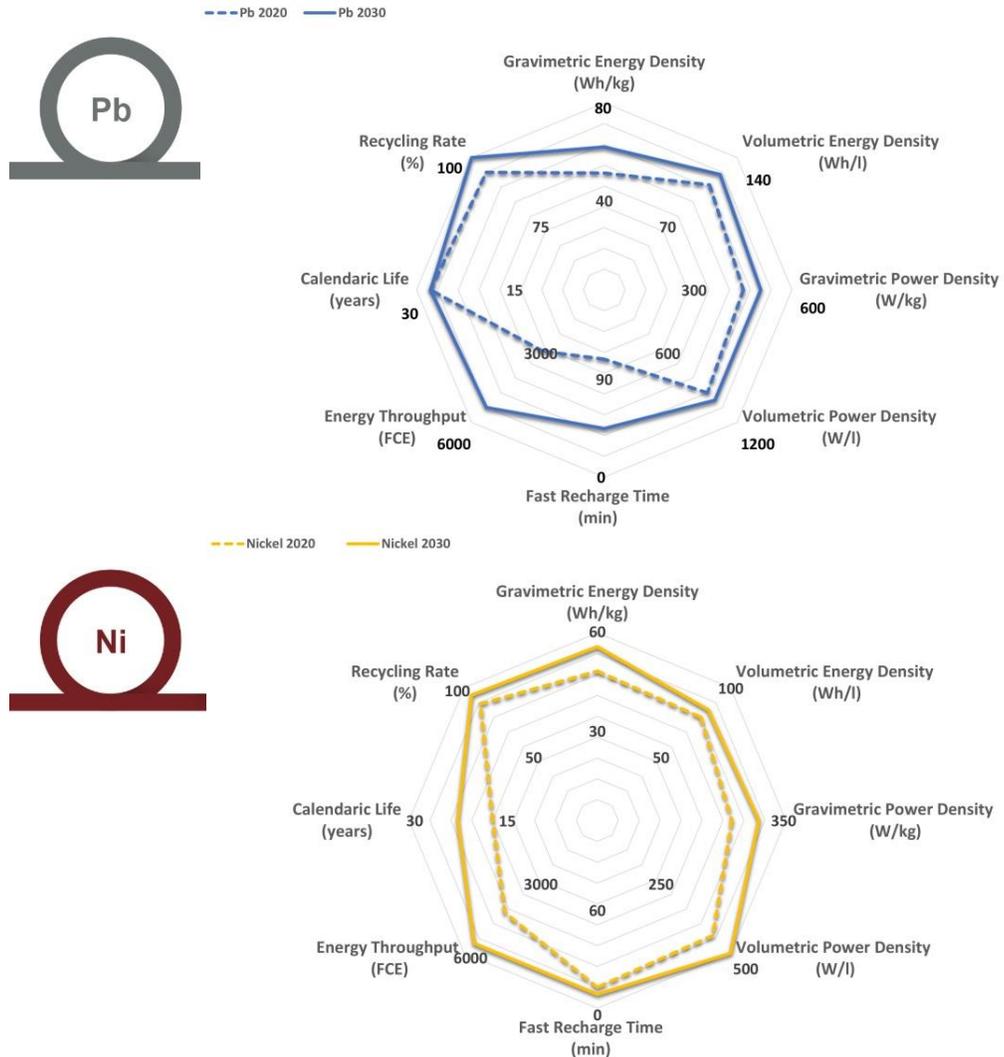
Scope: 4 Areas – 12 Battery Applications



- **No one-size-fits-all battery technology**
- **Battery Innovation is an ongoing process, driven by the requirements of applications**
- **Europe's battery sector has for decades had a market-driven innovation approach to meet new demands**

Battery technologies: performance targets 2020 - 2030

Key Performance Indicators, Lead- and Nickel based



Lead-based batteries

Strengths:

- + Recycling efficiency
- + Calenderic life (stationary)
- + Functional safety

Development potential :

- Rechargeability (automotive)
- Cycle life time (stationary)

Nickel-based batteries

Strengths:

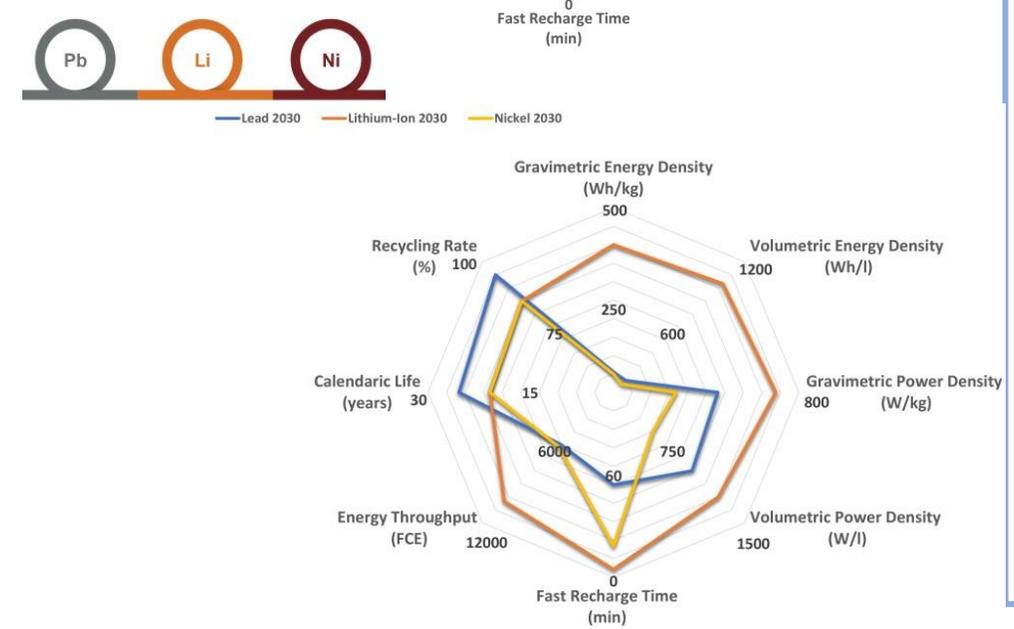
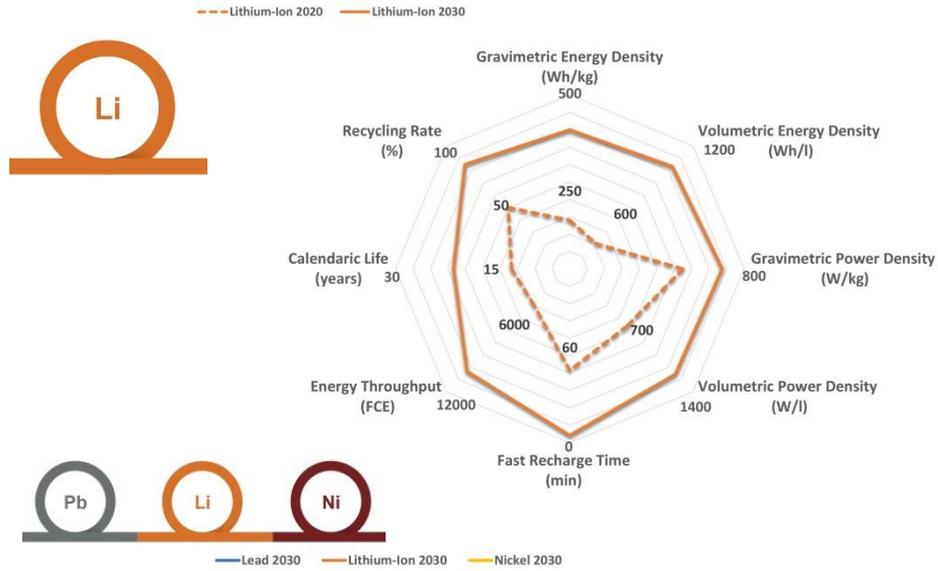
- + Cold temperature performance (NiCad)
- + Fast recharge time

Development potential:

- Cycle life
- Calenderic life

Battery technologies: performance targets 20 – 30

Lithium and summary



Lithium-based batteries :

Strengths:

- + Specific energy density
- + Specific power density
- + High cycle life

Development potential:

- Recycling efficiency (and material sourcing)
- Calendaric life

Comparing the 2030 outlook:

- Li-ion: newest chemistry with highest development potential for coming 10 years
- The established chemistries prove their right of existence due to:
 - Affordability
 - Proven and reliable functionality
 - Circular economy aspects

EUROBAT Battery Innovation Roadmap Area 1: Automotive Mobility



- **Micro-and Mild Hybrid Vehicles** use 12V Start-Light-Ignition batteries and 12V Start-Stop batteries (> 80% new vehicles in 2019). **99% of new cars utilise Pb-batteries.**
- **Key areas of development:** capture **regenerative braking energy**, improve **dynamic charge acceptance**, **better temperature robustness**
- Dominant technology by 2030: Pb-based, Lithium to penetrate with few percentages



- **PHEV and EV traction batteries:** mainly Li-on, LFP or NMC
- **Key areas of development:** **volumetric energy density** and **preventing thermal runaway**
- Solid state will help to increase the energy content and the security aspects in case of an accident or other high physical stress
- Dominant technology by 2030: Lithium-based



- **12V Auxiliary Batteries** are used in ICEs and x-EVs to support the 12V on-board net, majority lead-based as an affordable and reliable energy source.
- **Key areas of development:** increase **cycling life**, **energy efficiencies**
- Dominant technology by 2030: Pb-based, lithium to penetrate with small percentage



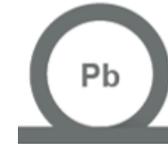
- **Heavy Duty Commercial Vehicles:** Total cost of ownership is KPI for fleet operators
- **Key areas of development:** support **hotelling functions** through better energy supply and deep-discharge capability.
- Dominant technology by 2030: Pb-based

EUROBAT Battery Innovation Roadmap

Area 2: Motive Power – Material Handling & logistics



- **Material handling & logistics market:** mainly Pb batteries in forklifts (+/- 90% market share).
 - ✓ **Noise and emissions legislation:** battery forklifts replace ICE (73GWh by 2030).
 - ✓ **Lead** to remain dominant (2030: 80% market share vs 15-30% for Li).
 - ✓ **Key advantages for Pb:** counterweight and standardisation
- **Key areas of development:**
 - ✓ Cycle life, charge efficiency, fast charge in a wide temp range and PSOC cyclability.
- **Dominant technology in 2030:**



- **Automated Guided Vehicles and Carts (AGV/AGCs):** transport systems operating without direct human interaction and powered by lead, NiCd and lithium batteries.
- **Key areas of development:** high volumetric energy and power density, broad operation temp range and cyclability.

- **Dominant technology in 2030:**



EUROBAT Battery Innovation Roadmap

Area 3: Motive Power – Off-Road Transportation



- **Railway batteries and railway standby:** used in various applications today; mainstream technologies: NiCd, lead and lithium.
- **New applications for battery systems:** hybridisation and electrification of rail power traction. High energy, power density and cyclability suit **lithium systems** best and fastest growing battery segment for railway applications.
- **Key areas of development:** volumetric energy density, lifetime and operation temp range.

• **Dominant technology in 2030 traction:**



auxiliary:



- **Marine sector** strong contributor to CO2 emissions and pollution. Lithium used for hybrid/pure electric propulsion, lead for on-board auxiliary services.
- **Key areas of development:** gravimetric/volumetric energy density and cyclability

• **Dominant technology in 2030 traction:**



auxiliary:



EUROBAT Battery Innovation Roadmap

Area 4: Stationary Energy Storage Batteries Telecom/UPS

Global Telecom and industry (UPS): biggest segments in “stationary” market with highest volume and growth in EU. UPS: data centres and commercial/industrial/health facilities; security, emergency lighting.



- **Uninterrupted power supply (UPS):** lead is the dominant technology providing instant power if the main power source fails. Existing market with new requirements where **Lithium** will have 7-18% market share by 2030.
- **Key areas of development:** power density, charge acceptance, high temperature float life and fast rechargeability
- **Dominant technology in 2030**



- **Telecom:** largest income stream for lead batteries. Technical enhancement of 4G, 5G, and better telecom infrastructure key drivers for lead. Telecom batteries are cells or blocks supplying power to ITC or telecom sites if the main power source is unavailable/insufficient.
- **Key areas of development:** energy and power density, energy throughput, charge acceptance and high temp operation.
- **Dominant technology in 2030**



EUROBAT Battery Innovation Roadmap

Area 4: Stationary Energy Storage Batteries RES behind the meter/ESS batteries



- **Renewable Energy Storage batteries behind the meter:** supply load when electricity costs are high or renewable power output low.
Main drivers: increased self-consumption and need for power continuity. Both **lead and lithium** compete in this market, each with their own features.
- **Key areas of development:** design life and cyclability
- **Dominant technology in 2030**



- **Utility grid-scale energy storage (ESS batteries):** batteries provide grid stability in multiple ways - store energy quickly or feed in for grid compensation and supply energy to an island power. Depending on requirements and grid-functionalities, **all battery technologies** to be used.
- **Key areas of development:** cycle life, PSOC operation, power density, high power discharge capability, and round-trip efficiency.
- **Dominant technology in 2030**



EUROBAT Battery Innovation Roadmap: Concluding remarks

- Our Battery Innovation Roadmap 2030 demonstrates that:
 - ✓ **All battery technologies are complementary**, each have specific features and **significant development potential**
 - ✓ Different **battery chemistries powering numerous applications** will continue to evolve according to specific requirements
 - ✓ **Developing all battery chemistries** will maximize the contribution of our Industry to meet the zero-pollution targets **of Europe's Green Deal by 2050**
 - ✓ If the EU battery industry is to meet future demand – anticipated at 3x today's volume by 2030 – **all 4 chemistries have to be able to play their role**
 - ✓ Having different manufacturing chemistries in our portfolio also **provides strategic advantages** with regard to **Europe's competitiveness** and **self-sufficient sourcing and manufacturing**

More information on our website

For the full report, please consult the EUROBAT website – www.eurobat.org :

1. **Executive Summary**
2. **EUROBAT Battery Innovation Roadmap 2030**
3. **Technical Annex**

