



BATTERY POWER | TOUR FOR SKILLS Czech Republic

ALBATTS – Education and Training

João Alves, ATEC / ALBATTS WP Leader, joao.alves@atec.pt



EDUCATION / TRAINING



Analyse **new job tasks**

Propose **learning and competence objectives**

Develop **course plans and learning materials**

Pilot Innovative courses

Train the trainers and develop guidelines

Make use of European tools and national good practices

ALBATS TRAINING FRAMEWORK AT BATTERY INDUSTRY



Co-funded by the
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of the European Union

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Education and training framework



Pillar 1 Curricula for all levels

- EQF levels 3 to 8
- Learning outcomes approach
- Modular approach based on micro-learning
- Reference of transversal, cross-sectoral, sector-specific and occupation-specific skills

Pillar 2 Innovative and flexible learning

- Inclusive training methods
- Training methods adapted to initial and up/re-skilling
- Work-based learning
- ICT based on open educational resources
- Adaptive learning solutions
- Joint educational programs, including transnational learning



- Continuous train the trainer programs for sectoral skills update
- Digital skills development programs
- Language skills (VET)
- Companies' tutors development programs (Dual system)
- Mobility programs for teachers/trainers in companies
- Expert and discussion international forums

Pillar 3 Competent trainers and tutors

- Reference to other frameworks
- Micro-credentials / Digital badge
- Adapted to national and regional frameworks
- Validate and recognition of Competence
- Training recognition
- Sectoral Skills Strategy Alignment
- European Vocational Core Profiles

Pillar 4 EU wide recognition





What types of training have been developed?



Skills Cards



26 job skills cards produced
(15 on HE level and 11 on VET level)

- Each card has short description of the job role and
- Cross-sectoral specific competences
 - Sector specific competences (has a big importance)
 - General transversal competences
 - Academic competences



Summaries of Skills Cards (available in our website)



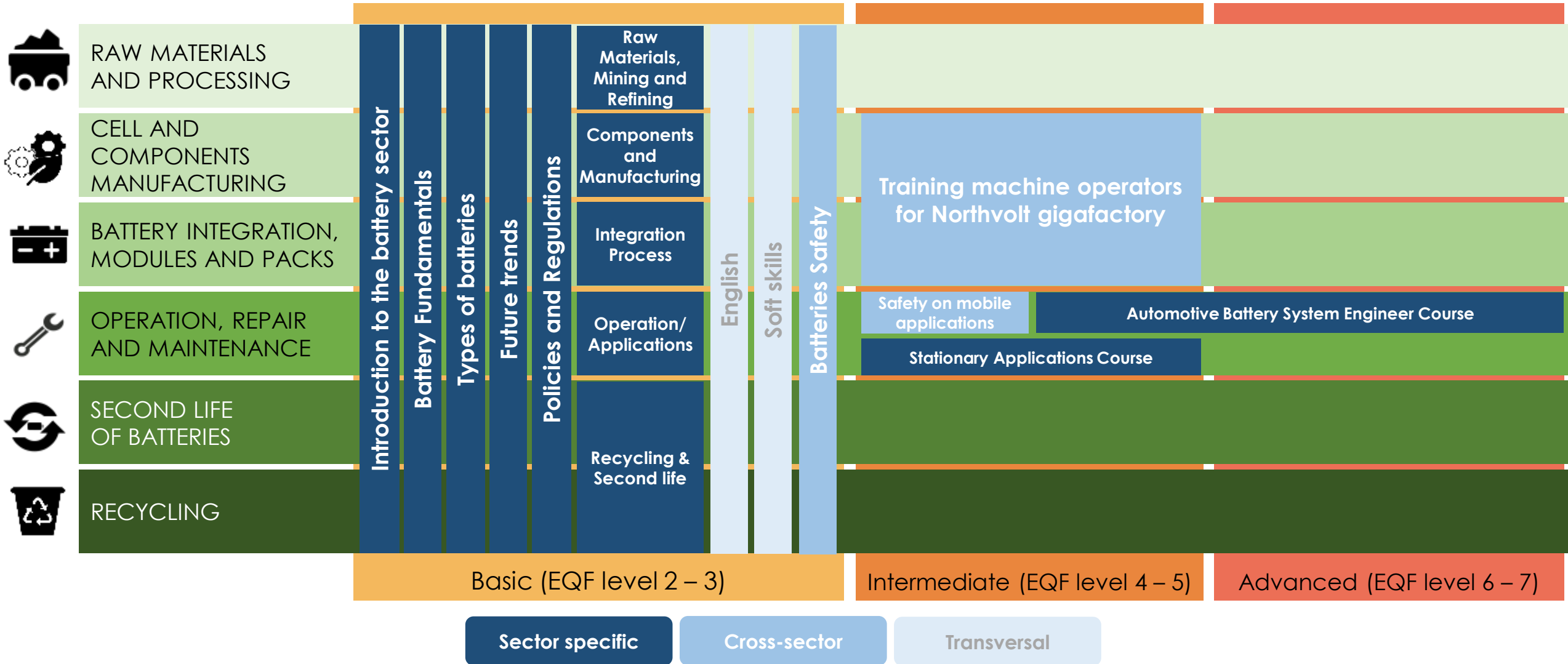
ALBATTs SKILLS CARDS



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ALBATTTS Training Offer



Sector specific

Cross-sector

Transversal

Courses



Examples of available courses

Available through the Automotive Skills Alliance (ASA), an association created through the bridging of the projects ALBATTS and DRIVES activities.



ALBATTS COURSES

Training recognition



Learning Platform eroush (EN) -

COURSES

All General Production Maintenance Engineering &D Battery Sector

BATTERIES BASICS

ALBATTs - Integration Process

MOOC TYPE

EN LANGUAGE

Details

ALBATTs - Manufacturing Processes

MOOC TYPE

EN LANGUAGE

Details

Automotive Battery Systems Engineer

MOOC TYPE

EN LANGUAGE

ASA Badges

Details

BATTERIES BASICS

ALBATTs - Raw Materials, Mining and Refining

MOOC TYPE

EN LANGUAGE

Details

- Recognized by the sector
- Skills recognition through digital badges
- Skills aligned with European Frameworks (e.g. ESCO)

Training available on the **Automotive Skills Alliance (ASA)** learning platform

<https://learn.skills-framework.eu/>



Training for VET teachers



About BaTT Forum

The Batteries Teachers & Trainers Forum (BaTT Forum) is an initiative launched by ALBATTs.

It aims to gather current and future teachers and trainers to share ideas and good practices, work together and deepen their knowledge about the battery sector. Two events have been run so far.

The BaTT Forum is now funded and further developed through the CaBaTT - Capacity Building for Battery Teachers in Vocational Education and Training Erasmus funded project 2023-1-FI01-KA220-VET-000160282 with the aim to develop a sustainable model offering Erasmus+ courses for VET teachers that are open to all and eligible for the VET schools own Erasmus+ Mobility funding.



What have we identified to be important to take into consideration?



STRATEGY FOR EDUCATION & TRAINING



STRATEGY FOR EDUCATION AND TRAINING IN THE BATTERIES SECTOR

TARGET GROUPS TO BE CONSIDERED:



MACRO



MICRO



EUROPEAN COMMISSION



NATIONAL AUTHORITIES



SCHOOLS (VET & HE)



INDUSTRY/COMPANIES



Recommendations /Vocational Education!



EU-level:

- Skills agenda roll-out over Europe
- Funding for labs, on- and offline

Regional/National level:

- Green skills in curriculum!
- Flexible curricula – easy to update and adapt
- Modular
- Force education providers to cooperate!
- English language learning!
- Soft skills

VET provider level:

- Cooperate – universities - industry, - other VET providers!
- Be proactive! Don't wait!
- Take advantage of Erasmus+ opportunities to participate in initiatives and projects

Working life:

- Communicate with VET providers!
- Offer on-site experience for teachers and trainers!



Recommendations /University Education!



Challenge:

- **Universities teach only what they research...**but few universities have eg. battery research
- **Incentives** for European universities to cooperate not only in research, but also in education offerings, also on Bachelor level

Recommendations:

- **Subcontract** a research-specialised university for the needed course!
- **Wrap** a MOOC course from a good university!
- **Introduce Elective green-skills courses! In all relevant programmes, now!**...while program development speeds up...



Battery Training Courses & Skills Collaborations



- ⚡ Need for urgent and continuous training courses offer and update & Need for active and sustainable collaborations, e.g.: **New Eba Academy – InnoEnergy Skills Institute**



An initiative of the European Commission





Thank you!



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BATTERY POWERED TOUR FOR SKILLS

Enabling a prepared education network for the battery ecosystem in Europe



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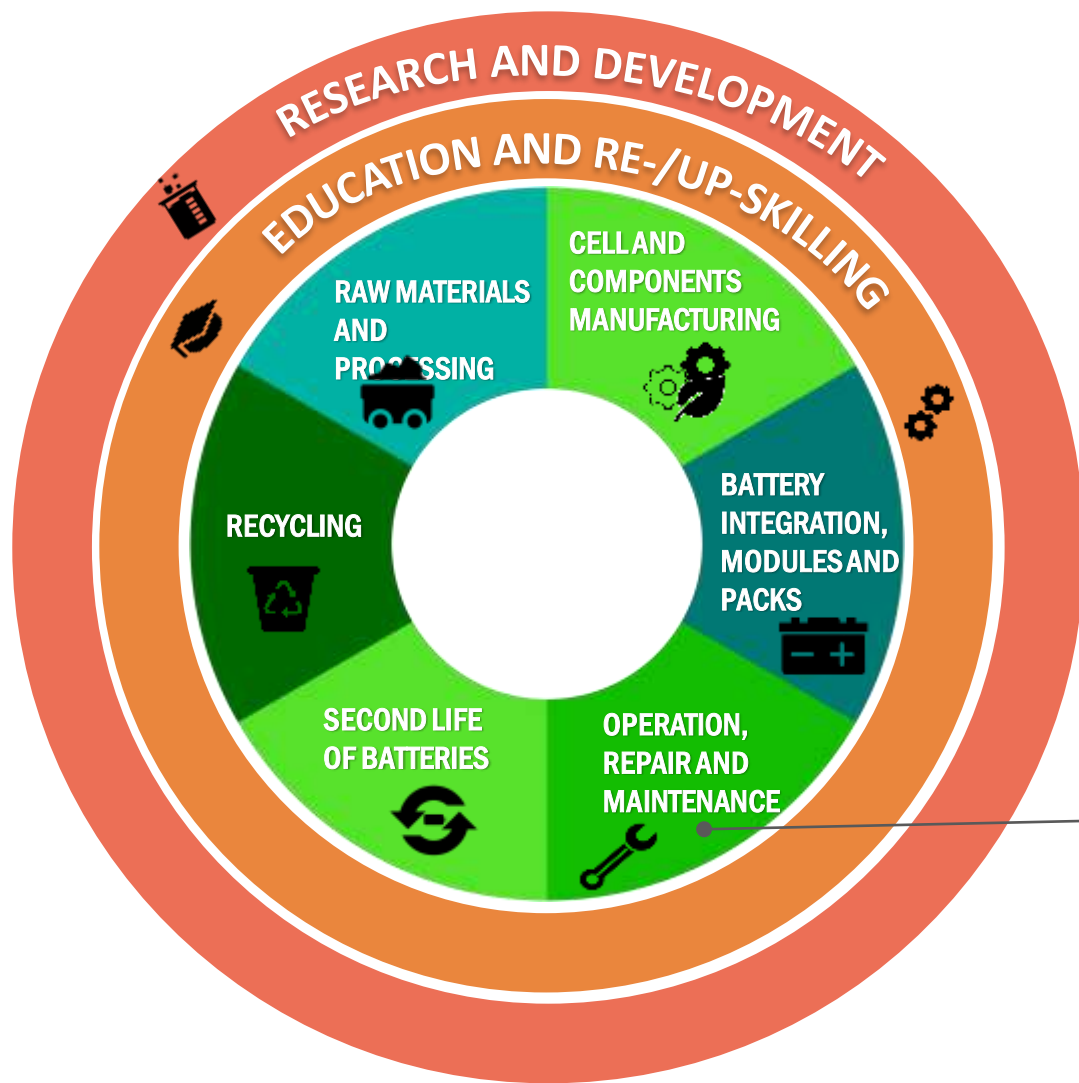
Alliance for **B**atteries **T**echnology, **T**raining and **S**kills
2019-2023


WP4 INTELLIGENCE IN STATIONARY AND INDUSTRIAL BATTERY APPLICATIONS

Kari Valkama

November 22, 2023

Battery Value Chain & WP4



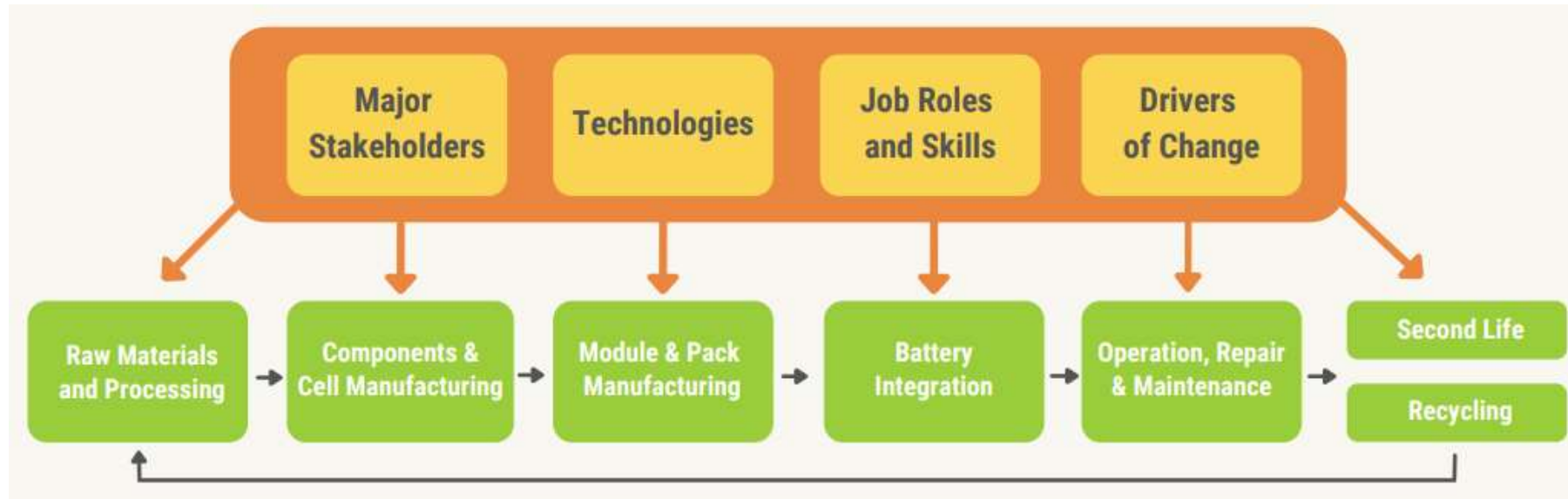
 STATIONARY BATTERY APPLICATIONS AND BEYOND



REPORTS' HIGHLIGHTS

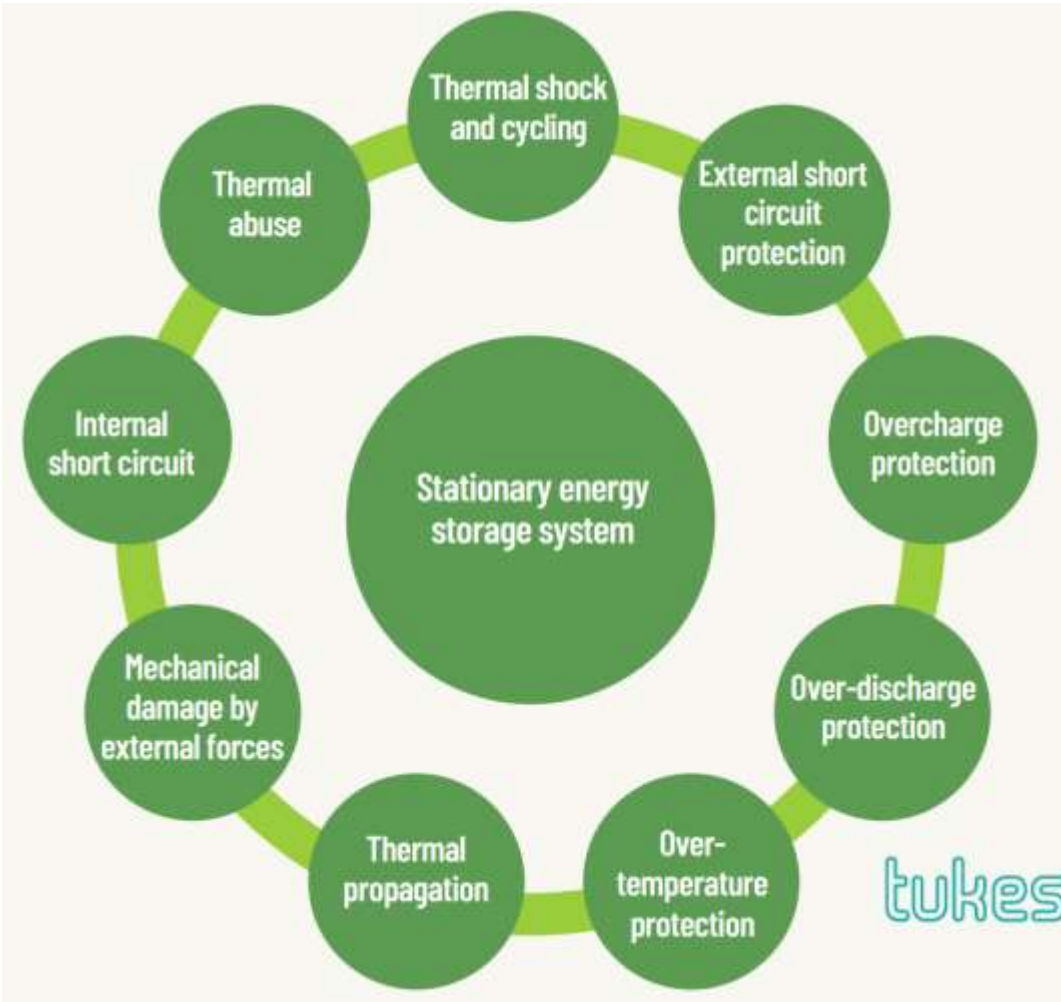
D4.1 Desk Research & Data Analysis

ISIBA –Release 1 (2020)



- Provides an overview of the European battery sector in terms of drivers of change, stakeholders, technologies, job roles, skill needs and education.
- studies stationary battery applications by covering, for example
 - variable renewable energy sources supporting grid and off-grid systems
 - various heavy-duty applications and telecom applications

D4.3 Future Needs Definition for Sub-sector ISIBA - Release 1 (2021)



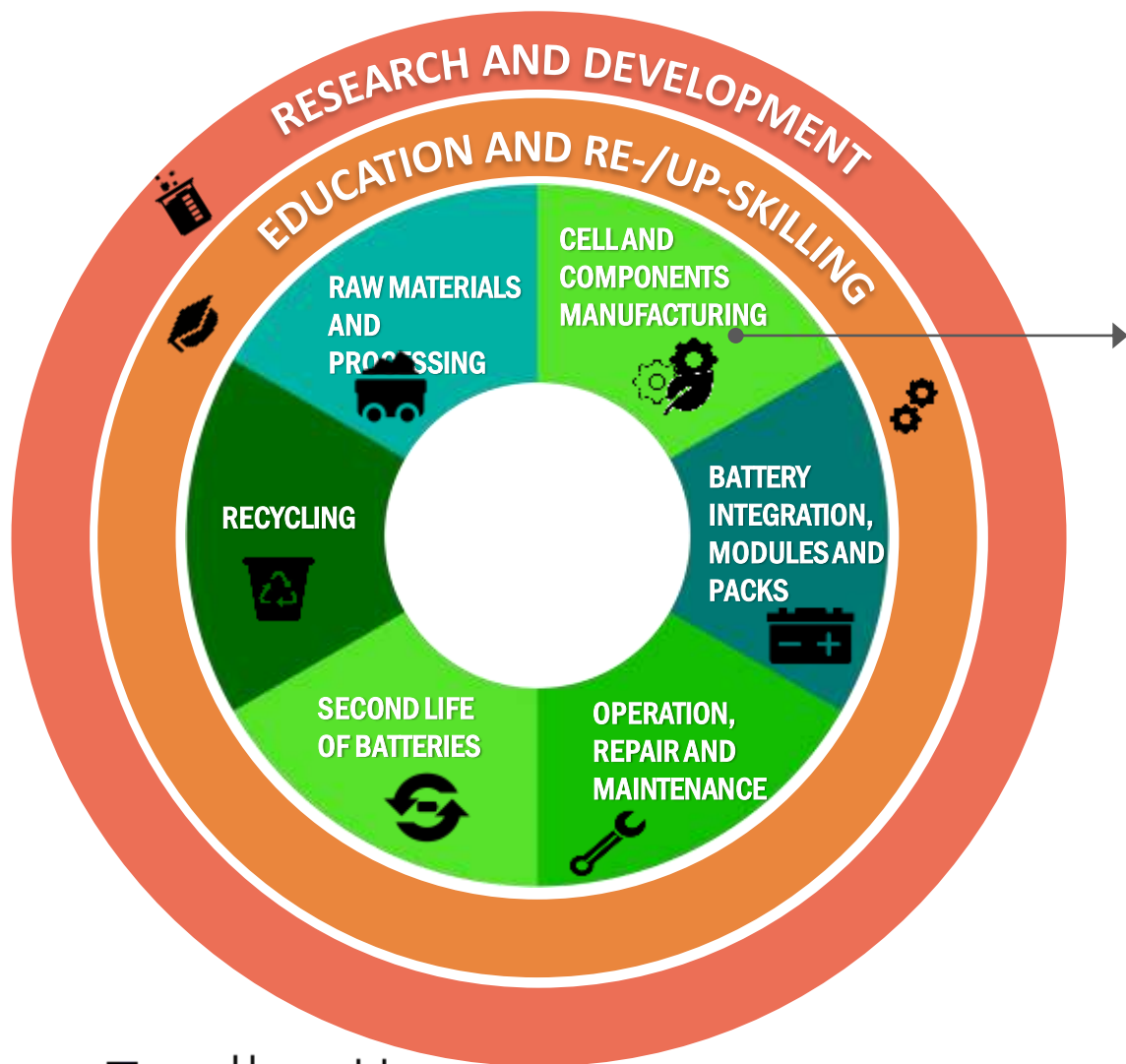
⚡ Workshop on stationary energy storage in grids and telecom applications: major focus on safety

⚡ The increasing application of batteries is a gamechanger regarding how fire and rescue services will need to operate in emergency situations.

⚡ Battery fires are very challenging to be extinguished.

⚡ What methods are taken into use to address this need to maintain and increase the safety?

D4.4. - Battery Manufacturing (The Anatomy of a Gigafactory - 2021)



-  **PRODUCTION**
-  **MAINTENANCE**
-  **LOGISTICS**
-  **QUALITY**
-  **OTHER ASPECTS**

Most employees are blue-collared (80-90 % of the staff): operators & technicians

manufacturing processes, Material handling, Sampling/testing, Dry/clean room activities

PRESENT & FUTURE:

- Maximizing production automatisation, including material inputs
- Digitalization
- Despite of the high level of automation blue-collared will be needed

D4.6 - Future Needs Definition for sub-sector ISIBA - Release 2 (2022)

ALBATTIS INTERVIEWS

15 September 2021 - 14:00h / 14:45h

albatts
interviews



European Battery Ecosystem - Job roles and competences now and in the future: Building a Gigafactory

albatts
interviews



European Battery Ecosystem - Job roles & competences now and in the future:

With Duarte Conde Silva,
Plant Manager
at Graciolica

BATTERY ENERGY STORAGE
ENABLING SUSTAINABLE ISLANDS

17 November 2021
13:00-13:45 CET
Online

- ⚡ War on talents – challenges finding people experienced with batteries, greenfield building, and large-scale production
- ⚡ Supporting systems such as schools, housing, services important
- ⚡ Active cooperation with education sector (universities & VET)
- ⚡ Training in volumes – new methods needed & developed, VR etc.

- ⚡ challenges of installing and using a BESS in island conditions
- ⚡ BESS together with renewables has resulted in major improvements in power quality → voltage and frequency profiles
- ⚡ major reduction of CO2 emissions

D4.7 -Skills & Job Roles in Battery Applications Supporting the Modern Society (2022)



Data Centers - use of battery backup & UPS systems

⚡ Replacing diesel generators → components for CO2 free energy systems

Renewable Power Farms

⚡ the application of BESS in the context of renewable energy

⚡ wind power, hydroelectric power, and solar plants



BESS in residential applications

⚡ production shifting to renewable energy sources incr. demand for BESS

⚡ growing need for self-sufficiency and to decrease electricity costs



Electrification of heavy work machines

⚡ Current status

⚡ mining, forestry, cargo handling & heavy construction

D4.9 - Future Needs Definition for sub-sector ISIBA - Release 2 (2023)



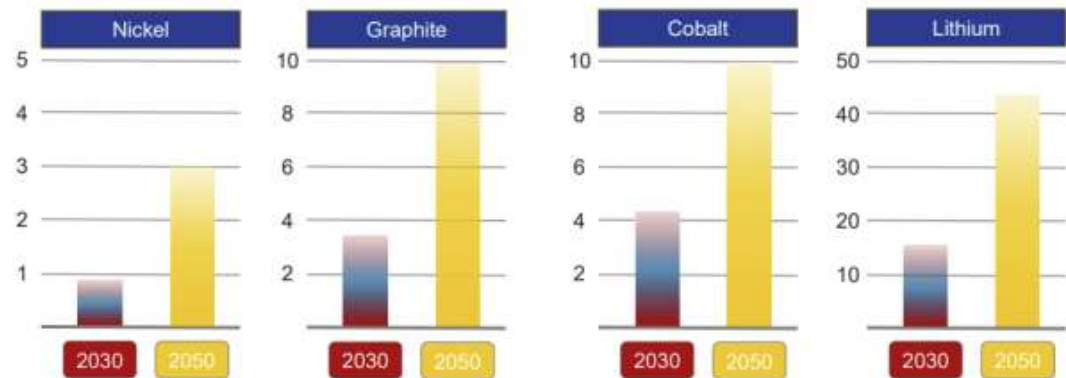
Summary data about Europe's 5 largest publicly reported lithium production projects

Country	Location	Company	Resources (Meas. + Ind., Mt Li eq.)	Type	Status
Germany	Insheim, Upper Rhine Graben	Vulcan Energy Resources	2.98	Geothermal brine	Feasibility study in progress. Awaiting permitting. Target: 40 kt Li hydroxyde/yr.
Czech Republic	Cinovec	European Metals	0.87	Pegmatite	Feasibility study in progress. Awaiting permitting. Target: 29 kt Li hydroxyde/yr.
Serbia	Jadar	Rio Tinto	0.44	Jadarite	Project suspended due to exploration licence revoking/ local opposition. Feasibility was in progress. Target: 58 kt Li carbonate/yr.
Spain	San Jose	Infinity Lithium	0.13	Pegmatite	Feasibility study in progress. Awaiting permitting. Target: 19.5 kt Li hydroxyde/yr.
Germany	Zinnwald	Zinnwald Lithium	0.13	Li-mica greisen/aplite	Feasibility study completed in 2019. Awaiting funding. Target: 7.5 kt Li carbonate eq./yr.

Location and summary of Lithium projects in Europe. Source: Patrice Christmann's presentation

- ⚡ Geopolitical challenges with raw materials
- ⚡ actions needed to strengthen EU production, diversify supply sources, and secure critical raw material supplies
- ⚡ Recycling

The demand for battery raw materials will increase



Source: Critical Raw Materials for Strategic Technologies and Sectors in the EU; A Foresight Study. Joint Research Centre, European Commission, 2020

D4.9 - Future Needs Definition for sub-sector ISIBA - Release 2 (2023)



2nd life Bus batteries and battery system used in the apartment complex in Gothenburg. Source: Ylva Olofsson's presentation

⚡ Second Life Bus Batteries in BESS Residential Applications

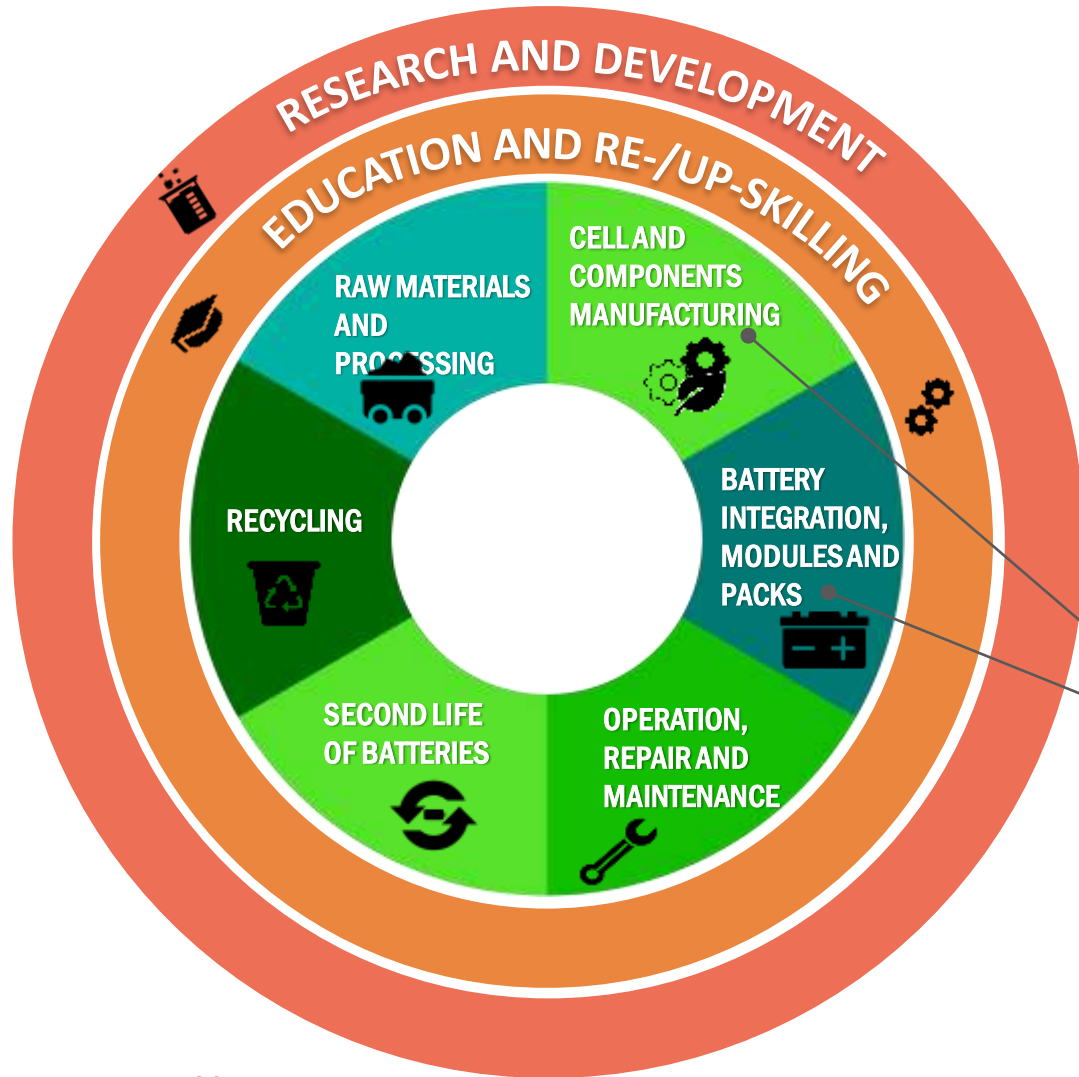
⚡ reuse buss batteries in Gothenburg, Sweden in a residential applications

⚡ An apartment complex implemented a system storing surplus electricity from photovoltaic panels and releases it at night

⚡ bolsters the adoption of renewable energy sources and promotes carbon neutrality in the electricity sector

⚡ Recycling of resources deferred until all possible uses for the batteries have been exhausted.

D4.10 – Legislative Evolution and Introduction to the Machines, Skills and competencies in batt. production



⚡ Critical Raw Materials Act and the Net Zero Industry Act's importance in the battery sector during the green and digital transition

⚡ mid- and downstream production processes

⚡ detailing some of the most important production equipment, their providers, and the skills, competencies essential to operate them

⚡ electrode manufacturing, cell assembly, module and pack assembly, and dry/clean room operations

⚡ modern education and training methods, VR, AR, AI, and Digital Twins, etc.

Thank you!



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Elektromobily a další dopravní prostředky

Lukáš Folbrecht, Sdružení automobilového průmyslu (AutoSAP),
vedoucí ALBATTS WP5 – Baterie v mobilních zařízeních

22. 11. 2023



SDRUŽENÍ
AUTOMOBILOVÉHO
PRŮMYSLU



Využití baterií zejména na elektromobily



Source: BloombergNEF

Phase-out **osobních** vozidel na fosilní paliva v EU k roku 2035 (někde i dříve)

Strategie pro **těžkou nákladní dopravu a autobusy** je ve finální fázi jednání na úrovni EU

Využití baterií v relativně menších objemech také na **městskou mobilitu** (koloběžky apod.) **kola, motorky, vlaky, drony, letadla, lodě,...**



Reporty ALBATTs



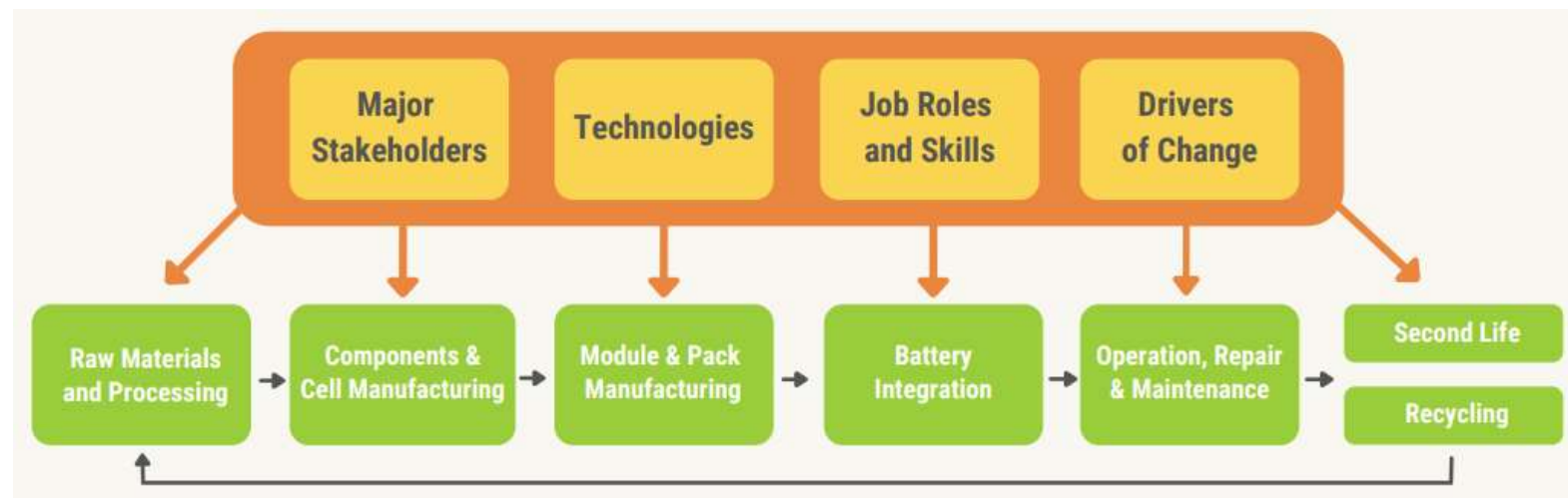
www.project-albatts.eu/en/results



REPORTS' HIGHLIGHTS

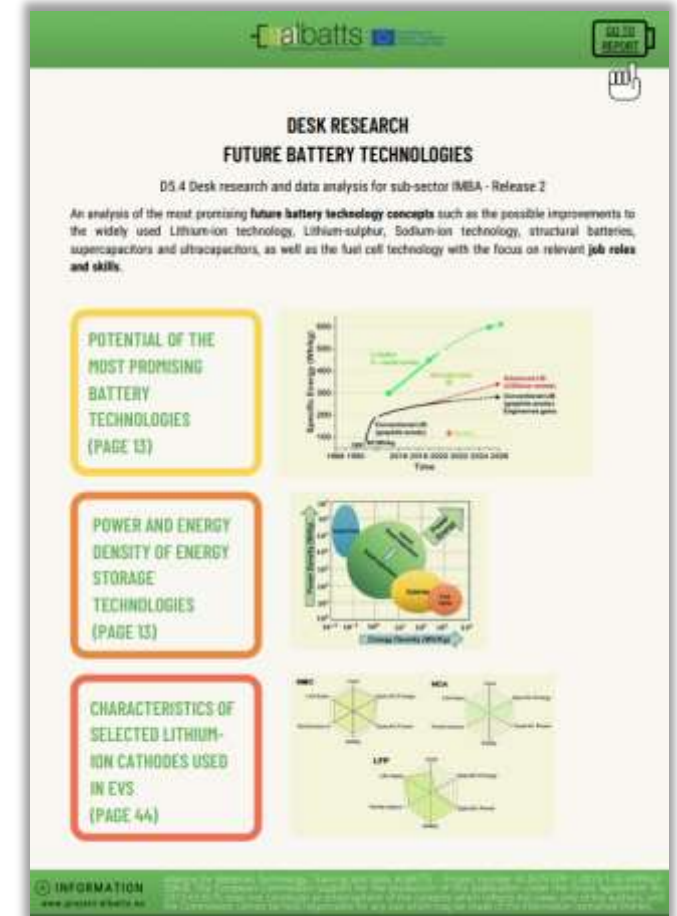
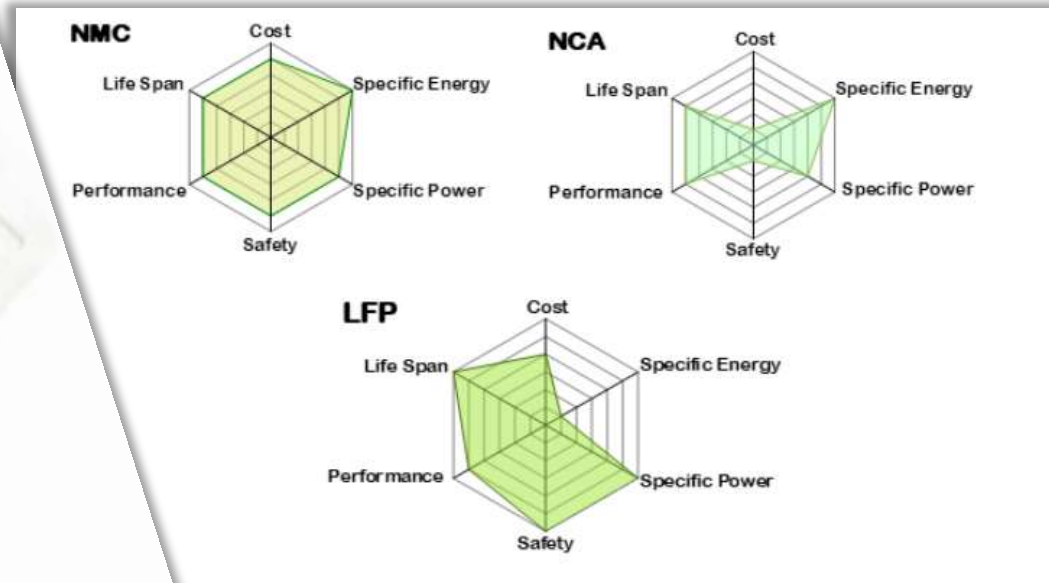


Report D5.1: Napříč celým hodnotovým řetězcem baterií





Report D5.4: Bateriové technologie budoucnosti



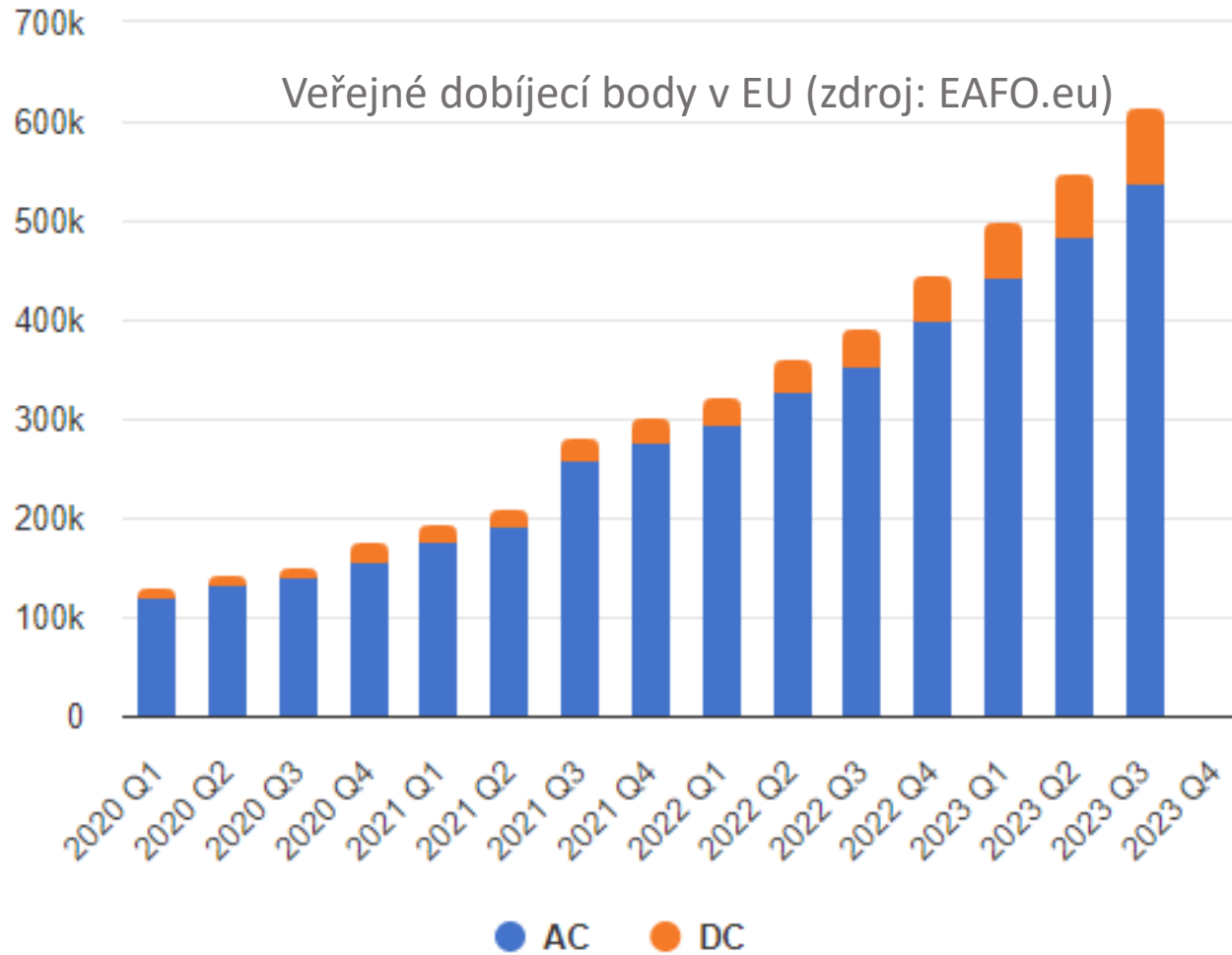


Report D5.7: Elektrifikace dalších dopravních prostředků





Dobíjecí infrastruktura



Zdroj: Evanex, Wallbox



Report D5.10: Dobíjení



Zdroj: VW Group, Hyundai, Nio, Sinopec, Denik.cz, Wave, Charging Summit



Dotazníkové šetření, webináře, interview

albatts interviews

European Battery Ecosystem – Job roles & competences now and in the future

With **Claudia Giamon**, Member of the European Parliament

THE IMPACT OF THE BATTERY PASSPORT ON THE BATTERY VALUE CHAIN

17 October 2022
13:00-13:45 CET
Online

albatts interviews

FUTURE BATTERY TECHNOLOGIES: Job roles, skills & knowledge

14 November 2022
15:00-15:45 CET
Online

Interviewing **Noshin Omar**, Founder & CEO of Avolta Battery & Energy Engineering (ABEE)

albatts interviews

European Battery Ecosystem – Job roles & competences now and in the future

With **Duarte Conde Silva**, Plant Manager at Graepoka

BATTERY ENERGY STORAGE ENABLING SUSTAINABLE ISLANDS

17 November 2022
13:00-13:45 CET
Online

albatts interviews

Second Life Bus Batteries in BESS Residential Applications: Job Roles, Skills and Competences

22 November 2022
15:00-15:45 CET
Online

Interviewing **Ylva Olofsson**, System Design Engineer & Project Manager at Volvo GTT

albatts interviews

Future geopolitical challenges in the source of raw materials and the battery value chain

19 January 2023
15:00-16:00 CET
Online

Interviewing **Daniel Cioș**, Policy Officer - Raw Materials, DG GROW, European Commission

albatts

WEBINAR

ELECTRIFICATION OF HEAVY-DUTY VEHICLES: WHAT SKILLS AND COMPETENCIES WILL BE NEEDED?

Tuesday - November 29, 2022
09:30-11:00 CET

albatts

WEBINAR

BATTERY MANAGEMENT SYSTEMS AND CONTROL SYSTEMS: JOB ROLES, SKILLS & COMPETENCIES

Thursday - November 24, 2022
15:00-16:00 CET

albatts

WEBINAR

SKILLS TRANSITION IN THE BATTERY INDUSTRY: TRAINING PEOPLE FROM OTHER INDUSTRIES

Thursday - February 9, 2023
15:00-16:30 CET

albatts

WEBINAR

ELECTRIFICATION OF THE AVIATION SECTOR & FUTURE QUALIFICATIONS NEEDED

Tuesday - January 17, 2023
15:00-16:30 CET

albatts

WEBINAR

SAFE RECYCLING & SECOND USE OF EV BATTERIES: SKILLS AND COMPETENCIES NEEDED

Friday - January 27, 2023
09:30-11:00 CET

albatts interviews

FUTURE BATTERY TECHNOLOGIES: Job roles, skills & knowledge

26 October 2022
15:00-15:45 CET
Online

Interviewing **Tomasz Kazda**, Associate Professor at the Department of Electrical and Electronic Technology of Brno University of Technology

albatts

WEBINAR

ELECTRIFICATION OF INLAND WATERWAYS & FUTURE QUALIFICATIONS NEEDED

Thursday - January 25, 2023
13:00-15:00 CET

albatts

WEBINAR

LITHIUM MINING AND EXTRACTION: EUROPEAN SOURCING AND SKILLS

Wednesday - April 27, 2022
10:00-12:00 CEST

albatts

WEBINAR

SAFETY ASPECTS OF ELECTRIC VEHICLES: MANUFACTURING, USE, MAINTENANCE, REPAIR & DISPOSAL

Wednesday - May 3, 2023
10:30-12:00 CET

YOUR OPINION COUNTS!

SURVEY ALERT

We are conducting information about job roles and skills needed in BESS & second life battery market which is crucial and want to hear from researchers, academic institutions, industry and general public.

Answer our EB website survey to contribute to the design of a handbook for manufacturing and training activities in the battery and second life battery market.

SURVEY AVAILABLE UNTIL THE END OF JANUARY
<https://www.albatts.eu/en/er/2022>

Examples of webinars that were held

<https://www.project-albatts.eu/en/listnewsevents>



Děkuji za
pozornost!



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ABOUT OUR WORK & BATTERY SECTOR SKILLS AGENDA!**



BATTERY POWERED

TOUR FOR SKILLS

Enabling a prepared education network for the battery ecosystem in Europe

Needed Job Roles and Competences in the Battery Industry

Ing. Marek Spányik, MBA (VSB-TUO)



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What is the European Battery Sector?

European Battery Sector

⚡ Highly emerging and rising sector in Europe
 ⚡ Electromobility is pushing the European battery sector

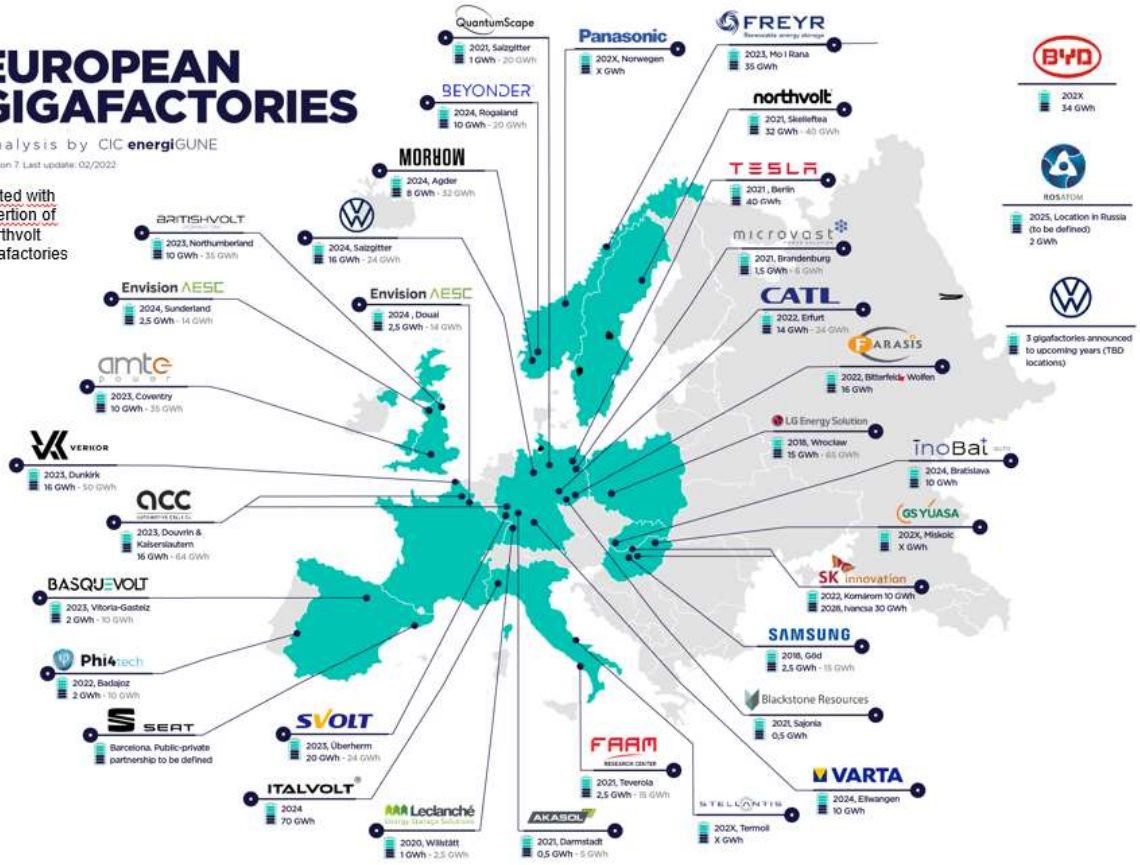
⚡ This needs to be supported by the workforce with the right skills
 ⚡ Change of needed skills/competences or knowledge during the individuals' career – the change is constant.

⚡ High demand for workers “The industry estimates that by 2025, this growing *skills shortage* could amount to some **800,000 jobs** across the entire battery value chain.” - EC Vice-President Šefčovič March 12th, 2021

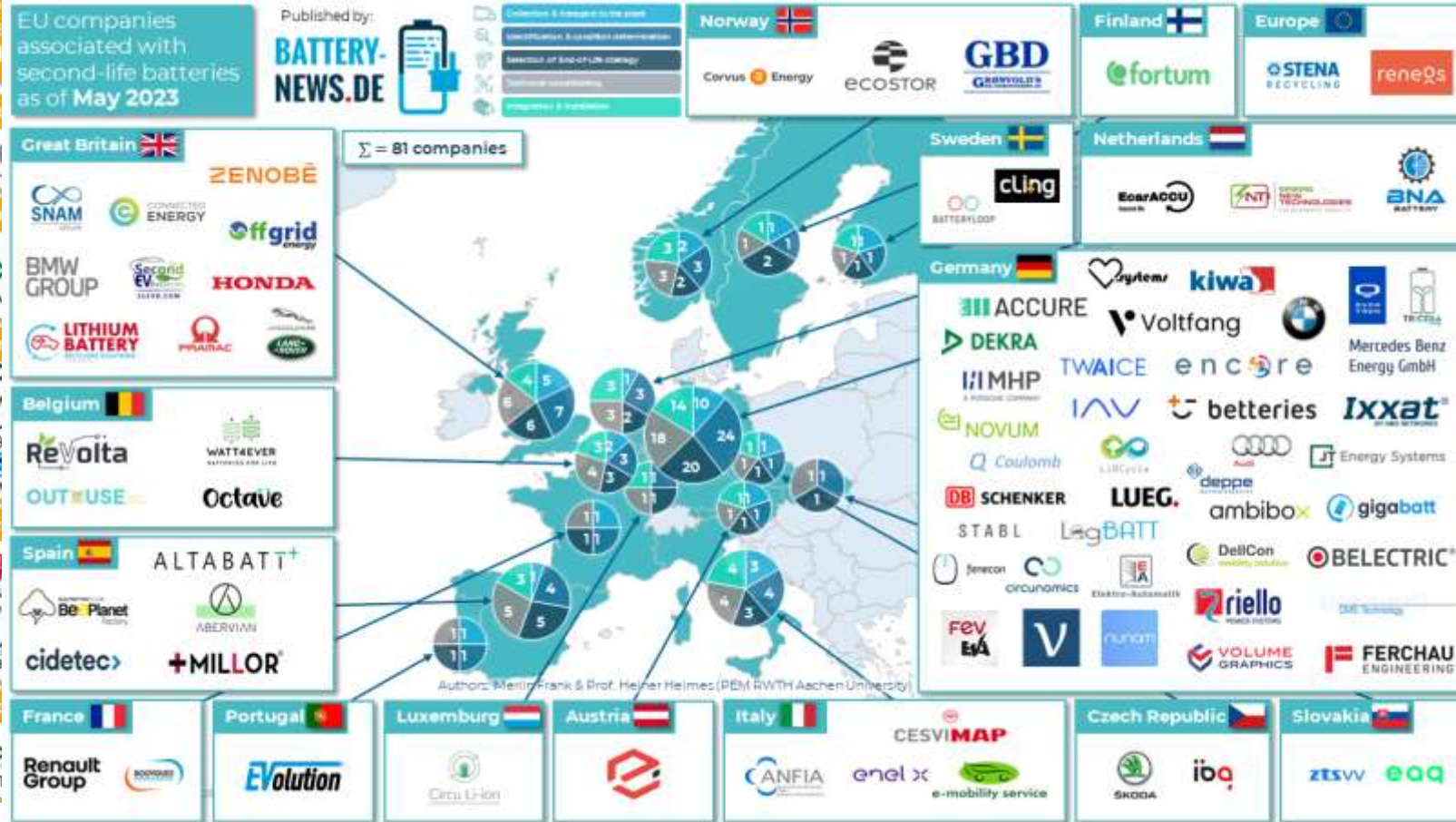
EUROPEAN GIGAFACTORIES

Analysis by CIC energigUNE
 Version 7. Last update: 02/2022

Edited with
 insertion of
 Northvolt
 gigafactories



SECOND LIFE APPLICATIONS



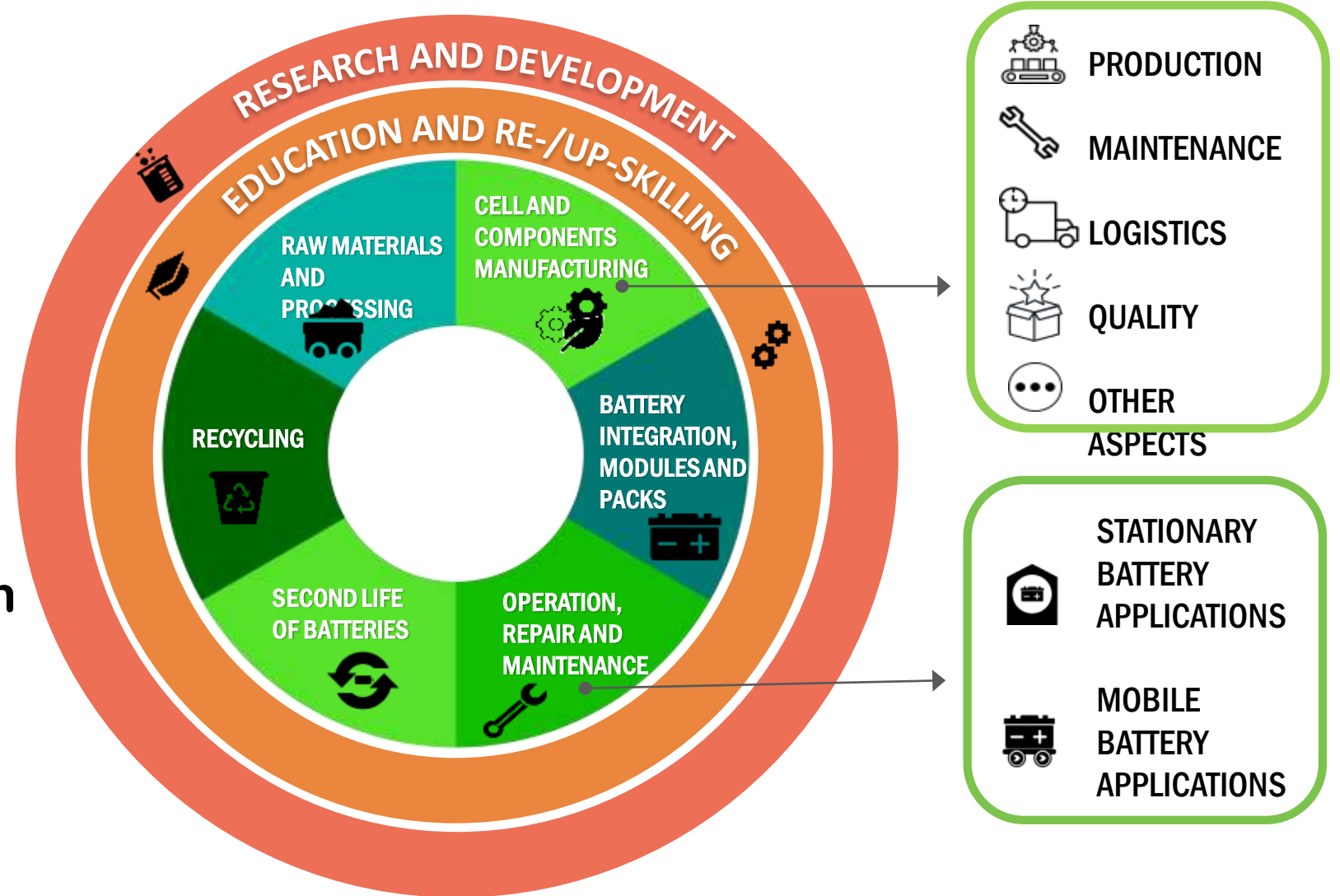
Source:
Battery Atlas Europe

Battery Value Chain

⚡ There is a lack of information on needed skills and job roles

⚡ We need more collaboration

⚡ Needed skills impact on each phase of the production cycle



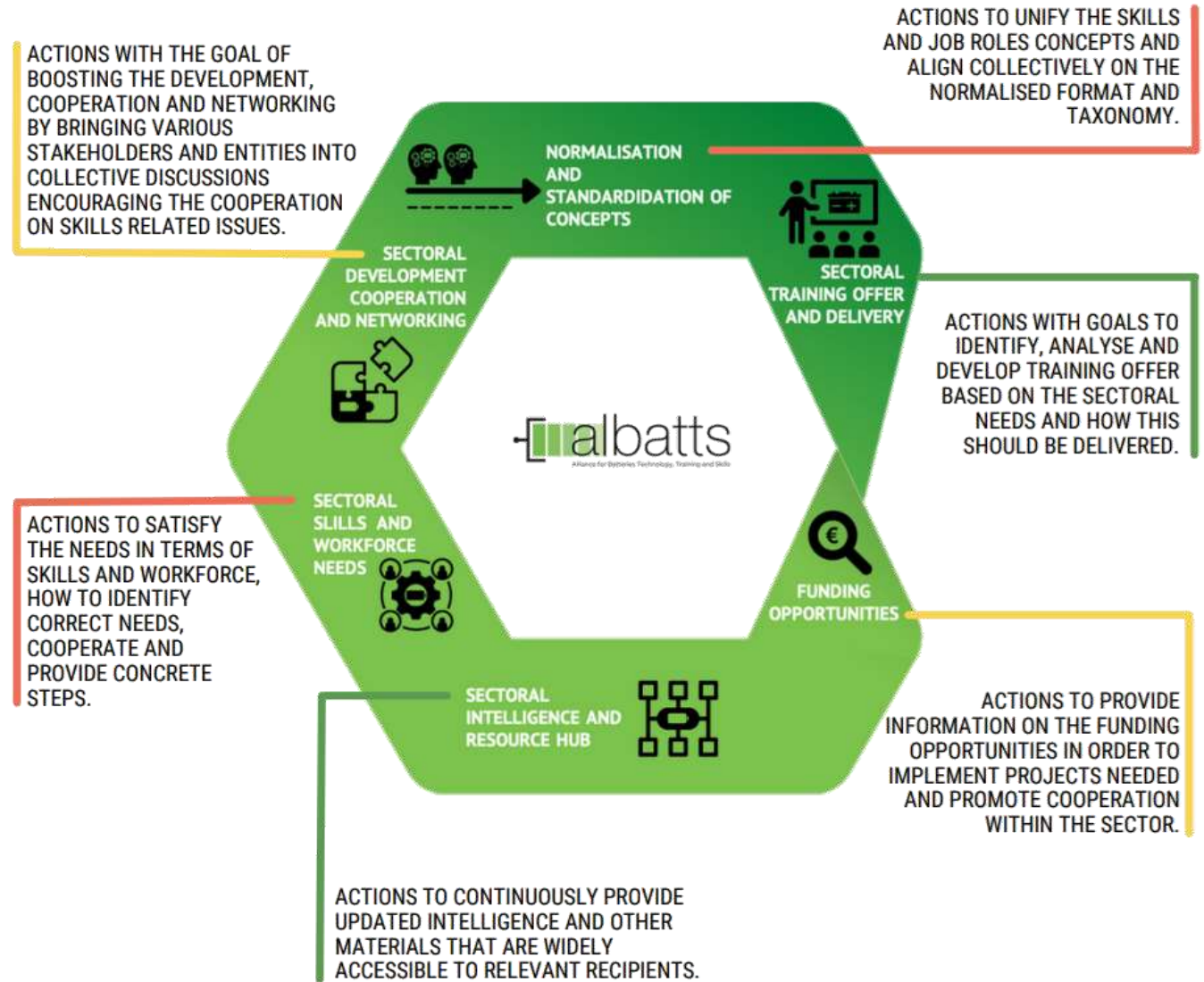
Skills Agenda and Strategy



⚡ The overall assessment is supported by a strategy

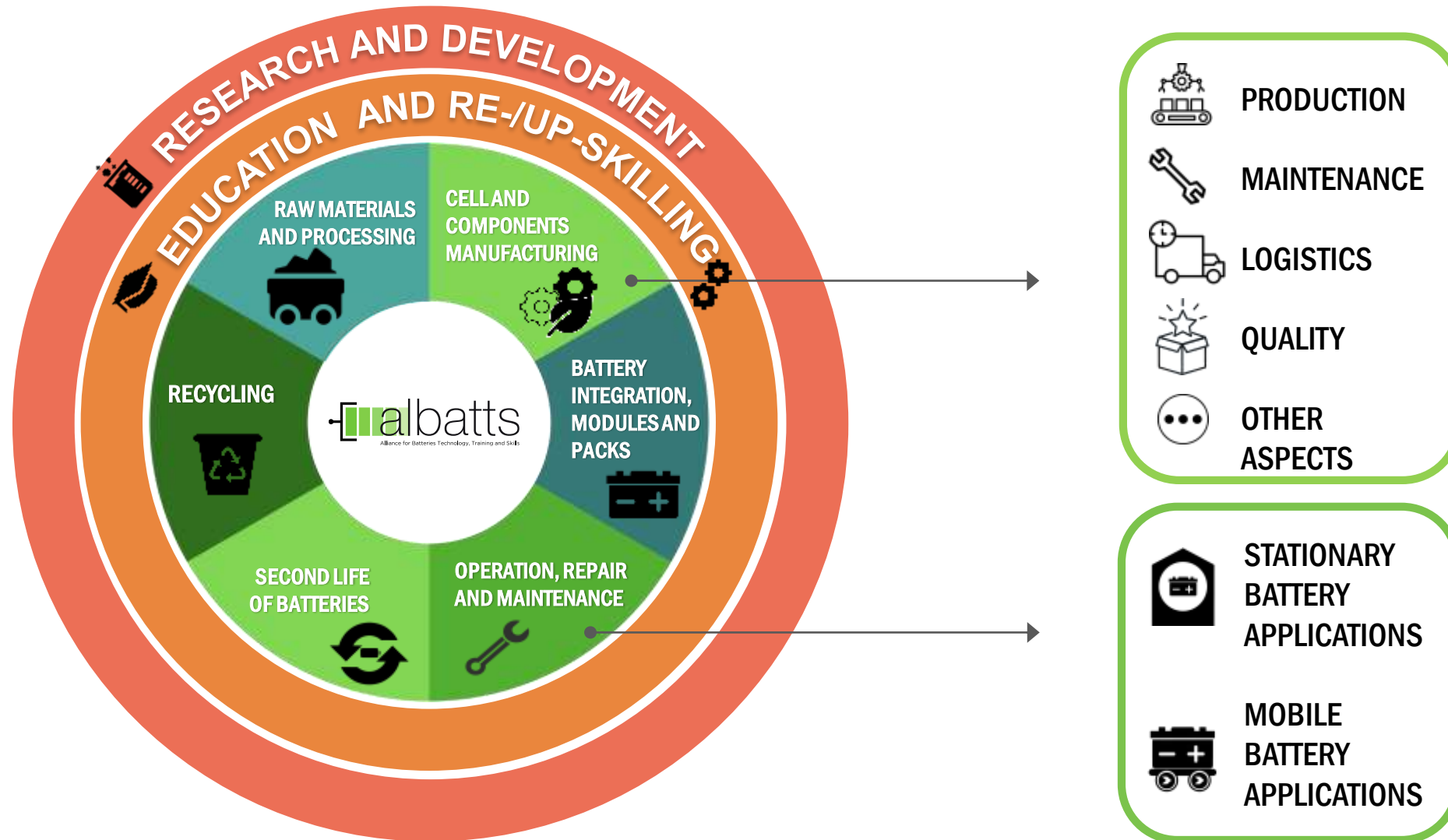
⚡ The whole value chain and all levels of education need to be addressed

⚡ Competences can be sector specific and cross-sectoral



Glance on Needed Skills

RAW MATERIALS AND PROCESSING



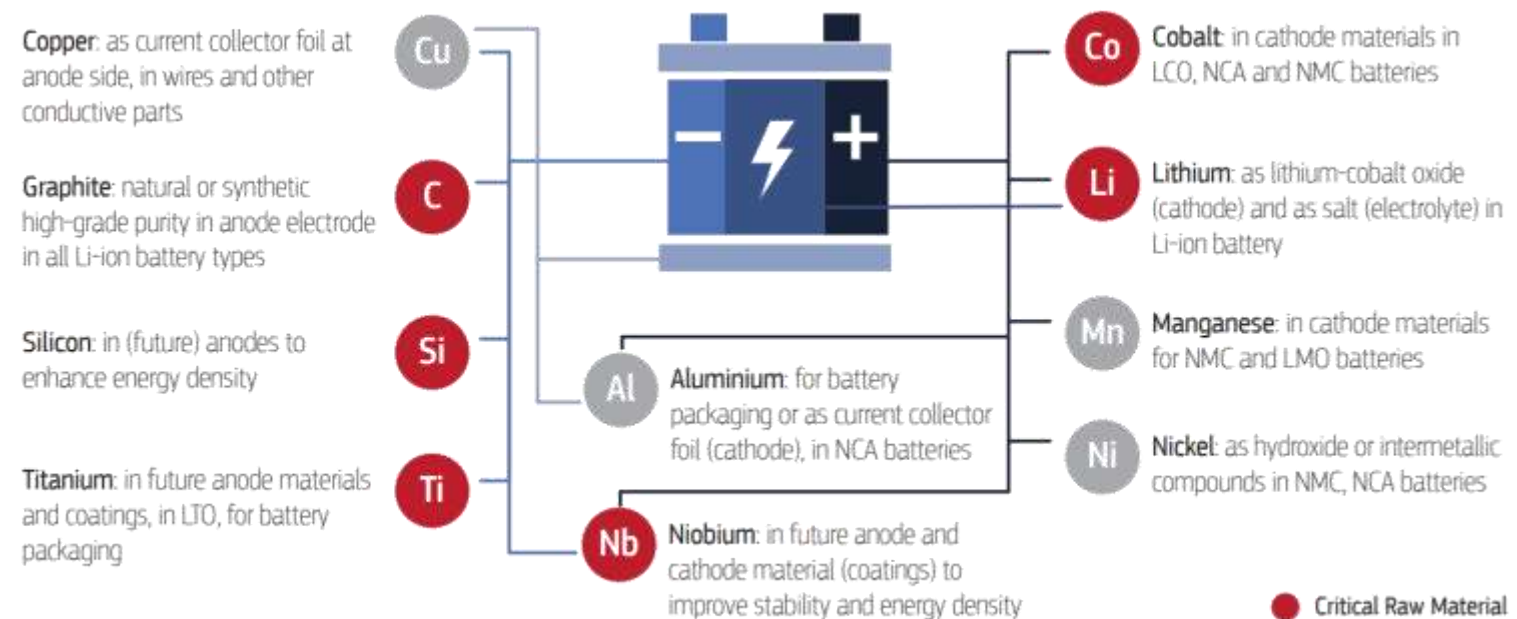
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Raw Materials and Processing



- ⚡ Strengthening the awareness on the critical raw materials questions for Europe and connected emerging trends and issues;
- ⚡ Development of new skills needs for mining and refining of raw materials relevant for the battery production (and relevant training material)
- ⚡ Cooperation on the skills agenda and organization of education events with relevant stakeholders within the sector



Critical Raw Materials for Europe - [DocsRoom - European Commission \(europa.eu\)](https://docsroom.ec.europa.eu/)

Raw Materials and Processing – Job Roles

→ What Industry Demands



Blue-collar workers expertise domains: process and machine operation; material planning; calibration and instruments/ equipment; and other.

White-collar workers expertise domains: material engineering (electrode, cathode, electrolytes and other); production control; inspection and quality; supply chain management; production; process and methodology improvement;

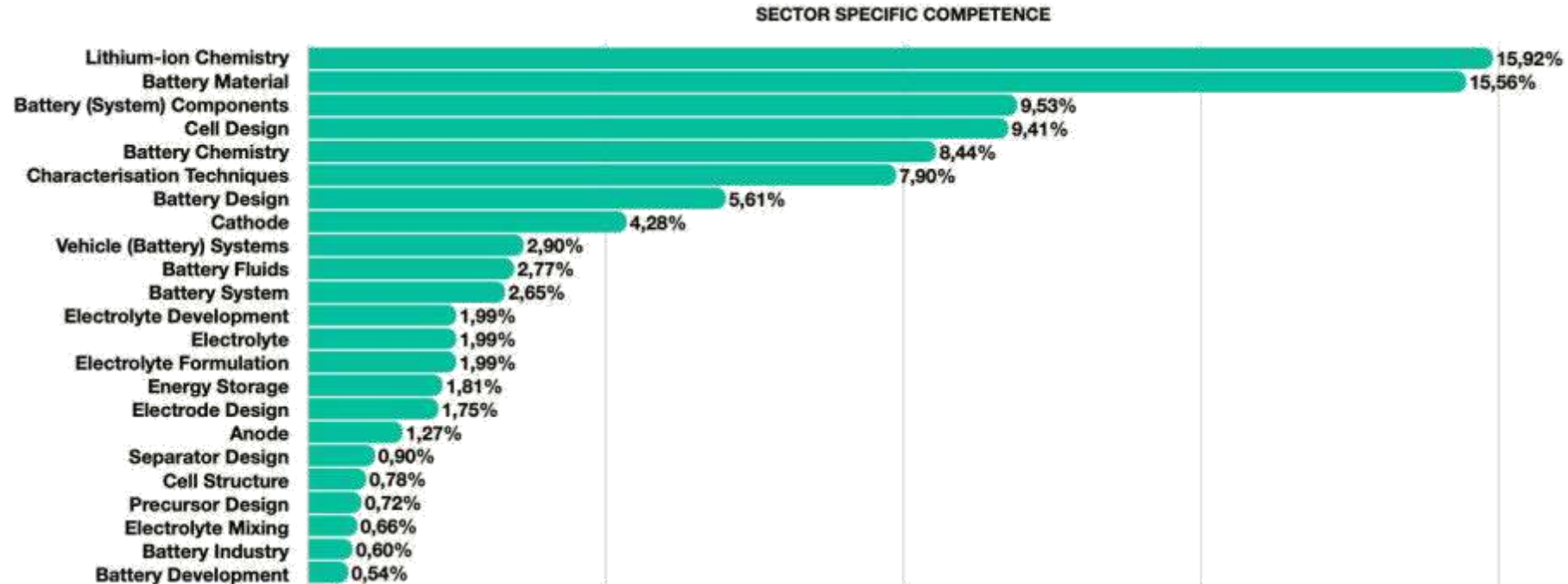


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Raw Materials and Processing – Skills and Competences

→ What Industry Demands

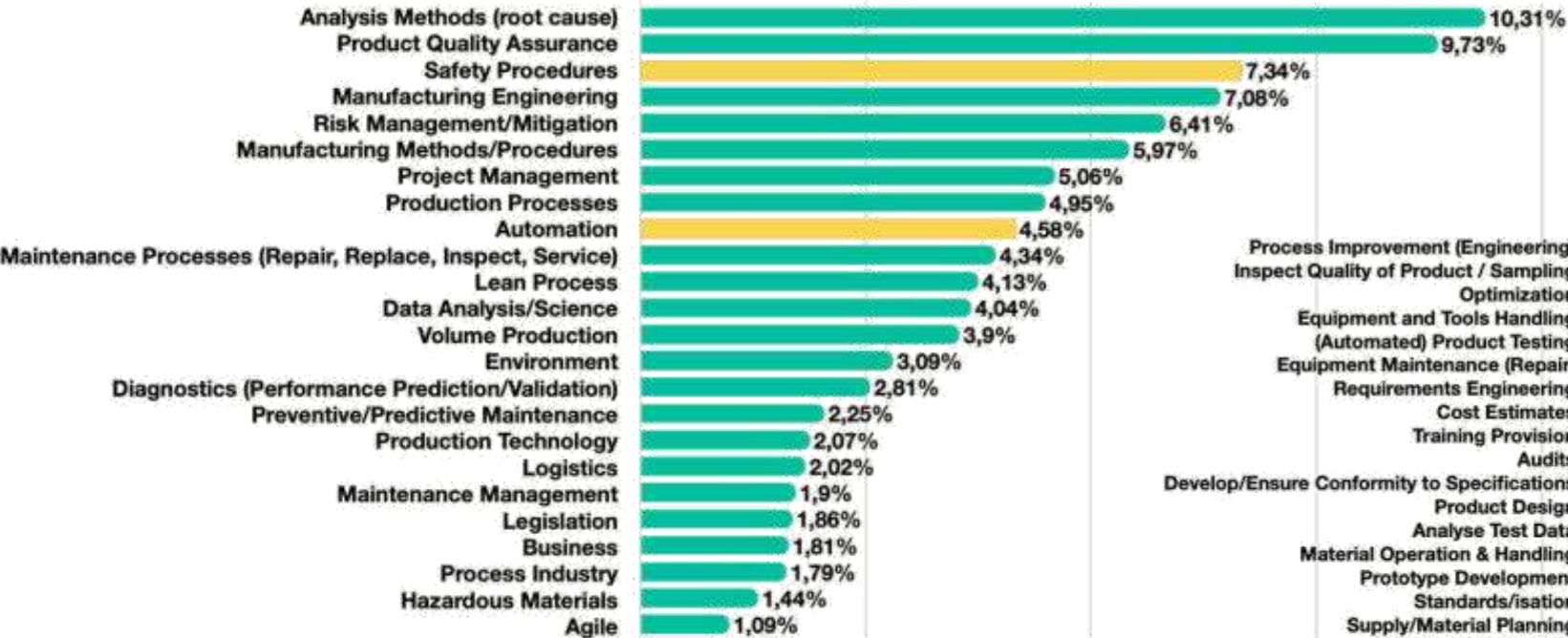


Raw Materials and Processing – Skills and Competences

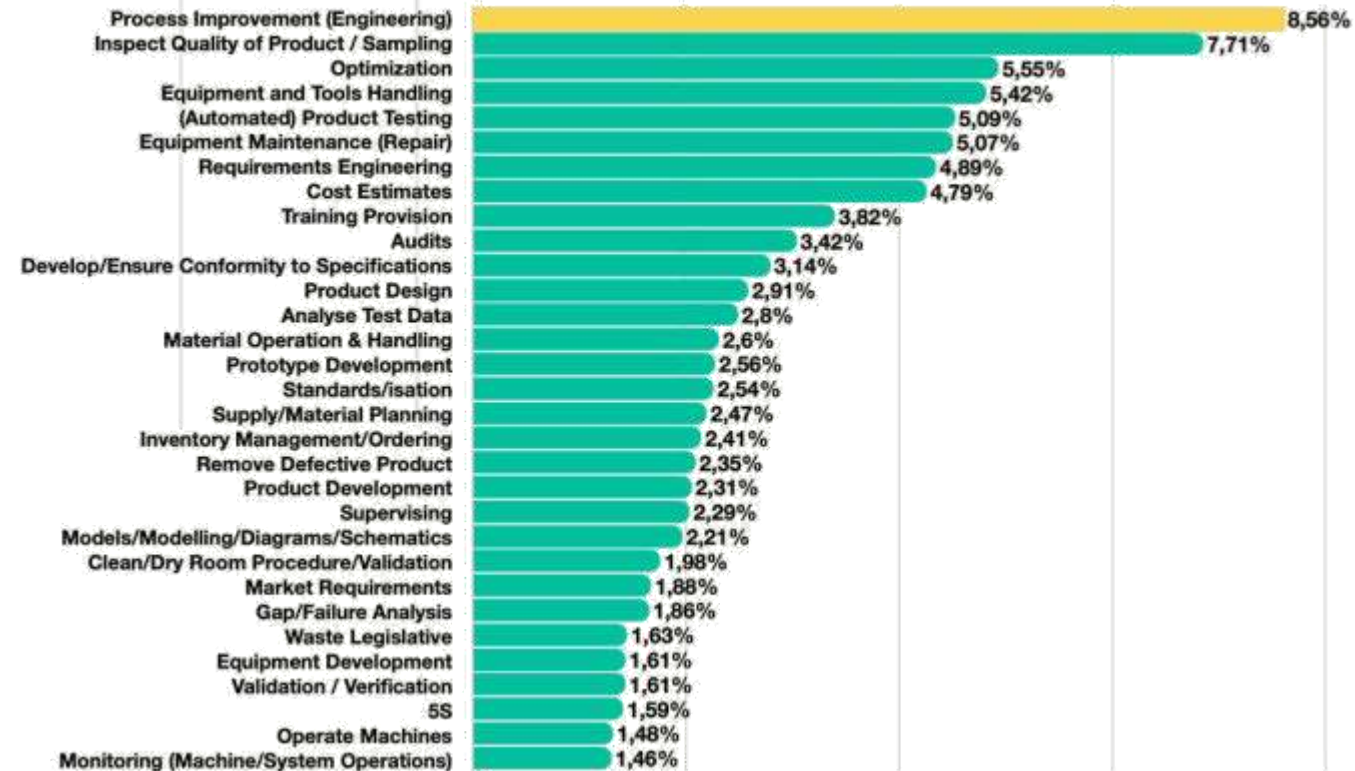
→ What Industry Demands



CROSS-SECTORAL SPECIFIC KNOWLEDGE

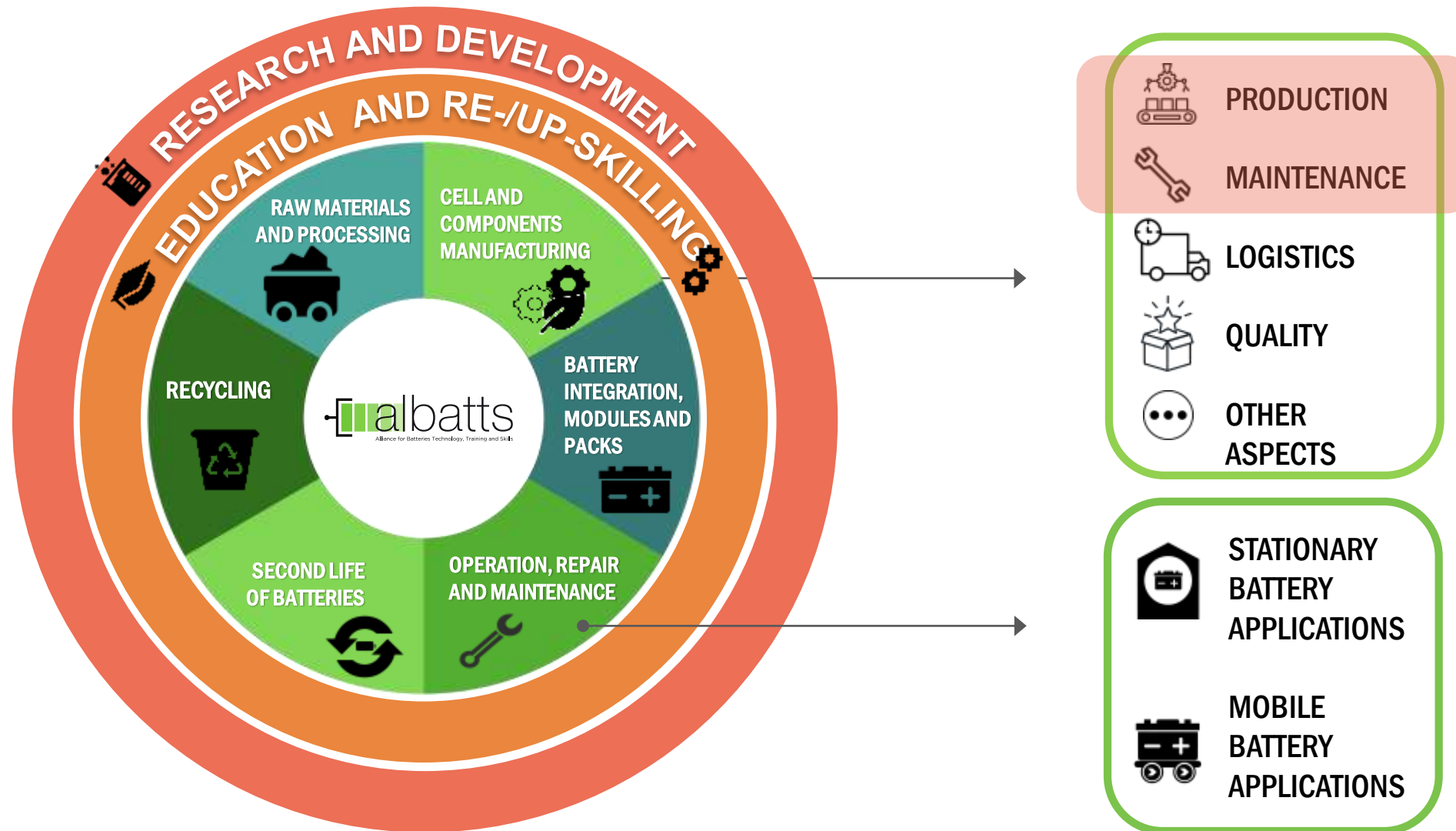


CROSS-SECTORAL SPECIFIC SKILLS



Glance on Needed Skills

CELLS PRODUCTION & CELLS MAINTENANCE



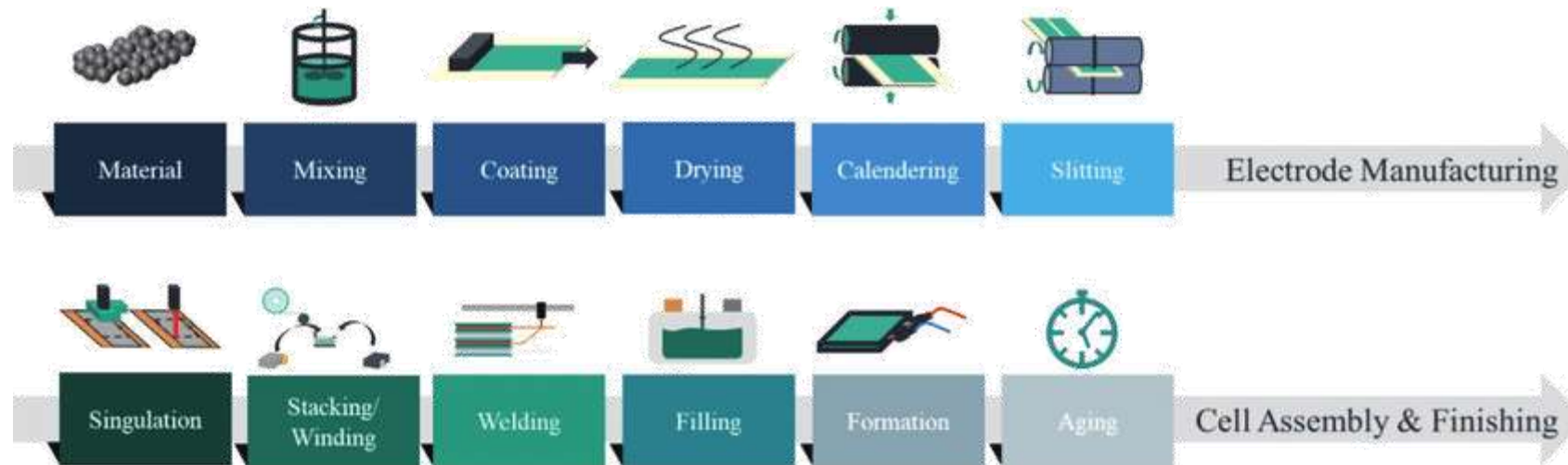
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Cell Production



- ⚡ Understanding in fields **electrochemistry, electronics, mechanical engineering, process engineering, manufacturing technology, automation and digitalization in manufacturing** (data analytics, maintenance and product process optimisation)
- ⚡ In general, to speak and understand foreign languages, mainly English in working environment



Critical Raw Materials for Europe - [DocsRoom - European Commission \(europa.eu\)](https://docsroom.ec.europa.eu/)

Cell Production and Maintenance – Specific Needs

→ What Industry Demands



PRODUCTION

- Apart from the general battery-related education, strengthening the skills and competencies to ensure understanding of setting up the production, preparing the related structures, commissioning the machines, chemical, and mechanical assembly, automation experience, and mechanical understanding of the automated systems combined with understanding the related software and calibration.
- Strengthening general IT and data analysis skills to cover future needs.
- Battery skills (also mentioned in the context of Production)
- "Dry and clean room" maintenance (including room contamination measurement)
- Predictive and preventive maintenance
- Diagnostics

WHITE-COLLAR SPECIFIC NEEDS

- Increasing competencies in **production and material engineering, production planning, production management, shift management, process engineering, cell design, machine learning and optimisation, modelling and simulation;**
- Strengthening the focus on **large-scale manufacturing**, understanding of **chemical processes** and **quality, risk and safety management;**
- **Battery industry-related knowledge skills:** battery material, battery chemistry, battery fluids, battery components, battery testing, defective products removal

BLUE-COLLAR SPECIFIC NEEDS

- "Upstream" production - increasing knowledge to understand the **risks, envision the safety issues**, and how **chemicals** behave;
- "Downstream" production - increase **machine understanding, 5S skills**, and the ability to **troubleshoot;**
- Overall production system understanding;
- Knowledge/skills: **material handling, Clean/Dry Room Procedure/Validation, Inspect Quality of Product / Sampling, material pressing, electrode process, fine mechanics, HMI (Human Machine Interface)**



Production and Maintenance

→ What Industry Demands



BLUE-COLLAR

TECHNICAL ASSEMBLY WORKER
ELECTROMECHANICAL EQUIPMENT ASSEMBLER CMM LAB TECHNICIAN

BATTERY TECHNICIAN OPERATOR

MAINTENANCE TECHNICIAN SHIFT LEAD

LITHIUM MAINTENANCE TECHNICIAN

CALIBRATION TECHNICIAN

CELL ASSEMBLY TECHNICIAN

ELECTRICAL TECHNICIAN
MECHANICAL DRAFTER MACHINE OPERATOR

AUTOMATION/PROCESS OPERATOR

TEAM ASSEMBLER INSTRUMENT TECHNICIAN

PRODUCTION ASSEMBLY OPERATOR BATTERY PRODUCTION TECHNICIAN

COMPUTER-CONTROLLED MACHINE TOOL OPERATOR MATERIAL PLANNER
GENERAL-MACHINIST

WHITE-COLLAR

DEVELOPMENT ENGINEER HIGH-VOLTAGE STORAGE COMPONENTS BATTERY CELL SIMULATION ENGINEER
CELL SIMULATION ENGINEER SR. BATTERY CELL ENGINEER MAINTENANCE ENGINEER
ELECTROCHEMISTRY LEAD-BATTERY MATERIALS SR. ELECTRONICS ENGINEER TECHNICIAN
FORMATION MAINTENANCE MANAGER CONTROLS ENGINEER CELL TEST ENGINEER
MECHANICAL CELL DESIGN ENGINEER ELECTRICAL ENGINEER
BATTERY MECHANICAL ENGINEER SENIOR CELL DESIGN ENGINEER
LITHIUM ION CELL BATTERY SYSTEM ENGINEER
CELL ASSEMBLY PROCESS ENGINEER MANUFACTURING ENGINEER
EQUIPMENT ENGINEER
MECHANICAL ENGINEER PRODUCTION ENGINEER
MECHANICAL BATTERY DESIGN ENGINEER
SENIOR/STAFF BATTERY ENGINEER ELECTRO-MECHANICAL ENGINEER
PRINCIPAL MECHANICAL DESIGNER
TOP CAP ENGINEER CELL DESIGN ENGINEER
CELL MECHANICAL ENGINEER DESIGN ENGINEER-BATTERY TECHNOLOGY
MECHANICAL DESIGN ENGINEER MANUFACTURING ENGINEER, LI-ION ENGINEER
PRODUCT MANAGER CELL ASSEMBLY ENERGY STORAGE PRINCIPAL ENGINEER
PRODUCTION MANAGER DOWNSTREAM PRODUCTION MANAGER CELL ASSEMBLY
AUTOMATION ENGINEER SENIOR ENGINEER-BATTERY MODELLING & ANALYSIS
ELECTRICAL DESIGN ENGINEER SENIOR BATTERY MECHANICAL ENGINEER

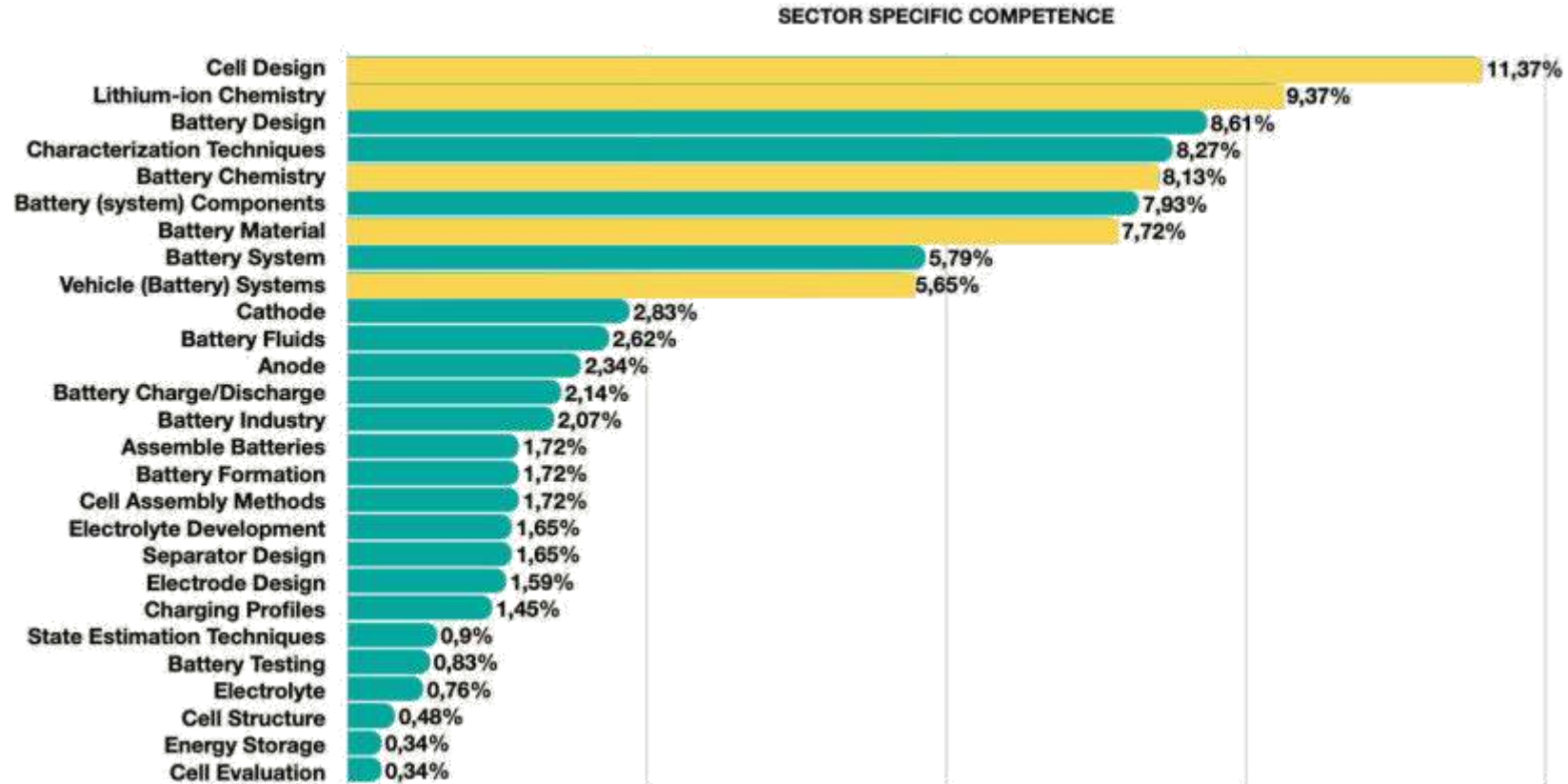


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Production and Maintenance– Skills and Competence

→ What Industry Demands

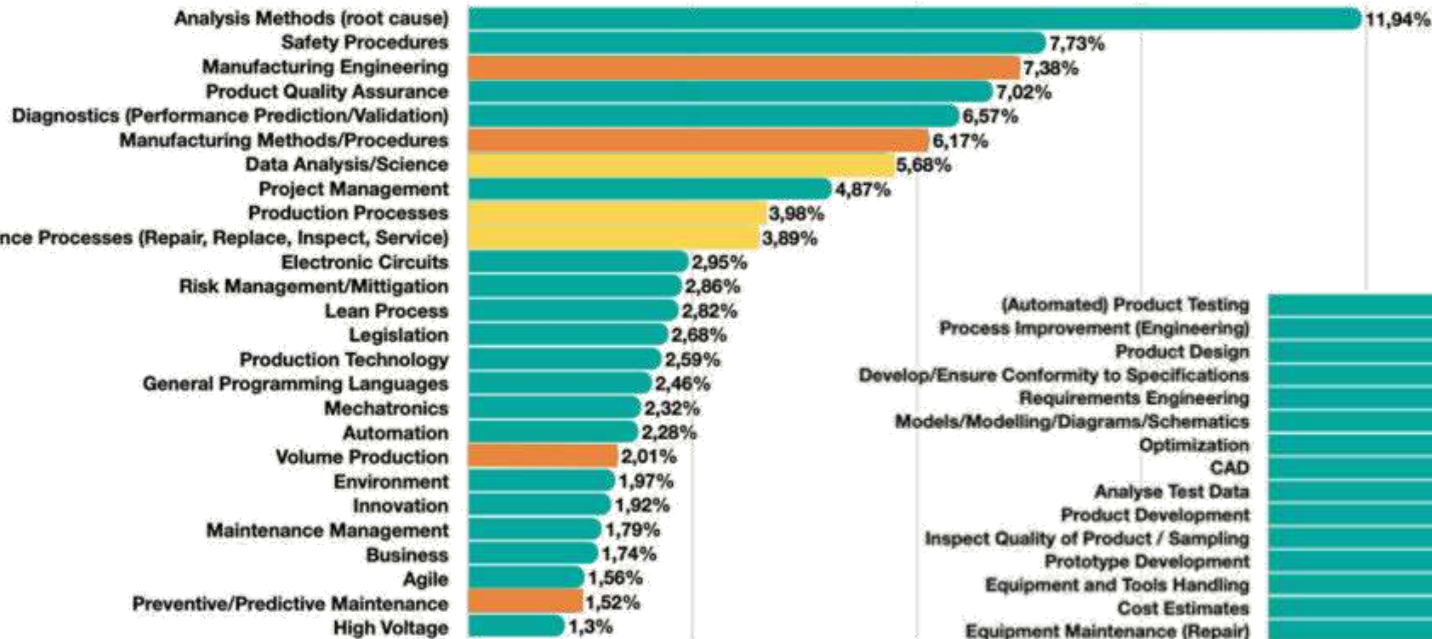


Production and Maintenance– Skills and Competence

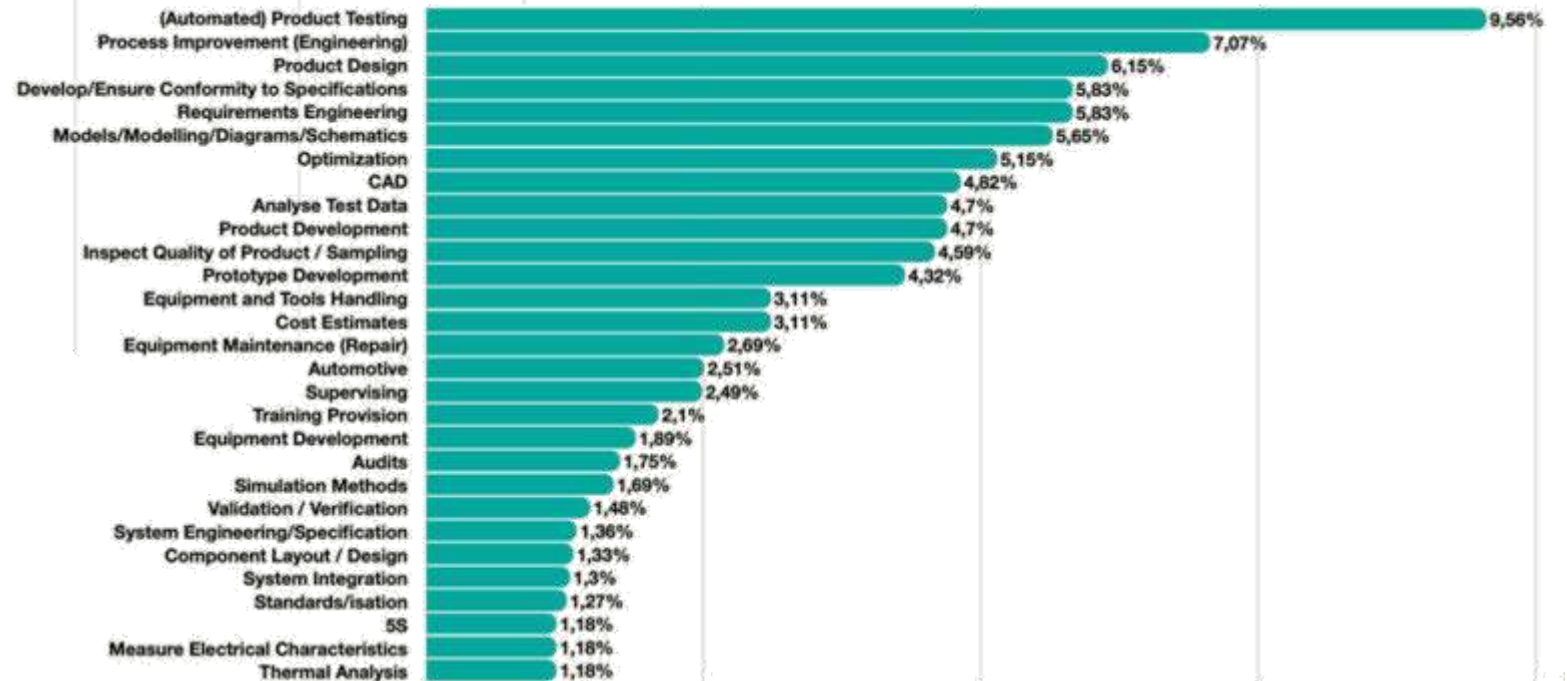


→ What Industry Demands

CROSS-SECTORAL SPECIFIC KNOWLEDGE

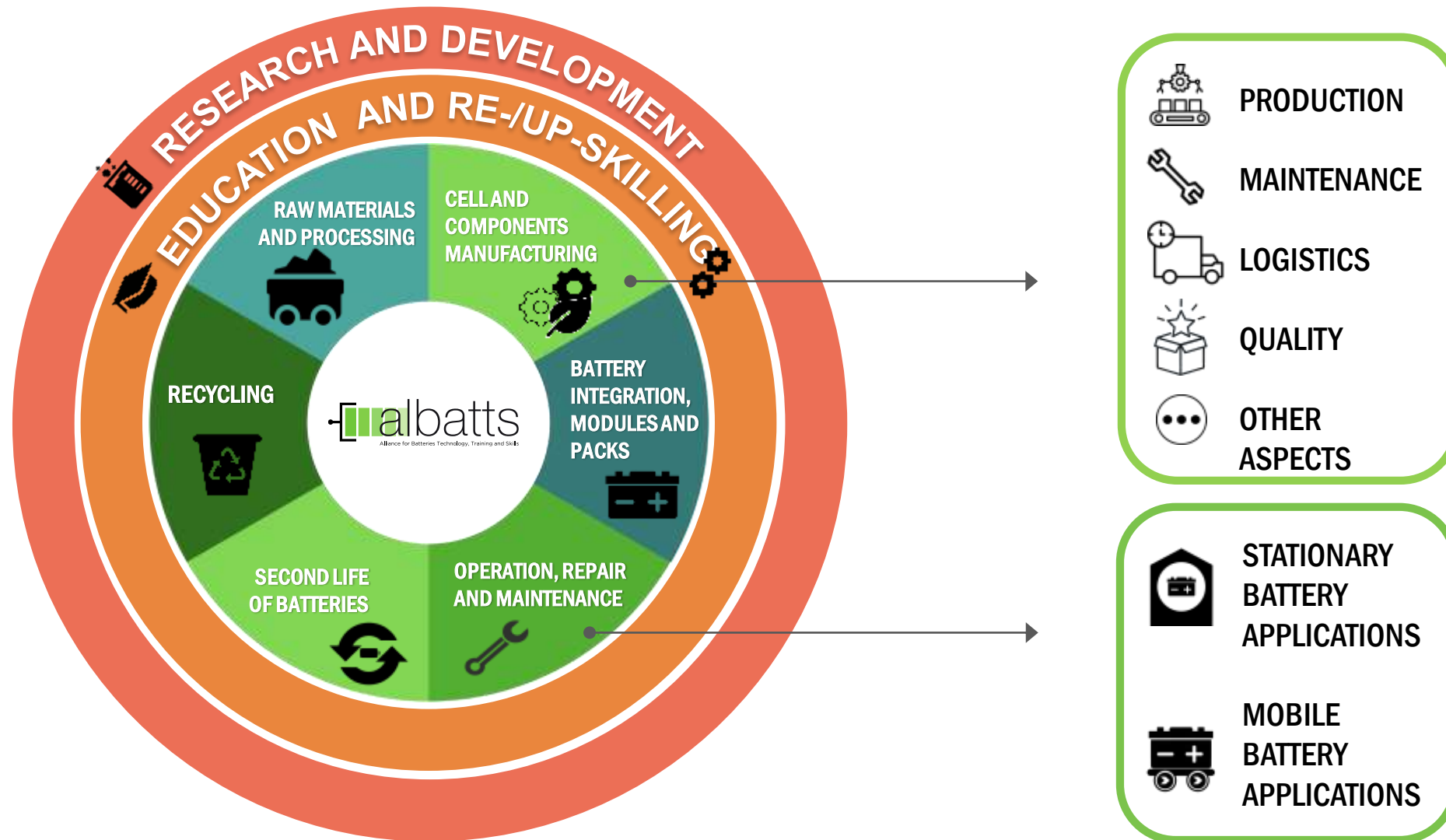


CROSS-SECTORAL SPECIFIC SKILLS



Glance on Needed Skills

BATTERY INTEGRATION, MODULES & PACKS



Battery Integration, Modules, and Packs

→ What Industry Demands



Strengthening competence in BMS development to achieve development in efficiency, predictable behaviour, and risk mitigation – concern is a battery system safety

Development of competence within the standardization and frameworks for integration process and procedures of battery modules and whole systems

Understanding the battery systems topologies and components

Development and improvement of a framework for quality assessment and assurance

Research and development within the BMS – concern is a battery system safety; efficiency and more advanced features of the system

Battery integration & control - testing of integrated battery system within the application

Development of more efficient SoC & SoH algorithms

Strengthening of cooperation between integrators, manufacturers, and BMS suppliers

Overall digital skills

Development and research on BTMS - thermal management issues and other aspects – (1) safety; (2) physical or mechanical performance; (3) durability; (4) ripple current; (5) accuracy of measuring instruments; (6) materials for fire resistance and electronics packaging;

Battery Integration, Modules, and Packs

→ What Industry Demands



BLUE-COLLAR

FACILITY TECHNICIAN SERVICE TECHNICIAN
CLEANING TECHNICIAN PLANNER
MAINTENANCE TECHNICIAN
MACHINE OPERATOR BESS TECHNICIAN
OPERATOR SR. QUALITY TECHNICIAN
SHIFT LEAD CELL ASSEMBLY TECHNICIAN
ELECTRONIC MOTOR BENCH TEST TECHNICIAN
BATTERY TEST TECHNICIAN
CELL INSPECTION TECHNICIAN RELIABILITY TECHNICIAN

WHITE-COLLAR

ELECTRO-MECHANICAL ENGINEER EV PROJECT MANAGER
MECHANICAL CELL DESIGN ENGINEER BATTERY SYSTEM & TECHNOLOGY ENGINEER
MECHANICAL SUPERVISOR PROJECT ENGINEER-CONTROLS ELECTRONICS FOR MOBILITY
HIGH-VOLTAGE BATTERY DRE SENIOR INTEGRATION ENGINEER SYSTEM ENGINEER
LITHIUM ION CELL BATTERY SYSTEM ENGINEER MECHANICAL BATTERY DESIGN ENGINEER
MECHANICAL ENGINEER PRODUCTION BLOCK MANAGER PRODUCTION ENGINEER
SENIOR ENGINEER-BATTERY MODELLING & ANALYSIS APPLICATION ENGINEER
CELL TEST ENGINEER ELECTRIC ENGINEER-FIRMWARE MANAGER
PRODUCTION MANAGER CELL ASSEMBLY BATTERY SYSTEM ENGINEER
MOBILE HYDRAULICS-APPLICATION ENGINEER
ELECTRICAL VEHICLE ENGINEER-CHARGING BATTERY SYSTEMS MANAGER
BATTERY TECHNICAL LEAD DESIGN ENGINEER-BATTERY TECHNOLOGY
MAINTENANCE ENGINEER PRODUCTION MANAGER DOWNSTREAM
SENIOR SYSTEM DESIGN ENGINEER SOFTWARE/MODELLING ENGINEER LEAD
PRODUCTION ENGINEER MANUFACTURING ENGINEER FORMATION MAINTENANCE MANAGER
CONTROLS ENGINEER ELECTROMOBILITY PROJECT LEADER POWER DISTRIBUTION ENGINEER
ELECTRICAL SYSTEM ENGINEER SR. ELECTRONICS ENGINEERING TECHNICIAN

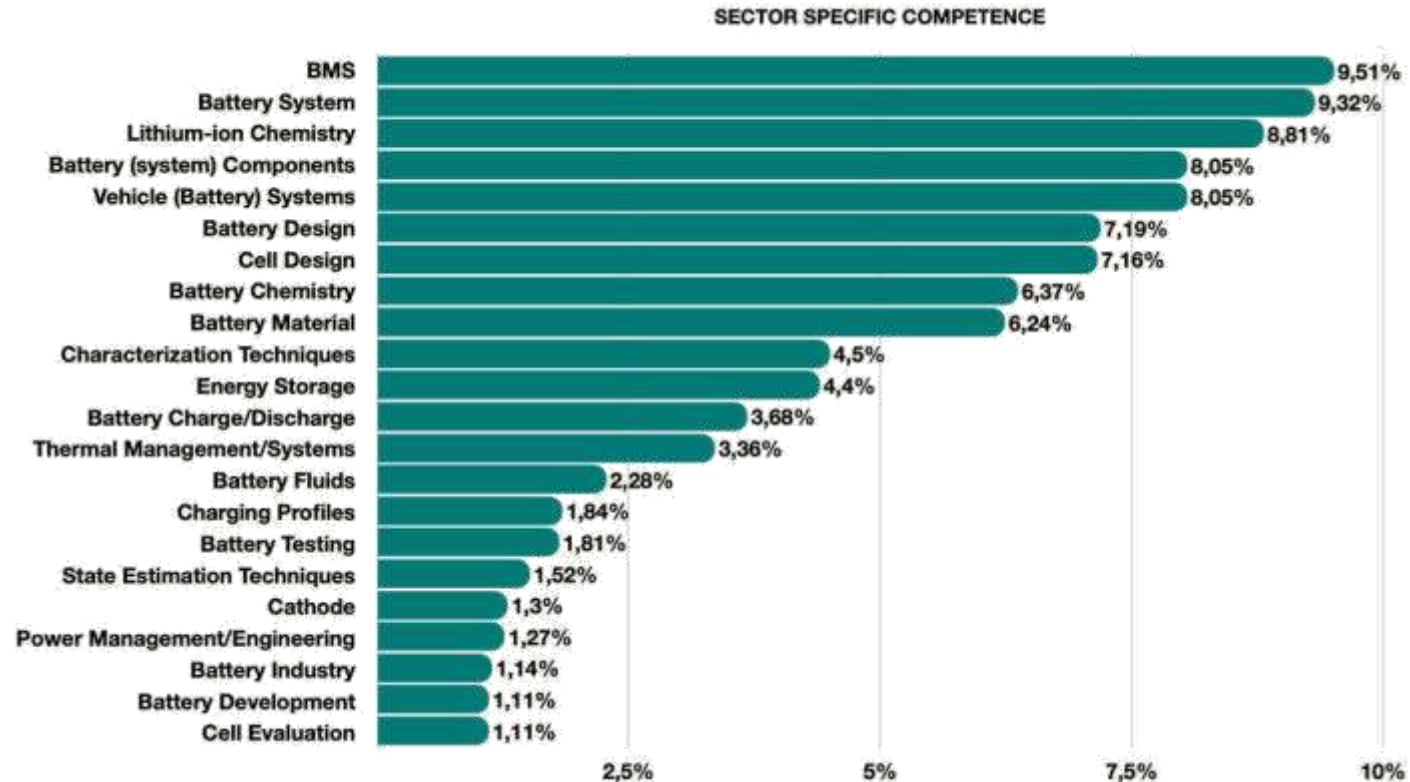


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Battery Integration, Modules, and Packs – Skills and Competence

→ What Industry Demands

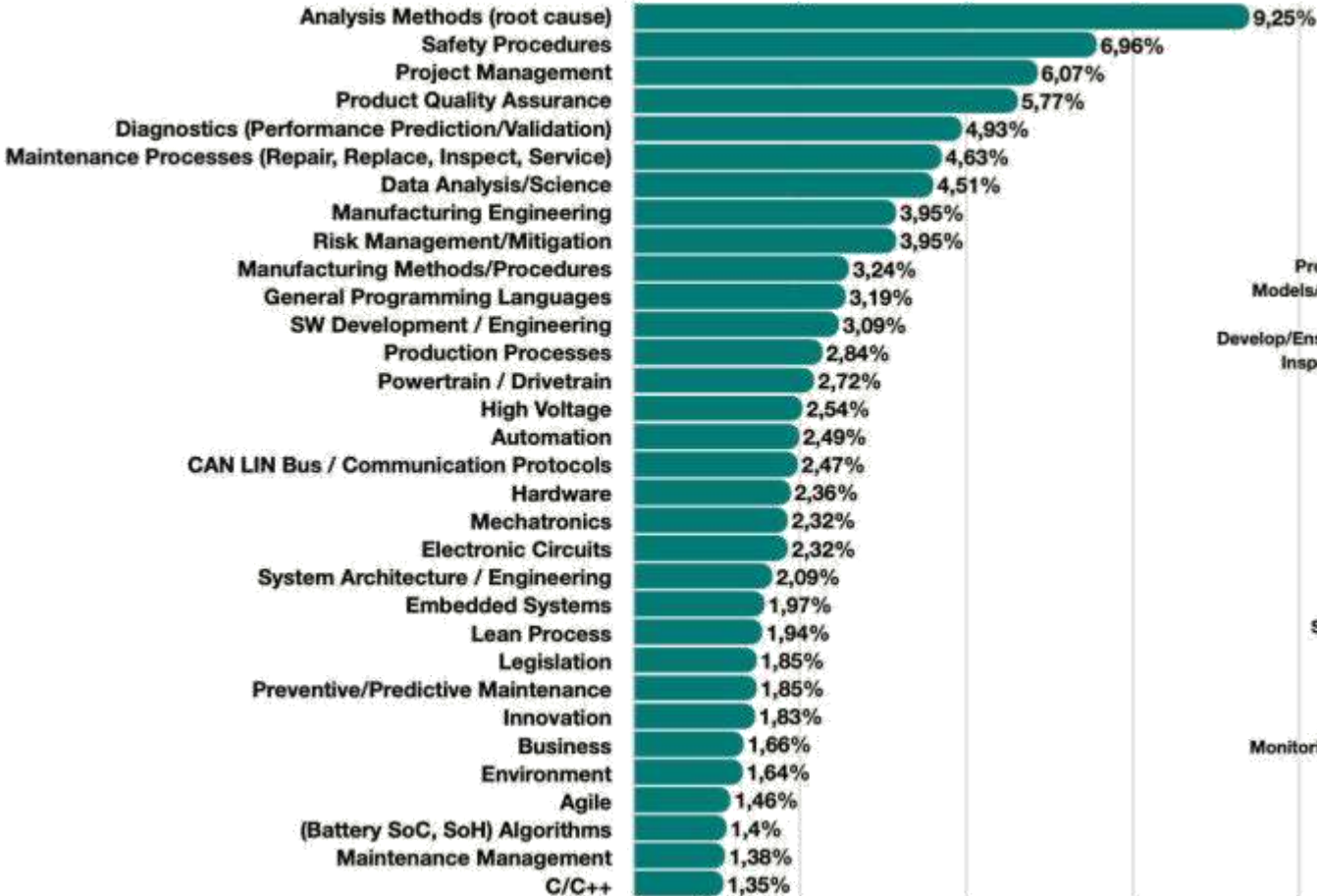


Battery Integration, Modules, and Packs – Skills and Competence

→ What Industry Demands



CROSS-SECTORAL SPECIFIC KNOWLEDGE

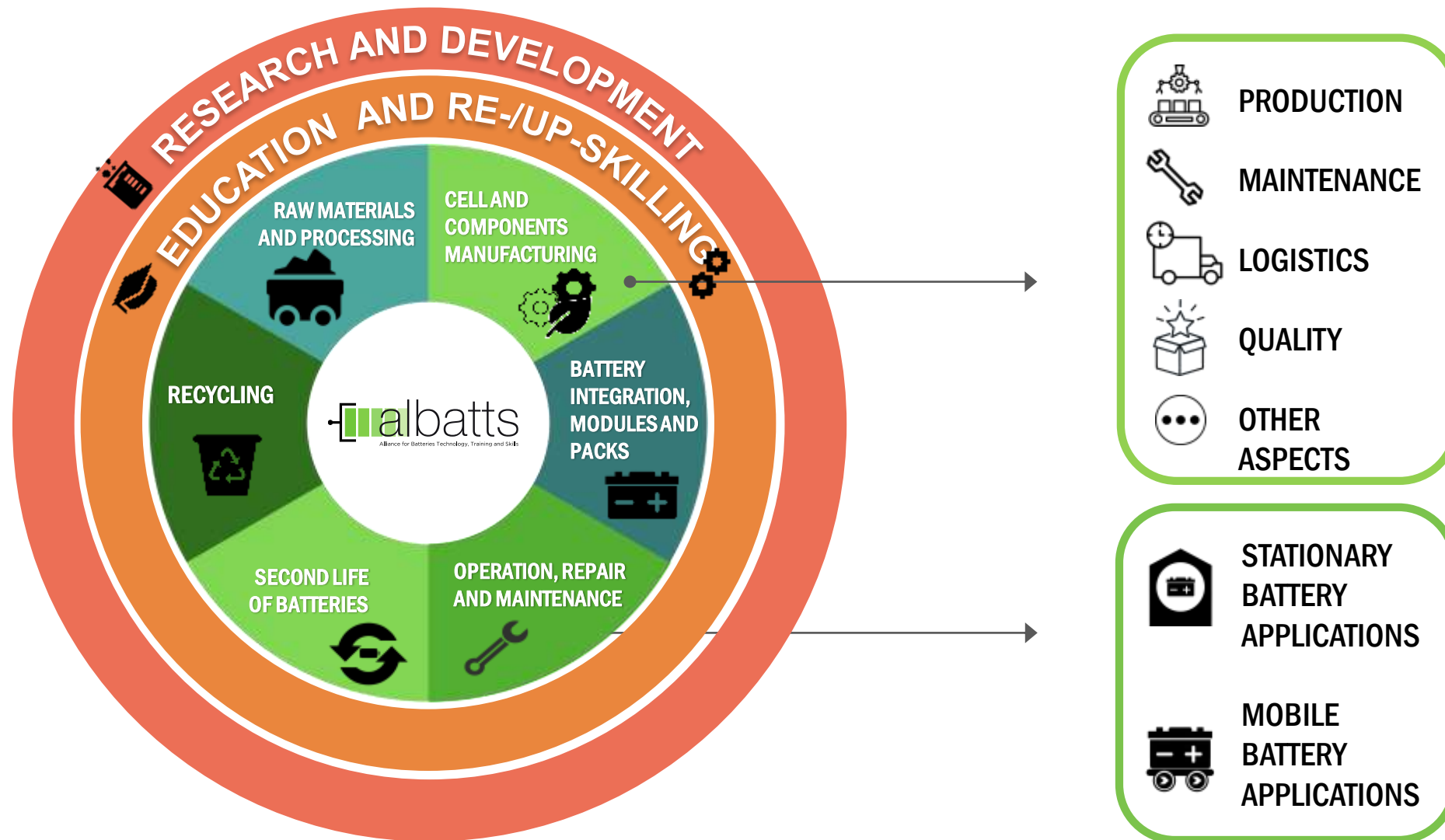


CROSS-SECTORAL SPECIFIC SKILLS



Glance on Needed Skills

Recycling and Second Life



Battery Integration, Modules, and Packs

→ What Industry Demands



The most extensive recruitment challenges currently concern the hiring of engineers and researchers. In the set-up phase of recycling plants, most staff are university-educated white-collar employees. However, after a plant becomes more established, the share of blue-collar employees with vocational education increases.

With the battery recycling-related positions, it is important to know battery technologies and recycling processes (chemical/physical) themselves.

Regarding environmental legislation, it is important to understand related national and EU directives. Safety is also important.

It is recommended to provide education and training in the following areas: (1) Environmental management and circular economy concepts; (2) Battery design - Battery components: Cell, anode, cathode, electrolyte and Precursor design, Electrode design, Separator design; (3) Battery material (material science) - Battery fluids and chemistry (Lithium-ion) and other materials and their properties; (4) Vehicle and other battery systems; (5) Material flow including procurement; (6) Battery testers; (7) Recycling knowledge to enable developing recycling programs - Recycling processes and technologies, R&D, Automation; (8) Production Planning.



Battery Integration, Modules, and Packs

→ What Industry Demands



BLUE-COLLAR

RECYCLING TECHNICIAN
QUALITY TECHNICIAN
MACHINE OPERATOR
MATERIAL HANDLER
CELL INSPECTION TECHNICIAN
AUTOMATION/PROCESS OPERATOR
MATERIAL PLANNER
DIRECT LINE WORKER

WHITE-COLLAR

LOGISTICS MANAGER
TECHNICAL PRODUCT MANAGER SAFETY MANAGER
ISO INTERNAL AUDITOR SENIOR SCIENTIST
INDUSTRIAL PRODUCTION MANAGER SENIOR AUTOMATION ENGINEER
PROCESS ENGINEER QUALITY PROCESS ENGINEER
POWER SYSTEM REGULATORY ENGINEER MECHANICAL ENGINEER
CERTIFICATION & HOMOLOGATION MANAGER
INTERNAL LOGISTICS MANAGER AUTOMATION ENGINEER
DATA ANALYST ELECTRICAL ENGINEER
SAFETY SPECIALIST BLUEPRINT DATA SCIENTIST
BATTERY TEST ENGINEER MAINTENANCE ENGINEER
QUALITY ENGINEER BATTERY MATERIALS ENGINEER
ENGINEERING TECHNICIAN COMPLIANCE ENGINEER

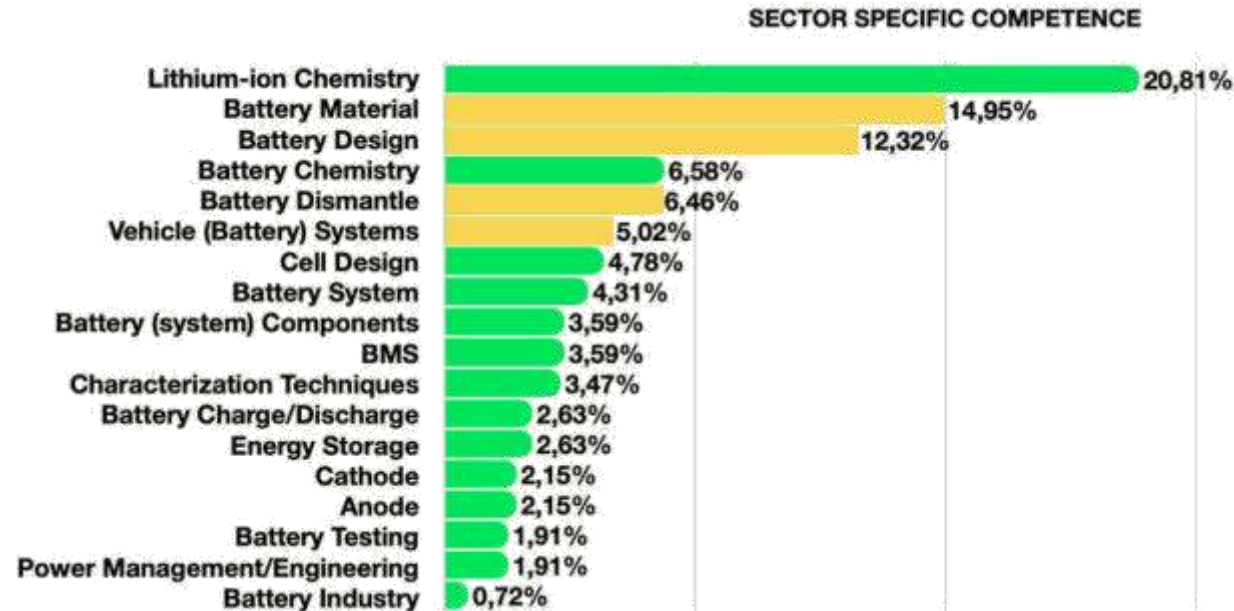


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Battery Integration, Modules, and Packs – Skills and Competence

→ What Industry Demands



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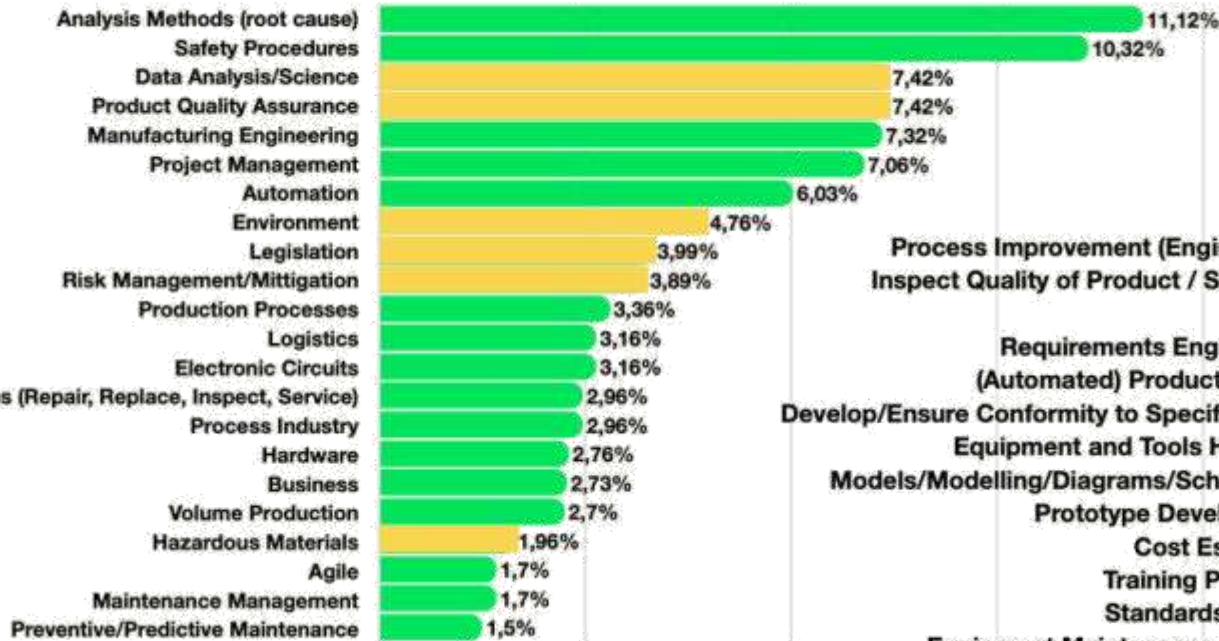
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Battery Integration, Modules, and Packs – Skills and Competence

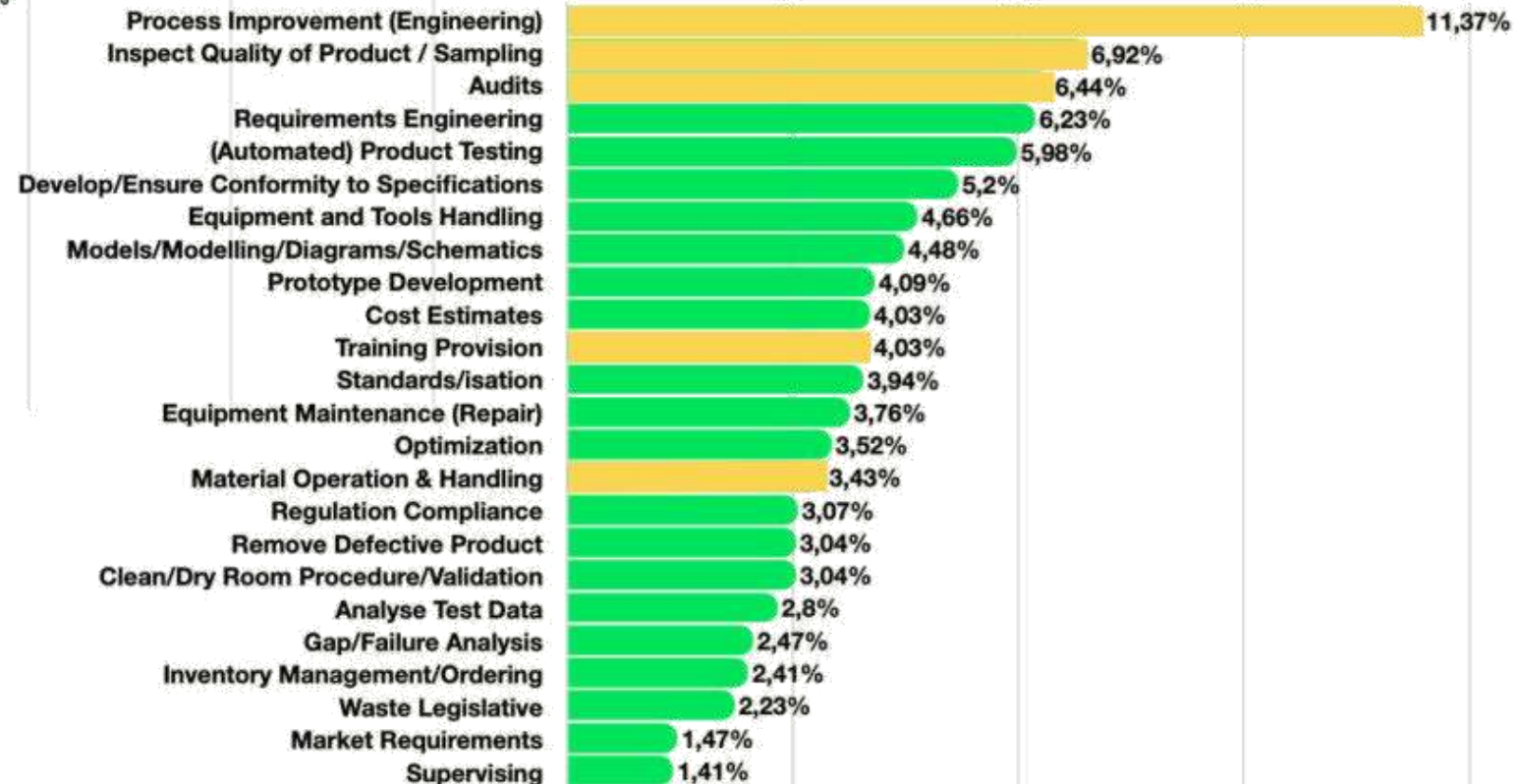
→ What Industry Demands



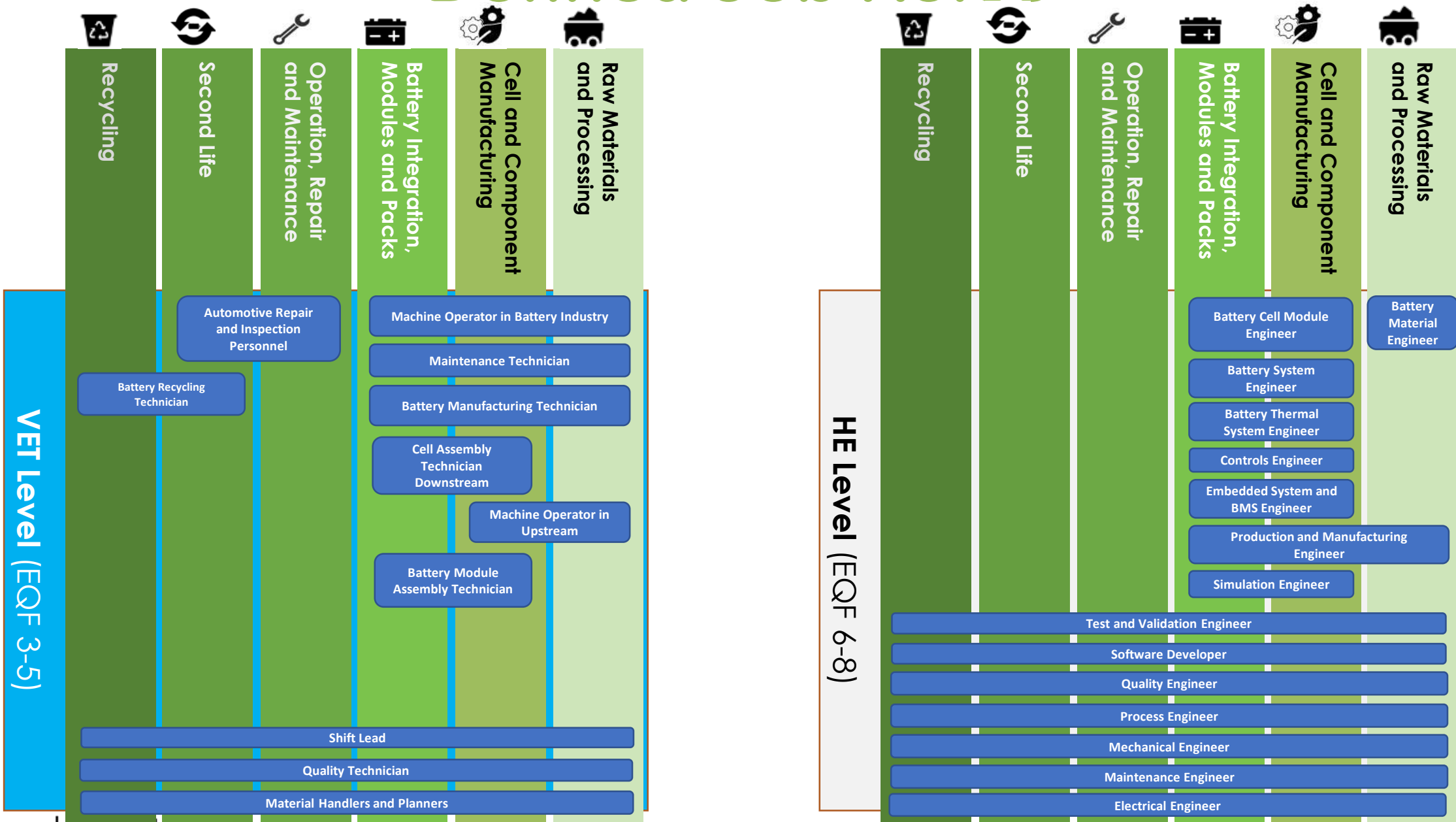
CROSS-SECTORAL SPECIFIC KNOWLEDGE



CROSS-SECTORAL SPECIFIC SKILLS



Defined Job Roles



Skills Cards

26 job skills cards produced
(15 on HE level and 11 on VET level)

Each card has short description of the job role and

- Cross-sectoral specific competences
- Sector specific competences (has a big importance)
- General transversal competences
- Academic competences







Summaries of Skills Cards (available in our website)



ALBATTs SKILLS CARDS

Reports

<p>Intelligence in Mobile Battery Applications</p> <p>R&D and technological perspectives for the battery sector</p> 	<p>Sectoral Intelligence</p> <p>Intelligence in Battery Manufacturing and Battery Technology</p> 
<p>Stationary & Industrial Applications</p> <p>Intelligence in Stationary and Industrial Battery Applications</p> 	<p>Education and Training</p> <p>State-of-art of job roles and education in the batteries' sector</p> 

Examples of reports released



REPORTS' HIGHLIGHTS

Thank you!



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