

FINLAND

# BATTERY POWERED TOUR FOR SKILLS

Enabling a prepared education network for the battery ecosystem in Europe

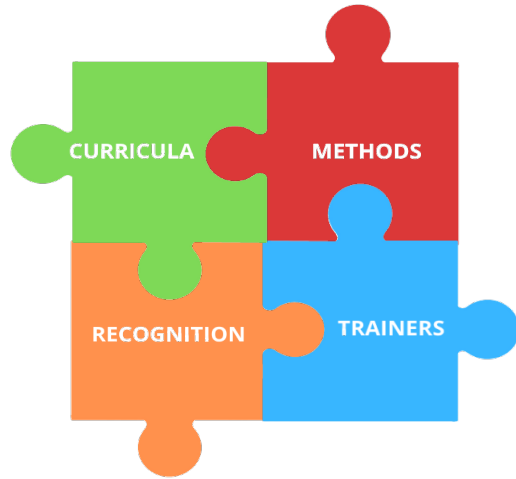
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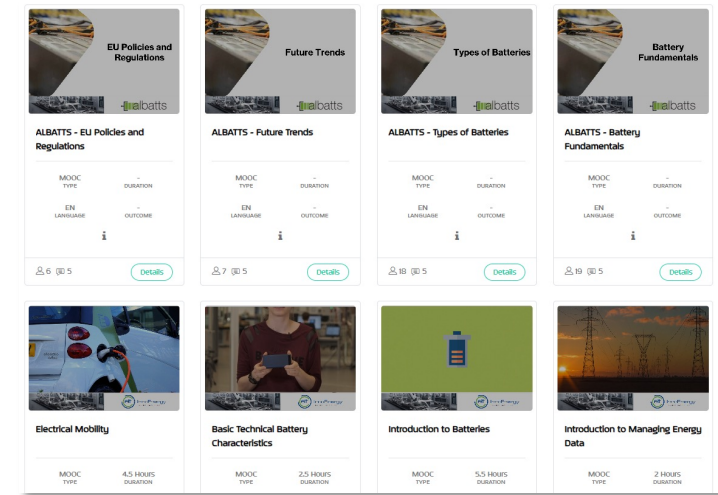
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# ALBATTTS Tackles Two Main Questions



Learning  
Platform



2

HOW CAN WE ADDRESS CURRENT CHALLENGES?

EDUCATION & TRAINING

- **FOCUSING ON** Vocational Education and Training (**VET**) & Higher Education (**HE**) **AIMED AT initial training and re-skilling and up-skilling of workforce**



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# Courses

11 Courses already available

Manufacturing Processes



 ONLINE COURSES

Introduction to the Battery Sector



 ONLINE COURSES

Future Trends



 ONLINE COURSES

EU Policies and Regulations



 ONLINE COURSES

Types of Batteries



 ONLINE COURSES

Battery Fundamentals



 ONLINE COURSES

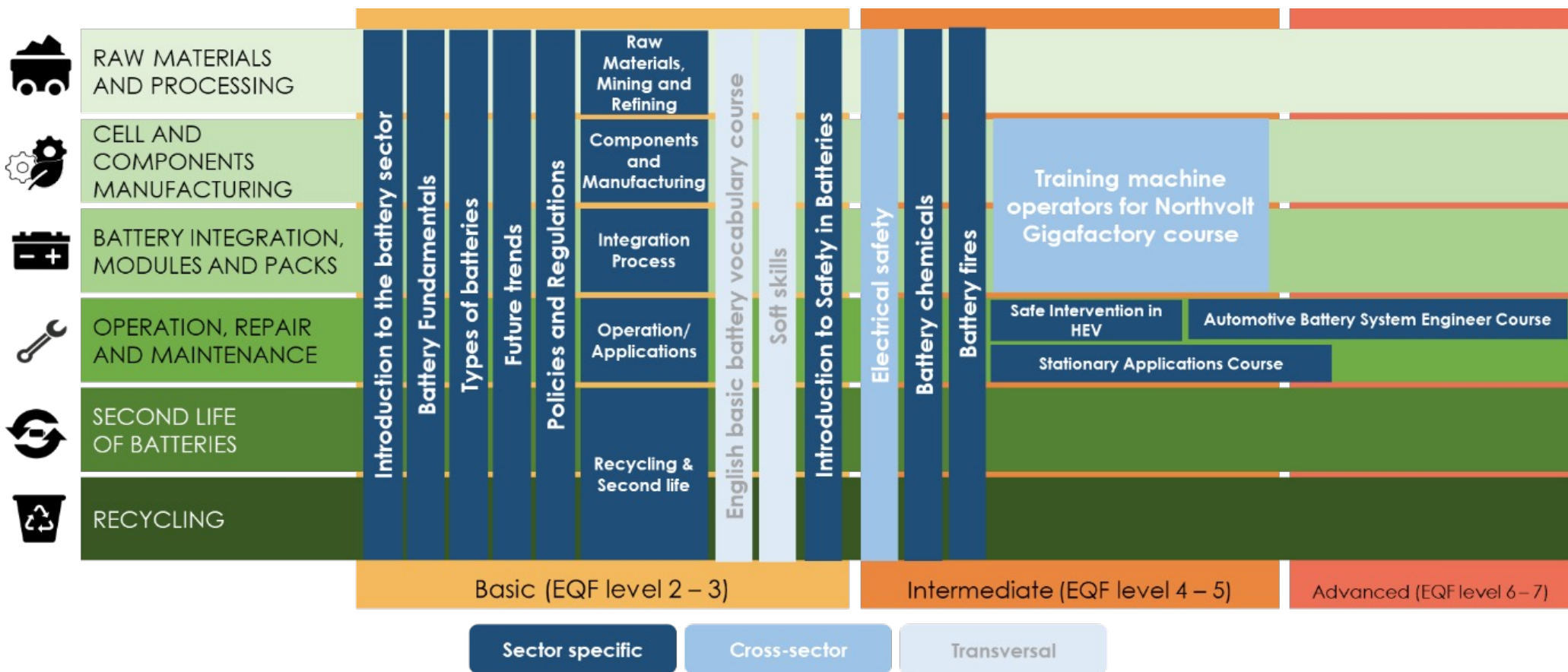
*Examples of available courses*

Available through the Automotive Skills Alliance (ASA), an association created through the bridging of the projects ALBATTs and DRIVES activities and to sustain project results



**ALBATTs COURSES**

# Albatts courses



# Training for VET Teachers

COLLABORATION

BEST PRACTICES &  
FUNDRAISING

Support of Knowledge Sharing

## About BaTT Forum

- The Batteries Teachers & Trainers Forum (BaTT Forum) is an initiative launched by ALBATTs
- Upskilling and sharing of the best practices among VET teachers to support Batteries education and training (especially EQF 3-5)



Alliance for Batteries Technology, Training and Skills



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Handbook for  
**TRAINING IN THE BATTERY INDUSTRY**  
Why? What? To whom? Where? How?

**Will be published in March 2024**

**Will be found on Albatts  
homepage [https://www.project-  
albatts.eu/en/home](https://www.project-albatts.eu/en/home)**

**Target group: VET schools,  
teachers, companies**

# Recommendations



## Vocational Education

Support FLEXIBILITY & COLLABORATION  
=> SPEED UP REACTION TO THE CHANGES

### EU-level:

- Encourage flexible modular approach
- Encourage cross-disciplinary content
- Promote cooperation between VET & HE
- Funding for labs, on- and offline

### Regional/National level:

- Green skills in curriculum
- Flexible modular approach – easy to update and adapt, cross-disciplinary content
- Training in English and soft skills
- Funding for labs, on- and offline, teacher training
- Funding encouraging education providers to cooperate

### VET provider level:

- Cooperate – universities - industry, - other VET providers, municipality, authorities
- Be proactive! Don't wait!

### Industry /Working life:

- Communicate with VET providers!
- Help with training material and content
- 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...

# Thank you!



**FOLLOW US / GET INVOLVED**



[info@project-albatts.eu](mailto:info@project-albatts.eu)



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



**@ALBATTs – Alliance for Batteries Technology, Training and Skills**



**@ALBATTs1**



**@Project ALBATTs**

**JOIN OUR NETWORK THROUGH OUR WEBSITE AND GET FIRST-HAND INFORMATION ABOUT OUR WORK & BATTERY SECTOR SKILLS AGENDA!**



BATTERY POWERED

# TOUR FOR SKILLS

Enabling a prepared education network for the battery ecosystem in Europe

## Skills intelligence and identified job roles in the battery value chain

Ing. Simona Jursová, Ph.D. (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

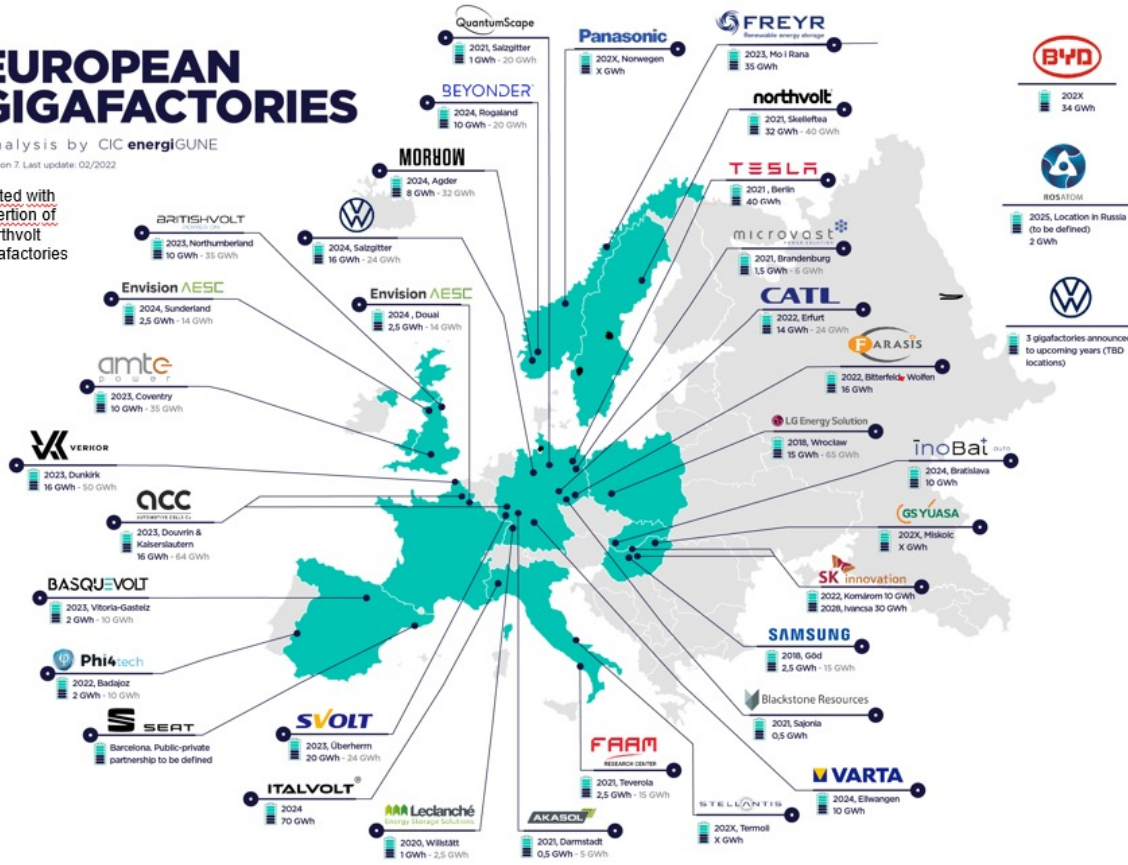
This needs to be supported by the workforce with the right skills  
 Change of needed skills/competences or knowledge during the individuals' career – the change is constant.

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

EU companies associated with second-life batteries as of May 2023

Published by: **BATTERY-NEWS.DE**



- Collection & transport to the plant
- Identification & condition determination
- Selection of End-of-Life strategy
- Technical conditioning
- Integration & Installation

**Norway**

Corvus Energy

ECOSTOR

GBD

GRØNVOLD'S

**Finland**

efortum

**Europe**

STENA RECYCLING

reneos

**Great Britain**

ZENOBE

SNAM

CONNECTED ENERGY

offgrid energy

BMW GROUP

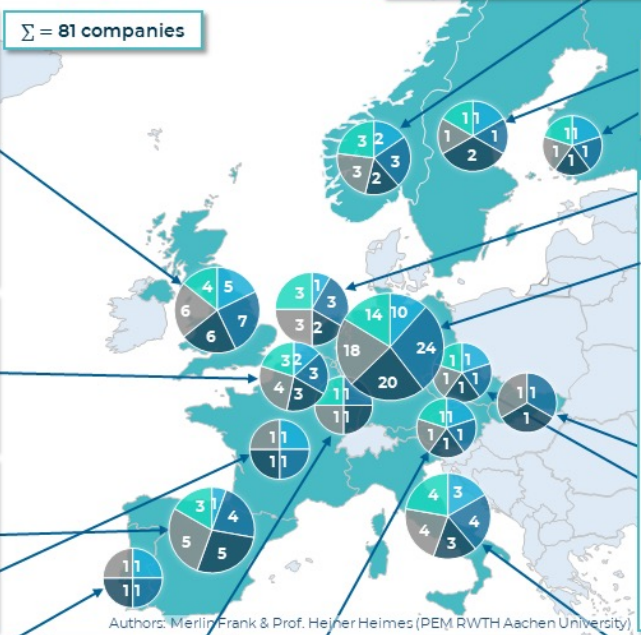
Second EV

HONDA

LITHIUM BATTERY

PRAMAC

LAND-ROVER



**Sweden**

cling

BATTERYLOOP

**Netherlands**

EcarACCU

FNT

SPINERS NEW TECHNOLOGIES

BNA BATTERY

**Belgium**

ReVolta

WATT4EVER BATTERIES FOR LIFE

OUT4USE

Octave

**Spain**

ALTABATT+

Be Planet factory

ABERVIAN

cidetec

+MILLOR

**Germany**

ACCURE

DEKRA

MHP

NOVUM

Q Coulomb

DB SCHENKER

STABL

fenecon

circunomics

Fev

EIA

V

nunom

Voltafang

TWACE

encore

betteries

Ixxat

Mercedes Benz Energy GmbH

Novum

LiBcycle

Audi

deppe

ambibox

gigabatt

LUEG

LogBATT

DellCon mobility solution

BELECTRIC

riello POWER SYSTEMS

OXIS Technology

VOLUME GRAPHICS

FERCHAU ENGINEERING

**France**

Renault Group

BOUYGUES

**Portugal**

Evolution

**Luxemburg**

Circu Li-ion

**Austria**

**Italy**

CESVI MAP

CANFIA

enel x

e-mobility service

**Czech Republic**

SKODA

ibq

**Slovakia**

ztsw

eaq

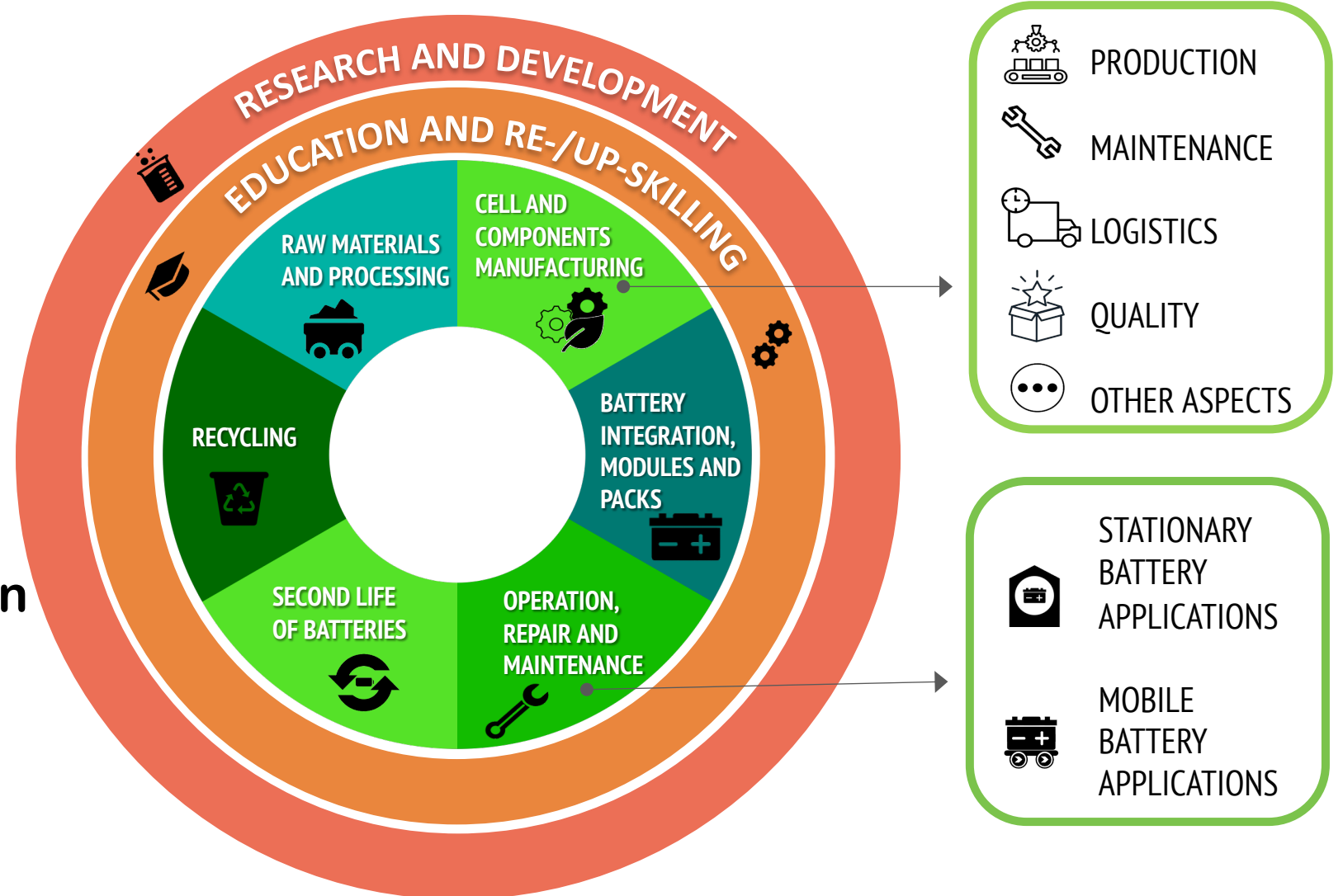
Source: Battery Atlas Europe

# 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



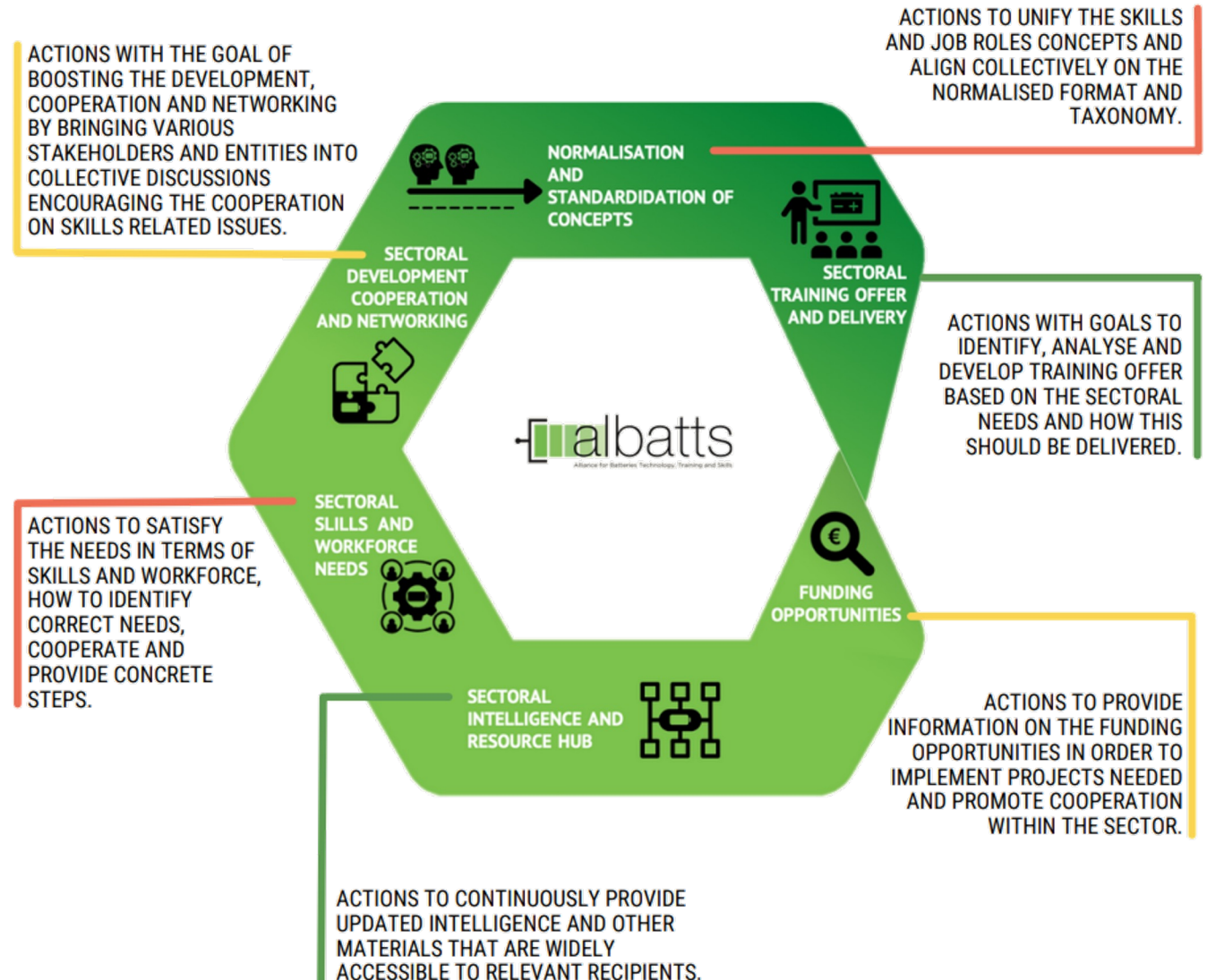
# Skills Agenda and Strategy



⚡ The overall assessment is supported by a strategy

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

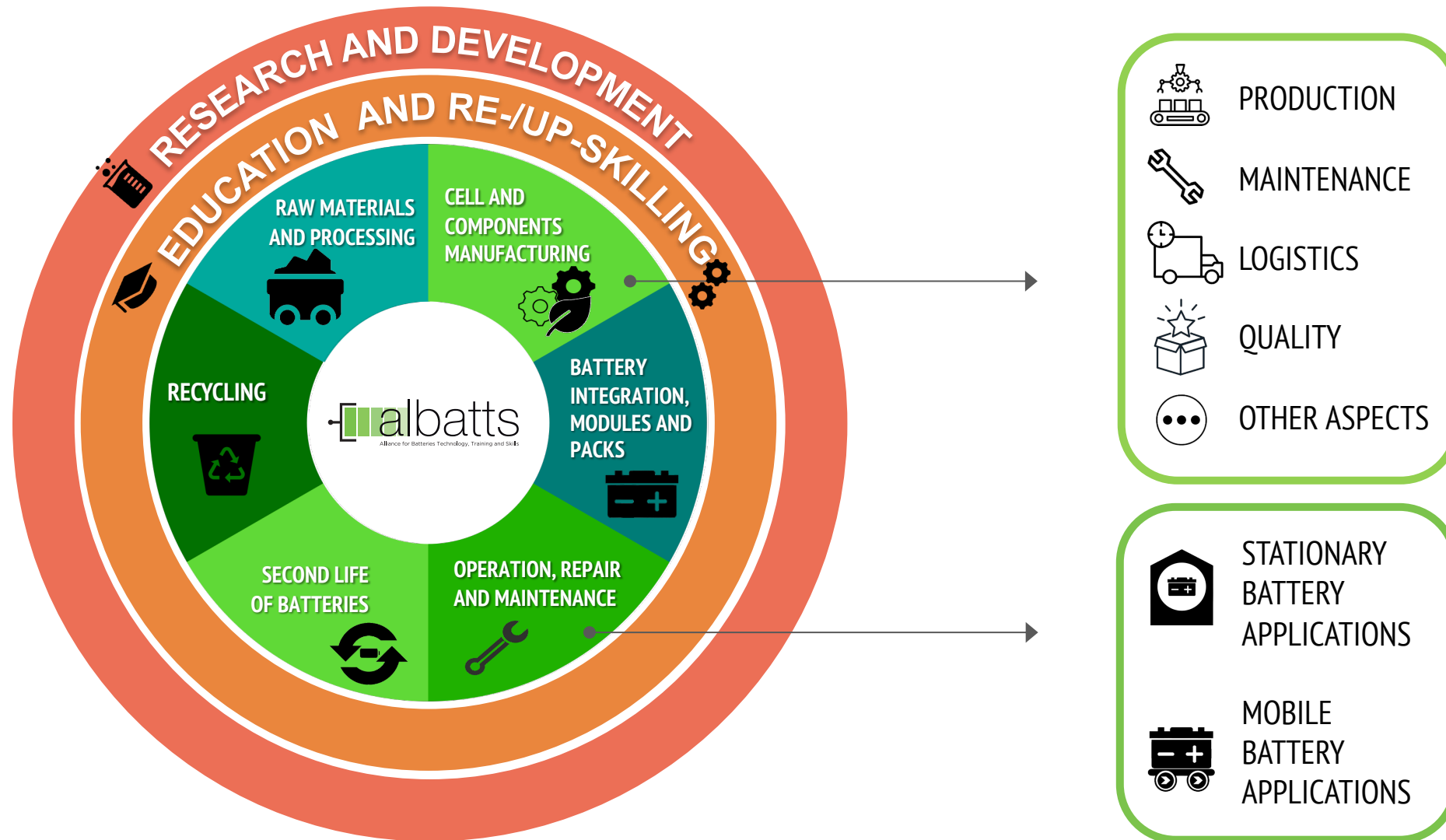
⚡ Competences can be sector specific and cross-sectoral





# Glance on Needed Skills

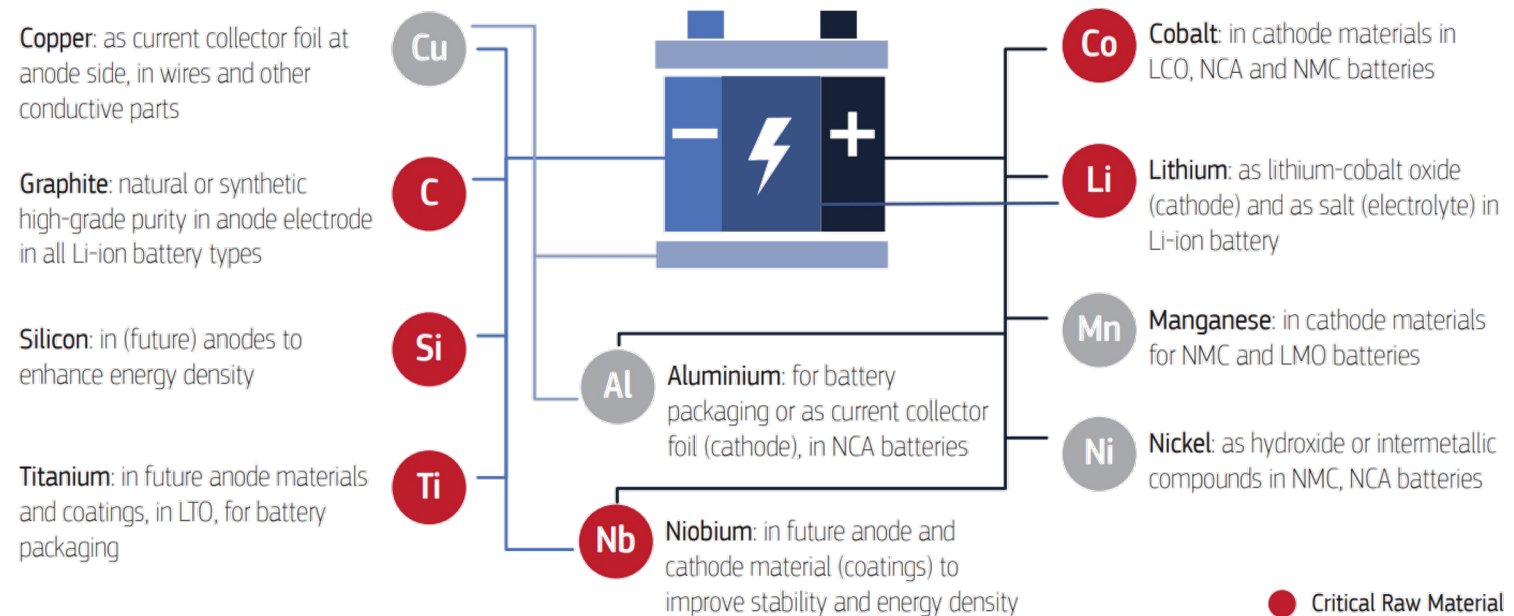
## RAW MATERIALS AND PROCESSING



# 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;

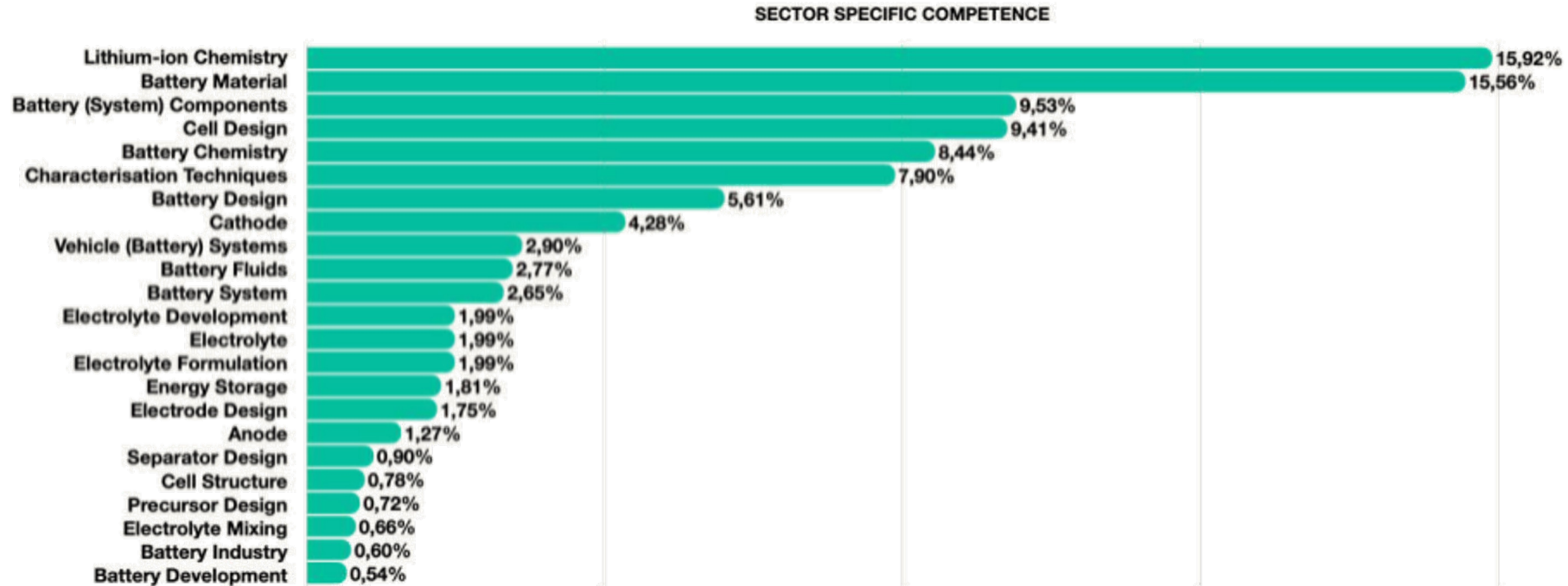


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# Raw Materials and Processing – Skills and Competences

## → What Industry Demands

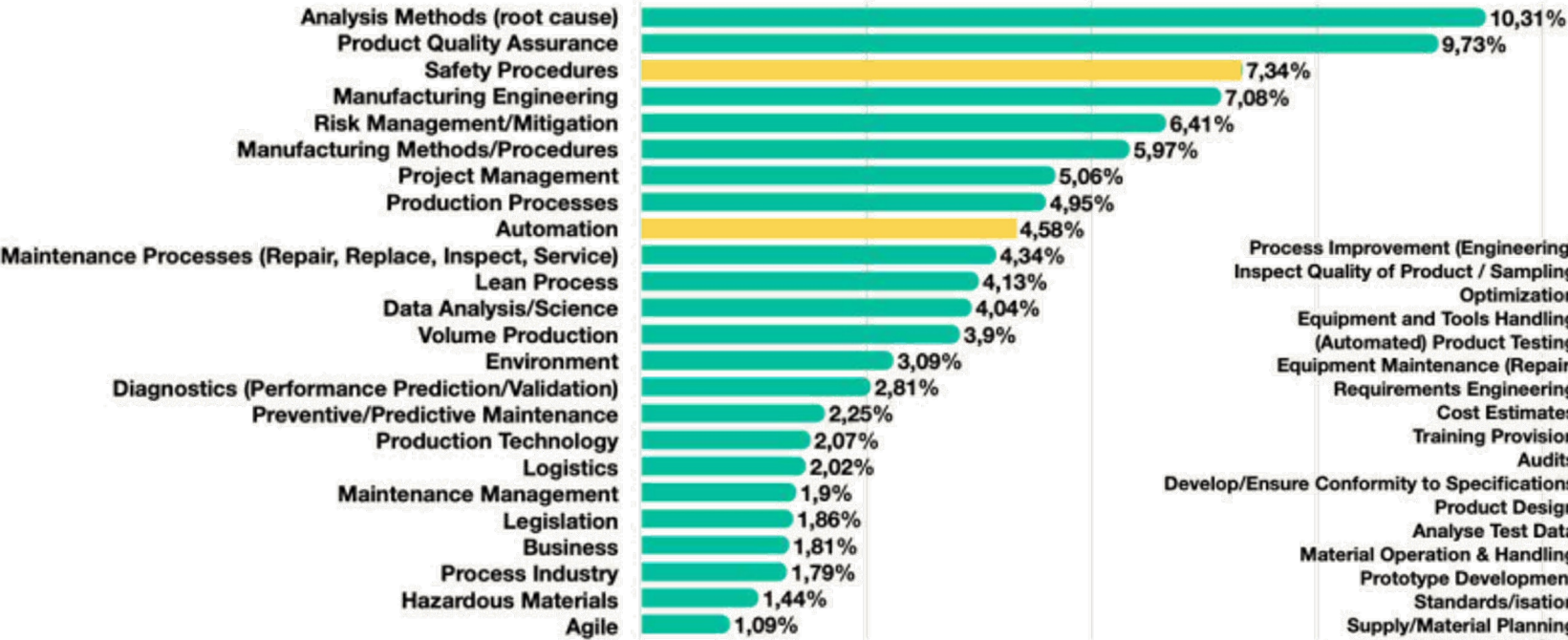


# Raw Materials and Processing – Skills and Competences

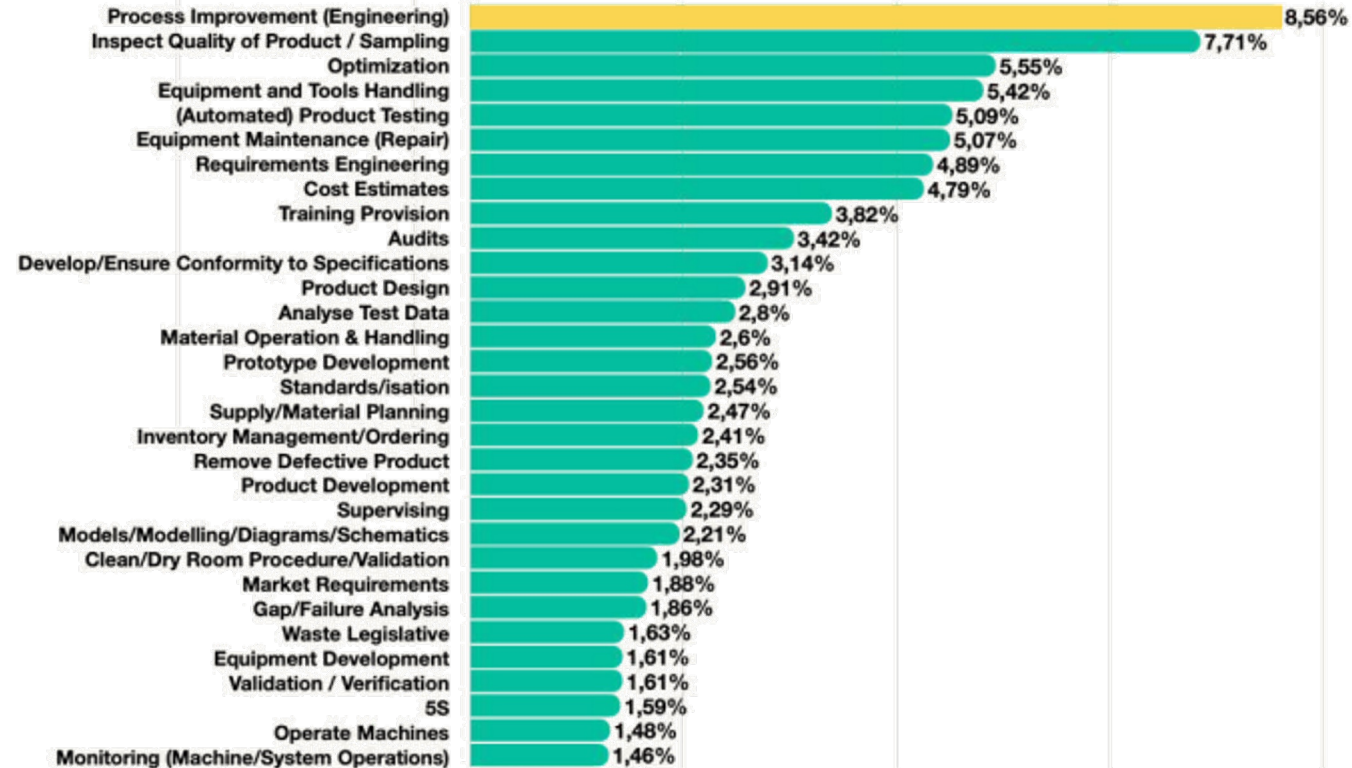


## → What Industry Demands

### CROSS-SECTORAL SPECIFIC KNOWLEDGE



### CROSS-SECTORAL SPECIFIC SKILLS

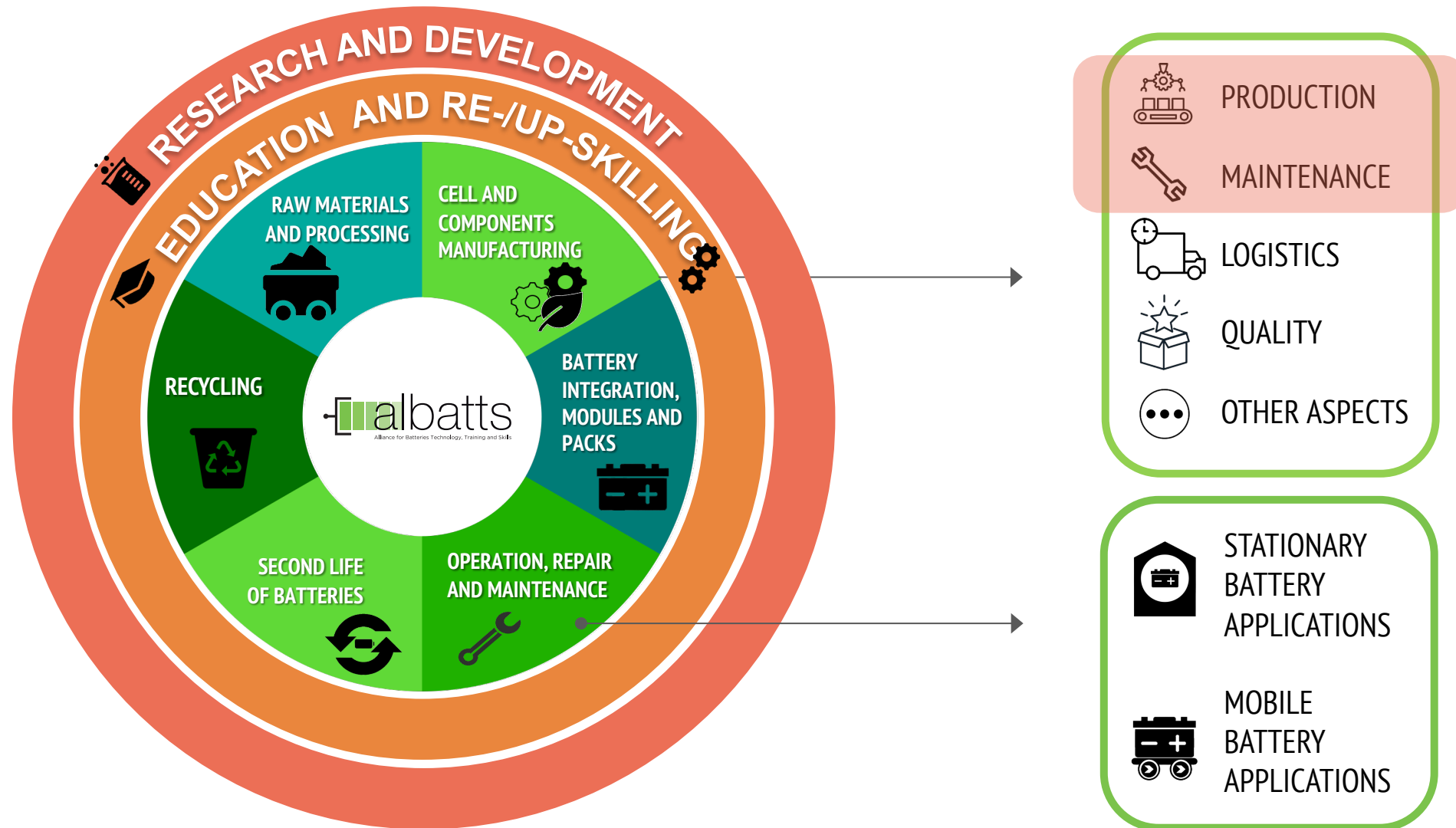


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# Glance on Needed Skills

## CELLS PRODUCTION & CELLS MAINTENANCE



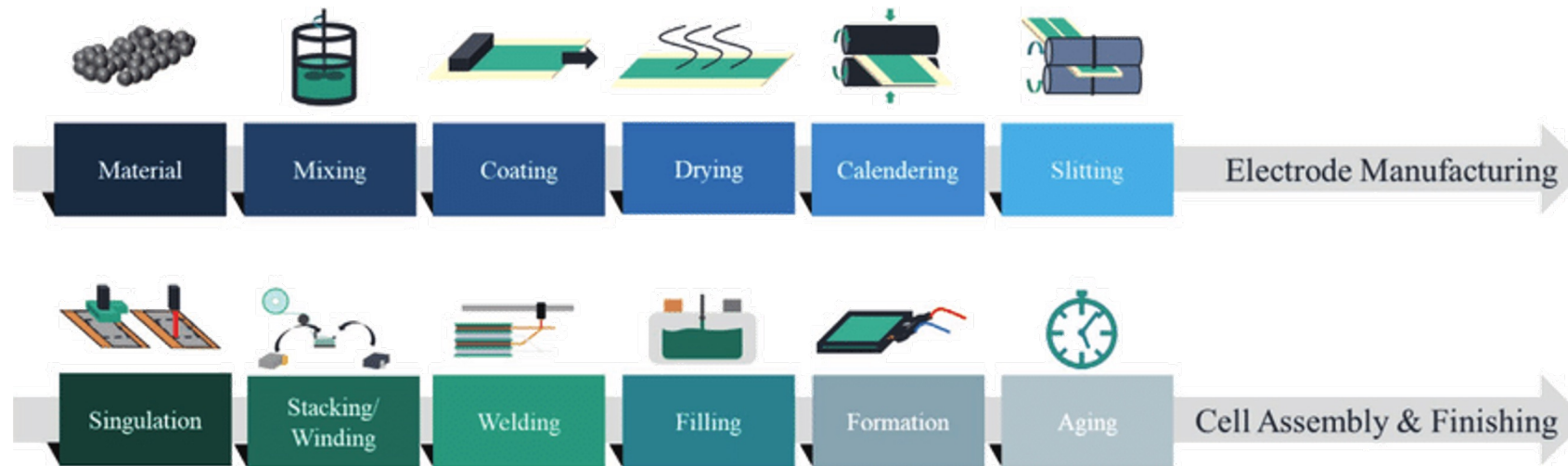
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# Cell Production



- ⚡ 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



# 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 MATERIALS ENGINEER HIGH-DENSITY ANODES  
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

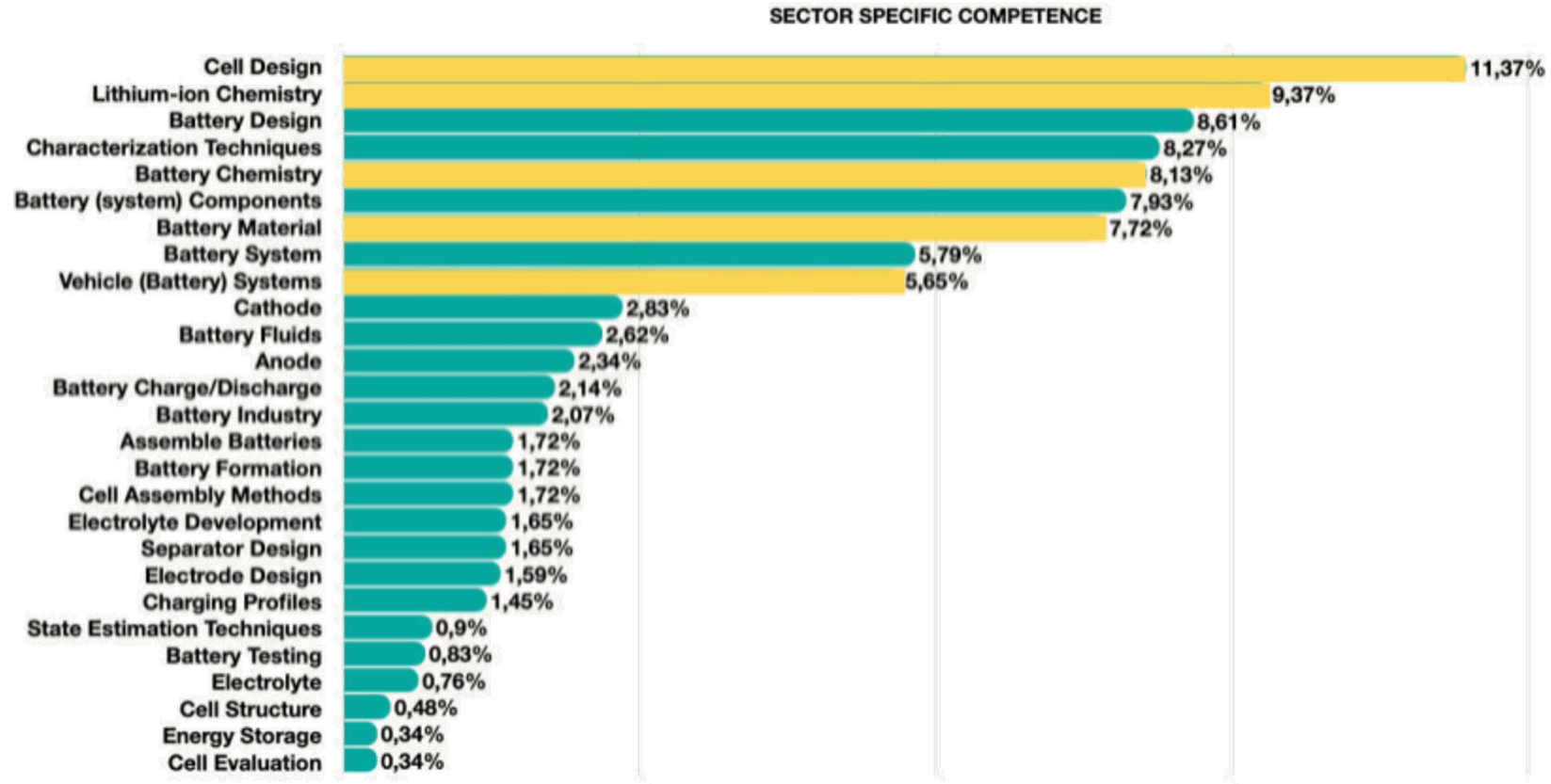


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# Production and Maintenance– Skills and Competence

→ What Industry Demands

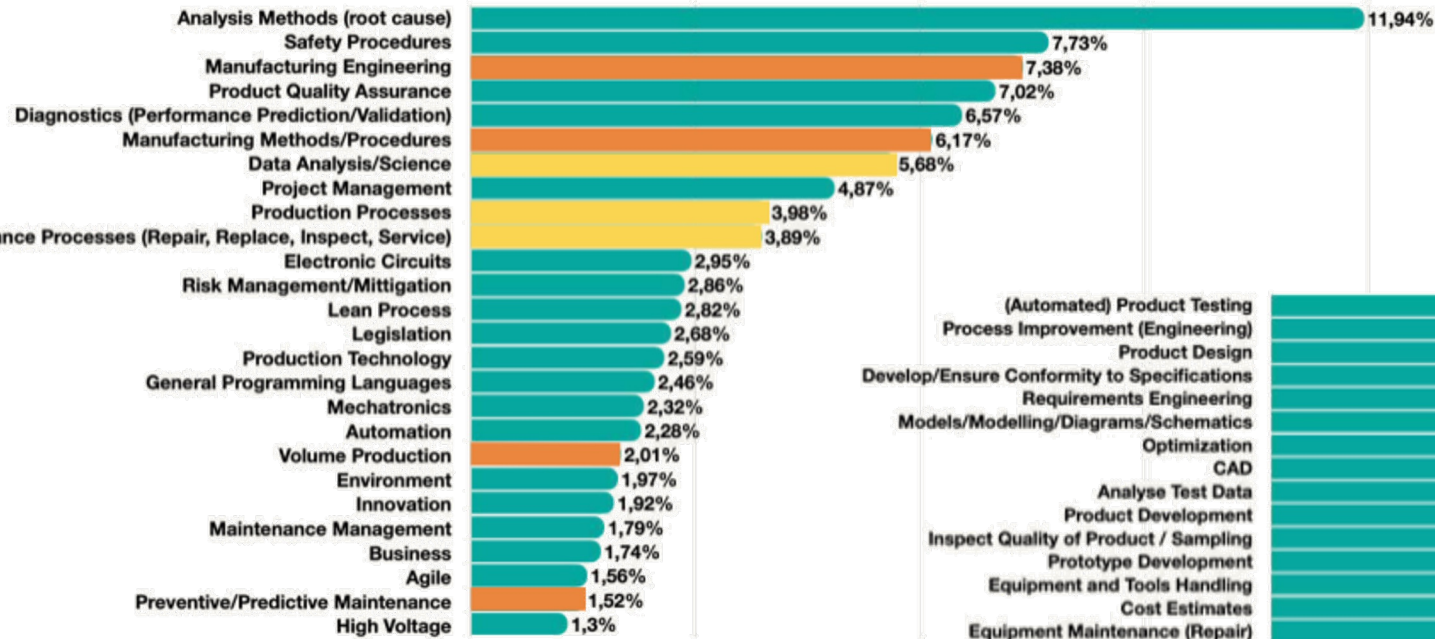


# Production and Maintenance– Skills and Competence

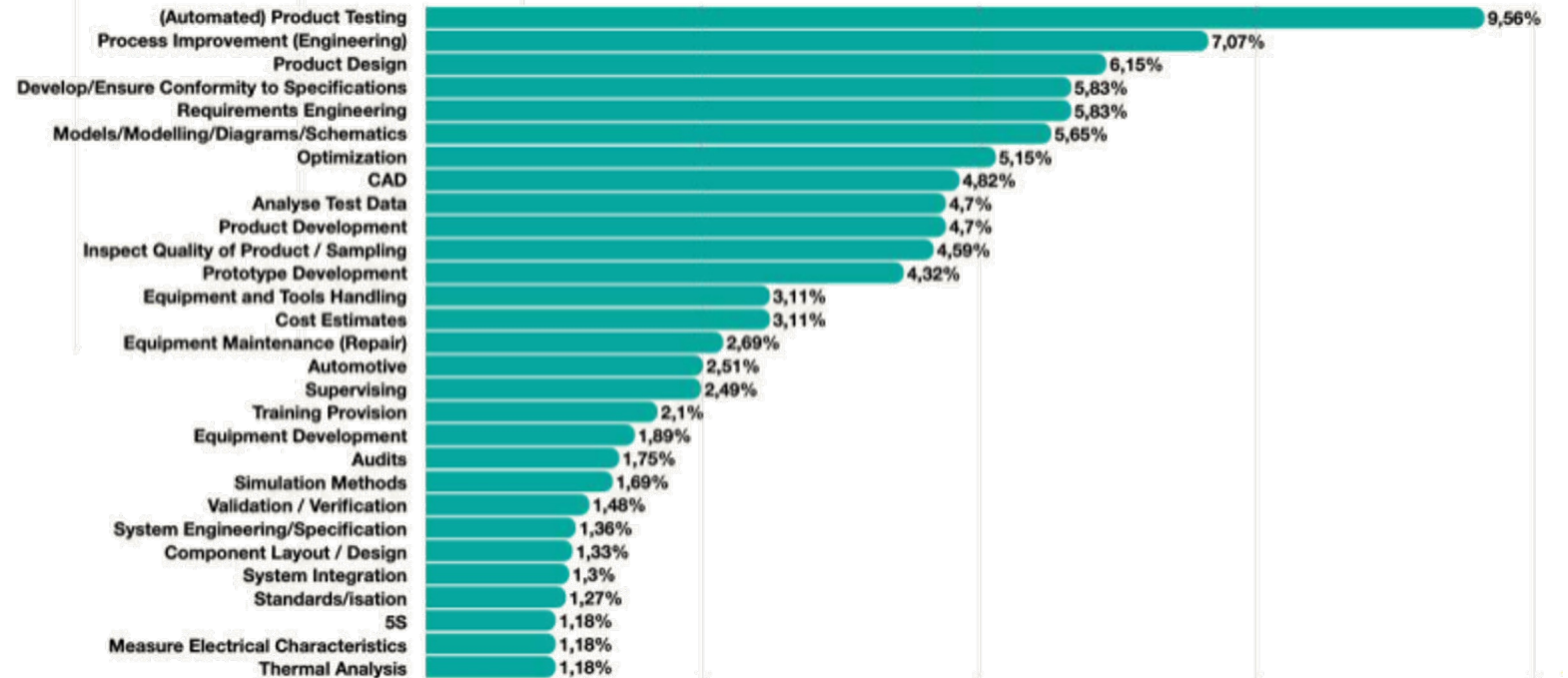


→ What Industry Demands

## CROSS-SECTORAL SPECIFIC KNOWLEDGE

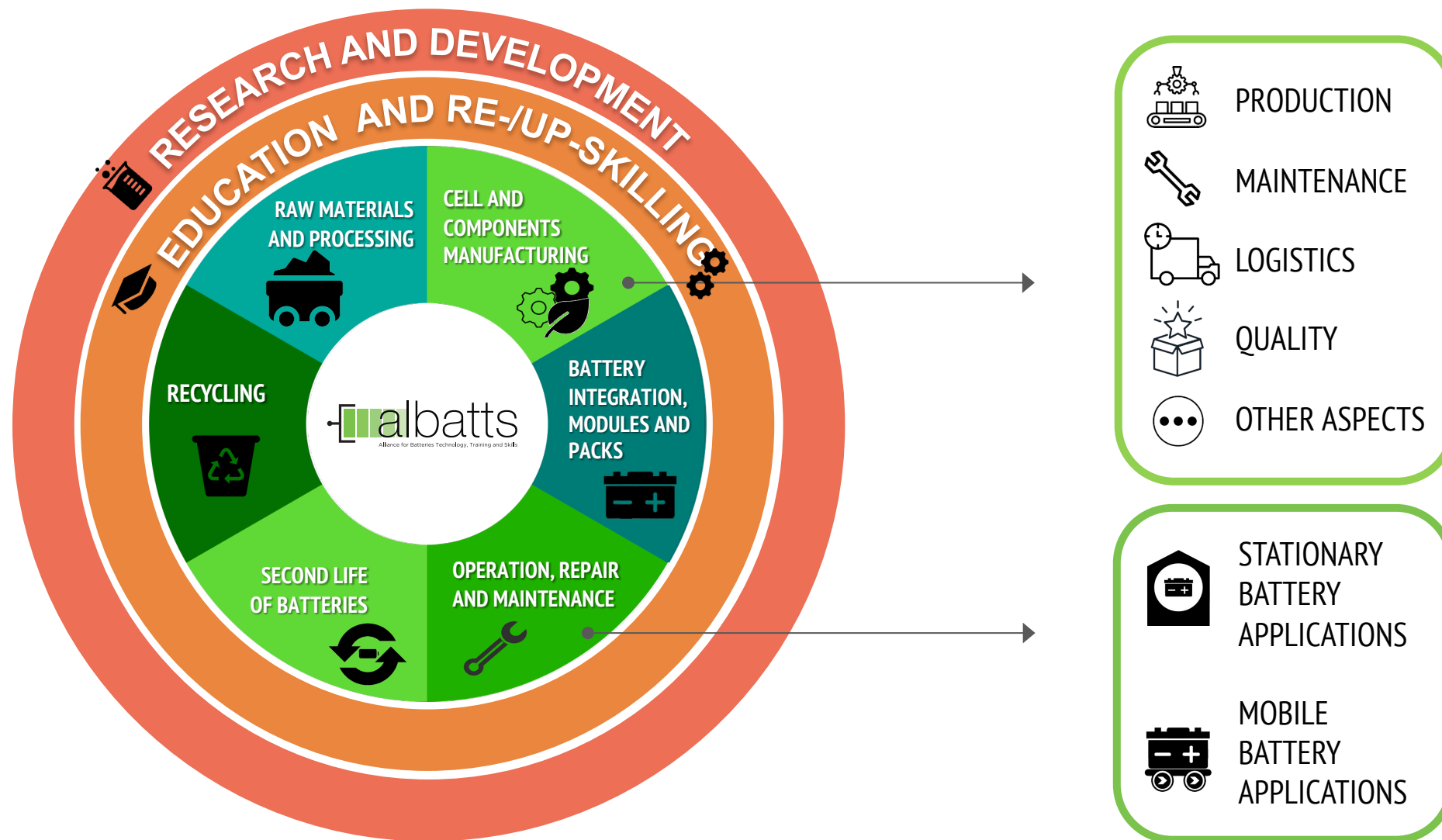


## CROSS-SECTORAL SPECIFIC SKILLS



# Glance on Needed Skills

## BATTERY INTEGRATION, MODULES & PACKS



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# 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

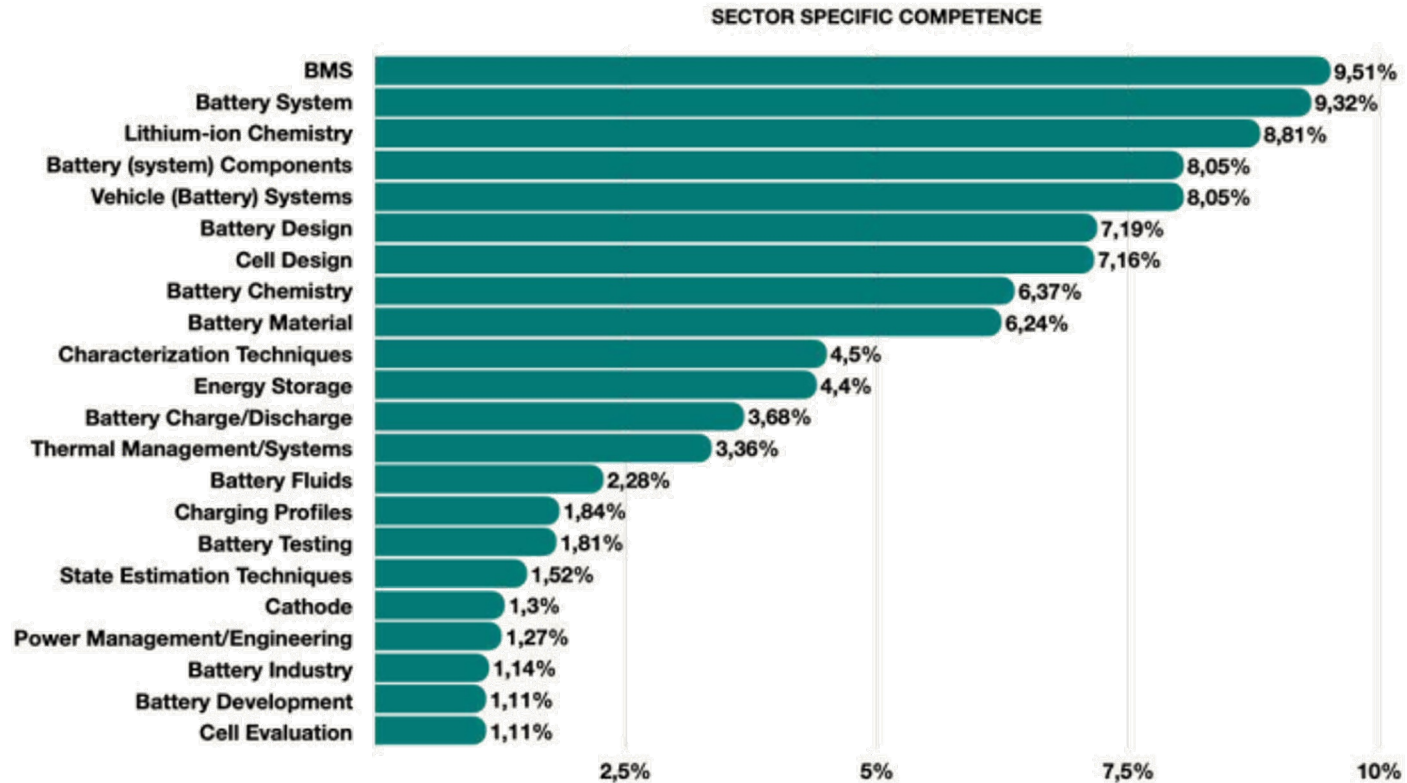


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# Battery Integration, Modules, and Packs – Skills and Competence

→ What Industry Demands



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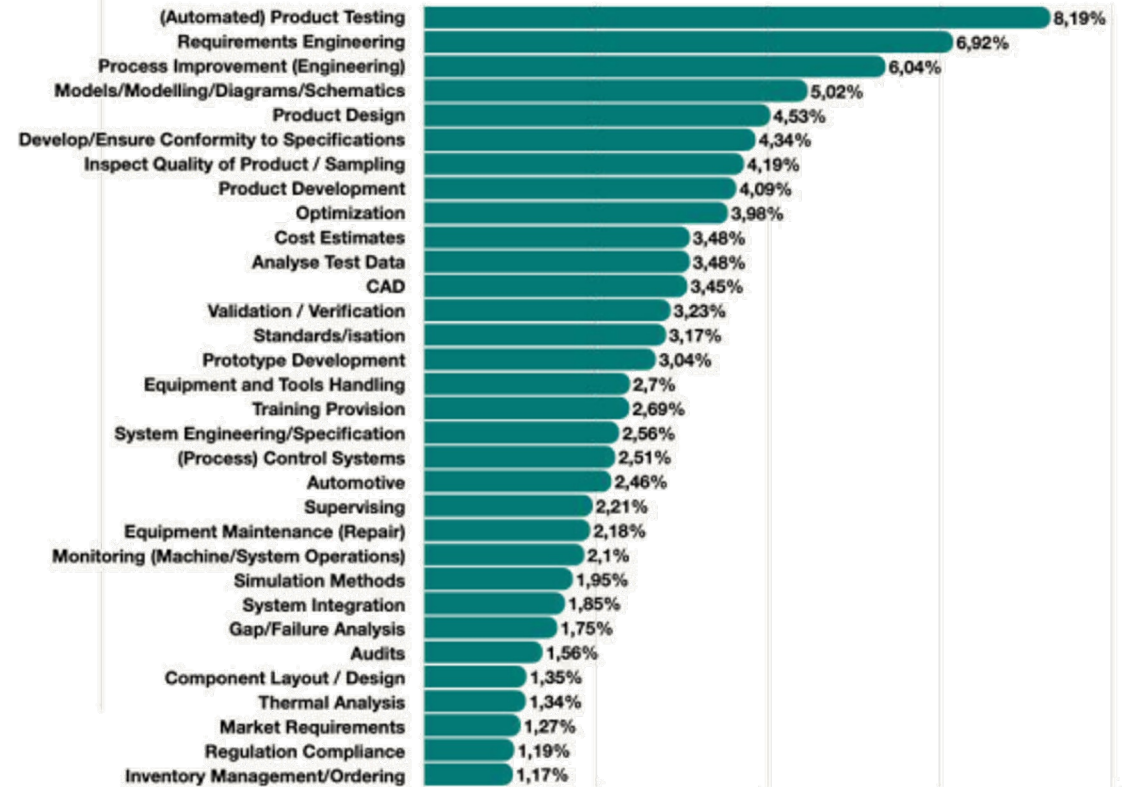


## → What Industry Demands

CROSS-SECTORAL SPECIFIC KNOWLEDGE



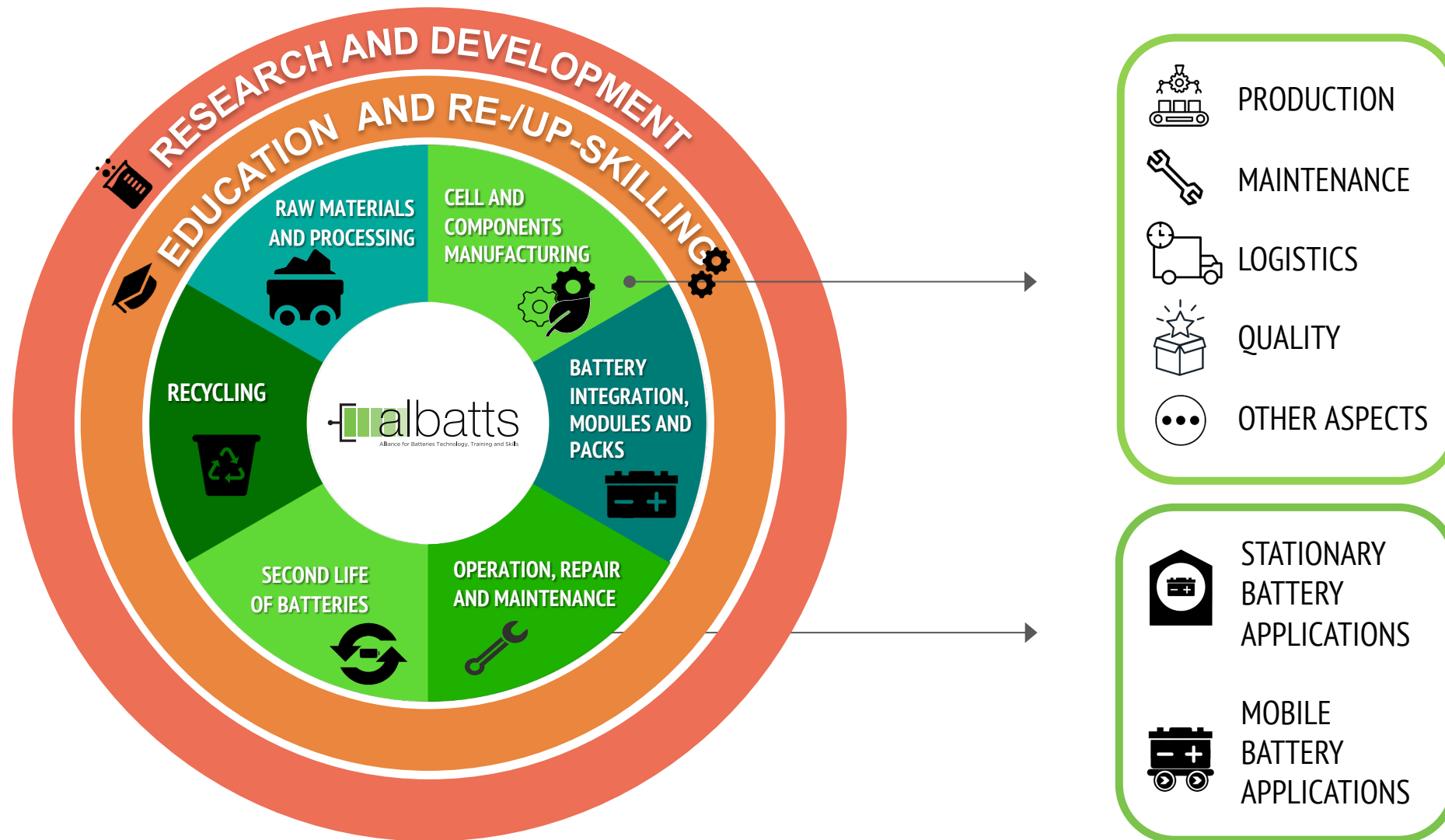
CROSS-SECTORAL SPECIFIC SKILLS





# Glance on Needed Skills

## Recycling and Second Life



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# Recycling and Second Life

## → 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



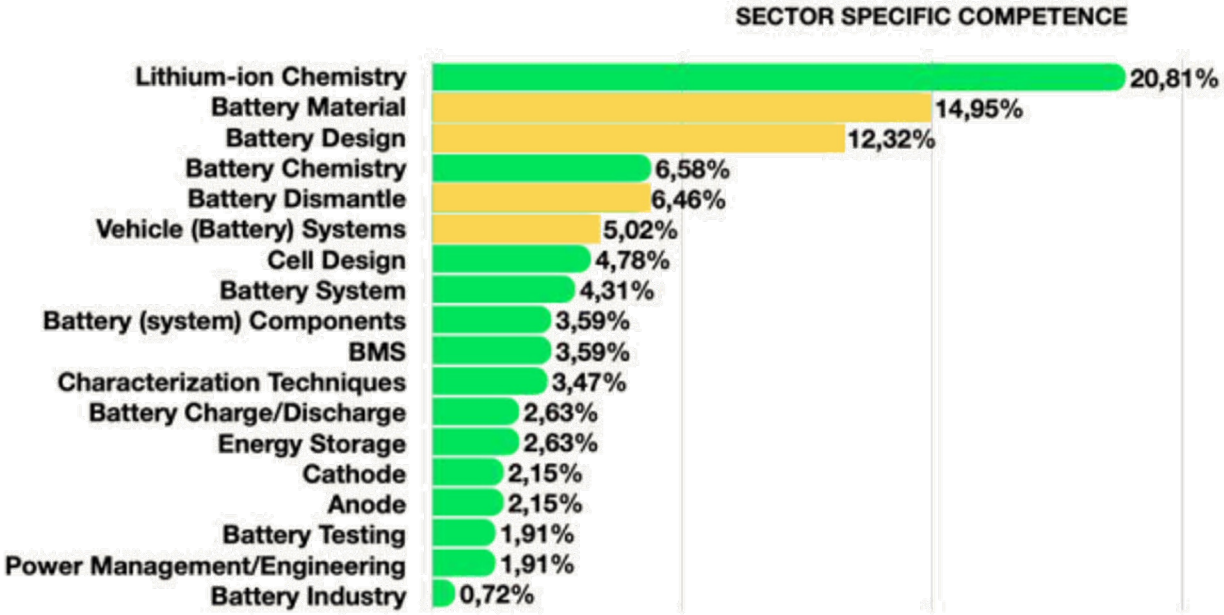
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# Battery Integration, Modules, and Packs – Skills and Competence



→ What Industry Demands

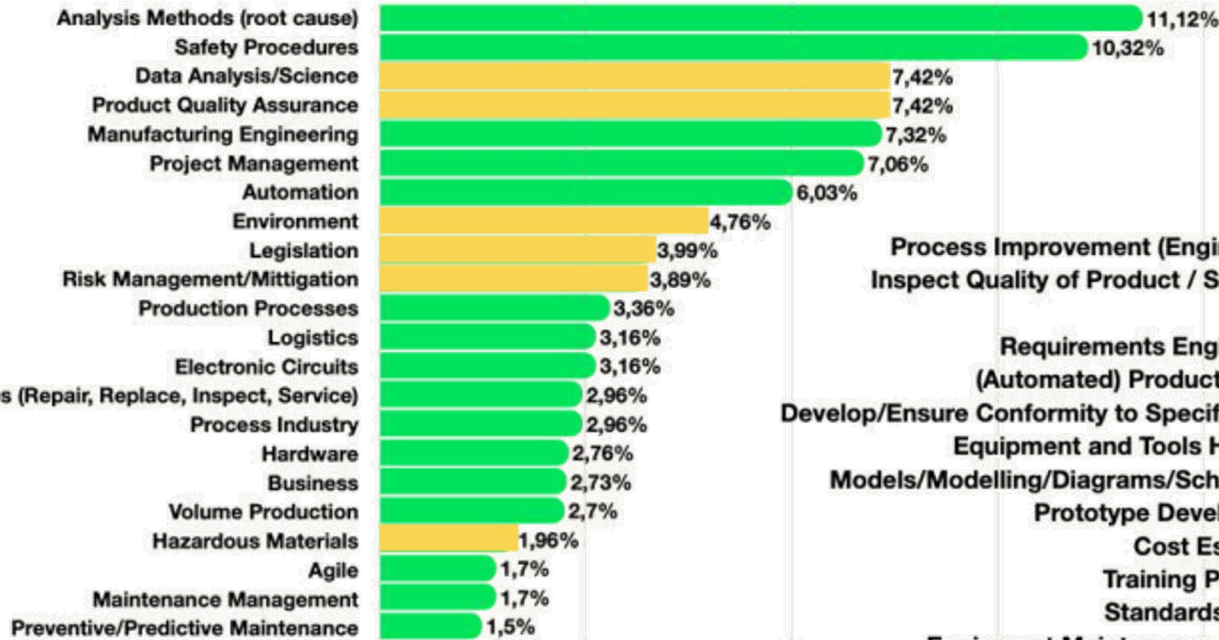


# Battery Integration, Modules, and Packs – Skills and Competence

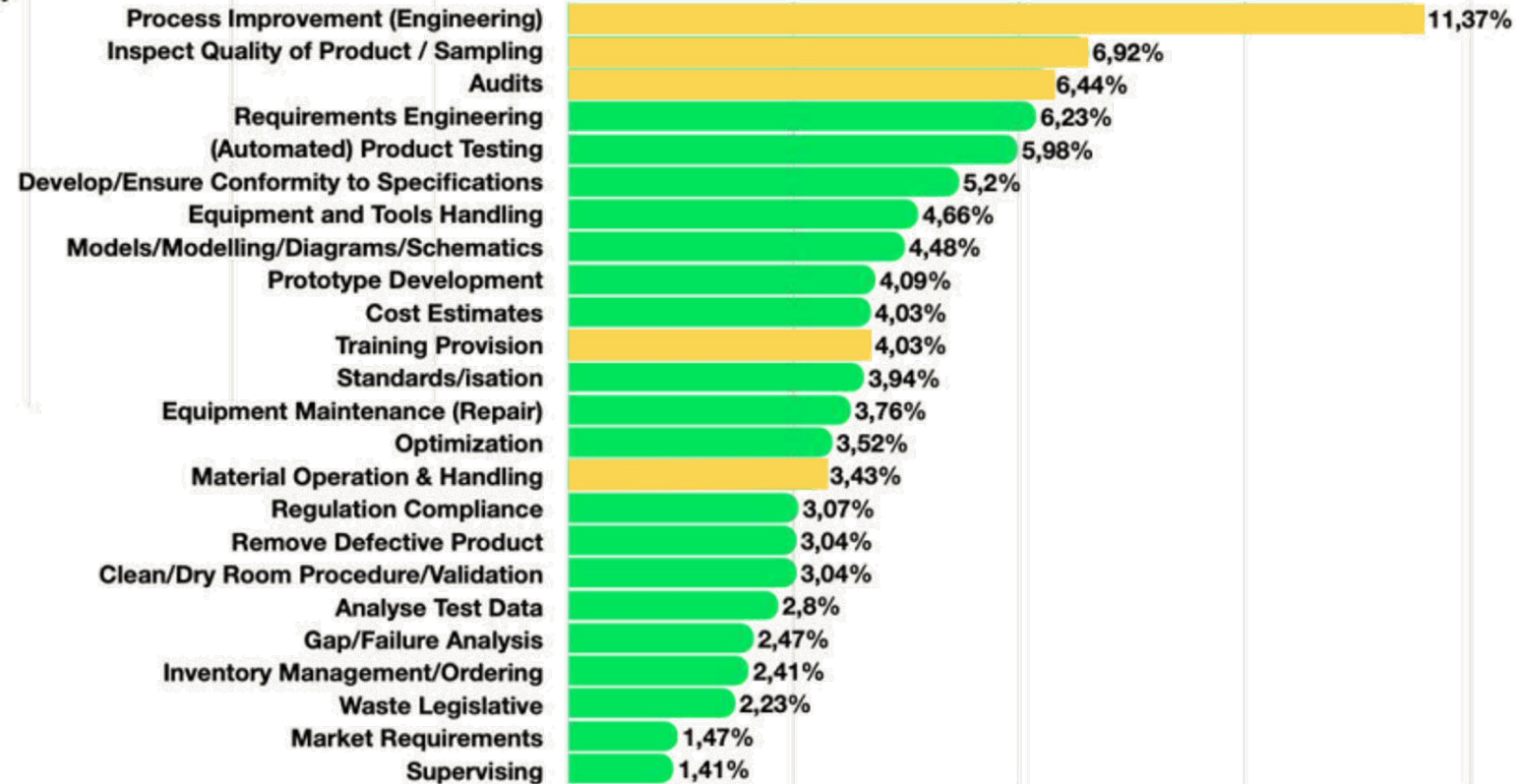


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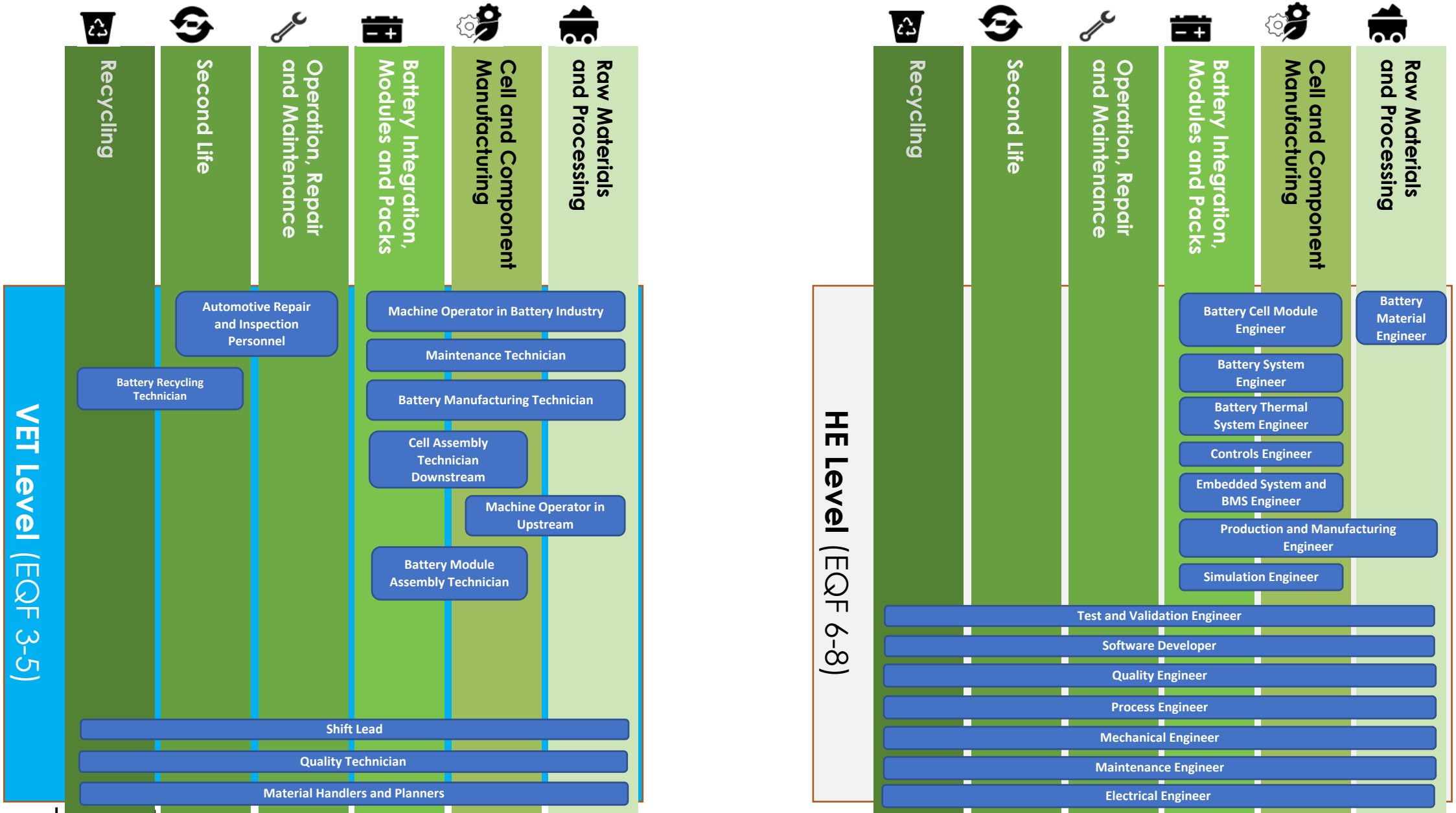
### CROSS-SECTORAL SPECIFIC KNOWLEDGE



### CROSS-SECTORAL SPECIFIC SKILLS



# Defined Job Roles

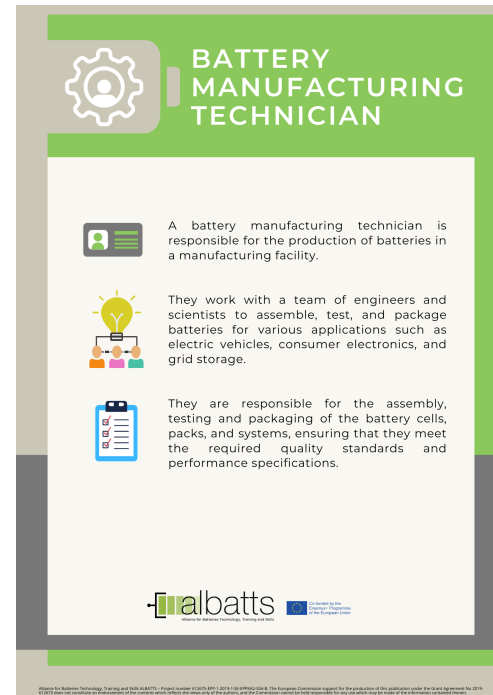
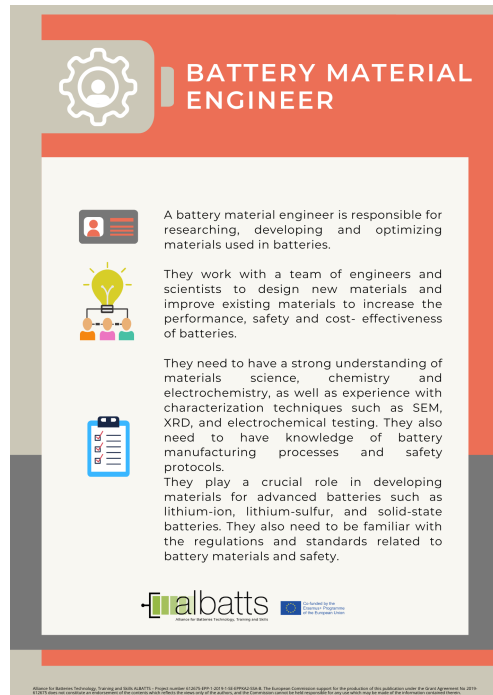


# Skills Cards

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



ALBATTS SKILLS CARDS

Summaries of Skills Cards (available in our website)

# Reports

## Intelligence in Mobile Battery Applications

R&D and technological perspectives  
for the battery sector



## Sectoral Intelligence

Intelligence in Battery Manufacturing  
and Battery Technology



## Stationary & Industrial Applications

Intelligence in Stationary and  
Industrial Battery Applications



## Education and Training

State-of-art of job roles and education  
in the batteries' sector



**REPORTS' HIGHLIGHTS**

*Examples of reports released*



# Thank you!



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



**@ALBATTs – Alliance for Batteries Technology,  
Training and Skills**

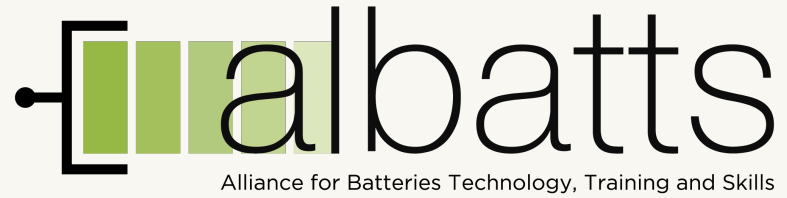


**@ALBATTs1**



**@Project ALBATTs**

**JOIN OUR NETWORK THROUGH OUR WEBSITE AND GET FIRST-HAND INFORMATION  
ABOUT OUR WORK & BATTERY SECTOR SKILLS AGENDA!**



BATTERY POWERED

# TOUR FOR SKILLS

Enabling a prepared education network for the battery ecosystem in Europe

## Database of Training Courses ASA Framework

Ing. Simona Jursová, Ph.D. (VSB-TUO)



Co-funded by the  
Erasmus+ Programme  
of the European Union



# TOOLS

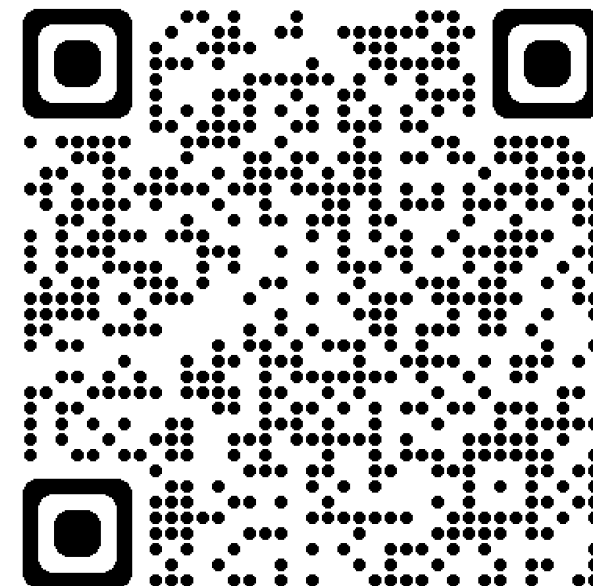


Learning Platform

- Online platform for hosting online courses
- More than 50 online courses now and growing
- Free of charge



Learning Platform



[learn.skills-framework.eu](https://learn.skills-framework.eu)



Courses Free of Charge



Learning Platform



...and more coming

# TOOLS

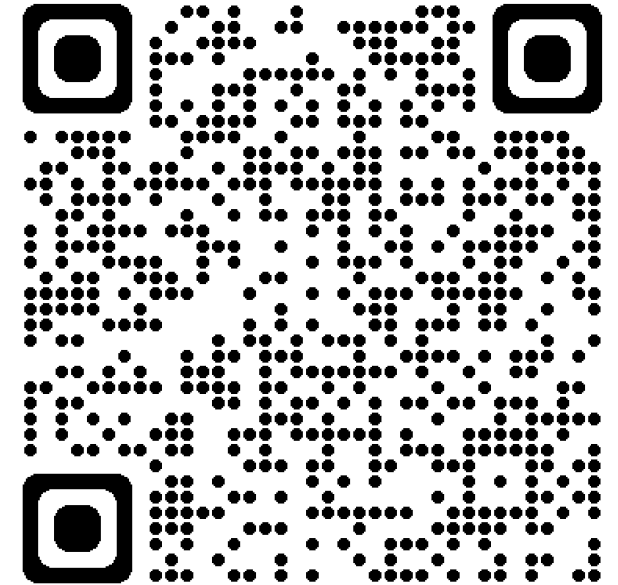


Learning Platform

- Online platform for hosting online courses
- More than 50 online courses now and growing
- Free of charge



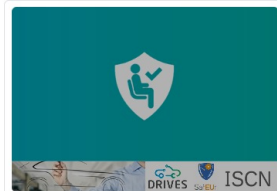
Learning Platform



[learn.skills-framework.eu](https://learn.skills-framework.eu)

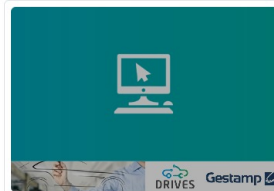
## COURSES

All General Production Maintenance Engineering R&D Battery Sector



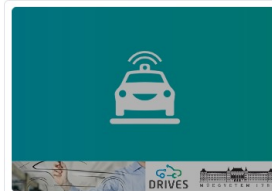
Functional Safety Manager - Strategic Level

MOOC TYPE 2 Days DURATION



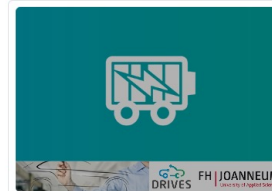
Automotive Engineering CAD, CAE, CAM Technician

MOOC TYPE 1 Day DURATION



ADAS/ADF Testing and Validation Engineer

MOOC TYPE 1 Week DURATION



Advanced Powertrain Engineer

MOOC TYPE 1 Week DURATION



Electrical Mobility

MOOC TYPE 4.5 HOURS DURATION



Basic Technical Battery Characteristics

MOOC TYPE 2.5 HOURS DURATION



Introduction to Batteries

MOOC TYPE 5.5 HOURS DURATION



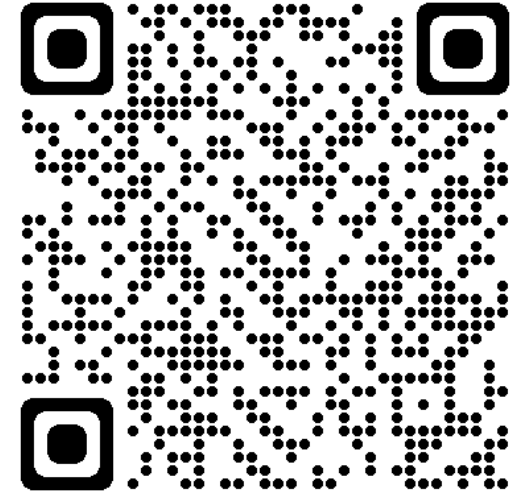
Introduction to Managing Energy Data

MOOC TYPE 2 HOURS DURATION

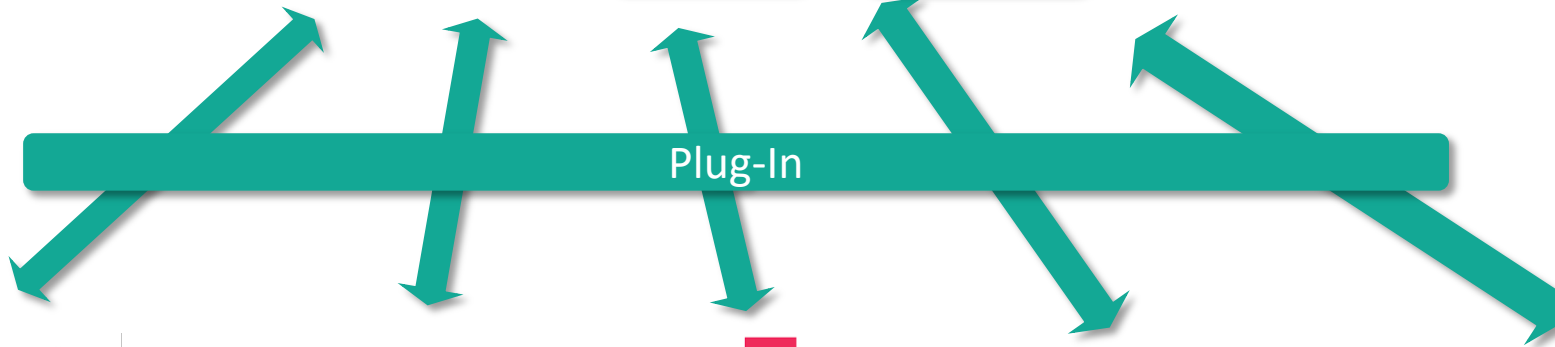
# TOOLS



- One-stop shop database for training courses in the Automotive-mobility ecosystem
- Definition and recognition of job roles and skills/competence concepts using micro-badges.
- More than 180 courses linked - by providers according to coherent structure and mapping exercise



<https://skills-framework.eu>



Learning Platform

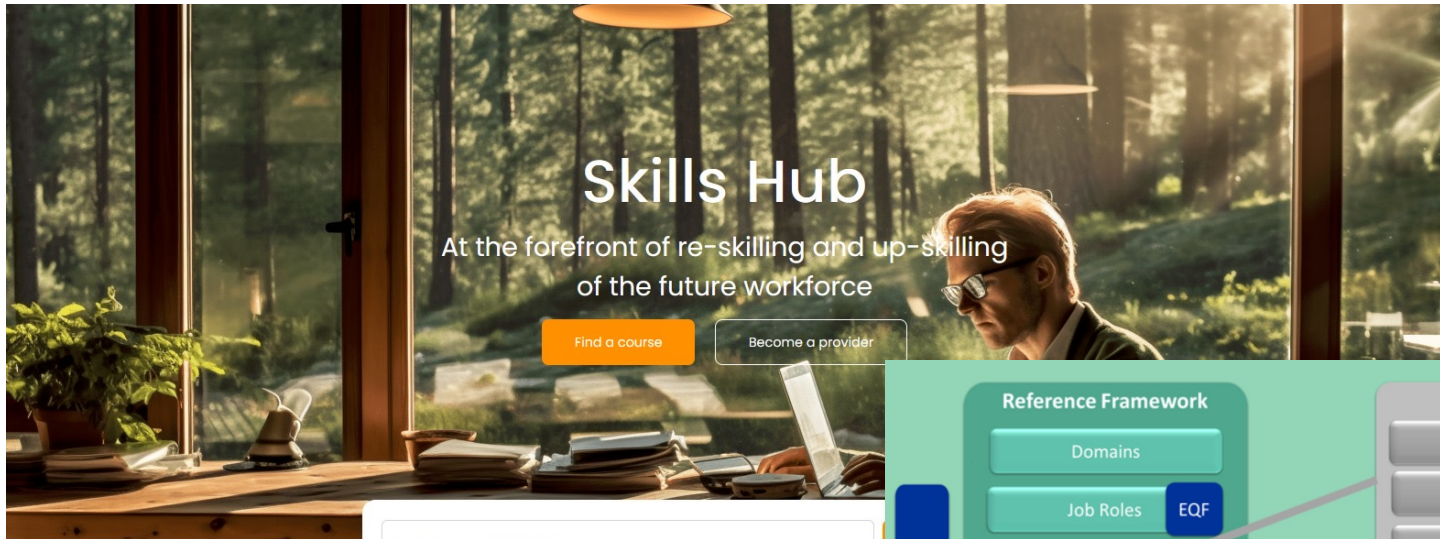
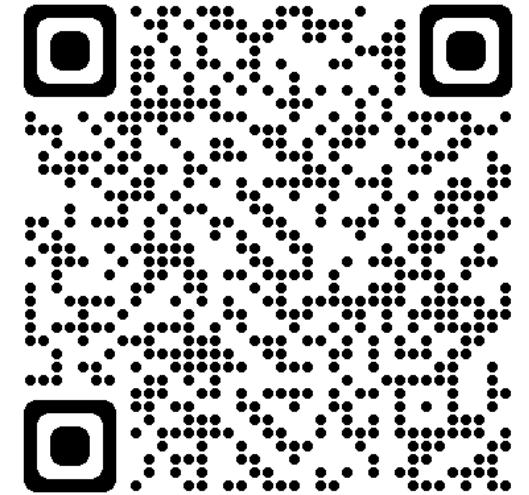


...and much more

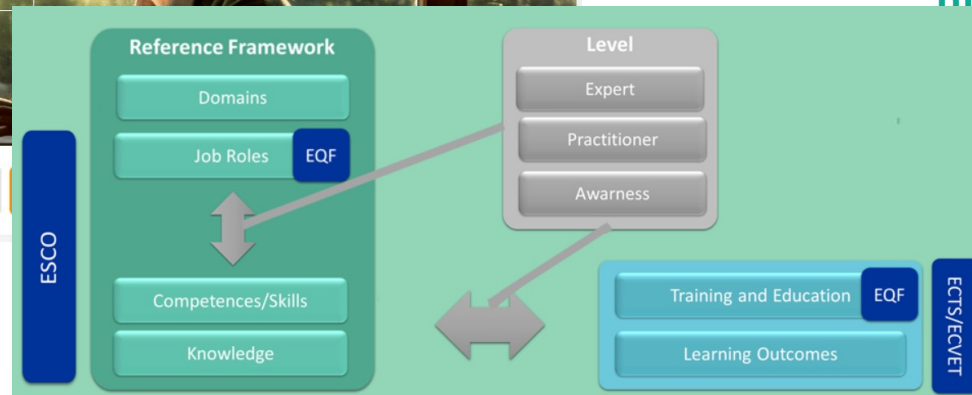
# TOOLS



- One-stop shop database for training courses in the Automotive-mobility ecosystem
- Definition and **recognition of job roles** and skills/competence concepts using **micro-badges**.
- More than **180 courses linked** - by providers according to coherent structure and mapping exercise



<https://skills-framework.eu>



# Thank you!



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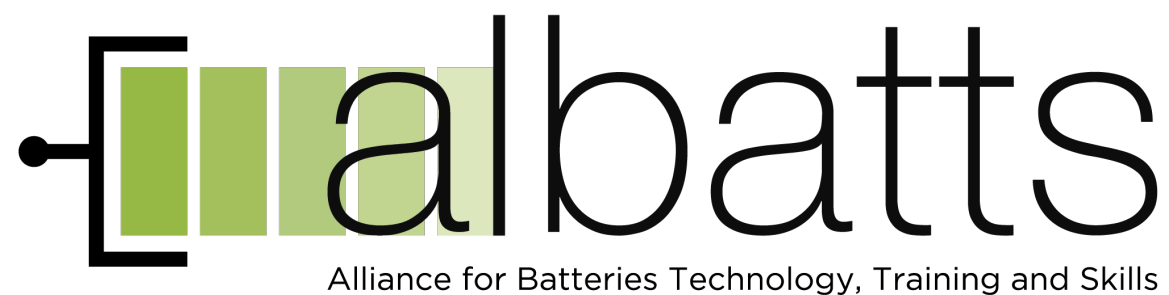
BATTERY POWERED

# TOUR FOR SKILLS

Enabling a prepared education network  
for the battery ecosystem in Europe

Tuesday, March 26th 2024 | 16:30 – 18:30

Utimia Madaleno, Eupportunity – ALBATTs WP Leader



Co-funded by the  
Erasmus+ Programme  
of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein

ITALY





# THE PROJECT



## THE BLUEPRINT FOR SECTORAL COLLABORATION SKILLS IN THE BATTERY SECTOR



# ALBATT'S CONSORTIUM



**20 EUROPEAN PARTNERS FROM 11 COUNTRIES REPRESENTING INDUSTRY AND EDUCATION**



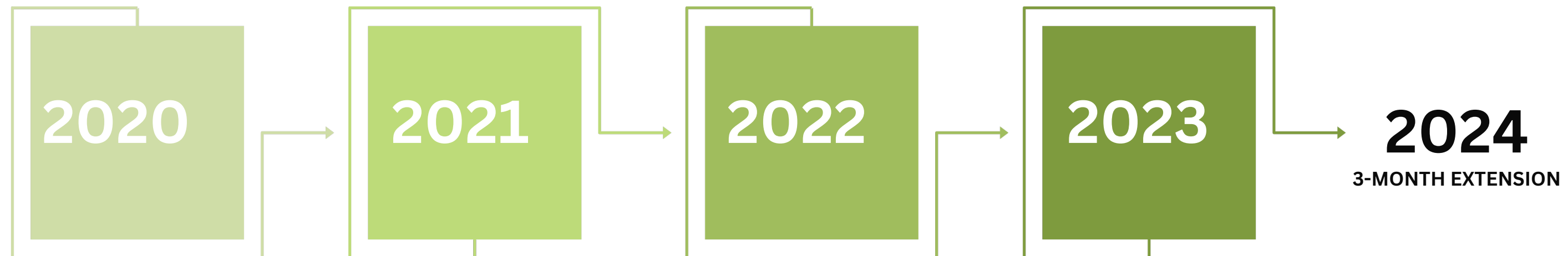
# ALBATTS STEERING COMMITTEE



**THE ALBATTS STEERING BOARD PROVIDED SUPPORT, GUIDANCE AND OVERSIGHT OF WORK PROGRESS**



# ALBATTs DURATION AND PURPOSE



**ALBATTs GOAL WAS TO CONTRIBUTE TO THE GREEN MOBILITY IN EUROPE BY ESTABLISHING A BLUEPRINT FOR PREPAREDNESS OF FUTURE SKILLS ACROSS THE BATTERY VALUE CHAIN**

# ALBATTS 2020 REVIEW

## Year 1

### Website



Launch of the ALBATTS website

### Stakeholders



Launch of the ALBATTS Stakeholders Database

### Covid-19



Recommendation of online courses during confinement

### Policy



Involvement with the Pact for Skills



# MORE THAN 30 WEBINARS & WORKSHOPS

Regions & Skills in the auto industry - Virtual Workshop  
 18th EUROPEAN WEEK of REGIONS and CITIES  
 Tue 13 October 2020 11:30 - 13:00  
 #EURRegionsWeek  
 DRIVES albatts

Vessels of the future: Maritime Batteries - Job Roles and Skills  
 January 19, 2021 - 13:00-14:30 CET

Battery Cells Manufacturing - Job Roles and Skills  
 January 20, 2021 - 10:00-11:30 CET

Stationary Energy Storage in Grids and Telecom Applications: Safety & Future Job Roles and Skills  
 January 26, 2021 - 15:00-16:15 CET

Electric vehicle manufacturing & battery integration - future qualifications needed  
 January 27, 2021 - 14:00-15:30 CET

Skills Alliance and the forthcoming e-mobility Urging the ecosystem global competitiveness  
 ONLINE EVENT  
 18 March 2021 - 10:00-11:30 (CMT +01:00)  
 EU INDUSTRY WEEK 2021  
 DRIVES albatts ORGANISED BY

Servicing of electric vehicles: Future qualifications needed  
 September 29, 2021 - 10:00-11:30 CET

albatts interviews  
 European Battery Ecosystem: Job roles & competences now and in the future: Building a Gigafactory  
 With Katarina Borstedt, Director of Growth at Northvolt  
 15 September 2021 14:00-14:45 CET Online

albatts interviews  
 European Battery Ecosystem - Job roles & competences now and in the future:  
 THE IMPACT OF THE BATTERY PASSPORT ON THE BATTERY VALUE CHAIN  
 With Claudia Gamon, Member of the European Parliament  
 12 October 2021 13:00-13:45 CET Online

albatts interviews  
 New EU Battery Regulation Proposal: Possible Implications on Job Roles & Skills  
 October 22nd, 2021 - 11:00-12:30 CET

albatts interviews  
 European Battery Ecosystem - Job roles & competences now and in the future:  
 BATTERY ENERGY STORAGE ENABLING SUSTAINABLE ISLANDS  
 With Duarte Conde Silva, Plant Manager at Gracilolica  
 17 November 2021 13:00-13:45 CET Online

Recycling Electric Vehicles' Batteries: Skills & Qualifications Needed in Auto Workshops  
 November 30, 2021 - 10:30-12:00 CET

Autonomous Operations and Virtual Reality in Maritime: Job roles & skills  
 December 7, 2021 - 13:00-14:30 CET

LITHIUM MINING & EXTRACTION: EUROPEAN SOURCING AND SKILLS  
 Wednesday April 27, 2022  
 EUROPEAN VOCATIONAL SKILLS WEEK 2022  
 OFFICIAL PARTNER

PREPARING A SUSTAINABLE CLEAN ENERGY ECOSYSTEM • SKILLS FOR BATTERY SYSTEMS  
 online workshop  
 13/10/2022 - 09:30-11:00 CET  
 REGISTRATION NOW OPEN  
 albatts

albatts interviews  
 FUTURE BATTERY TECHNOLOGIES: Job roles, skills & knowledge  
 Interviewing Tomáš Kazda, Associate Professor at the Department of Electrical and Electronic Technology of Brno University of Technology  
 26 October 2022 15:00-15:45 CET Online

albatts interviews  
 FUTURE BATTERY TECHNOLOGIES: Job roles, skills & knowledge  
 Interviewing Noshin Omar, Founder & CEO of Avesta Battery & Energy Engineering (ABEE)  
 14 November 2022 15:00-15:45 CET Online

albatts interviews  
 Second Life Bus Batteries in BESS Residential Applications: Job Roles, Skills and Competences  
 Interviewing Ylva Olofsson, System Design Engineer & Project Manager at Volvo GTT  
 22 November 2022 15:00-15:45 CET Online

Battery Management Systems and Control Systems: Job roles, skills & competencies  
 November 24, 2022 15:00-16:00 CET

Electrification of Heavy-duty Vehicles: What Skills & Competencies Will be Needed?  
 November 29, 2022 09:30-11:00 CET

Electrification of the Aviation Sector & Future Qualifications Needed  
 January 17, 2023 - 15:00-16:30 CET  
 Jakub GALDUSEK, Lukas FOLBRECHT, Michael KLICH, Tobias KARNERT

albatts interviews  
 Future geopolitical challenges in the source of raw materials and the battery value-chain  
 Interviewing Daniel Cios, Policy Officer - Raw Materials, DG GROW, European Commission  
 19 January 2023 15:00-16:00 CET Online

Electrification of Inland Waterways & Future Qualifications Needed  
 January 26, 2023 - 13:00-15:00 CET  
 Henryk DAIK, Lukas FOLBRECHT, Daghfin HJULDRUP, Chris HORNET, Michael IMT, Joost KLINT, Fredrik THORNELL

Safe Recycling and Second use of EV Batteries: Skills & competencies needed  
 January 27, 2023 - 09:30-11:00 CET  
 Kari VALKAMA, Lukas FOLBRECHT, Milena CHLEA, Alexander CRIFANES, Jan BORN, Johannes REISSNER

Skills Transition in the battery industry: Training people from other industries  
 February 9, 2023 - 15:00-16:20 CET  
 Jakub STOLFA, Kari VALKAMA, Tore KARLSSON, Fredrik HANNERZ

Safety aspects of Electric Vehicles' manufacturing, use, maintenance, repair & disposal  
 May 3, 2023 - 10:30-12:00 CET  
 Mika SAARIKONEN, Ole WILSTRAND, Free RICHTER, Richard MEDONAK, Dierck DEERT, Lukas FOLBRECHT, Kari VALKAMA

TOWARDS A FUNCTIONING BATTERY ECOSYSTEM - BUILDING KNOWLEDGE AND REQUIRED SKILLS  
 June 28, 2023 - 11:30-13:00 CET  
 albatts #EUSEW2023  
 Ursula MADALENO, João ALVES, Dimitris MALEKA, Jakub STOLFA, Marek SPANIK

SKILLS AND TALENT FOR THE GREEN TRANSITION - BOOSTING REGIONAL COMPETITIVENESS  
 October 25th, 2023 - 14:30-16:00 CET  
 albatts #EURRegionsWeek

BATTERY POWERED TOUR FOR SKILLS  
 Česká Republika  
 Webinář TRENDA A VZDELÁVACÍ POTŘEBY PRO E-MOBILITU A BATERIOVÝ PRŮMYSL  
 Sífeda 22. 11. 2023, 9.30 – 11.00 (online)  
 albatts Co-funded by the Erasmus+ Programme of the European Union

BATTERY POWERED TOUR FOR SKILLS  
 FINLAND  
 Navigating the Challenges of the Establishment of Large-scale Battery Manufacturing: A Focus on Workforce, Education and Training  
 Wednesday, March 13th 2024 13:00 - 14:30 (local time)  
 albatts Co-funded by the Erasmus+ Programme of the European Union

BATTERY POWERED TOUR FOR SKILLS  
 SWEDEN  
 Att etablera nätverk och hjälpmedel för utbildning i den europeiska batteri-värdekedjan  
 Onsdag, 20:e Mars 2023 13:00 - 15:00  
 albatts Co-funded by the Erasmus+ Programme of the European Union

BATTERY POWERED TOUR FOR SKILLS  
 PORTUGAL  
 Possibilitar uma rede educativa preparada para o ecossistema de baterias na Europa  
 Online Terça-feira, 26 de Março de 2024 10:00 - 11:00 GMT  
 albatts Co-funded by the Erasmus+ Programme of the European Union

BATTERY POWERED TOUR FOR SKILLS  
 ITALY  
 Webinar Enabling a prepared education network for the battery ecosystem in Europe  
 Tuesday, March 26th 2024 16:30 - 18:30 (CET)  
 albatts Co-funded by the Erasmus+ Programme of the European Union

BATTERY POWERED TOUR FOR SKILLS  
 FRANCE  
 TENDANCES ET BESOINS EDUCATIFS POUR LA MOBILITE ELECTRIQUE ET L'INDUSTRIE DES BATTERIES  
 Mercredi, le 27 mars 2024 14:00 - 16:30 CET  
 albatts Co-funded by the Erasmus+ Programme of the European Union

ALBATTS Decarbonisation Enabler Quo vadis battery value chain?  
 FINAL EVENT  
 09/04/2024 - 08:30-17:00  
 ACE Av. d'Auderghem 22 - 1040 Brussels  
 RESEARCH AND DEVELOPMENT EDUCATION AND REUP-SKILLS



# SPEAKERS IN WEBINARS & WORKSHOPS



More than 80 speakers helped ALBATTs research over the project's duration.

# ALBATTS NEWSLETTERS



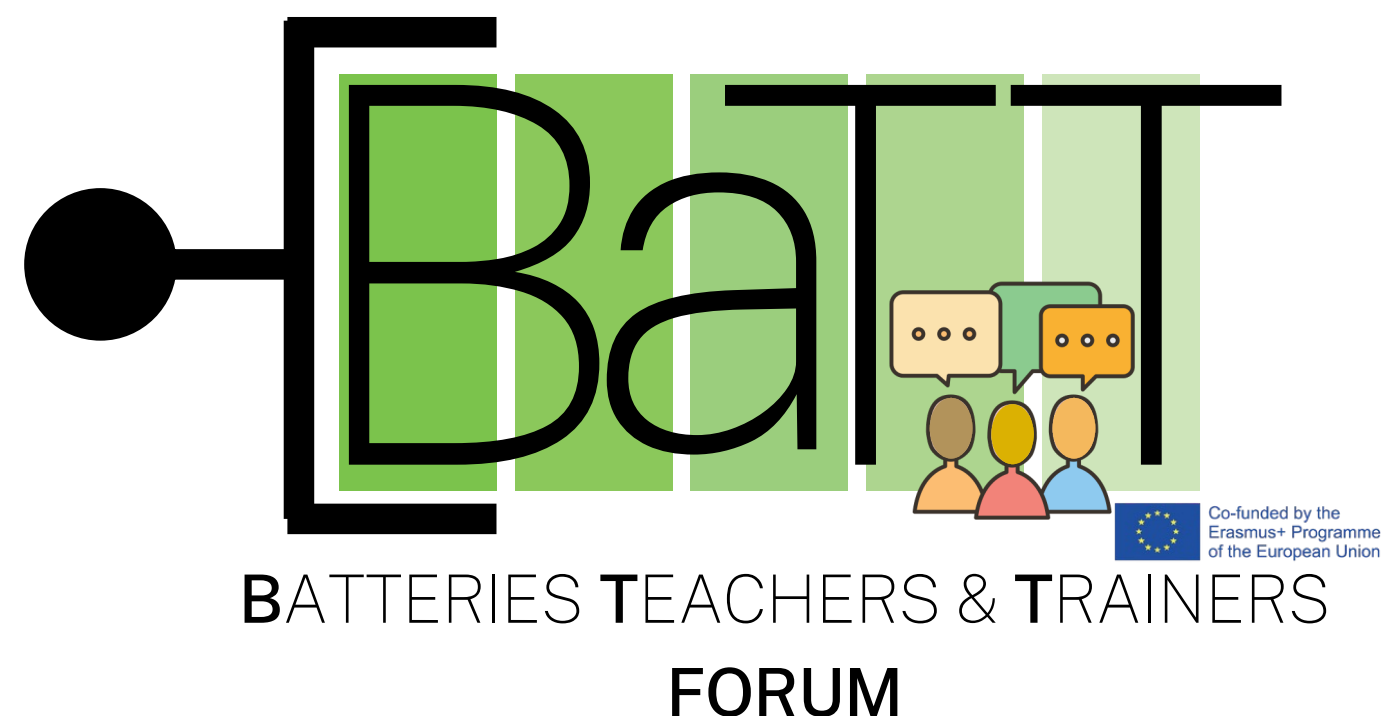
**REGULAR INFORMATION ON THE PROJECT'S ONGOING WORK, BUT ALSO INTERESTING INTERVIEWS AND ARTICLES, AS WELL AS INFORMATION ON POLICY MATTERS AND SECTOR RELATED EVENTS**





# BATTERIES TEACHERS & TRAINERS FORUM

The **BaTT Forum** is an initiative that was launched by ALBATTs with the purpose of **gathering** current and future teachers and trainers to share **ideas** and **good practices**, **work together** and deepen their **knowledge** about the battery sector.



Is now funded and further developed through the CaBatt - Capacity Building for Battery Teachers in VET, to develop a sustainable model for offering Erasmus+ courses for VET teachers.

SCAN TO JOIN THE BATT FORUM [LINKEDIN](#) GROUP

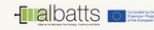


# ALBATTs REPORTS

**INTELLIGENCE IN BATTERY SECTOR  
STATE-OF-THE-ART OVERVIEW**  
RELEASE 1  
D3.3



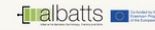
**INTELLIGENCE IN  
STATIONARY AND INDUSTRIAL  
BATTERY APPLICATIONS**  
RELEASE 1  
D4.1



**INTELLIGENCE  
IN THE BATTERY VALUE CHAIN  
MOBILE BATTERY APPLICATIONS**  
RELEASE 1  
D5.1



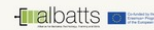
**DESK RESEARCH REPORT IV  
CHARGING BATTERIES OF EV  
AND OTHER ELECTRIC MEANS OF  
TRANSPORT - JOB ROLES & SKILLS**  
D5.10



**SECTORAL SKILLS STRATEGY  
FOR THE EUROPEAN BATTERY SECTOR**  
RELEASE 1  
D3.6




**BATTERY MANUFACTURING AND THE  
ANATOMY OF A GIGAFACTORY**  
RELEASE 2  
D4.4



**DESK RESEARCH  
FUTURE BATTERY TECHNOLOGIES**  
RELEASE 2  
D5.4



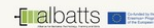
**STATE-OF-THE-ART OF  
JOB ROLES AND EDUCATION  
IN THE BATTERY SECTOR**  
D6.1



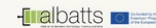
**RECOMMENDATIONS FOR  
THE EUROPEAN BATTERY SECTOR**  
RELEASE 1  
D3.6




**JOB ROLES & SKILLS RELEVANT TO THE  
OPERATION, REPAIR & MAINTENANCE  
OF STATIONARY BATTERIES**  
RELEASE 1  
D4.5



**JOB ROLES & SKILLS RELEVANT TO  
THE OPERATION, REPAIR &  
MAINTENANCE OF ELECTRIC  
PASSENGERS CARS & VESSELS**  
RELEASE 1  
D5.5



**TRAINING AND EDUCATION  
WORKPLAN**  
D6.2



**MORE THAN 30 REPORTS RELEASED!**



# EXPLANATORY FACTSHEETS

**REPORT ON THE STATE-OF-THE-ART OF JOB ROLES AND EDUCATION IN THE BATTERY SECTOR**  
D6.1 Report on state-of-art of job roles and education in the sector

The report reflects the state-of-art of job role description and education in the battery sector. It is a point of departure for the development work, as it describes where we stand as we are starting our European-level Blueprint work on Batteries and Electromobility.

**BATTERY JOB ROLES AND SKILLS**

**BATTERY OCCUPATIONS IN ESCO\***

- Battery assembler
- Battery test technician
- Automotive battery technician

**BATTERY SKILLS & KNOWLEDGE IN ESCO\***

- Operate battery test equipment
- Battery assembly
- Battery chemistry
- Battery fluids
- Repair battery components
- Battery components
- Battery testers

**JOB ROLES REFERENCE OBJECT: GIGAFACTORY 1**

The report discusses, as a reference, the job roles described in job ads for the Tesla/Panasonic Gigafactory 1. For the details, check page 19/21.

**BATTERY RELEVANT EDUCATION IN EUROPE OR ONLINE**

Using the EQF (European Qualifications Framework) for categorisation of education levels, the report provides examples of education and training courses on varying levels of education in Europe (from page 22).

It also presents the results of the research regarding Massive Online Open Courses (MOOC) on Li-Ion batteries and electromobility and other sources of open educational resources (from page 41).

\* ESCO-European Skills/Competences, qualifications and Occupations

INFORMATION  
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**DESK RESEARCH REPORT INTELLIGENCE IN STATIONARY AND INDUSTRIAL BATTERY APPLICATIONS**  
D4.1 Desk Research & Data Analysis ISIBA - Release 1

This report covers every stage of the whole battery value chain, which is analysed from the following perspectives:

Major Stakeholders | Technologies | Job Roles and Skills | Drivers of Change

Raw Materials and Processing | Components & Cell Manufacturing | Module & Pack Manufacturing | Battery Integration | Operation, Repair & Maintenance | Second Life | Recycling

**AND THERE IS MORE**

Have you ever wondered how batteries are used in stationary applications and what kind of skills and competences are needed?

This desk research also studied stationary battery use. It covers, for example, the increasing use of variable renewable energy sources to support grid and off-grid systems, telecom base stations and various heavy-duty applications.

INFORMATION  
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**ANALYSIS OF FUTURE NEEDS** RELEASE 1

**KEY MESSAGES AND NEEDS FOR THE DEVELOPMENT OF THE ROADMAP FOR THE EU BATTERY SECTOR**

These key messages and needs emerged from the main findings on sectoral intelligence following the workshops organized in January 2021 with the purpose of discussing the EU battery sector needs within the following themes: (1) electronic vehicles manufacturing and battery integration - future qualifications needed, (2) stationary energy storage in grids and telecom applications: safety and future job roles and skills, (3) battery cell manufacturing - job roles and skills, and (4) vessels of the future: maritime batteries - job roles and skills. The complete Analysis of Future Needs is located under Project Publications.

**MOBILE APPLICATIONS**

**KEY MESSAGES**

- Electrification is considered to be the main technological solution to achieving carbon neutrality in transport by 2050 in accordance with the Green Deal objectives.
- An important number of jobs in the supply chain is likely to be lost due to electrification of the vehicles.
- Demand for the electric vehicles is on the rise.
- Assembly capacities are growing constantly which brings about a shortage of skilled professionals and consequent skills and competences.
- Renewable energy and maritime electrification is a perfect combination for maritime investments in electrification.

**NEEDS**

- To stimulate the battery production in the EU and overcome consequent staff and competence shortage it is important to roll out and support dedicated projects and initiatives such as:
  - European Battery Alliance;
  - The European Skills Agenda and Pact for Skills;
  - Automotive Skills Alliance;
  - European Battery Innovation - IPCEI;
  - DRIVES, ALBATTIS and other Blueprint projects.
- Shortage of skilled workforce and consequent competences must be addressed on the national and regional level as well:
  - Implementation of greener policies;
  - Support for battery producers should be encouraged;
  - Charging infrastructure in Europe needs to be improved.

This covers the maritime applications and port charging infrastructure as well.

INFORMATION  
www.project-albatts.eu

**BATTERY SECTOR SURVEY RESULTS**

RESULTS PER STAKEHOLDERS GROUPS  
**FACTSHEET 4 - DRIVERS OF CHANGE**  
New technologies

**IMPORTANCE OF NEW TECHNOLOGIES**

LEAST IMPORTANT | SLIGHTLY IMPORTANT | MODERATELY IMPORTANT | IMPORTANT | MOST IMPORTANT

**FOR INDUSTRIAL STAKEHOLDERS**

| Technology                                      | Least Important | Slightly Important | Moderately Important | Important | Most Important |
|---|-----------------|--------------------|----------------------|-----------|----------------|
| Cybersecurity                                   | 20.64%          | 13.76%             | 22.71%               | 36.7%     | 6.17%          |
| Global technical harmonization, Standardization | 3.44%           | 23.36%             | 46.56%               | 26.61%    | 8.43%          |
| Smart grid                                      | 22.48%          | 37.7%              | 29.37%               | 8.43%     | 2.46%          |

**FOR EDUCATION PROVIDERS**

| Technology                                      | Least Important | Slightly Important | Moderately Important | Important | Most Important |
|---|-----------------|--------------------|----------------------|-----------|----------------|
| Cybersecurity                                   | 19.65%          | 37.39%             | 46.96%               | 37.83%    | 14.35%         |
| Global technical harmonization, Standardization | 26.22%          | 26.94%             | 37.83%               | 18.13%    | 14.35%         |
| Smart grid                                      | 18.13%          | 14.35%             | 46.96%               | 18.13%    | 14.35%         |

INFORMATION  
www.project-albatts.eu

**SECTORAL SKILLS INTELLIGENCE & STRATEGY FOR THE EUROPEAN BATTERY SECTOR**  
D3.6 - Sectoral Skills Intelligence and Strategy - Release 1

This is the first release of the sectoral skills intelligence and strategy covering the whole European battery value chain from raw materials to recycling of batteries in terms of skills needs, job roles needs and recommendations.

Readers will find designated actions needed in the sector to boost the overall re/up-skilling activities as well as cooperation, information sharing and provision and many more.

The report also provides quantitative and qualitative overview of the skills and job roles needs per identified areas of interest consisting of the battery value chain steps as well as specific aspects of production, quality or safety tailored to the battery production or other processes that are happening within the European battery sector.

INFORMATION  
www.project-albatts.eu

**CHARGING AND MID-DOWNSTREAM PRODUCTION**  
D3.12 Desk Research & Data Analysis - Final

**BATTERY CHARGING & CHARGING INFRASTRUCTURE**  
Power transfer can be supported by cables in traditional circuits or wirelessly. Learn about: these types of power transfer, battery degradation through charging and the charging principle of batteries. Go into all details about charging of passenger cars (locations, alternatives, innovative services), trucks & buses, motorbikes & micro-mobility devices, aircrafts and trains.

**BATTERY SECTOR EQUIPMENT & PRODUCTION MACHINES**

Learn about:

- Manufacturing equipment and an update on the battery sector and legislation.
- The Critical Raw Materials Act and the Net Zero Industry Act.
- Our insights on minerals & processing and circularity.
- An update of the main drivers of change in the sector and insights on the needed competencies regarding production equipment (electrode manufacturing, cell assembly, Education and training on production equipment).

**OVERALL, THIS REPORT**

- Brings out the importance of critical raw materials for batteries and the need to improve their sourcing to increase the EU's competitive advantage.
- Emphasises the significance of climate goals, regulation, and environmental challenges, as companies must commit to extensive decarbonisation and true sustainability.
- Addresses the challenges associated with fast charging, such as excessive heat production and the growth of dendrites that endanger the functioning of the battery.
- Underlines the importance of battery management systems that manage charging power and battery cooling and heating when needed.
- Discusses the different modes of operation of heavy-duty vehicles (HDVs) and the need for charging infrastructure to support them.
- Highlights the importance of specialised people in manufacturing, maintenance, and repair, as well as professionals to build, handle, and troubleshoot the necessary charging infrastructure.
- Accentuates the importance of diversifying the supply chain and securing the supply of critical raw materials for ensuring a secure and sustainable supply of critical raw materials for the battery sector.

INFORMATION  
www.project-albatts.eu

ALBATTIS released **over 40 FACTSHEETS** highlighting main findings in the project's reports!



# ALBATTS 2023 REVIEW

## Year 4

### Launching of Skills Cards



A series of papers describing occupational profiles - and corresponding competencies - within the scope of battery manufacturing, e-mobility and stationary battery storage.

### Free Training

ONLINE COURSES

The ALBATTS Courses are available through the Automotive Skills Alliance (ASA), an association created through the bridging of the projects' ALBATTS and DRIVES activities.

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REPORTS

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EVENTS ORGANISED



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of the European Union



# SKILLS CARDS

**PRODUCTION & MANUFACTURING ENGINEER**

A battery manufacturing and production engineer is responsible for the design, development and execution of the manufacturing processes for batteries.

They work with a team of engineers and scientists to create efficient and cost-effective manufacturing methods for electric vehicles, consumer electronics, and other applications.

They are responsible for overseeing the production of battery cells, packs, and systems, ensuring that they meet the required quality standards and performance specifications.

**BATTERY MODULE ASSEMBLING TECHNICIAN**

A battery module assembly technician is responsible for assembling battery modules in a manufacturing facility.

They work with a team of engineers and scientists to assemble, test, and package battery modules for various applications such as electric vehicles, consumer electronics, and grid storage.

They are responsible for assembling the various components of the battery module, such as the battery cells, wiring, and protective housing. They also need to ensure that the assembled modules meet the required quality standards and performance specifications.

**BATTERY CELL MODULE ENGINEER**

A battery cell module engineer is responsible for designing, developing, and testing battery cell modules for various applications.

They work with a team of engineers and scientists to create efficient and cost-effective energy storage solutions for electric vehicles, consumer electronics, and other applications.

They may also be involved in the selection of materials and components for the battery cell modules and in the optimisation of the manufacturing process. They should have a strong understanding of electrical engineering, materials science, and manufacturing processes, as well as experience with battery management systems and safety protocols.

**QUALITY TECHNICIAN**

A battery quality technician is responsible for ensuring the quality of batteries and battery systems during the development and production phases.

They work with a team of engineers and scientists to establish and maintain quality standards and procedures for the design, development, and production of batteries and battery systems.

They are responsible for identifying, analysing, and preventing defects in the batteries and systems, and for implementing quality control measures to ensure that the products meet the required specifications.

ALBATTTS created the **ALBATTTS Skills Cards**, a series of papers describing a number of occupational profiles within the scope of **battery manufacturing**, **e-mobility** and **stationary battery storage**.





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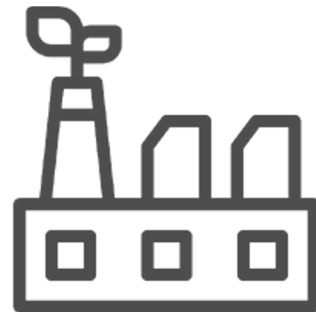
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The **Skills Cards** are a practical and helpful tool for...



**INDUSTRY/COMPANIES**



**SCHOOLS (VET & HE)**



**EDUCATION  
AUTHORITIES**



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Erasmus+ Programme  
of the European Union

# FREE ONLINE COURSES



ALBATTs created a series of basic and advanced **free online courses**, covering the whole battery value chain.



# HANDBOOK COMING SOON



**To be published in March 2024**

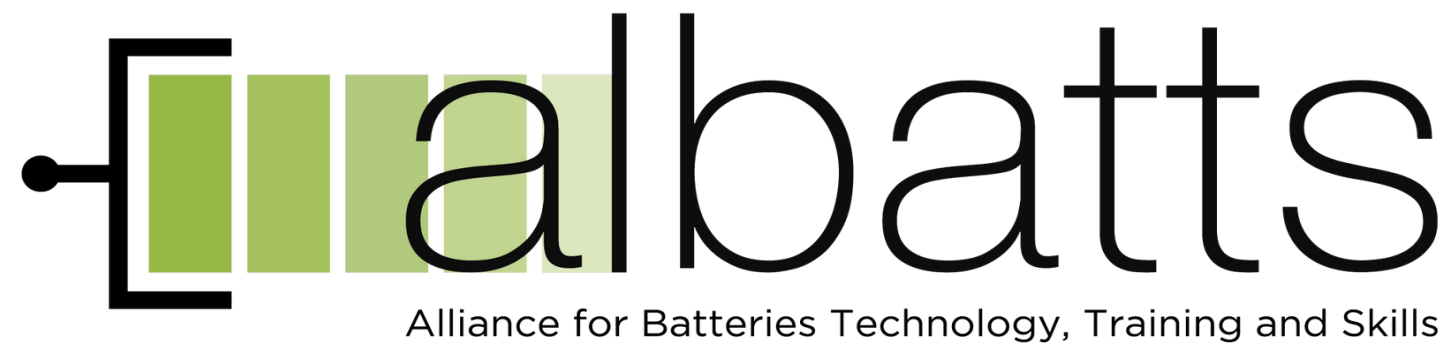
**Will be available through the homepage of the ALBATTTS Website**

**Target group: education providers, teachers, companies, education authorities**





# GRAZIE!



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**<https://www.project-albatts.eu>**



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Technology, Training and Skills**



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