albatts

Alliance for Batteries Technology, Training and Skills

2019-2023

ALBATTS Workshops:

Battery Applications in Automotive and Maritime Industry - Job Roles & Skills

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Deliverable D5.3 - Future Needs Definition for sub-sector

IMBA - Release 1

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EXECUTIVE SUMMARY

Altogether **4 online workshops** were held during the second half of January 2021 with focus on job roles and skills on these topics: Automotive sector, Maritime sector, Battery cells manufacturing and Stationary application of batteries. While this report describes outputs collected during the workshops on **automotive and maritime**, similar report is created by another project work package covering the two latter topics.

The Automotive workshop ***"Electric vehicle manufacturing & battery integration - future qualifications needed"*** took place on **27th January 2021** with a representative of the European Commission as moderator and a number of speakers, including major vehicle production and battery industry players (ACEA, Daimler, Skoda Auto, Northvolt).

The importance of the automotive industry for the EU economy is enormous and a consistent share of the **15 million automotive jobs** are at stake. Automotive industry is currently at the crossroads with many challenges ahead such as **electrification, digitalisation and autonomous driving**.

In 2030, the share of electrified vehicles in the new registrations might be up to 30-40%. Development of battery sector is critical for the EU recovery and the future competitiveness. Therefore, the EU has launched a number of initiatives, starting with the **European Battery Alliance** and the industry itself has been joining forces to get ready for the new era in the newly established **Automotive Skills Alliance**.

Switching from internal combustion engines vehicle to electrified vehicles will require massive **re-skilling and up-skilling** of the workforce (not only in OEMs, but also in the supply chain). It seems that the **educational systems lag behind** in producing a sufficient number of qualified personnel with battery- and High Voltage-relevant qualifications, and the OEMs often need to rely on their own activities to get the production going while complying with the safety regulations.

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Changes in curricula and cooperation between industry and educational institutions need to be intensified in the years to come. A number of relevant job roles and skills that are currently missing in the job market or will be lacking in the future were identified during the workshop, such as car **electricians, technicians, chemical or electrical engineers** with **competences** like IT skills, vehicle systems architecture, safety, physics, high voltage, data analytics etc. (more details in the chapters below).

An interesting fact from hiring of new personnel is that human resources not only come from automotive, but also from chemical, paper or pulp industry and can be effectively **retrained and reskilled** for the battery sector. **Mixing teams** of specialised people with trainees is a promising approach to be taken as it is being applied by e. g. Northvolt.

The Maritime workshop "***Vessels of the future: Maritime Batteries - Job Roles and Skills***" took place on **19th January 2021** with the representatives of some of the major players in maritime battery applications and advisory in classification, certification and risk management participating as moderator and speakers (DNV GL, Corvus, Kongsberg Maritime, ABB Marine).

With the demand for decreasing emissions in all modes of transport, there is a growing importance of batteries in the maritime sector, whereas **Europe seems to be among the forerunners in the electrification of the vessels**. At the moment, it seems **short range vessels** are more suitable for electrification than deep sea vessels.

Battery systems are virtually maintenance free, therefore ideal for **autonomous operation.** Fields of competence in the maritime applications are varied: providing propulsion, electric solutions, digital solutions services for vessels as well as port electrification, crane automatization, solutions for charging technology, on-board DC Grid, batteries, and fuel cells, etc.

International standards are being developed in parallel with technology developments, including vessel electrification. **Safety** in maritime is crucial, since there is no chance to run away in case of a fire incident.

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Among the **competences missing** now and potentially also in the future identified during the workshop were: deep competence in battery technology, mathematics, chemistry with a system overview of other fields, system integration and up-to-date technology, SW development, data management, battery experience and knowledge, servicing and fire safety. Important job roles in this sector include: **electrical engineer, control system expert, service engineer or fire safety engineer**.

Specific conditions at sea require specific set of skills, such as the ability to **predict and model** battery State of Charge (Soc) or State of Health (SoH). It seems that there is and will be a struggle to get talents between the maritime and automotive industry. However, there are also positive synergies, e.g. cost reduction of batteries due to the upcoming mass production of electric vehicles. When it comes to the education offering available for the battery relevant qualifications, according to some of the workshop participants, also in the maritime sector the **academy seems to be lagging behind industry.**

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LIST OF ABBREVIATIONS

IMBA	…	Intelligence in Mobile Battery Applications
IPCEI	…	Important Project of Common European Interest
CO_2	…	Carbon dioxide
EV	…	Electric vehicle
ESD	…	Electrostatic discharge
HV	…	High voltage
PHEV	…	Plug-in hybrid electric vehicle
BEV	…	Battery electric vehicle
OEM	…	Original equipment manufacturer
GWh	…	Gigawatt-hour
VET	…	Vocational education and training
ICE	…	Internal combustion engine
SME	…	Small and medium-sized enterprise
R&D	…	Research and development
ESS	…	Energy storage systems
LNG	…	Liquefied Natural Gas
DC	…	Direct current
SoH	…	State of Health
SoC	…	State of Charge

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1 INTRODUCTION

Organisation of workshops is specified as *D5.3 - Future Needs Definition for sub-sector IMBA - Release 1* in the ALBATTS project application. It **builds on previous tasks** carried out by ALBATTS project and extends the sectoral intelligence of the project, particularly on deliverable *D5.1 - Desk research and data analysis for sub-sector IMBA*[1] *- Release 1.*

Within the task on deliverable D5.1, data on drivers of change, stakeholders, technologies, job roles and skills and education were gathered reflecting all battery value chain steps and two concrete applications of batteries – in passenger cars and vessels.

These data were further elaborated in deliverable *D3.3 Desk Research and Data Analysis of the sector as a whole - Release 1.* In parallel to organisation of workshops, a survey was being conducted (Delivery *D5.2 - Survey results for sub-sector Mobile Battery Applications*).

Focus and organisation of workshops

Partners involved in organisation of workshops decided to organise four webinars (the COVID-19 pandemic prevented meetings in person) in **second half of January 2021** focused on battery applications and relevant job roles and skills with the following focus:

- Automotive sector
- Maritime sector
- Battery cells manufacturing
- Stationary application of batteries

Due to a number of synergies, organisation was coordinated in **joint meetings** of relevant partners of Work Package 5 (WP5 - Intelligence in Mobile Battery Applications, IMBA) and Work Package 4 (WP4 - Intelligence in Stationary and Industrial Battery Applications, ISIBA). These weekly meetings led by AIA, supported by Merinova, dealt with overall coordination, and ensured a consistent approach to the organisation of the workshops.

To deal with daily issues and specifics of the individual workshops, weekly **"Mini" meetings**

[1] IMBA – Intelligence in Mobile Battery Applications

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were organised and led by Workshop leaders (automotive – APIA, maritime – Corvus, Battery cells manufacturing – HE3DA (supported by SKEA), stationary – EFACEC).

This report, prepared by WP5, focuses on **Automotive and Maritime workshops**, while WP4 prepares a similar report on Battery cells manufacturing and Stationary application of batteries workshops.

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2 AUTOMOTIVE WORKSHOP

The decision to focus on battery application in the automotive sector was taken by the project partners involved. Reasons include the growing importance of batteries for vehicle production and related important attention paid by stakeholders as well as background, know-how, and networks of some of the WP5 partners who are associations of entities in the automotive industry (APIA, AIA, ACEA).

2.1 PREPARATION AND ORGANIZATION

Once the workshop topic and workshop leader (APIA) was agreed, weekly **"mini" meetings** were set up by **APIA** to coordinate:

- Focus of the workshop – "Electric vehicle manufacturing & battery integration - future qualifications needed"
- Preparation of the agenda
- Selection and invitation of the moderator and speakers
- Preparation of questions to be asked by the moderator
- Technical issues
- Communication
- Follow-up

The following partners took part in the meetings: APIA (lead), AIA, VSB TUO, ACEA, SPIN360 and EUPPY.

In its role as Workshop leader, APIA was responsible for overall coordination of the workshop, including communication with the moderator, speakers, and other tasks.

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2.2 EXECUTION

Workshop "***Electric vehicle manufacturing & battery integration - future qualifications needed"*** took place on **27th of January 2021** with **237** registered participants on the Cisco Webex platform which was used for all of the ALBATTS Workshop events.

2.2.1 Attendance

Overall attendance reached **96** participants on the Webex platform and **39** viewers on the Facebook, where the event was livestreamed, both online platforms are seen on **Figure 1** and **Figure 2** respectively. Access to the presentations and the video from the workshop is available on the **ALBATTS web site**[2], thus enabling an even wider reach to the stakeholders.

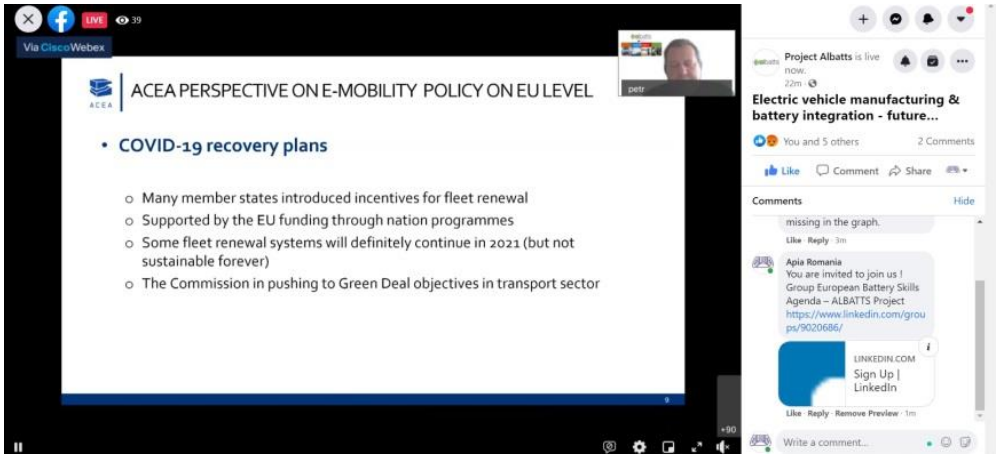

Figure 1 Facebook livestream

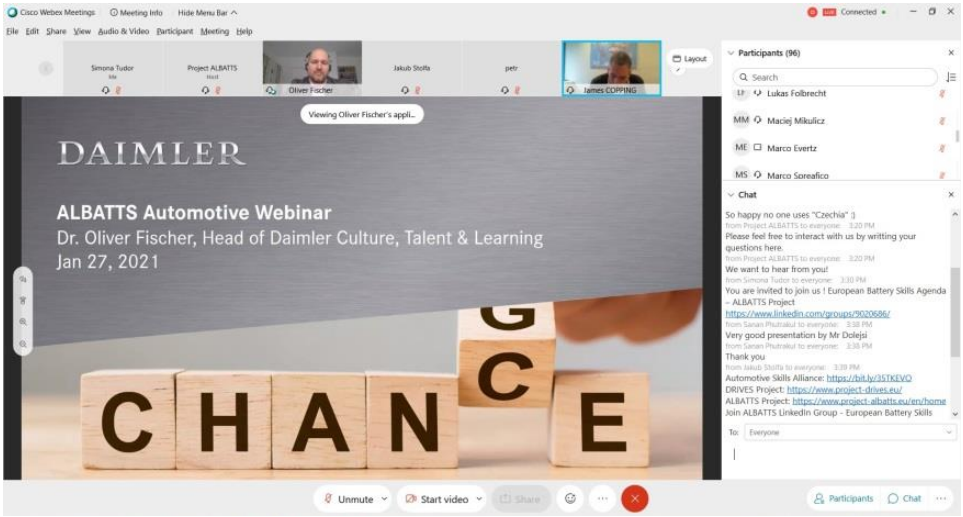

Figure 2 Cisco Webex environment

[2] Events, Project ALBATTS, available at: Project ALBATTS (project-albatts.eu)

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Registered participants were from a wide range of organisations as shown in **Figure 3**.

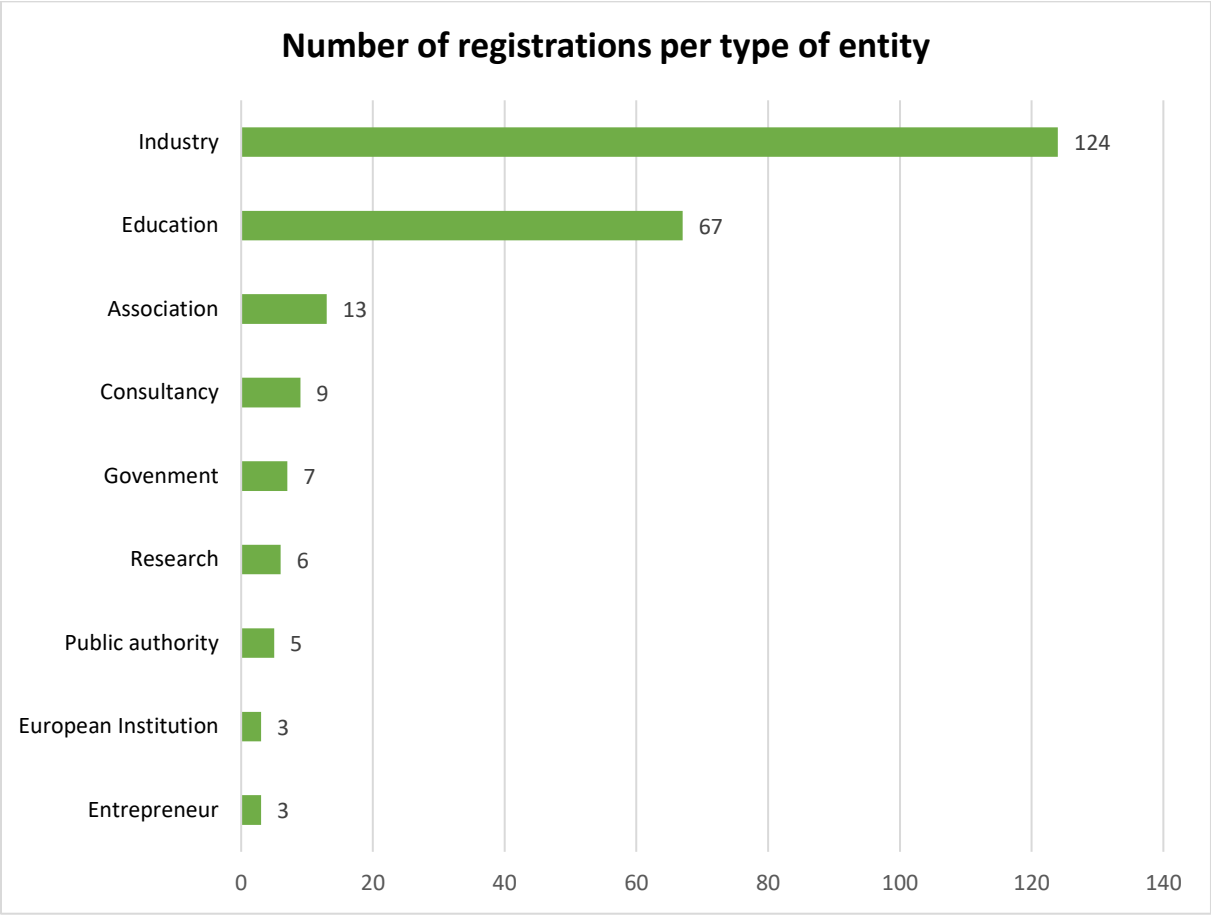

Figure 3 Registered participants by organization

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When it comes to the geographical coverage, most participants were from Sweden, Germany and Belgium, more detailed view can be seen in **Figure 4**.

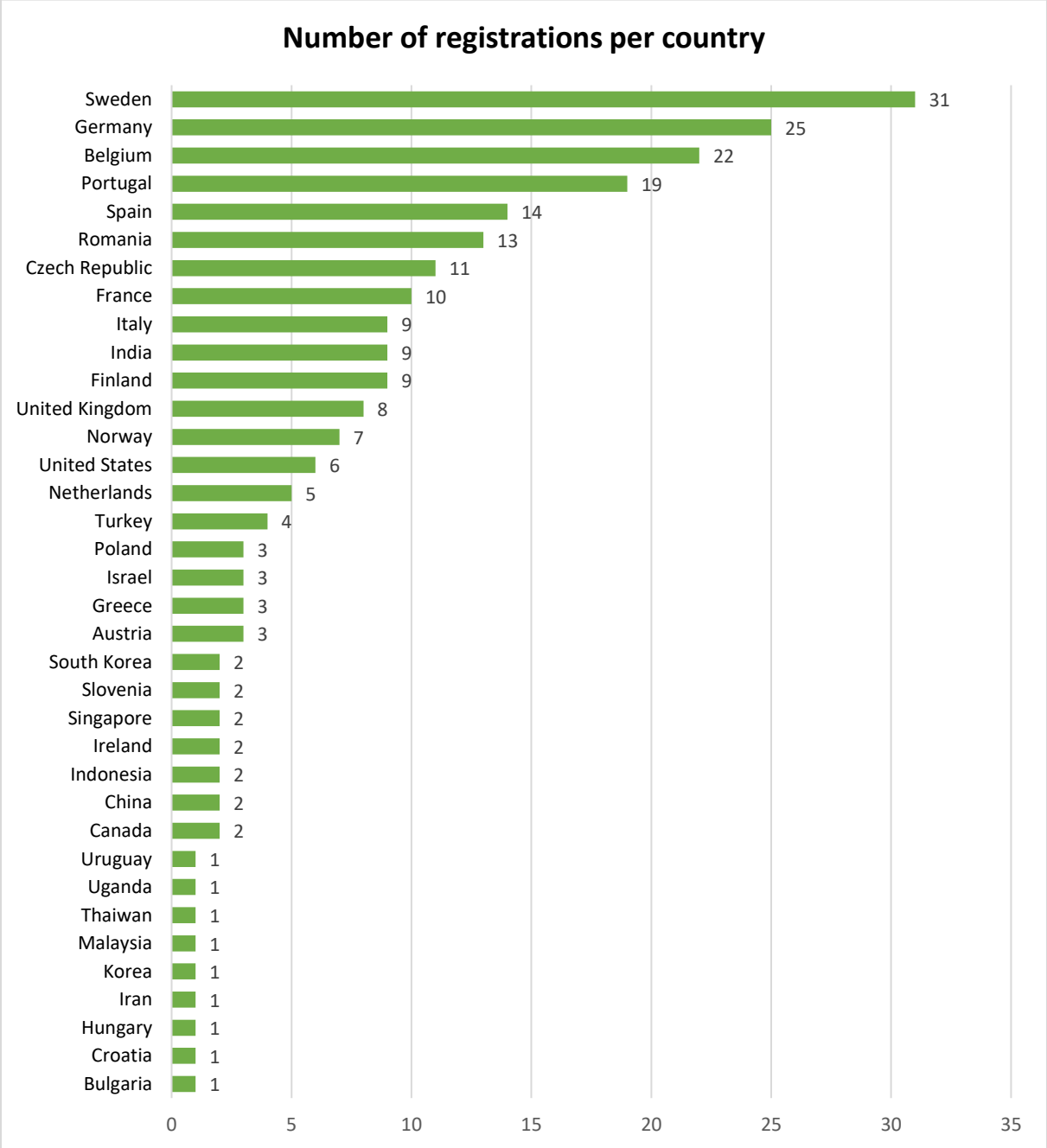

Figure 4 Registered participants per country

Number of connected participants was lower than the number of registered participants by 58%; something which had been expected. A few participants could not be defined because they joined by private emails, some were not registered while the link was forwarded to them.

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Figure 5 Number of participants per organization shows the distribution of entities participating in the workshop by their type. Participants from industry and education were most represented in the webinar.

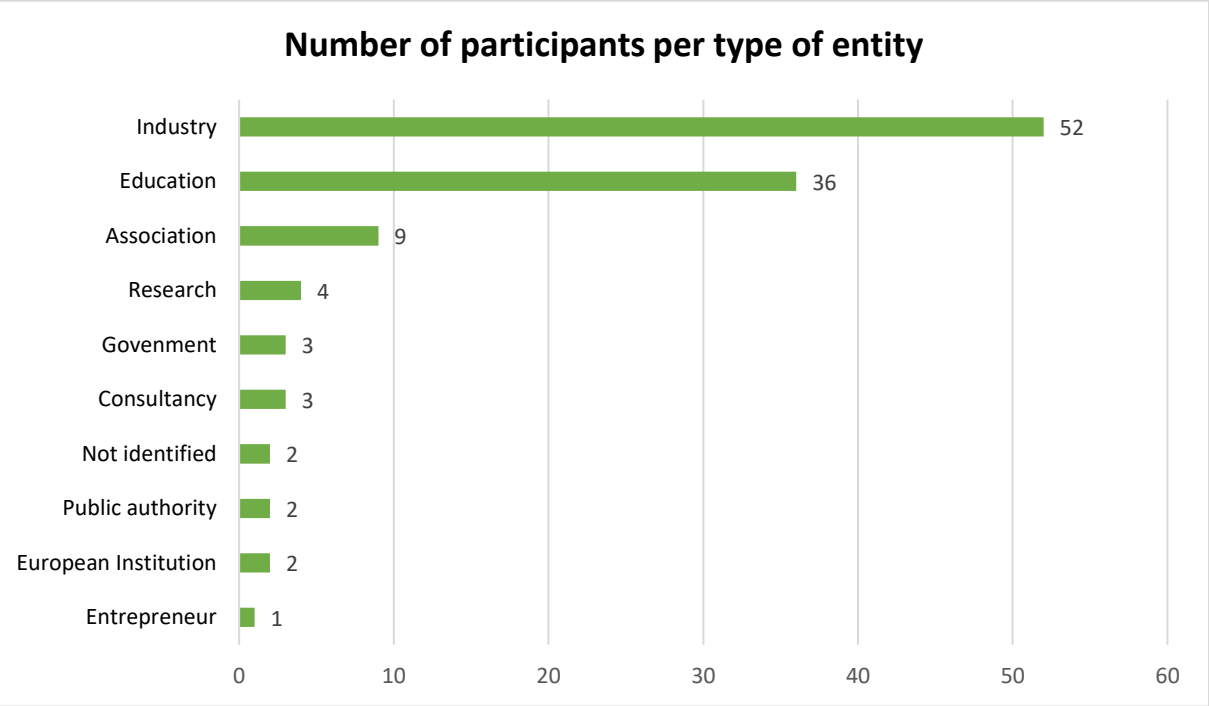

Figure 5 Number of participants per organization

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Figure 6 shows that the most connected participants were from Germany, Belgium, Sweden, and the Czech Republic.

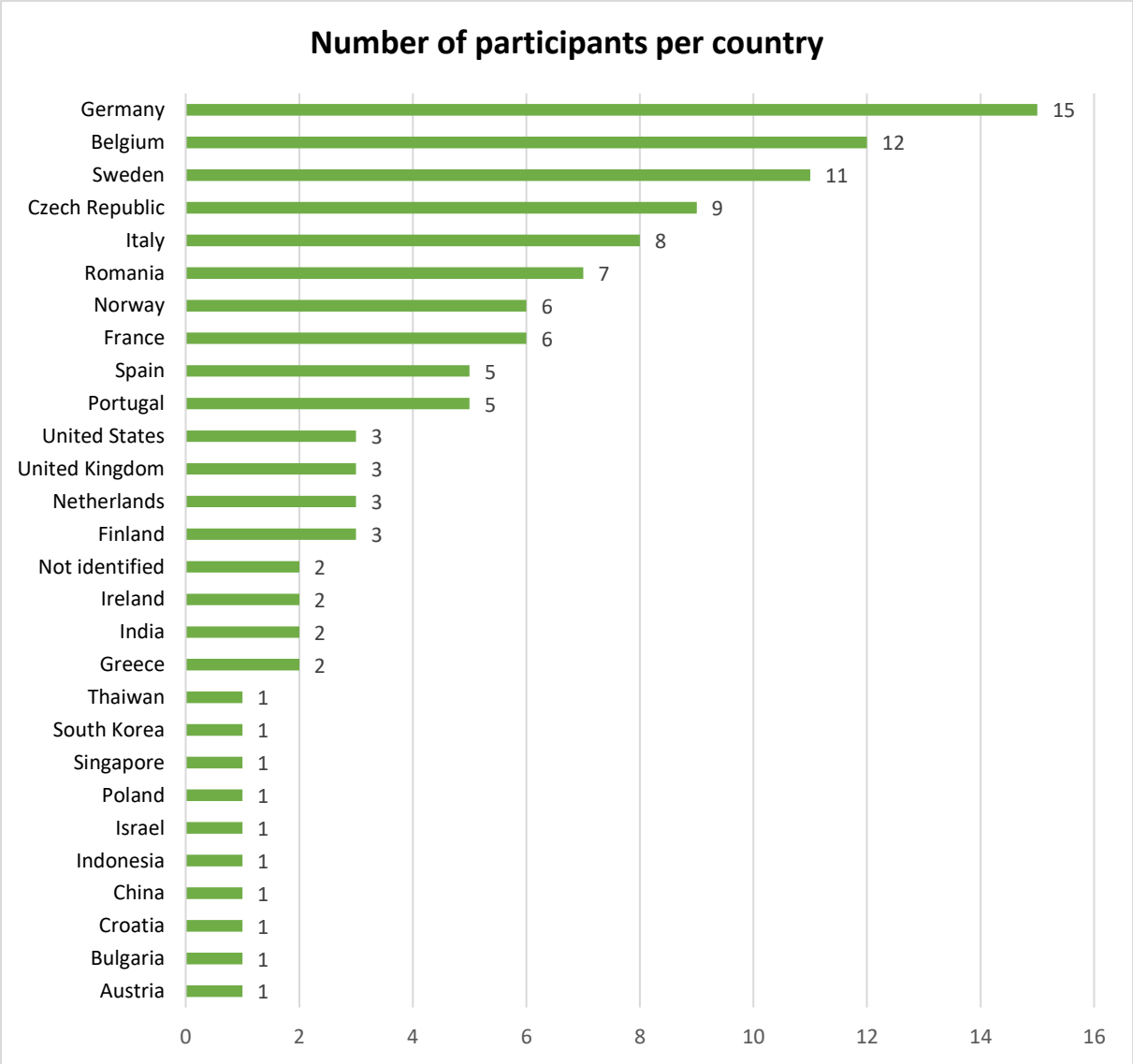

Figure 6 Number of participants per country

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2.2.2 Speakers and presentations

The moderator and the speakers representing the ALBATTS project, the European Commission, European Automobile Manufacturers Association and several major automotive and battery industry players were invited.

Moderator

James Copping - Policy Officer at DG GROW, European Commission, working in Automotive Unit, coordinating the Commission's policy on electro-mobility and, in particular, on supporting the work of the European Battery Alliance. Within these responsibilities, he is working on a number of EU skill-related projects including ALBATTS.

Key messages:

- Development of battery sector is critical for the EU recovery and future competitiveness
- European Battery Alliance helping to develop the battery industry since 2017
- 2nd IPCEI project launched, in total 12 bn. EUR supporting the battery industry in the EU
- European Skills Agenda helping to ensure qualified personnel for the industry – in the short- and long-term

Speakers

Jakub Stolfa - program manager and academic staff member at **VSB – Technical University of Ostrava**. He is responsible for the skills agenda in the automotive ecosystem. He coordinates the DRIVES project, a Blueprint for the automotive sector, and is a WP leader in the ALBATTS project.

Content of the presentation:

- Introduction of ALBATTS (battery industry) and DRIVES (automotive industry) projects
- European Skills Agenda, Pact for Skills among the key policy initiatives

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- Automotive Skills Alliance building on ALBATTS and DRIVES projects supporting massive reskilling and upskilling in the sector

Petr Dolejsi - Mobility & Sustainable Transport Director at **ACEA** with a specific focus on CO2 policy, industrial policy, and alternative powertrains.

Content of the presentation:

- New registrations of alternatively powered vehicles in EU rising, impact of EU regulatory framework, future outlook
- Need for e-mobility (incl. infrastructure), EU and national supporting schemes
- Transformation of labour force and restructuring of the sector

Key messages:

- Share of electric vehicles expected to grow significantly, EVs are expected to reach 30 to 40% in 2030
- Significant growth is expected in the segment of electric commercial vehicles
- Support to fleet renewal, charging infrastructure are essential for success of e-mobility, changing patterns in consumer behaviour
- Impact of COVID-19 (decrease in vehicle registrations), but positive effect of EU COVID recovery funding and initiatives on low-emissions vehicles registrations, needs to continue + tackle lack of infrastructure (fragmented throughout the EU)
- On the other hand, supportive schemes for e-mobility bring significant cost to national budgets = challenge
- Most regions will go through massive restructuring as the reshuffle of some jobs is expected
- Key challenge = Reskilling, upskilling of the labour force. ACEA involved both in ALBATTS and DRIVES projects – 15 million jobs are at stake in the EU

Oliver Fischer - Head of Culture, Talent & Learning at **Daimler AG**. In this position, he is responsible for Performance Management, Leadership Development and Learning, Culture Transformation, Talent Development, and Diversity & Inclusion at group level.

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Content of the presentation:

- Daimler AG structure, key data, sustainability, CO2 neutrality among key values
- CASE approach - Connectivity, Autonomous driving, Shared mobility and Electric propulsion systems
- Daimler strategy for identification and realisation of learning needs
- Impact of COVID-19 pandemic on R&D investments, possibilities of automotive

Key messages:

- Electrification is the most fundamental transformation of the automobile since its creation

Job roles and skills, competences:

- In general, need of skilled technicians and specialists is quite urgent
- Daimler went the extra mile by advising the VET providers on the mindsets, competencies and skills, even setting up its own qualifications such as the "Electric Specialist" with a modular design for basic qualification
- Daimler using "modular design" for basic qualifications:
  - Physics
  - Electrical engineering
  - Lithium-ion battery
  - Experience
- Power-system, operating systems, high voltage system, IT infrastructure
- Three types of competencies needed for digital transformation: hybrids among those are common:
  - Technical – analytics, infrastructure, risk and security
  - Enabling – communication, leadership, ways of working
  - Transformational – change, customer experience, innovation
- Requirements towards qualification:
  - Vehicles
  - Software OS

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- Components (powertrain)

Stanislav Hackl - E-mobility Systems Lecturer at **ŠKODA AUTO Academy**. His responsibilities include compulsory training system for electric / hybrid cars, and for high voltage batteries; ESD protection training programme; Car electronics and diagnostics training programme.

Content of the presentation:

- Introduction of SKODA AUTO – global production, 1,4 mil. units sold in 2019
- 6 models of BEVs or PHEVs in the product line using high-voltage (350V) - dangerous for human life

Key messages:

- The education system fails to provide adequate numbers of qualified personnel
- OEMs partly supplementing this role with their own initiatives, institutions

<u>Job roles and skills, competences</u>

- Special rules must be complied with by maintenance and repair technicians that are allowed to perform only the works that they are trained for
- Skoda training scheme is based on a European standard (EN-50110 - Operation of electrical installations) and consists of 3 competence levels covering all the works that may be carried out along the entire value chain of the automotive sector – assembly, maintenance and repair
- Special rules, construction and possible risks, qualification needed
- Unfortunately, no schools in the Czech Republic prepare people for battery integration work - Skoda had no choice but establish a Secondary vocational school of engineering that has already prepared over 1000 students in 15 new professions related to the electric drive
- In order to be better adapted to future evolutions, automotive industry and especially propulsion technologies, Skoda also started to collaborate with universities and enabled internships
- There are over 350 technicians of different qualifications involved in the EV

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component production

- Despite all these efforts, more electric engineering graduates are still needed – car electronics, car electricians, and electricians
- Detailed numbers of current relevant personnel in various ŠKODA AUTO production departments:
  - Components - HV battery assembly – 200 workers in total
  - (Vehicle) assembly - 140 workers with Level 2 qualification
  - Analysis and repair of batteries – 30 workers with level 3 qualification

Battery relevant qualifications currently missing on the job market:

- Graduates of Secondary Technical Schools of Electrical Engineering
- Graduates of Secondary Vocational Schools in professions: Car Electronics, Car Electricians, Electricians

Recommendations – to support education in two directions:

- Full-time study:
  - Higher number of teachers
  - Higher number of students in electrical engineering fields
- Re-skilling - distance learning:
  - Study of a completely new technical field
- Supplementing electrical engineering education

Sara Hermansson - a Talent Attraction Manager at **Northvolt AB**. Sara has worked at Northvolt since 2017. She has worked as Director of customer projects, technical recruiter and talent attraction manager. Today, she is technical project manager for automotive modules. Before Northvolt, she worked at Scania as Head of hybrid and electric powertrain projects.

Content of the presentation:

- Introduction of Northvolt - key facts, priorities, technology

Key messages:

- Northvolt's evolution as an evidence of the increasing demand for batteries in Europe, and therefore also employees with relevant qualifications and skills: from

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20 people in 2017 to over 1100 in 2021

- The company plans to manufacture soon around 40 GWh worth of batteries (equivalent to 600.000 EVs) annually with a total staff of about 3000 people
- Northolt aiming to produce the cleanest batteries in the world - low-emissions (close to zero), minimal environmental footprint, circular processes, responsible sourcing of raw materials. Sustainable hydro energy being used
- The battery demand is expected to skyrocket by 2030 (10-fold increase compared to 2020)
- Raw materials are bought directly from mines, enabling the company to impose tough ethical and other conditions on suppliers
- Vertical integration model - bringing as much of the supply chain in house as possible, in terms of battery systems development, digitalization, and recycling
- Batteries are expected to be required to have a traceable CO_2 footprint data
- In-house recycling of own decommissioned batteries (which no economic operator is capable of nowadays) is planned

All information about the event with bios of the speakers, presentations[3] and recording[4] can be found on the project ALBATTS website and Cloud repository.

2.2.3 Debate & questions

This section consolidates the debate section of the workshop.

Q: How do you see EV and battery revolution affect job market for skills and future job roles?

A:

- Very competitive area, qualifications (education) tend to take a while to deliver, it is behind the industry, emphasis on qualification, certification important elements, general certification.
- For a certain amount of time, the automotive industry will have to take the necessary measures to cushion the blow of the transition by reskilling and

[3] ALBATTS Automotive Workshop presentation: NewsEvents_2_SLIDES_20210204_141632.pdf (project-albatts.eu)

[4] ALBATTS Automotive Workshop recording, via Cloud repository: ALBATTS - cloud (project-albatts.eu)

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upskilling workers on their own and sourcing the necessary new staff with minimal external support. The emphasis will have to be more on internal qualification until the educational system, the VETs and the training organization are capable of picking up the slack and properly adjusting to the demand.

Q: ***What are the job roles endangered?***

A:

- Results of a Fraunhofer study commissioned by Volkswagen group show that the job loss in the manufacturing will be reasonable as many operations such as stamping, pressing, welding and painting will require the same workforce. Including the potential drop in demand and the evolution in robotization and automation of the manufacturing, the automotive industry would shed around 12% of its current workforce by 2030.
- Suppliers will bear the brunt of electrification as the difference in component volume between EV and ICE vehicle is around 70%. The issue there will be the appeasement of the change in a socially acceptable manner.

Q: What are the recruitment issues?

A:

- People do not have the skill sets needed, mixing teams of specialised people with people that needs to be trained (background in related industries) for batteries, out of the box thinking is needed. Unfortunately, the selection pool is still quite narrow and shallow – extra efforts are required to source staff.
- For the time being, people with any previous experience in batteries have an advantage: electrical engineering, risk awareness, battery operating conditions, vehicle system architecture, connection busses, diagnostic software, and data analytics. Electrical engineers are also quite easy to upskill to the new needs of the industry. Engine engineers, on the other hand will be more difficult to reskill and specialists from other fading industries such as paper production could more easily be reskilled to cell manufacturing as technological processes are quite similar. Chemical engineers could also find it easy to work in a battery factory or

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in a battery recycling plant.

Q: What evolution of EVs do you expect?

A:

- The required speed of transition is extremely high. Compared to other sectors where disruptive measures had to be implemented such as the mining that were not achieved in 30 years, the 10 years granted to the automotive seem to be mission impossible.
- The automotive industry in Europe currently employs 15 million people. Adapting many of them to the foreseen changes alone will be a daunting task. It may be simpler to switch knowledge for well educated people (MSc and PhD) but it is going to be hard to switch competences in the less educated.
- Beyond the changes we cautiously envisage, there will be many other disruptions and the one we dread the most is the regulatory framework which gets altered too often and in a deep manner.
- The best solutions to curtail these potentially negative outcomes seem to be the timely adaptation of the workforce: upskilling and reskilling, identification of the proper trainings, expansion of the view on skills and competences, the improvement of the synergies between the industry and the universities and other training providers.

2.2.4 Ex-post survey

After the workshop, a **satisfaction mini-survey** was sent to the participants - 5 people responded. All participants responded that they gained (fully or somehow) knowledge and information from participation in the webinar.

Recommendations for the future workshops include:

- More direct experience from the manufacturing companies,
- Create a network of market aware professionals to tap new opportunities,
- I would like to hear an OEM, or possibly an initiated consultant, talk about how car manufacturing changes when transitioning to EVs. How many less workers?

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Which skill decreases in demand? Which new skills are needed? This is apparently a sensitive matter to talk about openly, since it is a question about many jobs in Europe. The same on the service side.

- To repeat it quarterly would be best, make it 1 hour.
- Projects for development of new professions in battery field in the frame of Erasmus + or other EU programs.
- What are the battery relevant future jobs and skills needed in the sector and why?
  - Engineering and design to adapt to the new layout they will have to be allocated to on the vehicle.
  - For automotive, and if we think about car manufacturing, a lot more mechatronics competence is needed.
  - Assembly operator, testers, technicians, diagnosticians, engineers, H&S staff
  - Electronics, electrical specialisation, electrochemical.

2.3 KEY FINDINGS

The importance of the automotive industry for the EU economy is enormous and a consistent share of the 15 million automotive jobs are at stake. Automotive industry is currently at a crossroads with many challenges ahead such as **electrification, digitalisation and autonomous driving**.

Increasingly tough requirements coming in a quick succession are being put not only on the vehicle itself, but also on the production. Other factors and challenges that were discussed during the workshop can be seen in **Figure** 7.

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Figure 7 Identified drivers of change and influence factors

Switching from traditional internal combustion engines vehicle to **electrified vehicles** will require massive re-skilling and up-skilling of the workforce. It seems that the educational systems **lag behind in** producing sufficient number of qualified personnel with battery and HV relevant qualifications and the **OEMs need to rely on their own activities** to get the production going while complying with the safety regulations.

According to the presentations, many jobs in the automotive industry will be lost, not so much in the vehicle assembly where the losses are attributable rather to automation and demand fluctuation but in the supply chain where the lay-offs are expected to reach consistent levels as the difference in component volume between EV and ICE vehicle is around **70%.** The objective is to retain as much of these jobs as possible in Europe through **reskilling and upskilling** for the number of activities that are related to the electro mobility and help people in the industry affected to adapt to the new era.

On the other hand, a number of relevant job roles and skills that are currently missing in the job market or will be lacking in the future were identified during the workshop as seen in **Figure 8** and **Figure 9**.

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Figure 8 Identified skills, competences and knowledge

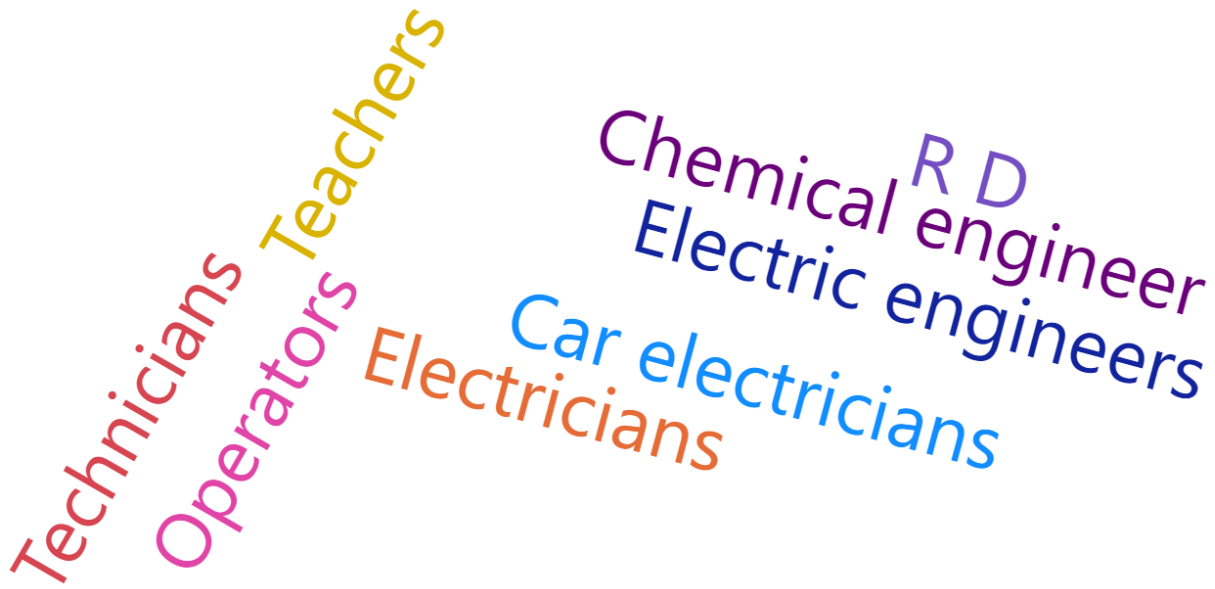

Figure 9 Identified job roles

Full data can be found in the **Annex**. These data will be **further processed** in the upcoming ALBATTS activities, such as further workshops, desk research or sectoral intelligence gathering.

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2.4 FOLLOW-UP

The **"thank you" emails with mini-surveys** were sent out to participants. Workshops were also ex-post **communicated** using ALBATTS communication channels such as LinkedIn, Facebook or Twitter. Presentations, streaming of the workshop were **made available** at the ALBATTS website.

Feedback was discussed among participating ALBATTS partners with some **lessons learned** (e.g. more focus on battery-relevant job roles and skills in some of the workshops, some of the presentations etc.).

Future workshops have started to be planned, perhaps also using **different workshop formats**, such as shorter (30 mins) workshops with a personality from the battery sector.

Data on job roles and skills, competences from the workshop will be **further processed** within the following ALBATTs project activities, including *D5.5 Sectoral Intelligence for the subsector IMBA.*

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3 MARITIME WORKSHOP

The decision to focus on battery applications in the maritime sector was taken by the project partners involved. Reasons include the growing importance of batteries in the maritime sector, whereas **Europe seems to be among the forerunners** in the electrification of the vessels, as well as background, know-how and networks of the WP5 partner Corvus, a company that specializes in integration of batteries into vessels.

3.1 PREPARATION AND ORGANISATION

Once the workshop topic and workshop leader (Corvus) was agreed, weekly **"mini" meetings** were set up by Corvus to coordinate:

- Focus of the meeting
- Preparation of the agenda
- Selection and invitation of the moderator, the speakers
- Preparation of questions to be asked by the moderator
- Technical issues
- Communication
- Follow-up

The following partners participated in the preparatory meetings: Corvus (lead), AIA, Merinova, VSB TUO, SPIN360, APIA and EUPPY.

In its role of the Workshop leader, Corvus was responsible for overall coordination of the workshop, including communication with the moderator, speakers and other tasks.

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3.2 EXECUTION

Workshop "***Vessels of the future: Maritime Batteries - Job Roles and Skills***" took place on 19th of January 2021 with **100** registered participants on the Cisco Webex platform which was used for all of the ALBATTS Workshop events.

3.2.1 Attendance

Overall attendance reached **82** participants on the Webex platform and the online platform is seen on **Figure 10**. Access to the presentations and the video from the workshop is available on the **ALBATTS web site**[5], thus enabling an even wider reach to the stakeholders.

Figure 10 Cisco Webex environment

[5] Events, Project ALBATTS, available at: Project ALBATTS (project-albatts.eu)

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Registered participants were from wide range of organisations as shown in **Figure 11**.

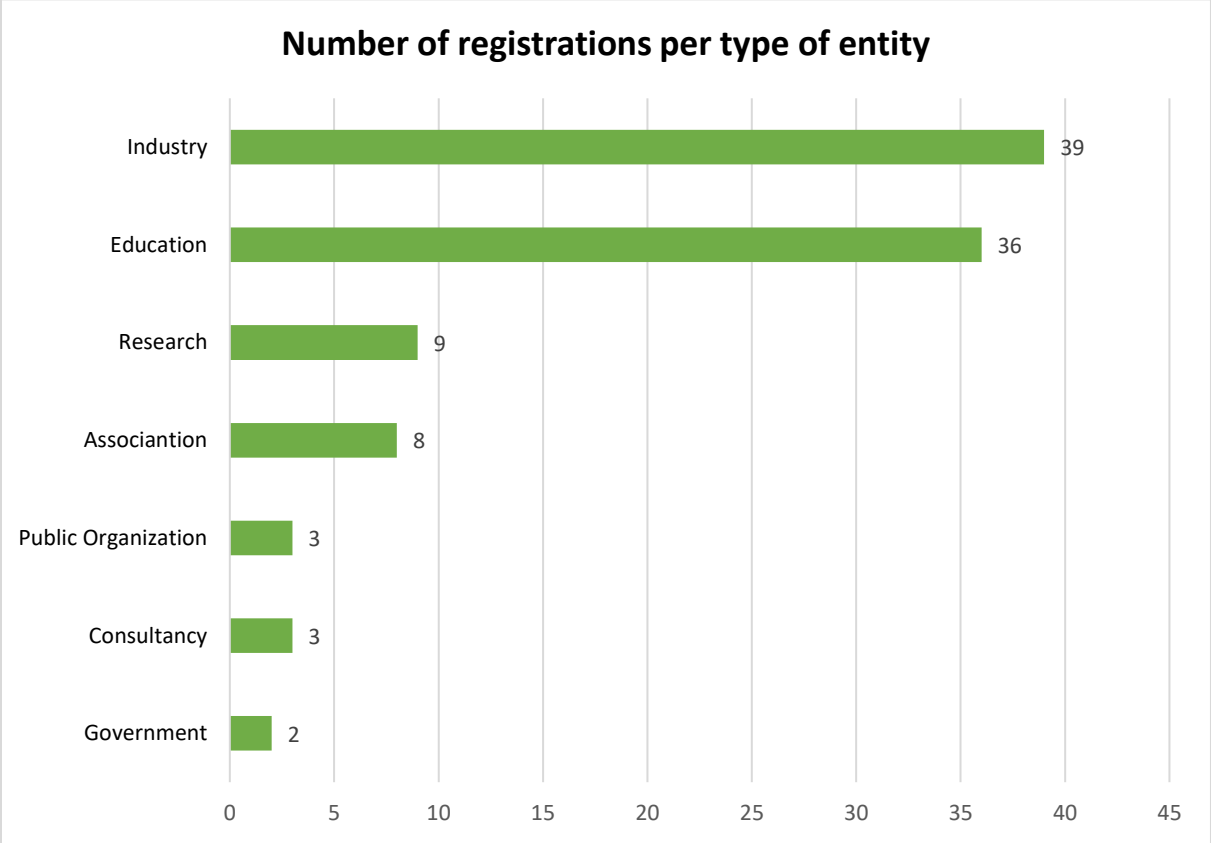

Figure 11 Number of registrations per organization

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When it comes to the geographical coverage, most registrations came from Sweden, Portugal and Norway, more detailed view can be seen in **Figure 12**.

Figure 12 Registered participants per country

Number of connected participants were more than **80 %** of registered participants, showing a great interest in the meeting. A few participants could not be defined because they joined by private emails, some were not registered, but the link was forwarded to them.

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In **Figure 13** the distribution of participants by organization type can be seen. Participants from industry and education were most represented in the webinar.

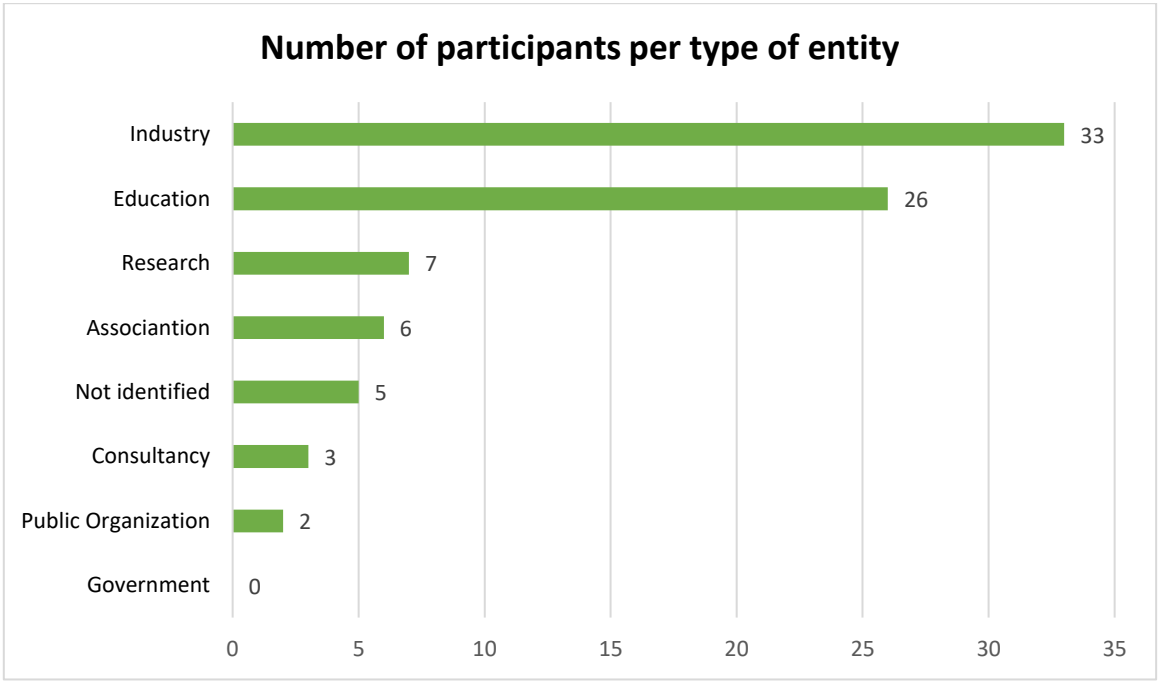

Figure 13 Number of participants per organization

Figure 14 shows that the most participants were from Sweden, Norway, and Italy.

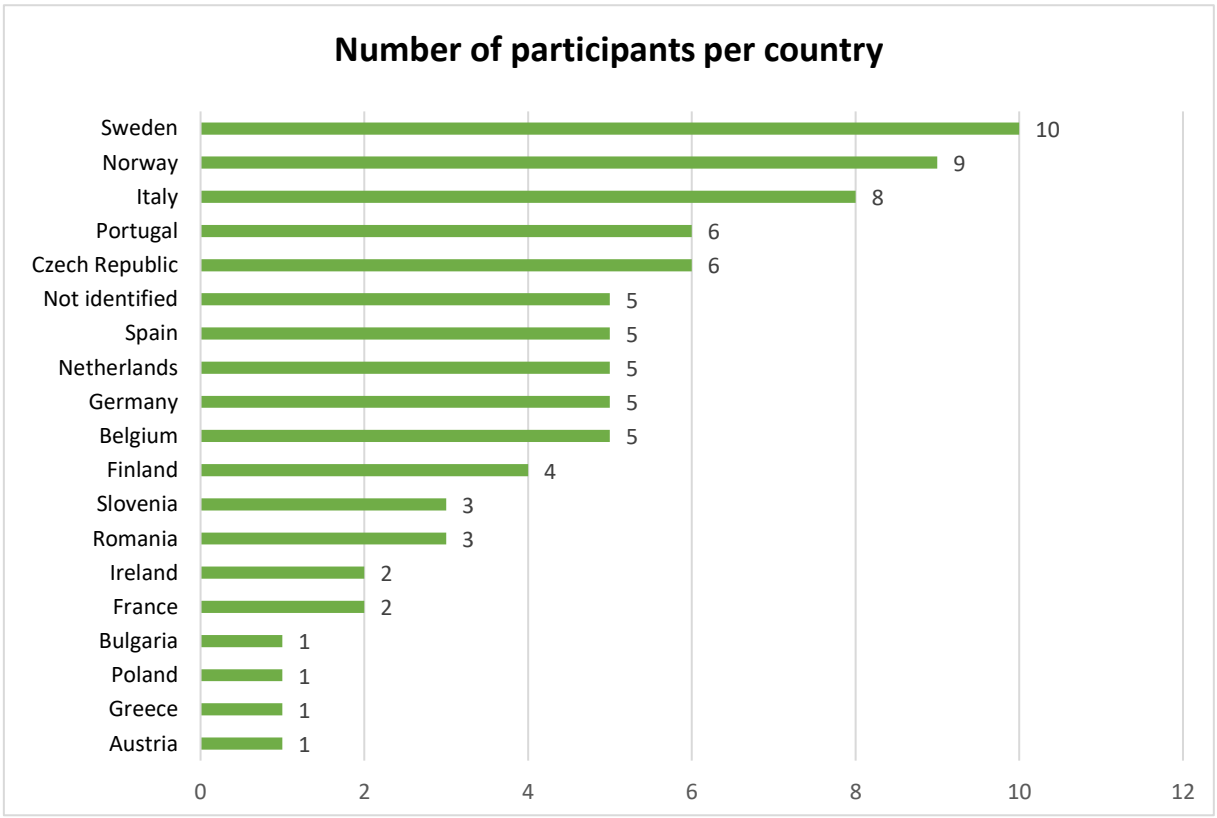

Figure 14 Number of participants per country

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3.2.2 Speakers and presentations

The moderator and speakers representing the ALBATTS project and some of the major maritime industry players were invited.

Moderator

Kristine Bruun Ludvigsen is a Principal Engineer at **DNV GL**. She has a PhD in Marine Technology with a focus on modelling and simulation of hybrid propulsion systems. Throughout her career she has worked with research and innovation projects as well as approval and advisory services related to power and control systems for the maritime industry.

Content of the introductory speech

- Purpose and organisation of the webinar

Key messages, trends

- Electrified vessels can bring environmental benefits and new business opportunities

Speakers

Kari Valkama - Project Manager at the Technology Centre **Merinova**. Merinova is a key member of the energy cluster in the Vaasa region. Technology Centre Merinova is involved in various projects, programs and services both regionally, nationally and globally.

Content of the presentation:

- ALBATTS project, members, activities and first results incl. first data on job roles and skills in maritime sector relevant to operation, repair and maintenance of electrified vessels

Key messages:

- Everybody invited to get involved – join as a stakeholder, participate in a survey, other webinars organised by the project

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Job roles and skills needed:

- Relevant to operation, repair and maintenance of electrified vessels:
  - A basic understanding of high voltage will be needed for all operations
  - Basic skills - Electrical & fusing, Mechanical skills, Communication protocols, Electronics, Software
  - New skills needed for both OEM Service Engineers and Service Engineers of System integrators: Data analytics, remote guidance and support, digital tools and software for remote operations

Lars Ole Valøen - CTO at **Corvus Energy**, a leading supplier of batteries and energy storage solutions for the global maritime industry. Lars Ole is a Doctor of Engineering in Electrochemistry with more than 25 years of experience within the field.

Content of the presentation:

- Vessel types and benefits of their electrification for environment and operations,
- Emerging trends in maritime, relevant job roles and skills needed

Key messages, trends:

- Electrification of vessels as a trend in the maritime industry
- Short range vessels more suitable for electrification than deep sea vessels
- Battery systems are virtually maintenance free, ideal for autonomous operation

Job roles and skills needed:

- Engineering + R&D; technical sales; customer applications and customer service
- Skills and knowledge trends: market understanding; adaptation and flexibility; learning ability; utilizing digital tools…
- Deep electrochemistry knowledge becoming key for R&D – model-building, digital twin construction
- Computer & programming skills needed – moving from on-ship to over the air service

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Stian Ramm Manger - the Technical Product Manager of Energy Storage at **Kongsberg Maritime**. His focus is on energy storage technology, product development and integration of systems board vessels worldwide to deliver environmentally friendly and financially sustainable maritime solutions.

Content of the presentation:

- Energy storage services – purpose, advantages, operating modes

Key messages, trends:

- Norway, Europe world leaders in the segment
- Future for the electrified vessels – enabling autonomous shipping; reduced maintenance; enabler for other alternative fuels (LNG, ammonia)

Job roles and skills needed:

- ESS - Safety; electrical capability and limitation; mechanical design of rack and modules; cell topologies
- Electrical skills – power electronics; electrical integration of ESS; external faults impact on energy storage
- Software development – internal safety, battery management system, integration aspects
- Deep chemical and production skills not as important for maritime as the market will be dominated and driven by mass production for EVs and ESS

Tomas Tengnér - Global Product Manager Energy Storage at **ABB Marine & Ports**. He arrived at ABB Marine & Ports in 2017. His research covered aspects from electrical and lifetime modelling and characterization, battery management systems and state estimation, to system integration and integration of energy storage devices with new modular multilevel converter concepts.

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Content of the presentation:

- ABB as a large multinational company providing battery solutions in different value chain stages
- Providing propulsion, electric solutions, digital solutions services for vessels as well as port electrification, crane automatization
- Offering solutions for charging technology, onboard DC Grid, batteries and fuel cells

Key messages, trends:

- Growing interest of ABB in long haul transport
- Digitalization of the vessels – enables remote diagnostics, cloud connection becomes important– future proof fleet
- Batteries future enabler for automation, parking assistance, autonomous sailing etc. leading to unmanned ships with no personnel due to remote diagnostic/servicing possibilities

Job roles and skills needed:

- In general - more versatile workforce; broader competence
- Specific needs presented by ABB can be seen in **Figure 15**

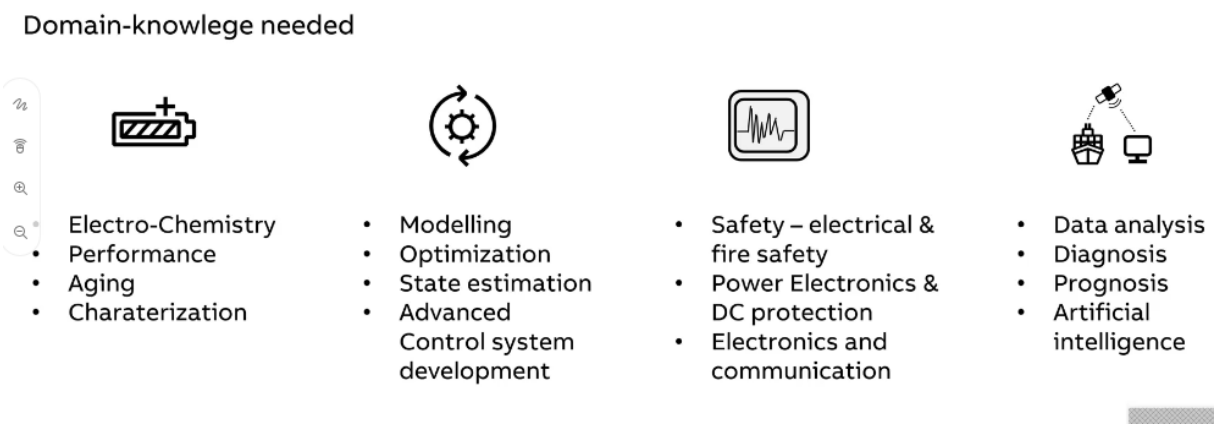

Figure 15 Specific knowledge needs presented by ABB

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Sverre Eriksen - Senior Principal Engineer at **DNV GL**, the class society for the global maritime and offshore industry. Sverre has been responsible for developing the DNV GL class rules for battery-powered ships. He also works on approval of electrical installations on ship and offshore units. Before joining DNV GL he worked with power supplies for telecommunication plants and with railway safety systems.

Content of the presentation:

- Classification of ships, certification, verification and testing against regulatory requirements, standards and recommended practices
- Development of new rules, standards and recommended practices
- Expert advisory on safety, technology, data management; efficiency, performance; and risk management
- Organizations in maritime sector somehow addressing batteries in vessels - ISO/IEC /UN/IMO/CENELEC/ANSI/UL

Key messages, trends:

- International standards being developed in parallel with technology developments, including vessel electrification – historically important also e. g. for insurance, crew comfort purposes
- Safety in maritime is crucial – no chance to run away in case of fire incident

Job roles and skills needed:

- Company employs electrical engineers, fire experts; control system experts
- Competences needed - Fire-safety engineers knowing how to extinguish lithium-ion battery, electric engineers, experts on certification of battery, industrial design, people able to embed SW into systems
- Competences needed: Electricity, control systems, fire safety, chemistry

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3.2.3 Debate & questions

Q: Solar panels use in maritime?

A: Not efficient solution due to high energy needs of vessels

Q: Synergies in batteries between maritime and automotive?

A: Focus of automotive on batteries is benefiting maritime: lowering battery costs etc.

Q: Job roles skills missing now and potentially also in the future?

A: Deep competence in battery, battery technology, mathematics, chemistry with system overview of other fields, system integration and up-to-date technology, battery experience and knowledge

Q: Can existing maritime machine engineers can be easily upskilled or reskilled to handle e-ships' propulsion systems?

A: They have better understanding of electronics and control systems, however young educated are better learners

3.2.4 Ex-post survey

A mini survey was sent out to workshop participants together with a **"thank you" email** and 8 responses have been received.

The responses received showed high satisfaction, the respondents also considered the event highly informative. Recommendation for the future workshops:

- Workshop organisation - Allocating more time for the speakers,
- Future job roles and skills expected to be needed - Battery service, working with high voltage, handling faulty battery,
- Recommendations - Comments Increasing awareness on battery safety to all (end user, service person, technical and non-technical management, etc.).

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3.3 KEY FINDINGS

The trends identified within the workshop include gradual tendency towards **electrification of the vessels**, either partial or full. Some of the vessel segments seem to be better suitable for the electrification, e. g. **passenger/car ferries or fishing vessels**. Norway and the EU are **world leaders** in Electric storage systems (ESS) for vessels. Standardisation remains an important element for vessels as well as battery safety. Other **identified factors** that drive maritime battery applications can be seen in the following picture (**Figure 16**).

Figure 16 Drivers of change identified

All these trends identified will have an impact on job roles and skills. Specific conditions at sea require a specific set of skills, such as ability to **predict and model** battery State of Charge (Soc) or State of Health (SoH) to ensure the vessel is not left in the middle of the sea without power. Electrification of vessels becomes a driver for other trends such as **autonomy or remote repair & maintenance**, which will themselves bring a number of new job roles and skills.

Job roles and skills relevant to batteries were identified as seen in **Figure 17** and **Figure 18**.

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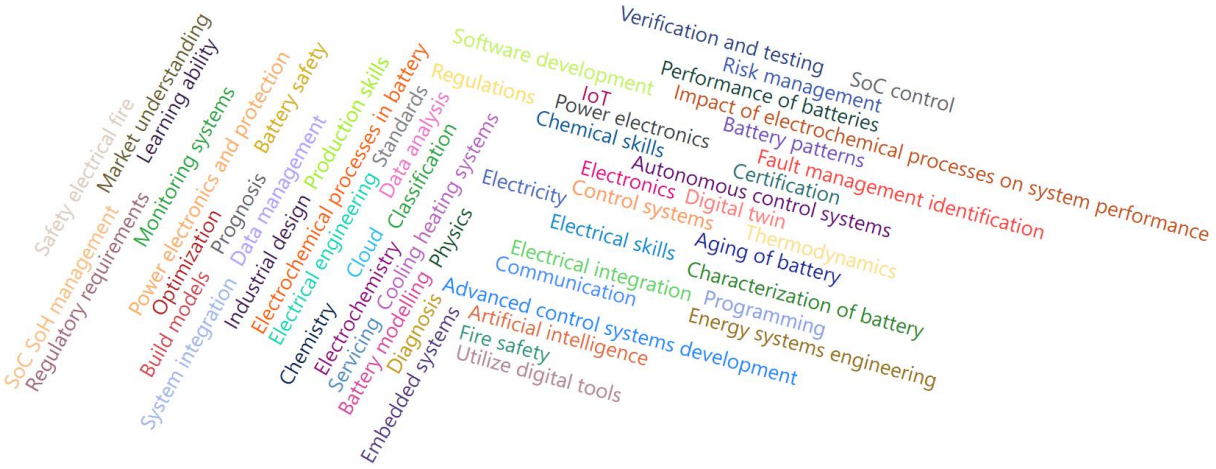

Figure 17 Skills, competences and knowledge identified

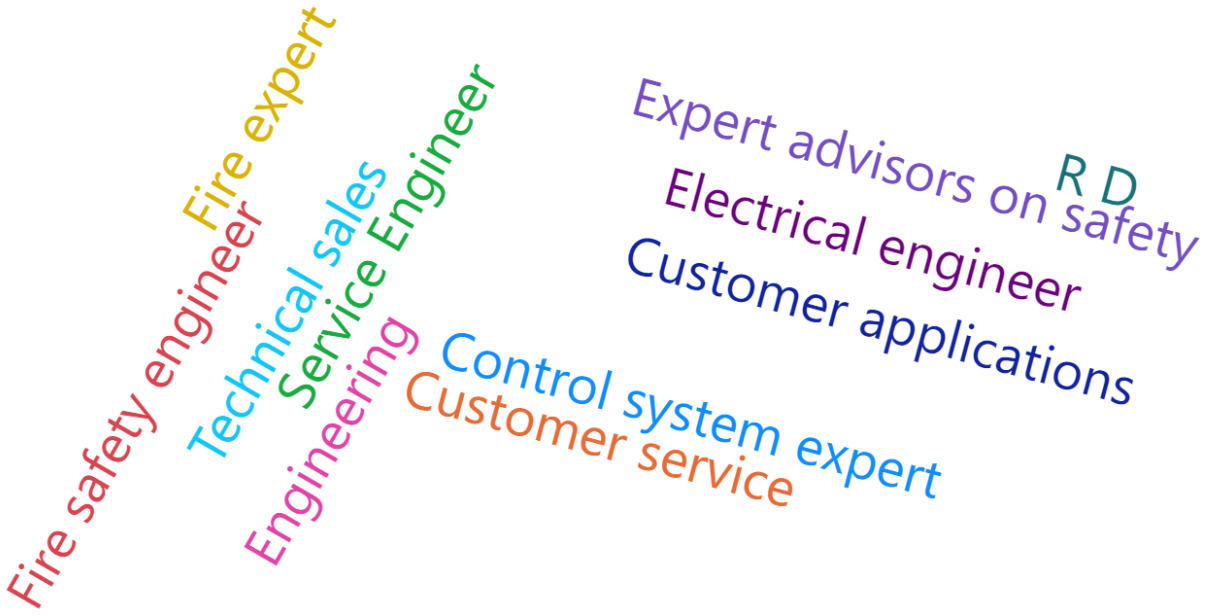

Figure 18 Job roles identified

The full data can be found in the **Annex**. This data will be **further elaborated** in the next stages of the project, such as additional workshops and desk research analyses. While **basic knowledge of high voltage** seems to be crucial for most of the job roles discussed, deep chemical and production skills might not be that important for maritime as the market will be dominated and driven by mass production for EVs and ESS.

There is and will be a **struggle to get talents** between the maritime and automotive industry,

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which remains the key driver for electrification. However, there are also synergies, e. g. cost reduction of batteries due to the upcoming mass production of electric vehicles.

When it comes to the education offering available for battery relevant qualifications, according to some of the workshop participants, the **academy seems to be lagging behind** industry in the battery sector.

3.4 FOLLOW-UP

The above mentioned **"thank you" emails with mini-surveys** were sent out to participants. Workshops were also ex-post **communicated** using ALBATTS communication channels such as LinkedIn, Facebook or Twitter. Presentations, streaming of the workshop was **made available** at the ALBATTS website.

Feedback was discussed among participating ALBATTS partners with some lessons learned (e. g. more focus on job roles and skills in some of the workshops, need to address better connection quality of some speakers in advance etc.).

Future workshops have started to be planned, perhaps also using **different workshop formats**, such as shorter (30 mins) workshops with a personality from the battery sector.

Data on job roles and skills, competences from the workshop will be **further processed** within the following ALBATTs project activities, including Delivery *D5.5 Sectoral Intelligence for the subsector IMBA.*

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