



**NETWORK OF RESEARCH PILOT LINES
FOR LITHIUM BATTERY CELLS**

D3.2

Expert Groups Setup

Deliverable Information

Related work package(s)	WP 3
Contractual date of delivery	M6
Actual date of delivery	M6
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Contributing participants	
Estimated person months used	1
Dissemination level	Public
Nature	Report

Project Information

Project title	Li-ion cell pilot lines network
Project acronym	LIPLANET
Project call	H2020-LC-BAT-2019-2020 (CSA)
Grant number	875479
Project duration	01.01.2020 – 31.12.2021



This Project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement N. 875479

Executive Summary

The expert groups incorporate a significant role in LiPLANET, as they are the main networking and exchange point within the network. This report elaborates the overall goal of the expert groups, their specific topics, their internal structure and the integration into the LiPLANET network structures.

The goal of the expert groups is to foster the topic specific exchange between the networks members and to concentrate and structure the exchange regarding relevant issues. Within the expert groups, discussions regarding their expert group topic take place, for example concerning initiatives for workshops that are proposed and future trends on the European battery cell manufacturing market that are monitored. They will prepare the findings for presentations, discussions and publications.

The expert group will be open for every network member to join and will host a chair and, if necessary, a co-chair each. The chairs will be appointed by the executive board or the expert group members. Each chair will steer the group in suitable directions and organize the group management. The group of the different chairs will stay in close contact with the executive board in the form of regular conference calls in order to maintain transparency in the information flow.

The topics will be set up with both a process and strategy scope in mind. New expert groups can be proposed towards and be granted by the executive board. The network will start with six groups, covering the following issues:

- Materials Processing and Safety
- Production Technology and Sustainability
- Cell Design and Recyclability
- Education and Training
- Scientific Exchange and IP (Round Robin)
- Digitalisation, Measurement Methods and Quality

Adjustments and revisions of the groups and task descriptions can be made at a later stage of the project.

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1 Introduction

1.1 LiPLANET in brief

The overall objective of the LiPLANET project is to set up a European network of research pilot lines for lithium battery cells. The network aims to create a European innovation and production ecosystem and reinforce the position of the European Union (EU) in the Lithium battery cell manufacturing market. In this regard, it plans to build a more competitive Lithium battery cell manufacturing ecosystem and increase the production of Lithium battery cells towards industrial scale, by bringing together the most relevant European Lithium battery cell pilot lines and the main stakeholders of the battery sector. The project LiPLANET lays the foundation for establishing this network during the two-year project runtime. This network allows exploiting synergies between pilot line operators, identifying knowledge and equipment gaps, organizing joint trainings, as well collaborating with industry and academia, and facilitating the access to market for its stakeholders.

For this purpose, different activities are followed throughout the project:

- ✓ mapping of the European Li-ion cell pilot lines and implementation of a network,
- ✓ creation of a standardized legal framework and a data exchange platform for the cooperation between industry, academia, and pilot lines,
- ✓ conducting of round-robin tests to compare qualification methods,
- ✓ development of a roadmap for joint strategies of the network towards industrial scale battery cell production in Europe.

1.2 Scope and objective of this deliverable

The expert groups will be set up until month 6 (June 2020) of the LiPLANET project. This includes the topics and organization of each individual group, their relationship with one another and their integration into the LiPLANET network.

At first, the goals of the expert groups are elaborated, followed by the internal structure of each group, regardless of the topic. Afterwards, the integration into the LiPLANET network and the relationship with its different bodies is described. The relationship is displayed with the usage of chosen examples. At last, the deliverable will work on the specific topics of each expert group, including examples for every group.

2 Goal for Expert Groups in LiPLANET

The main goal for the expert groups is to foster the exchange between the LiPLANET network members. Within an expert group, topics that are of interest for that group, can be worked on with all the participants being able to contribute to the discussion. The Groups will then be able to identify the steps that are needed to further advance the project through workshops, trainings or

collaborations with other expert groups. A summation of the purpose, from the network and the members' perspective, can be taken from Table 1.

The suitable expert groups will be the body to contact from inward and outward of the network for points like collaboration with industry partners, advice on best practice, requests for data and material sharing, education, etc.

The key issues to work on by the expert groups are:

- **Scientific Exchange:** New discoveries, papers and interviews will be shared. This includes both the work that has been done by LiPLANET members and work from non-members. Research that might be of interest for the whole network will be mentioned in a regular newsletter. More topic specific research will be circulated within the expert group.
- **Exchange of experience:** In order to find further opportunities to increase energy and resource efficiency in battery production, the members experience on yield quotas, energy demands and cell quality will be shared.
- **Education:** In collaboration with the industry and academia, the expert groups will develop new concepts to strengthen European battery production. This can be new university courses or trainings and educational videos for already operational production facilities.
- **Benchmarking/ comparison:** Production processes and measurement methods will be compared in order to identify opportunities for growth within the member's facilities.
- **Best practice:** Best practice identification regarding production processes (e.g. in terms of process speed, flexibility, resource and energy efficiency) and measurement methods.
- **Information material and summaries of core findings:** These will be prepared by the expert groups to be provided to task 3.2.1 and WP6 for distributing results to associated partners and the public.
- **Work on new topics together:** As issues may overlap between the expert groups, an exchange between the expert groups is desired.

Setting up expert groups is a widely used approach, in order to collaborate more efficiently (see ETIP working groups).

 From the network's perspective	 From network members' perspective
<ul style="list-style-type: none"> ▪ EGs functions as the main topic-guided internal discussion forum ▪ EG are fundamental to let members engage with the network and other members ▪ LiPLANET requires bodies to organize the topic-related discussion capable of producing results ▪ EGs are essential for a sustainable development of the network as they can be a significant working body ▪ EG reflect priorities of the network 	<ul style="list-style-type: none"> ▪ EG are main points of interaction within the network and with the network members ▪ EGs identify persons' profiles and engage with them ▪ Outcome = personal benefit - effort should be > 0 for the members

Table 1: Expert group from the perspective of the network and from perspective of the members

3 Structure for Expert Groups in LiPLANET

Thematic expert groups consist of experts representing the diverse scope of duties of lithium battery manufacturing pilot lines. The expert groups in LiPLANET are set up to ensure the involvement, contribution and communication of all concerned stakeholders in the network. The groups are generating input, giving guidance and continuous feedback for the development of the network, as well as exchanging knowledge on certain topics. They are responsible for identifying new challenges and issues that European battery pilot lines could face in the future. Furthermore, potential collaborations with suitable working groups of ETIP Batteries are being sought in order to generate synergies.

The selection of expert group members is based on the technical competence of individuals based on their professional profile. The expert groups are set-up according to the principle of avoiding overlaps among their goals and activities carried out.

However, the working groups have a certain degree of freedom, to develop additional topics, papers and other initiatives aiming at fostering and optimizing the collaboration of European pilot lines.

The following working groups are established:

Group 1) – Materials Processing and Safety

Group 2) – Production Technology and Sustainability

Group 3) – Cell Design and Recyclability

Group 4) – Education and Training

Group 5) – Scientific Exchange and IP (Round Robin)

Group 6) – Digitalisation, Measurement Methods and Quality

3.1 Structure of Expert Groups

The expert groups are coordinated by a chair, possibly assisted by a co-chair. The expert group leader, respectively the chair and the potential co-chair is a natural person. It is required that the chairs have expertise in the associated topics. The chairs can be either appointed by the executive board or the group members, taking into account a balanced view of representativeness of different stakeholders in the LiPLANET network. The executive board of LiPLANET approves the chair and membership of each expert group based on their specific expertise. An interdisciplinary exchange of the group chairs via conference calls is planned to take place approximately every two months, based on necessity.

The content and purpose of the expert group deals with a well-defined topic, which matches the network's goal. The purpose of each group is defined by targets but can be modified if necessary. The discussion and exchange within the groups is possible in several formats: mailing lists, regular

virtual & physical meeting, etc. The group members are only natural persons who are primarily network members. If reasonable, expert groups can also include natural persons outside of LiPLANET by going through a nomination process approved by the executive board.

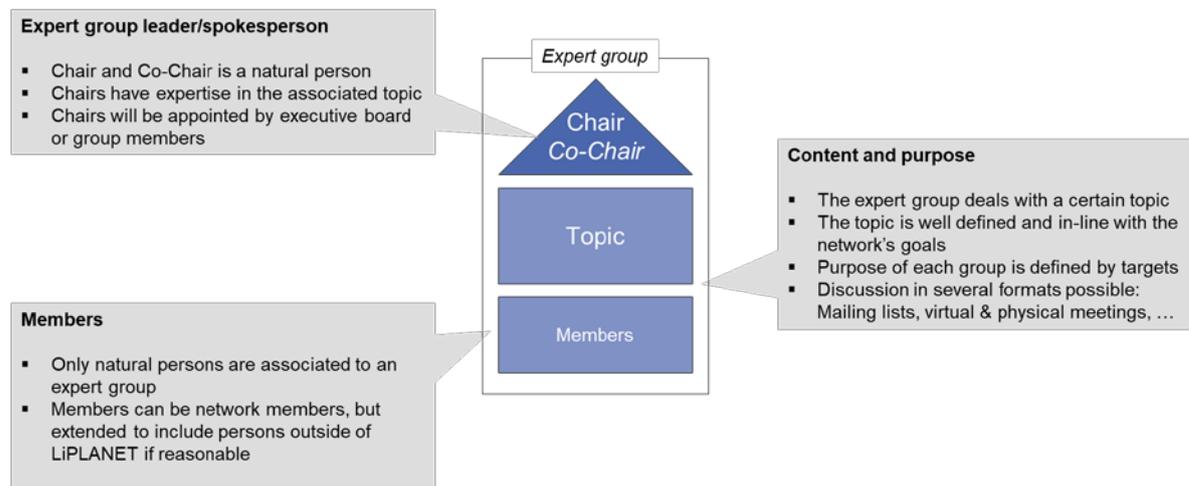


Figure 1: Structure of expert groups

3.2 Integration into network organization

The organizational structure of the LiPLANET network comprises five different types of bodies: the body of members, the expert groups, the executive board, the CEO and the external advisory board. The organs and their relationship with each other is presented in Figure 3. It shows, that both the expert groups and the expert group chairs are within the body of members. The chairs of each expert groups stay in close contact with the executive board.

As previously mentioned, the network will start with six different expert groups. If at some point it may become necessary, the expert groups can be modified by the executive board. All members can bring up propositions for new expert groups or repurposing of already existing ones by adapting the topics and scope.

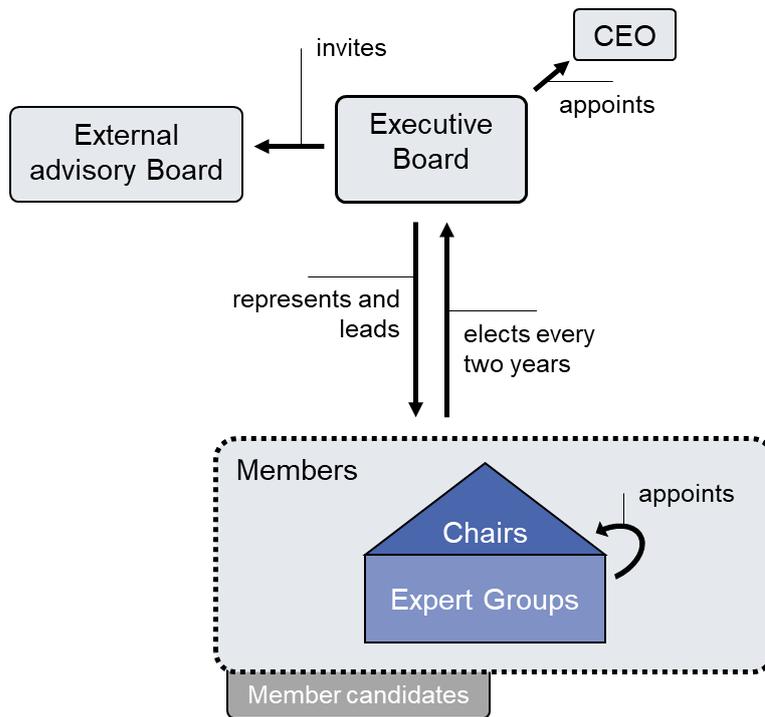


Figure 2: Position of the expert groups within the LiPLANET network

3.3 Operational workflow

The range of tasks of expert groups can be versatile. The table below shortly represents three different uses cases. Following on from example A, the integration into the network organization is explained.

Example A	The European commission asks for IP guidelines for the next funding program, in form of a proposition paper.
Example B	A new measurement method is available, and the industry asks LiPLANET to develop new standards.
Example C	In case safety issues arise for a new material, LiPLANET is asked to collect best practice guidelines for all pilot lines.

Table 2: Examples of use cases

External requests follow a specific pathway. As an example of the expert group’s tasks and their integration into the network organization, the use case A is illustrated in the following flowchart (see Figure 4). An external request (e.g. EC asks for opinion on IP guidelines) is directed at the executive board. The board members are delegating requests to the concerned group chairs depending on the request’s content. The Group leader initiates the discussion and hands over tasks to the group members. The group members work on any tasks that arise and involve other working groups when topics overlap. Results can be prepared for example in a form of a report, position paper, interview or others. The results can go through an optional review process. After the final approval, the group chair communicates the results externally.

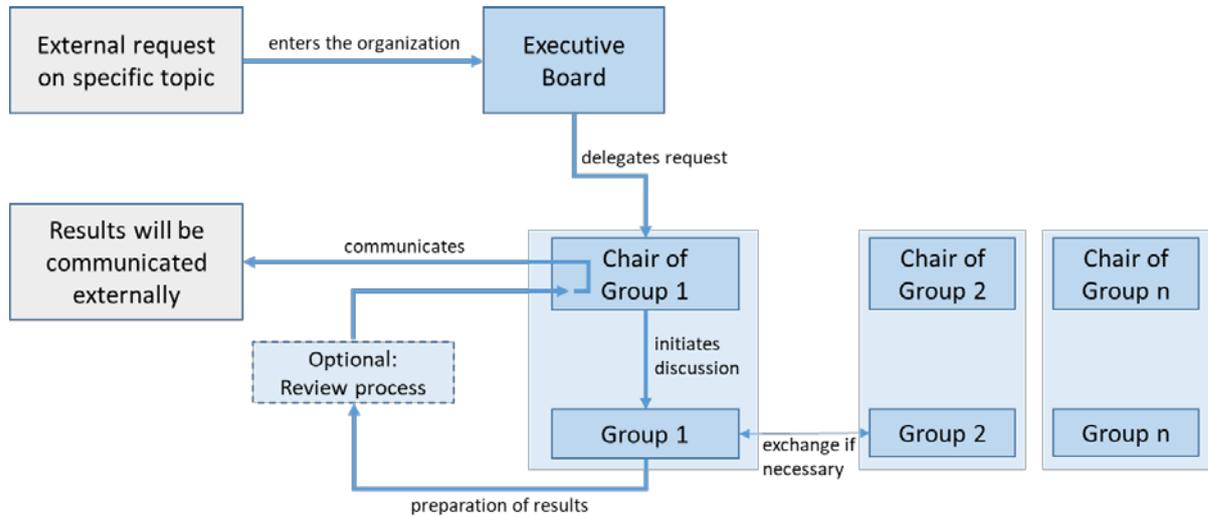


Figure 3: Flowchart of a use case: External request enters the organization

4 Scope and topic description

With regard to the expert groups structure and topics, three different scopes have been discussed: a process-centered scope (e.g. based on defined pilot line scope: from material processing to cell formation), a scope centered around strategic topics or a mixed form that combines both (see Figure 5).

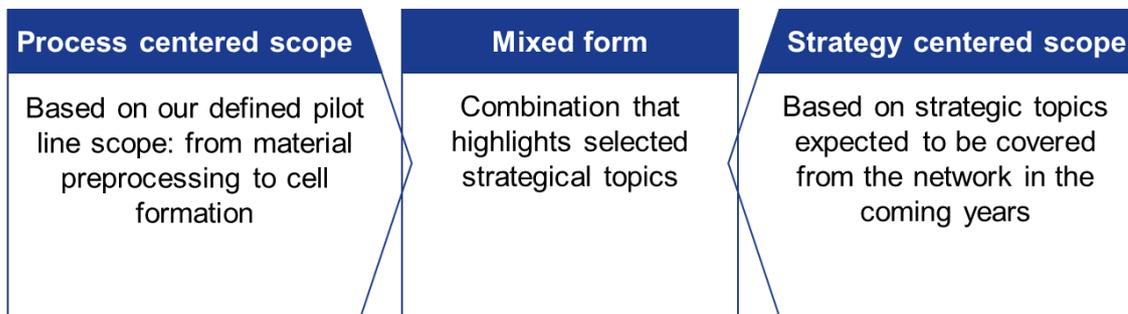


Figure 4: Possible expert group scopes

Keeping the networks tasks and scope in mind, the consortium has agreed on a mixed form. Topics like materials, electrodes, cells, formation, module & packaging and safety are transferred into the expert groups „Production Technology and Sustainability“, „Material Processing and Safety“ and „Cell Design & Recyclability“. Issues, that have a more strategic nature are covered by groups like „education and training“, „scientific exchange and IP, as well as “Digitalisation, Measurement Methods and Quality“. Figure 6 illustrates the merging of scope oriented group topics and objective oriented group topics.

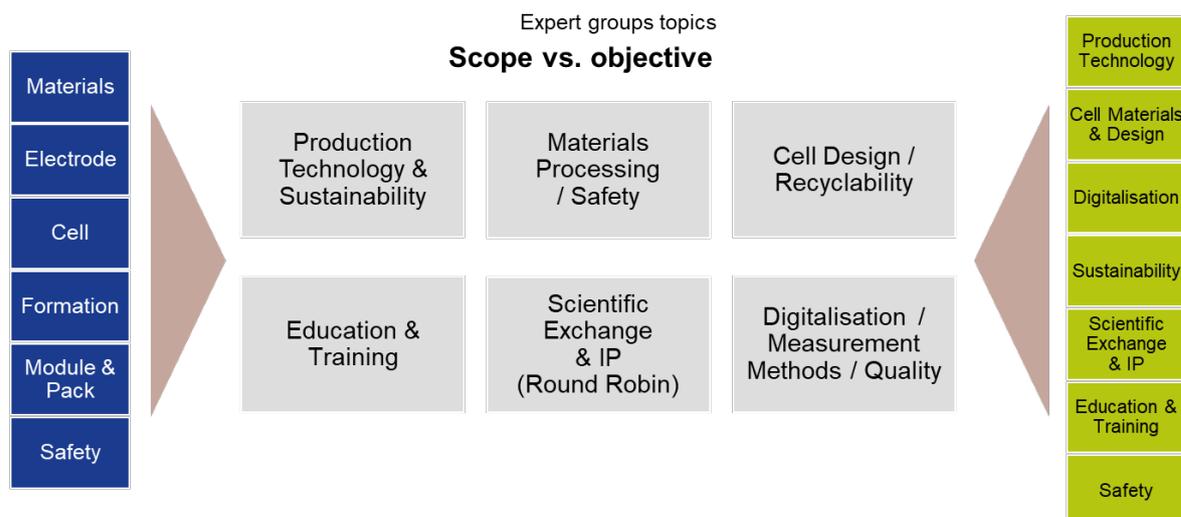


Figure 5: Scope vs. objective oriented group topics

The expert groups consist of experts within the pilot line network and the project consortium. In a sensible discussion format, they will deliver input to main discussion points, such as the knowledge exchange, data sharing, education, best practice and others. A key task of the expert groups will be the identification of improvement potentials of pilot plants. In order to identify the optimization potentials, joint workshops, trainings and educational material will be prepared either by a specific expert group or a collaboration of different groups. General communication and cooperation takes place via regular physical meetings and web-based interaction. Therefore, the chair will set up mailing lists and work with the data exchange platform.

The working groups will be structured in six subgroups with different key topics. Every single working group will identify relevant aspects and topics for a regular exchange. Furthermore, they will be preparing information material and summaries of their key findings and provide them to the other groups, associated partners and the public, depending on the scope. The distribution process for the results is described in WP6 (deliverable 6.1 and 6.2). The following groups and group scopes are defined as a starting point for the network. Key issues are listed below:

Group 1) – Materials Processing and Safety

- Processing of materials (process steps from material mixing to electrode coating)
- Development of new materials and process technologies (e.g. high voltage cathode materials, high-performance anodes)
- Exchange of data and knowledge on yield quotas
- Safety aspects when handling powders (nanomaterials, moisture reactive materials etc.)
- Exchange on general employee protection

Group 2) – Production Technology and Sustainability

- Best Practice identification regarding production processes (e.g. in terms of process speed, flexibility, resource and energy efficiency) and measurement methods
- Optimization of cell assembly processes (flexibility and agility in production with regard to new cell designs and configurations, reduction in cell production time and costs)
- Exchange of energy demands and main energy consumption contributors
- Tracking and optimizing resource and energy efficiency (reduction of scrap, enhance yield, resource-saving)
- Development of environmentally friendly manufacturing processes (aqueous based slurries, etc.)
- Conducting Sustainability Assessments (e.g. LCA)

Group 3) – Cell Design and Recyclability

- Exchange on Cell Design, Cell format, Cell chemistries, Casings, etc.
- Exchange on Recyclability, Recycling quotas, Design for Recycling strategies and safety in Recycling
- Tracking of new legal requirements (e.g. new battery directive)
- Discussion on possible End-of-Life strategies for battery cells and circular economy approaches
- Communication on how to ensure the correct disposal of non-recyclable components

Group 4) – Education and Training

- Development of Workshops and providing of education materials
- Training of experts in order to raise the overall productivity and know how
- Specific teaching programs for pilot line operators (e.g. educational videos) will be developed to professionalize the knowledge
- Creation of a concept in order to facilitate the sharing of facilities and staff training via courses or direct exchange of experts.

Group 5) – Scientific Exchange and IP (Round Robin)

- Creation of a concept for knowledge and data transfer taking IPR (Intellectual Property Rights) into account
- Benchmarking and Identification of knowledge gaps (e.g. scientific reports on competitiveness)
- Regular search for new public scientific knowledge in concerned areas (publications, patents, etc.)
- Discussion of technology trends (e.g. Post Lithium cells) and long-term challenges

Group 6) – Digitalisation, Measurement methods and Quality

- Enhance productivity via digitalization (Industry 4.0 initiatives, application of IoT for operation)
- Foster intelligent electrode and cell production via usage of web Services, application of artificial intelligence and machine learning for forecasting
- Data Mining, Data Science and usage of big data
- Standardization of analytics, enhance large-scale data driven testing
- Identification of the need for action required to safely satisfy demanding quality expectations

5 Annex

5.1 Annex A - Key input documents

- ETIP SNET - NATIONAL STAKEHOLDERS COORDINATION GROUP (last visit: 23.06.2020)
https://www.etip-snet.eu/wp-content/uploads/2017/05/NSCG-A4-2016-11-19_Terms-of-Reference_v6.0.pdf
Batteries Europe - Working Groups (last visit: 26.06.2020)
https://www.eba250.com/wp-content/uploads/2019/05/Expression-of-interest_BatteriesEurope_WGexperts.pdf