Strategic competence forecast of the battery value chain in Flanders

Call 543, SCOPE 2021 - Project number 11119

Final reporting of the strategic competency forecast

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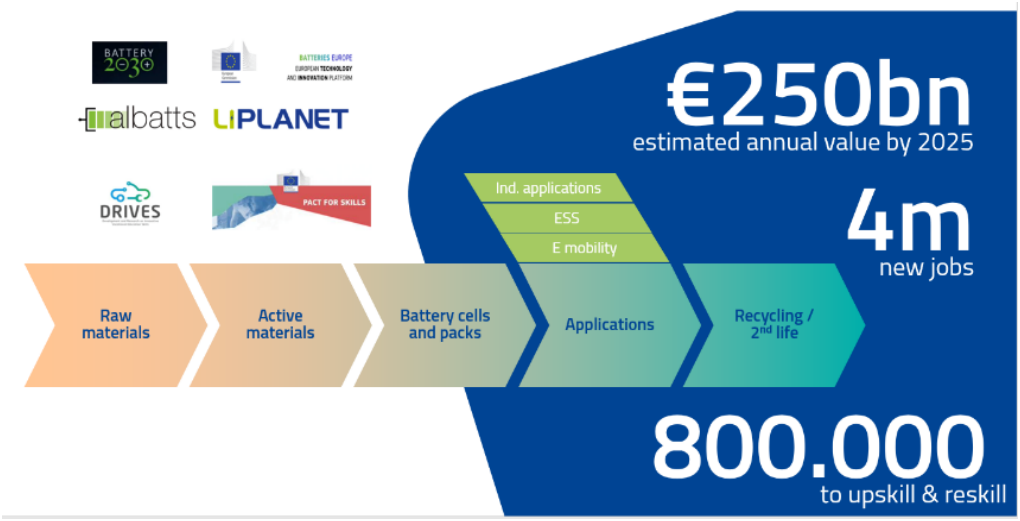
1. Introduction

This competency forecast deals with a new market at the heart of the energy transition : storage of electrical energy. The energy transition is on its turn a basic element in the climate transition and the accompanying strive to carbon neutrality. With this study we want to use the Flemish research and development expertise in batteries in the rest of the labor market. This work builds on earlier feasibility studies and collective research undertaken at the initiative of Flux50 and is part of the establishment of a European Battery Academy (EBA).

1.1 The battery value chain in Europe

The European economy undergoes a drastic transformation by the future -proof green and digital technologies to achieve climate neutrality , maintain the long -term competitiveness of European industry and succeed in open strategic autonomy. The emerging Europe 's battery ecosystem is crucial in the transition, as batteries are the key technology for the switch to emission-free mobility and for energy storage in the electricity system.

The current labor policy is therefore focused on preparing a dynamic and flexible labor market with highly educated and qualified workers necessary for the new production processes and new strategic value chains . Industrial actors estimate namely, due to the accelerated pace of many battery projects , these market will be good in the future for 4 million new jobs in Europe. There is need for initiatives for upskilling 800,000 employees.



Continuing the success story of the European battery shall depend on our ability to meet the skills challenge which already hinders the development and which is considered as one of the critical factors for the success of the European Battery Alliance (EBA). The European job market is not yet enough tuned to meet the growing demand from the battery market for skilled, qualified and experienced labor force. Specific skills and competences are not readily available in Europe, mainly because of the battery ecosystem which is still in full development and the lack of a directly compatible industry where employees can be to draw from. Moreover is its huge number of training needs in such a short period of time a unique challenge for the European education and training ecosystem .

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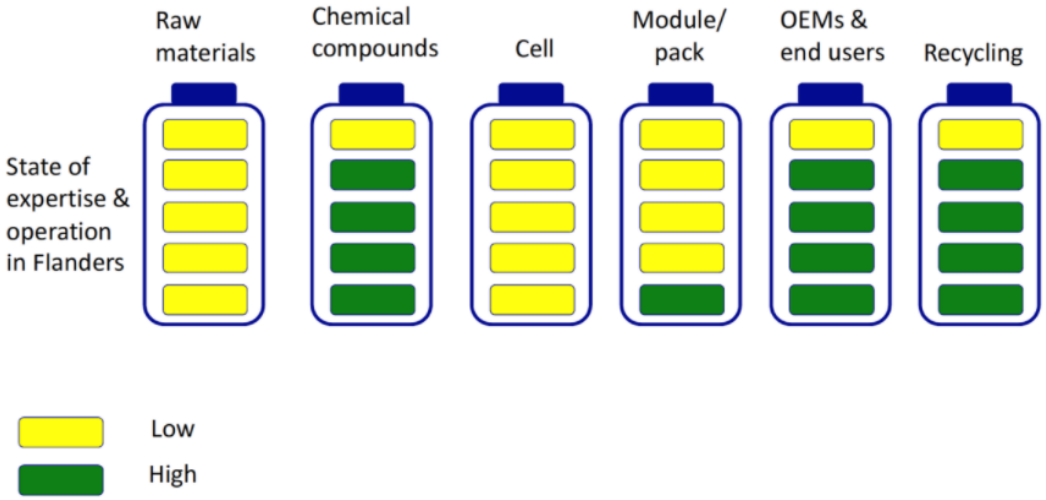
1.2 The battery value chain in Flanders

Led by Agoria Flanders and in collaboration with Flux50 and SIM Flanders , a VIS Study called LIFEBAT was performed in 2018-2019 on Opportunities for the Flemish Companies in the full (Lithium-Ion) battery value. In the final report the Flemish battery value chain is analyzed, as shown below, and the potential for innovation and market deployment has been described .

Repeatedly the attention was drawn to the need of training and education, for both technicians as well as engineers. The status of Flemish expertise in the battery value chain is shown in the graph below. The magnitude of this educational need, as well as the specific training needed for the Flemish industrial environment where not part of the research question .



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2. Approach

2.1 Scope

The scope of the project which is reported on, is delineated as follows:

- Industry: update the Flemish battery value chain to the current market situation, based on the research results and the description in the LIFEBAT VIS feasibility study;
- Level: battery technician (EQF level 5) up to Master in engineering (EQF level 8)
- Target group : re -skilling the unemployed workforce and up -skilling of the employees

2.2 Methodology

When executing the competency forecasts the VLAMT methodology is used as described below :

The Preparation phase (phase 1) must ensure that at the start of the project clear choices were made concerning the research process. A proper planning (Step 1) of the research approach is thereby the first step. A second step (Step 2) consists of bringing together a sector specific steering group to make sure relevant actors are involved in the research process.

The Preliminary Investigation phase (phase 2) targets to determine the future of the sector and to explore the associated competence needs. The Preliminary Investigation happens based on desktop research and a(n) exploratory workshop(s). The most important components of the Desktop Research (step 3) are a quantitative and qualitative document analysis based on the documents provided by the steering committee .
The Interactive Workshop (step 4) targets on the one hand to detect the most important developments and trends with relevance for the sector and on the other hand to estimate the impact of those developments. The knowledge gained in the Preliminary Investigation shall be deployed be in the third phase .

The Analysis Phase (phase 3) constitutes the actual investigation of the focus study . What has been discovered in the second phase, will now be analyzed in detailed to get a deeper insight in changing competence and training needs . The information about the competence needs is collected on the basis of company visits and

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interviews (step 5). The approach and working method (e.g. questionnaires, case studies,…) are worked out in detail prior to the interviews. In order to meet the competence needs in the future , it is necessary to analyze the current Training Offer (step 6) and then compare it with the results of the interviews.

The Decision Making phase , (phase 4) finally, consists of drawing the conclusions, setting up an action plan and to distribute the Final Report to the different target groups concerned. The conclusions are formulated in the form of recommendations. Concrete initiatives by the concerned actors are collected in an Action Plan (step 7) .

The project is concluded by drafting the Final Report and spreading the Learnings (step 8) to all possible stakeholders and interested parties as much as possible tailor-made on their specific needs.

3. Preparation

3.1 Schedule

The research project ran from November 1 , 2021 to August 31 , 2022. In the following picture the project scheme for the implementation of the methodology as described above, is displayed. The different partners in the project who are responsible for the implementation are Flux50 and KU Leuven/ EnergyVille , with research bureau Mpiris as subcontractor. The partners had their kick-off meeting on 23/11/2021 to discuss the planning and to make the necessary concrete agreements.

Stappen	Planning									
	nov	dec	jan	feb	mrt	apr	mei	jun	jul	aug
VOORONDERZOEK										
1.1. Deskresearch										
1.2. Praktische voorbereiding										
1.3. Verkennende workshop 1										
1.4. Rapportering										
1.5. Terugkoppeling deelnemers + stuurgroep										
DETAILLERENDE FASE										
2.1. Opmaak interviewstructuur										
2.2. Voorkeurslijst 40 bedrijven (stuurgroep)										
2.3. Vastleggen van 25 bedrijfsbezoeken										
2.4. Afnemen interviews bedrijven										
2.5. Tussentijdse opvolging stuurgroep										
2.6. Opleidingsaanbod in kaart brengen										
2.7. Rapportering										
BESLUITVORMING										
3.1. Samenkomst expertisecel										
3.2. Formuleren van aanbevelingen										
3.3. Opstellen actieplan (stuurgroep)										
3.4. Eindrapportering										
3.5. Disseminatie										
Projectmanagement										

3.2 Composition of the Steering Committee

In order to create a broad support for the results of the project and to have the necessary vigor a strong Steering Committee was composed in which both the battery value chain as the education sector was

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represented. The tasks of the members of the Steering Committee consist of providing input for the Preliminary Investigation, to participate in the workshops, to advise in the selection of the companies for interviews, to monitor the implementation methodology and finally the validation of the results. Below are the organizations and contacts that make up the Steering Committee of the Battery Academy project:

Organization	Name
VITO	Jeroen Büscher, Carlo Mol, Bert Gysen
EIT InnoEnergy	Johan Thys
Flux50	Frederik Loeckx
KUL	Johan Driesen, Adinda Vandereyken
Mpiris	Johan Desseyn , Geert van den Bossche
Green Energy Park	inne Peersman , Isabelle Pirmez
Synergrid	Ronny Mertens
Syntra -PXL/T2	Roald Swerts
VDAB	Stien Van Hevele
VLAIO	Vicky Wildemeersch
Volta	Benjamin Verfaillie , Paul Jacobs
Volvo Car	Nico Van Den Broeke , Wim Valentyn
WSE	Nikas Goossens
agoria	Jean-Marc Timmermans
247Energy	Kris De Pooter , Kurt Ahrens
iinno Benelux	Vincent Beckens
VEKA	Kris Ronge, Evert Eriksson

Members of the Steering Committee have met 4 times on next meeting dates : 1/2/2022 , 16/4/2022, 19/6/2022 and 29/8/2022. The reports of these meetings are bundled appendices 9 to 13 .

4. Preliminary investigation

The knowledge described below was gathered by the partners in the project in the following way: desktop research, professional literature, digital training content descriptions from EIT InnoEnergy (Battery Storage and the Energy Transition; Battery Storage Technology), training sessions from the Flux50 Smart Energy Academy (16-18/11 2022) , site visit at EnergyVille & T2 Campus, the exploratory workshop with 13 companies and organizations with knowledge of the battery value chain. The bibliography of the preliminary study is enlisted if first appendix.

4.1 Desktop research

Out of previous studies it turns out that Flanders plays a role in the field of research and development different steps of the battery value chain. These transforming technologies will reform the labor markets by creating opportunities for new clean jobs. But they also include risks for the traditional job profiles, especially in the 'brown' sectors with a big ecological footprint .

The processes within the Flemish battery value chain which are subject to change are described below. The trends which drive these changes are also mapped out.

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Which competences the economic actors will require will depend on the choices these businesses make to anticipate the current trends. These strategic business choices are being discussed and linked to the processes mentioned above.
To identify training needs , it is appropriate to identify systematically, step by step, the value chain. It starts with raw materials especially the extraction, refining and processing of the basic components for the electrodes and electrolytes. In practice these processes are executed abroad but there are important commercial activities which take place our country. Thereafter in different steps, the battery cells (unit cell) are produced, combined in the modules (series and/or parallel connection of cells until a desirable voltage and power level) and equipped with a battery management system (BMS) and safety components like fuses . Most of these steps are performed outsides Flanders after which the fished, complete batteries are imported e.g. in preparation for assembly in an electric car, stationary equipment…. To come to the final usable product there have to be performed a couple of steps depending on the end application. If the battery is meant to be used for a transport application, the 'battery pack' has to be built into the chassis of the vehicle during assembly. Until now that was the case for electric buses and passenger cars, but now it is more and more also the case for freight transport. The electromobility is a strong growing market on the one hand because of the strong falling prices of batteries (especially caused by mass production), and on the other hand by technological progress among which digitization and finally because of policy measures. This in its turn also causes a strong demand for charging solutions ranging from slow charging in buildings to ultra-fast charging on the road and specific charging infrastructure for heavy transport applications.
The second group of end applications are static or stationary applications where the battery works to support (balancing) the electrical energy system in the short or medium term, and at various scales. This includes the relatively little home batteries as complementary to a photovoltaic installation, to large 'containers' that can be used on industrial sites scale, e.g. as peak consumption control. Part of these applications are specific digital energy management systems (EMS) which provide the necessary competencies required to obtain optimum performance .

The current battery market still sees the extreme strong growth and development, but there is however already the necessary attention for the end-of-life stage of batteries. At that point there are three options depending on condition or usage history: either the battery can be redeployed as a whole, or just parts of the battery can be re-used (modules or cells), or no part of the battery can still be used and as much as possible reusable material has to be create by recycling the battery. Given the intrinsic value of battery materials, this is in most cases a positive business case and relatively few batteries are dumped in the waste deposit. The re-use of batteries in a circular chain has been taken into account in advance and will becomes further developed and expanded in the future .

Because batteries intrinsic high energy densities, there is at all time an implicit danger present, of which each person handling a battery has to be aware of. Therefore it is important that in all steps of the value chain enough attention is paid to security, specific storage and transport rules, monitoring, etc.

Finally , one can state that the attention in the media mainly goes to battery cells and much less attention is given to the system and usage aspects of batteries. This image needs to be adjusted because all over the value chain, and all the more if one gets to the product and usage phase, one has to think about the complete energy system as in those area’s a lot of local employment opportunities are available.

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To gain insight into the necessary changes in competences in the battery value chain the relevant trends are mapped out, possible business scenarios responding to these trends are analyzed and finally the processes are studied that are influenced by the business scenarios .

These trends, business scenarios and processes are explained in the following paragraph describing the exploratory workshop.

4.2 Exploratory Workshop

The desk research provided the necessary input to prepare the lists of trends, business scenarios and processes to be discussed and completed during the workshop. The interactive workshop was held on January 6 , 2022 and was thoroughly prepared. As for the content the steering group played an important role. The practical organization was done by Flux50, the methodological aspect was guarded by the contractor Mpiris , while KUL -EnergyVille delivered the content support.

4.2.1 Trends

Trends are the most important external transitions in the environment that have an impact on the sector. The identified trends, as displayed below, can be divided in 3 groups in particular :

1. trends through the transition to a carbon neutral and circular economy with ecological and economic effects
2. trends in line with digitization and with a technological impact
3. trends that affect the social developments and have demographic and cultural effects

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Koolstofneutrale en circulaire economie

Disruptieve verandering, die steeds meer op de voorgrond komt

Klimaatverandering
Energie-efficiëntie
Ontwikkeling einde-levensfase batterij meteen opgenomen in waardeketen

Nieuwe technologieën en digitalisering

Disruptieve en versnellende verandering

Snel opeenvolgende innovaties
Elektrificatie
Digitalisering energiebeheer
Thuis- en gemeenschapsbatterijen
Steeds energiezuinigere woningen
Methodes voor dataverzameling en -opvolging

Beleid/regelgeving

European Green Deal
Streven naar open strategische autonomie
Onduidelijkheid bevoorradingszekerheid
Subsidies en incentives
Striktere normering
Gedeelde standaarden?

Economie

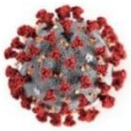
Shift naar diensteneconomie
Sterke groei elektromobiliteitsmarkt
Sterke groei statische toepassingen
Dalende prijzen batterijen
Grote vraag laadoplossingen
Nieuwe tariefstructuren
Energiegemeenschappen

Demografie

Vergrijzing ~ krapte arbeidsmarkt
Stijgend aantal huishoudens

Cultuur

Schonere, stillere leefomgeving
Bewustzijn klanten
Aanspreekbaarheid, verantwoordelijkheid en aansprakelijkheid



Corona

Versnelt trends (digitalisering)
Versterkt bewustzijn risico grondstofschaarste en kwetsbaarheid supply chains

4.2.2 Business Scenarios

Business scenarios are the choices which companies internally make as a response to changing conditions, being the trends as displayed above. Most business scenarios are strategic choices of the companies in response to the trends requiring a turnaround to carbon neutral and circular economy and digitization.

During the workshop the intention was to link the named trends to the possible business scenarios, but this turned out to be a difficult exercise because of the fast changes in the sector . This leads to the conclusion that the battery value chain in Flanders is still a sector under development and that as such it is not possible to

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already define proper generic business scenarios. As a result of this conclusion an important part of the discussion in the exploratory workshop was dedicated to discussing the business scenarios in order to deepen and to refine them, possibly to split them up into more concrete scenarios , looking for missing scenarios.

Below is an overview of the 10 business scenarios which were proposed by the actors in the battery value chain as strategic options:

1. **Developing energy services :** The offered energy services include building EMS of buildings, smart control, usage pattern prediction, integration of mobile and stationary batteries, setting up temporary battery installations for building sites, building and managing energy communities, creating overall system integration concepts: designing complete electric installations in house, sizing , …
2. **Commitment to management and monitoring of battery systems:** Including security, remote monitoring, predictive maintenance , including automotive.
3. **Developing the concept of 'Energy-As-A-Service':** There is a market to act as an advisor to guide clients through the various possible energy solutions, as intermediary between battery suppliers and customers. Informing about how and when batteries are used become, why they are necessary and which applications in industry they are useful. Customers will have to be convinced of certain energy solutions and the importance of energy storage in terms of added value, e.g. to be used in production processes or increase the efficiency in self-consumption.
4. **Create own digital platforms and systems to increase the user-friendliness:** modify existing software packages and merge or develop own systems for processing of data, monitoring or designing installations .
5. **Commitment to modularity :** To guarantee the lifetime and increase the flexibility of energy storage systems components need to be separated and/or combined, components need to be integrated with other technology and regulations.
6. **Developing total solutions:** When solving a problem not only a specific solution needs to be taken into account because looking at the bigger picture and the complete system can lead to a much more complete result. It is key to look for overall smart combination of solutions optimizing the overall specific requirements of the battery system with the optimal individual component features.
7. **Developing the use of AI:** Companies can specialize in developing AI applications that can monitor battery health, optimize power management and at the end of battery life can evaluate the life course of the battery .
8. **Offer after sales service, aftercare, follow -up of installations:** Companies can focus on signing maintenance contracts to maintain battery installations. In addition installations also need to be monitored. This can be done from a distance and/or on site. During the life of a battery installation it is also possible to deploy data - driven services where the battery conditions are constantly evaluated, predictive maintenance can be done and the battery installation can be monitored to predict when the end of life is reached. Businesses can opt for specialization and choose to be in a certain niche in function of the technology (e.g. integration mobile & stationary batteries), the activity (e.g. charging infrastructure), the service provision (e.g. maintenance contracts) or the market segment (e.g. residential , public , large construction projects or temporary recruit).
9. **Developing strategic partnerships:** Also inside battery systems collaboration is crucial to be able to provide a total solutions. Businesses shall need to go into strategic partnerships in addition to their chosen specialization, in order to get the best out of the battery system .

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10. **To strive to circularity :** It will be important to focus on a circular economy to invest in the repurposing and recycling of batteries. With the repurposing of batteries a second life industry shall be developed. For this purpose also the recycling of batteries needs to be scaled up.

4.2.3 The Process

Processes are defined as consecutive steps that allow to achieve results and generate added value as described in Porter 's added value chain model. They are generally recognizable through time (10 years) and are identified based on their specific added value in the specific industry sector. In this study the Flemish battery value chain was used as defined in the VIS LIFEBAT study (see image under 1.1). The process steps in the battery value chain are defined as follows:

1. **Trading battery raw materials and building blocks:** Purchase and sale of raw materials and reusable / recyclable components . These are on the one hand available in mines on the planet and on the other hand they can be created cost-effectively with current technology. Hedging using long-term contracts is common to hedge the risks that are mainly driven by technological and economic developments. An important Flemish player is Umicore, which purchases, processes, sells and conducts research into the strategic importance of purchasing the right raw materials for the right technological development. Solvay is also active in electrolytes such as used in lithium-ion batteries. These are complex products containing different materials, some of which are sensitive to supply risks. Important minerals used as raw materials are ores or oxides containing lithium, cobalt, aluminum, manganese, iron, nickel, copper and graphite. Materials most sensitive to supply risks are lithium and cobalt, and aluminum has the lowest risk.
2. **Design electrodes** : In each battery there are two electrodes present, the cathode and the anode. They have both a different function and usually not made of the same material. The cathode is connected to the positive side of the battery where the current leaves the battery during the discharge. The anode is connected to the negative side of the battery where electric current enters the battery while charging. The material which is used to make these electrodes differs in components and their relative share. It is therefore important to do constant research towards the development of new electrode designs to improve the technology . In that way new designs can lead to more powerful batteries .
3. **Electrode synthesis** : The process of electrode synthesis, producing the electrodes, is fairly automated. The electrodes are made in the correct shapes and the raw materials are converted into electrode materials. The electrodes are surrounded by an electrolyte, usually an acid that allows the ionic charge carrier to conduct well and the whole is then sealed airtight and watertight. No moisture should enter because as soon as it penetrates the cells, unwanted and harmful chemical reactions occur.
4. **Cell assembly and module assembly** : The battery production process can be split be in on the one hand cell assembly and, on the other hand , module assembly (= packs assembly) where the cells are composed in bigger units like for example home batteries become.
    a. Cell Assembly is a complex and long lasting process with strict requirements related to environmental conditions since temperature, humidity and purity have a considerable influence on the quality, safety, performance and lifespan of the cells. Thereby the production process is also very energy intensive. The cells are assembled and sealed . The cell assembly happens currently mainly in other countries , namely China, South Korea and Japan.
    b. Compared to cell production is the assembly of battery packs and modules a less complex and energy-intensive process. In the battery packs mostly also additional components are used such as a BMS and security components . They are assembled either by a cell manufacturer

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and then delivered at, for example, the car manufacturer, either they are assembled by, for example, the car manufacturers self .

5. **Assembly (off the shelf) containers/ systems (incl. repackaging)** : A separate process within battery production is container construction. It has important safety requirements with regard to transport because those modules are produced locally (in China) so large and custom-made after which they need to be transported. When assembling the packs, the modules are combined with the BMS, inverter, rectifier, charge controller. Most traction batteries also require a thermal management system to equalize temperature gradients between cells, to cool the batteries, and to prevent thermal runaways and battery destruction from overheating. The BMS is required because the cells fail if they are overcharged, completely discharged, or outside their safe temperature window. BMS ensure the optimal utilization of the battery cells, can guarantee safe operation, maximization of energy and increased lifespan. The BMS and electrical system includes circuit boards for battery modules, a high voltage system including a battery interface system, and a low voltage system, as well as cables, fuses, connectors and gaskets. In the future, BMS will be decentralized and contain smarter cells with limited cabling, designed for the circular economy. Fast(er) charging is made as reliable as possible through additional measurements and thermal management. The BMS is reconfigurable and can be repurposed for second life applications.
6. **Development of EMS inverters , converters ... (hard- and software)** : The batteries are integrated in an energy system, with an overarching control system, the EMS. The hardware interface between the batteries and the power bus consists of a power electronic converter (“converter” or “inverter”). Here is a big difference between hardware and software. Production development and production in software are two processes that are inextricably linked. Whereas with hardware, the focus is first on product development and its production only takes place in the next stage.
7. **Production of hardware components** : In line with the development of EMS, inverters , converters , with an emphasis on production of functional whole systems rather than their constituent components .
8. **Pre-sales** : People and/or companies need to be informed about how and when batteries are used, why they are necessary and for which applications in industry they are available. There is a big market to act as a consultant and there will also be created a demand for employment in specific sectors .
9. **Technical sales (incl. system engineering) of custom-made battery solutions B2B excl . Automotive** An analysis of the needs of the user takes place, after which a design is drawn up to offer solutions. That is a relatively short development process based on which components (cells – EMSs) are available on the market, the calculation (what is the cost price and what are the payback effects?) and finally closing the sale.
10. **(Technical) sales commodity battery solutions / charging stations B2C** : Based on an analysis of the user's needs, a solution is designed (system engineering), a cost calculation is made and an analysis of the payback effects is done in order to close the sale, e.g. applied to the charging (post))solutions.
11. **Assembly and installation of custom-made battery solutions B2B** : After the analysis and sale, the tailor-made battery solutions are assembled and installed. This is done including a safety inspection, commissioning, adjustment, programming control. Packing the batteries is part of this process and subject to changing and stricter regulations depending on the environment where the batteries are installed. This has an impact on the insurance of the installation or the building.

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12. **Installation commodity solutions B2C (e.g. charging stations , home batteries)** : Practical on-site installation of batteries that are not custom made, but are a commodity solution. In addition to the installation, a safety inspection, commissioning, adjustment and programming for control are also carried out.
13. **Assembling batteries in vehicles (automotive):** The 'containerization' or installation of the battery in a vehicle (excluding charging stations), wider than EV: buses, trucks, forklifts, agricultural machines, etc.
14. **Control (monitoring) and optimization exploitation battery solutions :** This process includes quality and safety checks, fine-tuning EMS, reading BMS, evaluation of the (residual) value with the aim of optimizing the system.
15. **Transport & storage batteries (and battery components)** : This process also includes the applications of electric transport (electric cars, trucks and buses) as well as small and large electric energy storage.
16. **disassembly battery solutions and extraction materials / raw materials** : In view of material scarcity and the importance of circularity, efficient recycling processes are becoming increasingly important for optimal recovery of finite minerals and energy- and pollution-intensive materials. In principle, metals are infinitely recyclable, but in practice recycling is often inefficient or essentially non-existent due to the constraints imposed by social behavior, product design, recycling technologies and the thermodynamics of separation. After a battery no longer works optimally, the BMS is read to evaluate its condition. After checking the cells, it is checked whether the battery as a whole should be reused or not disassembled. For example, a car battery can enjoy a new life, a repurposed battery, as a static battery, used for balancing renewable energy or peak management. If necessary, after checking, the good cells can also be repacked or the materials recycled by melting them in a blast furnace and then filtering them out.

Importantly, the selection of processes takes into account the impact on employment of highly skilled workers, one of the focus groups in this study. Therefore, all the above processes were valued in function of the research question by means of a Mentimeter vote during the workshop. Per process, 7 criteria were rated from 1 to 5 as shown in the table below. High ratings from score 4 are indicated in dark green. The scores for processes 7 and 8 were added later.

	Processes / Valuation Criteria	Sector specificity	Employment total	Employment Higher educated	Strategic interest	Knowledge intensity	Subject to change	Overall average
1	Trade in battery raw materials and building blocks	3	1.94	2.25	2.88	3.62	3.75	2.91
2	Design electrodes	4.47	1.2	4.13	2.27	4.3	4.2	3.43
3	Electrode synthesis	4.25	1.83	3	2.42	3.08	3.83	3.07
4	Cell Assembly & Module Assembly	3.92	2.67	2.25	3.25	2.75	2.82	2.94
5	Assembly (off the shelf) containers/ systems (incl. repackaging)	4.08	3.38	2.69	4.31	3.54	3.69	3.62

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6	Development EMS inverters , converters (hard- & software)	4.15	3.46	4.31	4.31	4.69	4.46	4.23
7	Production of hardware components							
8	Presales (' evangelism ')							
9	Technical sales (incl. system engineering) of custom made battery solutions (excl . automotive) (B2B)	4.36	3.71	3.57	4.36	4.29	4.23	4.09
10	Technical sales (incl. system engineering) of battery solutions for automotive applications	3.71	1.57	4	2.43	3.71	3.69	3.19
11	Technical sales commodity battery solutions / charging stations (B2C)	3.47	3.8	2.2	3.4	3.13	3.27	3.21
12	Reassembly & Installation custom made battery solutions (incl. safety inspection , commissioning , adjustment , programming control) (B2B)	4.13	3.13	2.93	3.73	3.87	3.8	3.60
13	Assembly batteries in automotive equipment	3.93	2.47	2.27	2.87	2.8	3.13	2.91
14	Installation commodity solutions (B2C) (e.g. charging stations , home batteries)	3.33	4.07	1.67	3.67	2.73	3.21	3.11
15	Control (monitoring) and optimization exploitation battery solutions	4.54	3.38	3.92	4.46	4.08	4.42	4.13
16	Transport & storage batteries (and battery components)	3.54	2.54	1.23	3.46	2.38	2.77	2.65
17	disassembly battery solutions and extraction materials / raw materials	3.67	2.67	2.33	3.75	3.5	3.67	3.27

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4.3 Conclusion Preliminary investigation

The steering group validates at the meeting of 1/2/2022 next conclusions from the preliminary investigation (report in annex):

- Batteries are a key technology for carbon neutral mobility and energy storage in the electricity system.
- The multidisciplinary aspect of the 'battery world', which makes it difficult to define it as a single sector and has the context of a sector in full development.
- Many local employment opportunities across the value chain, especially in the product and use phase.
- Further development of the market requires qualified workers with specific competences, which confirms the relevance of the research project and specifically the competence forecast.
- More attention needed for system and usage aspects:
    - Strong growth in the electromobility market
    - Strong growth in static applications
    - High demand for battery solutions
    - Already developing end-of-life phase: circularity in processes
    - Strong attention to safety, specific transport and storage rules, monitoring, etc.

The Steering Committee confirms the trends and business scenarios as described in this report under 4.2.1 and 4.2.2 and validates the conclusion that the battery value chain in Flanders is still developing to such an extent that the business scenarios can be described more generically. In addition, it is difficult to understand how changes in competences can be defined within such a young sector. Therefore, a clarification of the research approach is proposed, which is explained in the next chapter 4.3.1.

Below is an overview of the 10 business scenarios, i.e. the internal business decisions that are taken in function of the identified trends:

1	Eigen digitale platformen en systemen creëren in het kader van gebruiksvriendelijkheid
2	Inzetten op modulariteit
3	Inzetten op beheermonitoring batterijsystemen
4	Inzetten op gebruik AI
5	Inzetten op totaaloplossing
6	Inzetten op energiediensten
7	Aanbieden dienstverlening na verkoop, nazorg, opvolging
8	Inzetten op specialisatie
9	Inzetten op strategische partnerships
10	Streven naar circulariteit

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4.3.1 Clarification of the research approach

During the first Steering Committee meeting of 1/2/2022 (report in attachment), research firm Mpiris asked the question whether the research design as described in 2.2 methodology can be realistically implemented for a sector in full development, as was apparent from the preliminary study. Especially because in such a rapidly evolving context, business scenarios and changes in competencies are rather difficult to define.

The Steering Committee therefore decided to perform the classic competency forecast with a sector-specific focus using equivalent processes from other sectors, which is more in line with the development phase of the sector. It is a standard methodology to identify the battery-specific future-oriented competencies through more focused survey and better matching with the companies in the sector. This makes the research results more relevant for a wider segment of companies in the battery value chain.

This clarification of the research approach was submitted to ESF by means of a memorandum on 15/2/2022 and approved after additional explanation on 23/3/2022. A detailed explanation of this clarification and the arguments are included in the report of the Steering Committee meeting 1/2/2022 (in attachment).

4.3.2 Selection processes

The following 4 processes were selected by the Steering Committee on the basis of the valuation exercise:

1. Development of the components of the EMS, converters, … (hard- and software)
2. Assembly (off the shelf) systems incl. repackaging (B2B, automotive: containers)
3. Technical sales (incl. system engineering) of custom-made battery solutions (B2B, automotive)
4. Control (monitoring) and optimization exploitation battery solutions

The detailed description of these processes can be read in chapter 4.2.3. The lists with the competences of the selected processes are included in appendices.

4.3.3 Selection of the companies

The list of companies active in the Flemish battery value chain was supplemented by the members of the Steering Committee. They also indicated their role in the value chain by linking the companies to the processes. In this way we were able to identify the relevant companies for further analysis. The overview below thus illustrates the importance of each process in the Flemish value chain based on the active companies:

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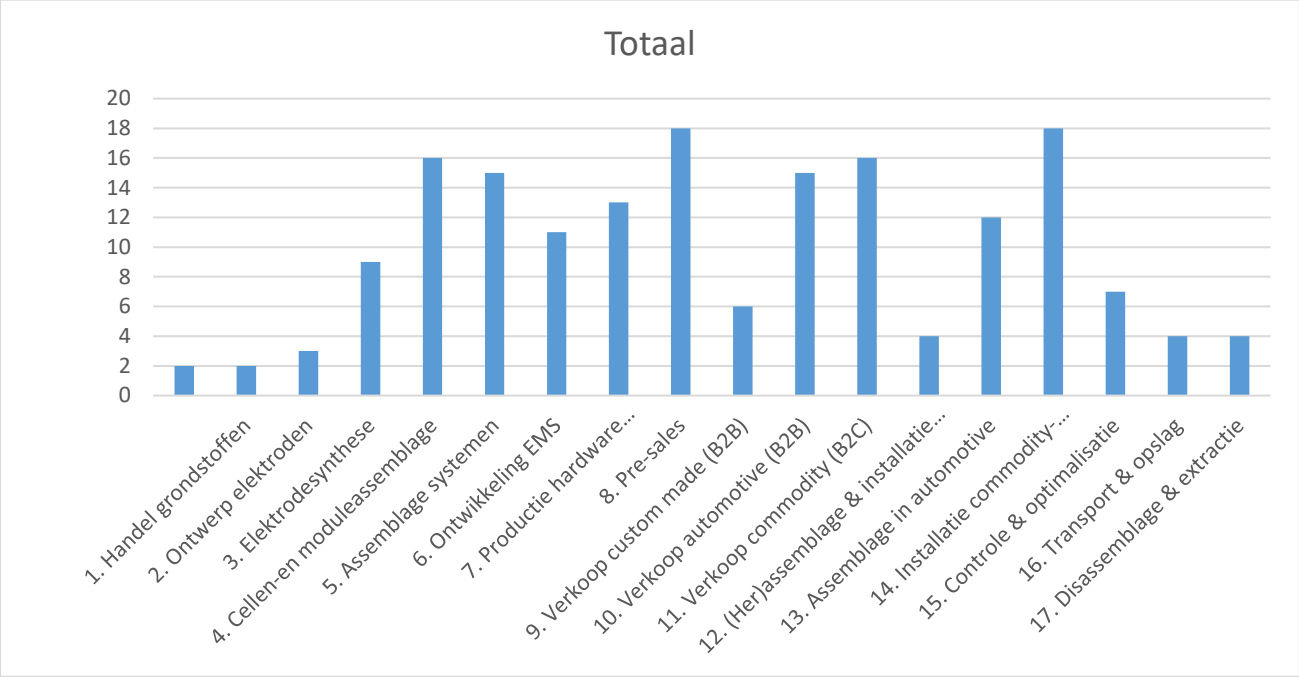

1. Trade raw materials

Bebat , Novali

2. Design electrodes

Audi, Nevalic

3. Electrode Synthesis

Audi, Exide , Novalic

4. Cells and Module Assembly

Audi, 247 Energy, Alfen , Altreonic , BatterySupplies , Exide , Novali , Posetron Energy, Watt4Ever

5. Assembly systems

Volvo, Audi, Posetron Energy, CET Energrid , Alfen , 247 Energy, Futech , Altreonic , BatterySupplies , Exide , iLumen , Izen , Novali , SDME, Sunbat , Watt4Ever

6. Development of EMS

Audi, Alfen , Futech , Posetron Energy, CET Energrid , iinno Benelux, Izen , Octave Energy, ReVolta , Volvo, 247 Energy, Altreonic , aug-e , Lifepower , SDME

7. Production hardware components EMS

Alfen, Posetron Energy, CET Energy, Volvo, Octave Energy, SDME, Lifepower, Futech, Audi, Altreonic, 247 Energy

8. Pre-sales

Alfen, Posetron Energy, Octave Energy, Futech, CET Energrid, Altreonic, 247 Energy, Riello UPS, Izen, inno Benelux, Bluesky, Aug-e, Audi

9. Verkoop custom made (B2B)

Alfen , CET Energrid , Altreonic , 247 Energy, Posetron Energy, Octave Energy, Lifepower , Futech , Watt4Ever, Sunbat , SDME, Novali , Izen , iLumen , iinno Benelux, Bluesky , BatterySupplies , aug-e

10. Automotive sales (B2B)

Volvo, Audi, Alfen , Novali , iinno Benelux, 247 Energy

11. Sale commodity (B2C)

Futech , Alfen , Posetron energy , Izen , 247 Energy , Riello UPS , Octave Energy , Lifepowr , BatterySupplies , CET Energrid , iinno Benelux, iLumen , Volvo, Bluesky , Audi

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12. (Re)assembly & installation custom made solutions (B2B)
Futech , Alfen , 247Energy, Watt4ever, Volvo, Posetron Energy, Novali , iLumen , iinno Benelux, Audi, batterySupplies , Sunbat , CET Energrid , Octave Energy, aug-e , Altreonic
13. Assembly in automotive
Volvo, Audi, Bluesky Energy, Alfen
14. Installation commodity solutions (B2C)
Posetron Energy, Izen , iinno Benelux, Futech , Volvo, Octave Energy, Lifepowr , iLumen , Audi, Altreonic , Alfen , 247 Energy
15. Control & Optimization
Futech , CET Energy, Audi, Lifepower , Alfen , Volvo, SDME, Posetron Energy, iLumen , iinno Benelux, GEP, Altreonic , Bebat , Riello UPS, Fluvius , Octave Energy, aug-e , 247 Energy
16. Transport & storage
Bebat , Volvo, Audi, Watt4Ever, inno Benelux, Futech , Alfen
17. Disassembly & extraction
Bebat , Watt4ever, Sunbat , Volvo
Without process
Rensol , Hoppecke , CKS, Bright Energy

5. Analysis phase

The analysis phase constitutes the actual investigation of the focus study . What in the first phase was brought on the surface, will now be analyzed in detailed with a view to changing competence and training needs. The information about the competence needs is first collected on the basis of company visits and interviews. This approach and working method was worked out explicitly prior to the implementation .

In order to detect the competence needs in the future, it is needed to analyze the available the training offer and then compare it with the results of the interviews to detect the gaps. This final analysis is explained under point 5.2.

5.1 Detailed interviews

Based on the 4 selected processes and the companies active in them, 24 interviews are scheduled to map out the specific competencies needed in these processes. For this purpose, the interviews are divided among the project partners and scheduled. The research bureau Mpiris drew up an interview guideline to support the project partners in arriving at the desired output. In addition, a competency list was drawn up for each process on the basis of parallel processes in another sector (details about this in the report of the Steering Committee meeting dated 1/2/2022).

5.1.1 Conducting interviews

The schedule of the interviews at the selected companies is shown below. For each interview, 1 process is discussed based on the generic competencies of the competency list, which are reviewed 1 by 1 with the question of what the battery-specific interpretation of this competency is.

The interviews were divided among the project partners who indicated that the exchanges were fascinating and instructive, valuable experiences for both parties.

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Development components EMS	Assembly	Technical sales	Control and optimization
iinnoBenelux (Hasselt, 22/3)	Volvo Trucks (Ghent, 1/3)	Altreonic (Heverlee , 17/3)	iinnoBenelux (Hasselt, 10/3)
CET Energrid (Genk, 23/3)	247Energy (Antwerp, 3/3)	Octave Energy (Brussels, 8/4)	iLumen (Tessenderlo, 18/3)
ReVolta (Brussels, 25/3)	Near Grid Solutions (Lokeren, 8/3)	247Energy (Antwerp, 12/4)	CET Energrid (Genk, 18/3)
Enervalis (Woodhalen , 14/4)	CET Energrid (Genk, 23/3)	alfen (Ghentbrugge, 6/5)	Audi (Brussels, 11/4)
Condogo (Antwerp, 21/4)	alfen (Ghentbrugge, 6/4)	Volvo Trucks (Brussels, 10/5)	Lifepower (Antwerp, 14/4)
Posetron Energy (Pear, 27/4)	CKS (Dilsen-Stokkem, 15/4)	Bluways (Leuven, 31/5)	Posetron Energy (Pear, 27/4)

5.1.2 Interview conclusions

Based on the interviews, recordings and notes, the competencies, influences & selected business scenarios are identified and reported in a user-friendly dynamic pivot table and sheets with detailed explanations per competency (delivered with this final report). Based on this report, the main lines of each process are analyzed, in particular the elements that repeatedly come up during the interviews.

In summary, two general conclusions can be drawn from the study:

On the one hand, a number of competences have been identified that are explicitly battery-specific and that can form the focus for companies that want to further develop their skills in certain processes or parts thereof, as well as for education providers who, by including these specific competences in existing or new training courses, can help support the development of the battery value chain in Flanders.

On the other hand, a whole range of non-battery specific needs have been identified, which caused some concern among some interviewees. However, this conclusion is also competence-oriented and indicates that the battery value chain also needs more general competences (often referred to as 'soft skills', such as communication and collaboration skills). This conclusion is relevant for the developing sector because a whole series of profiles come into view that may not have been thought of before. By comparing with comparable processes in other sectors, shifts in competences have been identified that can (co) steer the recruitment process in the battery value chain.

This twofold conclusion is a strong foundation for the action plan that the Steering Committee members will brainstorm on later in the meeting (see 6.2).

The main conclusions of the 4 selected processes, which form the basis of these two conclusions, are described below:

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Process 1: Development of the components of the EMS (hard- and software)

1. Mutual needed insight into hardware and software
2. Hardware related : importance flexibility of designs
3. Software related : both embedded if cloud based programming , modeling competences , increase importance of information security
4. Need for efficient collaboration (modularity , documentation)
5. Need for testing takes please , because of increase complexity and risks
6. Importance of communication skills in front of development teams , often international spread
7. Development of " manuals " for installers: who shall this one make up ?

Process 2: Assembly (off the shelf) systems incl. repackaging (B2B, automotive: containers)

1. More importance on knowledge and applications of the safety regulations
2. Mastering the manual assembly techniques stays necessary (classic , limited number)
3. Degree of automation depending on choice of battery technology , the development phase of the company and the assembly volumes
4. Evolution to a common language (English)
5. Communication about the work process, in particular reporting and testing, requires basic digital competences
6. Collaborate with subcontractors facilitates market development
7. Knowledge transfer and building a knowledge base become a general organizational competence

Process 3: technical sales (incl. system engineering) of custom-made battery solutions (B2B, automotive)

1. Basic knowledge as building block in combination with a fast learning ability
2. Commercial / Economic profile in function of market knowledge (international), application domains, technological and energy trends
3. Trust and network relationships are very crucial
4. Require complexity and variability (in the absence of history) They require more flexibility , communication and collaboration skills
5. Standards , legislation and safety should be known within the team
6. Internationalization (partly) determines the competence needs
7. Work towards evangelism of the battery applications/(mobility) consultancy

Process 4: Control (monitoring) and optimization exploitation battery solutions

1. Quality control follows safety regulations (battery technology specific)
2. Specialist knowledge in function of dummy proof quality control (data)
3. Collaboration with subcontractors facilitates market development
4. Knowledge transfer and building a knowledge base become a general organizational competence
5. More interdisciplinary communication necessary
6. Evolution to a common language (German)
7. Fast evolving market : importance of customer-driven services, agility and regulations

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4.1.3 Selection business scenarios

The result of the (limited) survey about business scenarios confirms the previous choice of the Steering Committee not to define the research on the basis of strategic choices , but to offer the space to a range of possibilities that the developing sector exploring is still exploring .

This one conclusion is reflected in the broad choice of interviewee companies , which found it hard to answer their top 3 demand in the coming five year: about all business scenarios were mentioned.

Below is the overview of the top 3 chosen business scenarios :

BS1	**Betting on batteries**	**24**		**24**
		Top selection	In top 3	Impact on competencies
BS2	Create own digital platforms and systems in the context of user-friendliness	1	3	3
BS3	Betting on modularity	6	9	8
BS4	Focus on management and monitoring battery systems	2	5	5
BS5	Betting on the use of AI	3	6	6
BS6	Bet on total solution	2	12	11
BS7	Bet on energy services	4	7	7
BS8	Offer after -sales service , aftercare , follow -up	2	9	8
BS9	Bet on specialization	-	4	4
BS10	Bet on strategic partnerships	3	9	8
BS11	To strive to circularity	1	8	8

One in two companies mentioned 'total solutions', 9 companies called 'energy services' (indicating the choice to go beyond pure battery technology) and 'strategic partnerships' (including an important role for subcontractors and non-battery companies that participate develop services). “Circularity”, which has only been placed at the very top once, is ranked in the top 3 by one in three of the companies interviewed – again confirming the industry's ongoing exploration of forward-looking development opportunities.

In terms of the impact on the necessary competencies, this is confirmed across the board: any strategic choice will affect the competencies required to further grow the sector, so competency development is what the battery value chain as a whole should focus on.

5.2 Analysis of training offer

The training offer that meets the necessary competences in the battery value chain is examined by the research partner EnergyVille/KULeuven. The comparison of the current training offer with the

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future competence needs will provide insight into the training that is missing and the competences that are insufficiently taught.

To this end, the study programs on the one hand and the educational institutions and training centers on the other hand are examined. In this analysis, internal company training is therefore not taken into account. Relevant training courses that came to light on the basis of the company visits were further examined in terms of content, as were best practices from abroad. The overview of the existing programs is included as an appendix. A total of 120 courses have been inventoried concerning 9 education providers and 13 levels:

- Secondary Education: TSO (6), TSO Dual (1), BSO (9), BSO Dual (3), DBSO (6)
- Higher Education: Graduate Program (HB05 - 3), PBA (6), Ma (6), ABA (4), Manama (1)
- Courses (47), Vocational Training (21), Syntra Apprenticeship (7)

If the courses are classified per examined process, this provides the following overview:

- Process 1 Designing components EMS: 25
- Process 2 Assembly: 77
- Process 3 Technical sales: 25
- Process 4 Control and Optimization: 65

5.2.1 Conclusions analysis training offer

This gap analysis of the training offer also results in guidelines that complement the decision-making process of this study.

The following conclusions are validated by the Steering Committee on 21/6/2022 (report attached):

1. Need for basic knowledge of electrical engineering & safety
2. Need for tech writing (for manuals)
3. Interest in offering “the bigger picture” of the energy transition

Actions that could result from this include:

- Support STEM campaigns
- Update secondary education curricula
- Use existing offer in training centers and day education (limited implementation due to shortage of trainers)
- New offer: basic module 'energy transition'

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6. Decision Making

On 21/6/2022, the Steering Committee unanimously validates the results of the research described in the recommendations below. The results are called “advantageous, useful and valuable” because they reveal what is possible in the industry, in particular that the area’s to reach and direct people to the industry is much broader than what was previously thought.

6.1 Recommendations

The recommendations below result from the conclusions of the detailed interviews in the analysis phase. They were elaborated and written by the research agency Mpiris in an iterative process with the Steering Committee and the client Flux50 and finally approved during the closing Steering Committee meeting on 29/8/2022. These recommendations form the basis for drawing up the Action Plan (see 6.2).

6.1.1 Business-scenario’s

Almost all business scenarios are covered in the selection of the interviewed companies, so the exploration of future-oriented development opportunities is in full swing. In terms of impact on the necessary competences, this is confirmed across the board: every strategic choice is expected to influence the required competences to allow the sector to grow further. It is therefore recommended that the battery value chain as a whole focuses (further) on competence development.

6.1.2 Competency development

With regard to the interpretation of this competence development, the detailed study provides three general recommendations.

To start with, a number of competencies have been identified that are explicitly battery-specific. Due to the battery-specific focus in this competency forecast, these competencies are often captured in equations (“more”, “more important”, etc.) that define battery specificity compared to similar processes in other sectors. Companies that want to become more proficient in certain processes or parts thereof, will have to focus on acquiring and/or developing these battery-specific competencies. The same recommendation applies to education providers: in order to (co-) support the development of the battery value chain in Flanders, they will have to include these specific competences in existing or new courses.

Second, a whole range of non-battery-specific needs have been identified that are also competence-oriented and indicate that the battery value chain also needs more general competences that can be categorized under the heading of 'soft skills', such as communication and collaboration skills. The recommendation to pay the necessary attention to this is important because a whole series of profiles come into view that may not have been considered before. By making a comparison with similar processes in other sectors, it has become clear which non-battery-specific competences can (co) steer the development and recruitment process of the battery value chain.

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The third general recommendation concerns competence needs that were emphasized in almost all interviews. In order to make a real difference in the further development of the battery value chain in Flanders, it is recommended that (at least) these needs are answered in the Action Plan to be drawn up. It is about:

- The lack of basic knowledge of electricity in the different levels of education.
- It is crucial to know and act on the specific safety risks of working with battery and energy storage systems.
- The increasing need for high-quality 'tech-writing', to understand this as well as the translation of highly specialized knowledge into realistic instructions, step-by-step plans and other instruments to properly support employees in their work processes.
- The increasing expectation, due to the rapid developments in the sector, of flexibility, learning capacity and willingness among employees.

The main findings in terms of competence needs and expectations are explained below. In accordance with phase 2 of the competency forecast, the detected challenges are presented per process in which they were identified during the detailed interviews. This provides the companies with a focus to (further) develop the processes in which they operate in a competency-oriented way. All of the recommendations form the basis for the Action Plan.

Conclusions for the process of developing the components of the EMS (hard- and software)

- In the still developing Flemish battery value chain, it is useful to limit own developments to components that provide added value compared to existing products. For this identification of possible added value and thus the (further) development of the company's distinctive position, both hardware and software developers need to be well aware of what is available on the complex and rapidly evolving (international) EMS market.
- For the development of EMS components, there is a need for electrotechnical profiles with reasonable IT knowledge, or computer scientists with a reasonable knowledge of electricity. The most frequently mentioned competency complaint throughout all the interviews is that the basic knowledge of electricity is often lacking in the various levels of education. It is especially difficult for small companies (start-ups) to recruit people with specific technical experience. Good and broad basic knowledge during recruitment is therefore important so that self-training or training for battery-specific knowledge can be used.
- Programming knowledge is necessary and evident (including the ability to model digital twins) but not the most important competence. Given the importance of the architecture at the system level, being able to control system components with communication protocols is crucial. This includes a good knowledge of the specifications and preconditions of the controlled components (including the battery).
- Developers must be aware of the standards, guidelines and legislation that apply to electrical installations. Specific for systems with batteries are the presence of DC voltage and increasingly higher

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voltages (>750V). Fire safety and the ability to estimate environment-related risks are also expected competencies.

- The data in EMS systems is semi-sensitive. A basic knowledge of privacy and GDPR legislation is expected. Software developers must have a deeper understanding of the relevant legislation and follow it closely. Cybersecurity is regarded as a basic competence.
- Software develops quickly. In state-of-the-art EMS solutions, control techniques based on machine learning and artificial intelligence (AI) are becoming increasingly important. These are relatively new techniques that are not yet standard in technical curricula.
- Since mutual understanding of hardware and software developments is essential, communication and collaboration skills are also crucial: EMS development, programming and testing often takes place across multiple development teams in different countries (and time zones). IT professionals are generally more focused on individual work. If the training does not evolve towards teamwork (including documentation skills), this is an important guiding and coordinating role for their supervisors.
- Sufficient and appropriate manuals for assemblers and installers will have to be drawn up to enable upscaling. The highly coveted competency of 'tech-writing', which is currently unused in the existing training offer, must also be accompanied by didactic skills within the company (see also below).

Conclusions for the process of assembly (off the shelf) systems incl. repackaging (B2B, automotive: containers)

- The assembly of battery systems requires little or no prior knowledge. Because the necessary knowledge about the functionality of the components and their importance in the system can be acquired on the shop floor, this offers recruitment opportunities to attract non-traditional profiles, people from other sectors or groups with a certain distance from the labor market. An important competence is the willingness and ability to learn, including the ability and willingness to closely follow internal instructions and procedures.
- The safety aspects of battery systems require a good knowledge of the specific risks, PPE and safety regulations. The on-the-job training must also include basic electrical knowledge, the practical applications (such as alarm signals and escape routes), and sharpen the sense of responsibility for one's own safety and that of colleagues.
- In a developing sector such as the battery value chain, many developments can be expected such as new battery options, expanding automation or a growth in assembly volumes. It is important to stimulate sufficient flexibility among employees for future work of a different kind, for example in differently composed teams, with new materials, machines, products and the related safety regulations. A willingness to continue training on a regular basis is also expected.
- As a growth sector in a developing market, Flemish battery companies regularly look for the necessary competencies from permanent subcontractors. Bringing their work into line with the requirements of the company requires the necessary attention to the development of instructions, safety and quality

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procedures and possible training (tech writing). This means a shift in the duties of eg the supervisor or the product leader or the need to invest in employees with didactic and communication skills.

- Reporting to the assembly lines will become increasingly digital. It is therefore necessary that every employee has a certain basic digital competences and is able to report correctly via digital applications.
- The workplace will become increasingly international. This requires attention to a sufficient command of a common language to, for example, understand work instructions, report safety problems and participate in meetings.
- It is necessary to closely monitor new evolutions in components, products, materials and working methods. By encouraging internal knowledge sharing and formalizing feedback processes, knowledge transfer and assurance become organizational competencies.

Conclusions for the process of technical sales (incl. system engineering) of a custom made battery solution (B2B, automotive)

- In the long run, (at least) two possible 'specializations' can be expected in the technical sales process of battery solutions: a more economic service and a more consultancy-oriented service. On the one hand, it is expected that the sales team will focus on mapping the competitive landscape and play a proactive role in the (international) energy market in function of the company's distinctive position. This requires a strong analytical capacity driven by technical know-how, which, among other things, understands the functioning of different industrial sectors (mining, drones, heavy or light vehicles, etc.) and can extrapolate from one application domain to another. These competences are usually acquired through experience (“on the job”).
- On the other hand, the function of the sales team is evolving into a (mobility) consultancy process in which new and complex concepts in a simple frame of reference gradually 'train' the customer in the new market of electrification. The competences expected here are mainly accessible and understandably fitting knowledge transfer into a commercial dialogue that makes the added value of the company explicit in a story personalized for the customer. In order to bring this 'evangelistic mission' to a successful conclusion, the acquisition of knowledge and keeping up-to-date with the rapid developments (preferably supported by internal training and guidance) will have to form a larger part of the sales staff's time commitment.
- Even more than in a 'classic' sales process, the emphasis in technical sales of a battery solution is on the customer relationship: being able to build and maintain (or extend) trust throughout the entire (often lengthy) process. This competence is based on (at least) three pillars: basic technical insight into (the broad outlines of) energy systems, being able to correctly assess the position of the customer (including possibly unrealistic expectations) and (functional) knowledge of the offer and operation. from the company.
- The content of the sales function is related to the development of the company itself. This means possible adjustments to the range of tasks in case of an expansion of the company, e.g. with an R&D or specialized technical team, or with a stronger emphasis on international activities. When developing within the company, ample attention must therefore be paid to the timing and impact of

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shifting tasks. Also because there is little standardized information available for customization, the sales employees are expected to have great flexibility and a strong adaptability.

- Communication is a naturally required competency. This also involves coordinating the often complex interaction between different teams on the customer side and their own technical, financial and/or legal teams. A larger part of the sales employee's duties will therefore be spent on consultation, collaboration and coordination. In addition to correctly assessing the possibilities and limits of one's own competences and switching flexibly between the different types of expertise available, presentation and written communication skills are also expected.
- The digital competences expected in the battery value chain are comparable to those in other (technical) sales processes. Because the process often takes longer, the structural and systematic registration of all generated data and the documentation of the customer relationship are all the more important. In the long term, a far-reaching digitization is expected, whereby the complexity of existing tools will increase and new tools will be introduced. It is then important to further develop the existing digital skills, including the flexibility to integrate new software into the work process.
- Internationalization has an impact on the expected competencies. If the company is (mainly) active internationally, knowledge of subsidy measures and financing options and performing measurements are no longer part of the range of tasks. As a result, the emphasis shifts even more to the assessment and decision-making capacity (funnel function) of the sales employee.

Conclusions for the process of control (monitoring) and optimization of the operation of battery solutions

- In the still developing market for battery solutions, it is not so much the products or the data, but the user needs that have to be identified and translated into a commercial offer. This non-battery-technical but economic approach requires commercial profiles that closely follow trends, legislation and regulations and the market, have a strong feeling with end users and invest in a pre-sales advisory function. In the short term, it is expected that awareness raising about community solutions will also gain in importance.
- It is also necessary for the control and optimization process to closely monitor new evolutions in components, products, materials and working methods. In addition, it is important to develop a methodology that facilitates the internal information sharing between the different teams and the onboarding process of new entrants in the battery value chain, e.g. by developing a user-friendly, visually oriented communication platform. In the rapidly changing battery market, it is necessary for knowledge transfer and assurance to evolve into organizational competencies.
- Defining, writing and testing the safety and maintenance plans requires detailed electrical knowledge, strong programming skills and knowledge of cybersecurity. Because quality measurements have to be determined per solution and the current variety of battery solutions will increase in the future, the competence expectations with regard to this profile will also increase, including keeping battery-specific knowledge up-to-date. In addition, various parties are often involved (see below), which means that the overarching safety coordination, project management and didactic competences are also part of the range of tasks.

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- Quality checks are usually performed by external subcontractors. In order to align their work with the requirements of the company, that execution must be made as dummy-proof as possible. The strong automation and digitization that results from this require the development of (short) training courses, instructions and step-by-step plans ('manuals'). The specific safety risks of checking battery systems must be given critical attention. The highly coveted competence of 'tech writing' is currently unserved in the existing training offer. In addition, there is a greater need for didactic competences.
- For the development of data-driven services, partnerships with specialized companies are often opted for. On the one hand, it concerns data storage, management and infrastructure, and on the other hand, it concerns the translation to the level of the end user. This requires internal employees who can explain a battery system to non-battery specialists or the expectations of the end user without detailed battery knowledge. Conversely, they must be able to empathize with data management or the visual representation of data sets. More time in the range of tasks will therefore be spent on coordination and consultation, with an increasing importance of interdisciplinary communication.

6.2 Action plan

This Action Plan was established through various consultation and feedback moments. The Action Plan was placed on the agenda of the Expertise Unit meeting (Steering Committee meeting 3, 21 June), and Steering Committee meeting 4 (30 August).

- During the meeting of the Expertise Unit, the research results, in particular the Recommendations or Guidelines, provided inspiration for the brainstorming session. In pairs, the Steering Committee members provided targeted input for each track (informing and raising awareness, deepening and training). The feedback to the plenary session resulted in further additions and details.
- On the basis of the results of the brainstorming session, supplemented with the expertise from previous competence forecasts, Mpiris developed a provisional Action Plan.
- In a consultation meeting with Mpiris, Flux50 refined the draft Action Plan and defined its own commitment to specific actions.
- In preparation for Steering Committee meeting 4, this draft Action Plan was sent to the members to complete with their own commitments and further details.
- The discussion of the completed draft Action Plan and the obtaining of advice on this from the Steering Committee formed the content of the meeting. This resulted in further refinements, the deletion of actions for which no or insufficient commitment could be obtained and more detailed objectives for the actions that are retained. This extra input allowed us to finalize the draft version in the present Action Plan.

Flux50 as promoter of this project takes some of the actions below and intends to integrate them as much as possible in the implementation of other related European projects in which it collaborates with partners who are also members of the Battery Academy Steering Committee. In this way, sufficient capacity in time and resources can be provided for an effective elaboration of the actions. Below are some examples of projects in which Battery Academy's actions can fit:

- the VOBAT training modules on batteries to be developed in 2022 by Green Energy park and VOKA. The first modules will be offered in the autumn of 2022.

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- EDI-H project, Energy in the build environment, led by VITO with educational institutions and the Flemish Construction Confederation. At the time of writing, this project is still in the approval phase, but with a view to a positive evaluation, a kick-off event is planned in January 2023.
- AMVELC (INTERREG), Labor Market Demand-driven Energy Learning Community - massive open online training courses on storage technology, application pending.
- MERIC (ERDF), Mobile extended Reality for Installation companies, as an implementation of training courses for VR applications led by eitInnoEnergy, GEP and VOLTA. The investments are planned for the spring of 2023.
- EVERY1 (HorizonEurope), Broad awareness training on the energy transition, digitization and renewable energy, with an international consortium.
- Training of the future (ESF), 2 new training courses provided for Energy Community Coach on the one hand by Evergi and Green Energy Park and on batteries by VOLTA and Green Energy Park.
- AP-COVE (Erasmus+), Training Center on Digitization in the Building Sector, +), final submission in September 2022 with Thomas More.

The integral action plan was validated by the Steering Committee on 30/9/202 (report in annex) and the final version of this report is included as an annex. With the ambition to deliver a realistic and executable action plan, the Steering Committee recommends opting for a limited but concrete action plan. Actions or ideas that cannot be adequately described are therefore not included in the action plan, but have been added and described in the last paragraph for possible future elaboration.

The action plan is structured according to 4 types of activities, as shown in the structure below:

Spoor 1	**Informeren en sensibiliseren**
	1. 'Intern' communicatieprogramma 2. 'Extern' communicatieprogramma
Spoor 2	**Reflecteren en verdiepen**
	3. Lerend Netwerk
Spoor 3	**Opleiden**
	4. Bestaande opleidingen 5. Nieuwe opleidingen
Spoor 4	**Opvolging acties en mogelijkheden tot vervolg**
	6. Opvolgacties

All validated actions are described in the next paragraphs with addition of responsible organization and the target group.

6.2.1 Actions related to until inform and raise awareness

1. Internal communication program unroll

1.1. Feedback nasty companies by Flux50

Results of the competency forecast share with the interviewee companies in the Flemish battery value chain middle a collective reflection moment . Convert the published report nasty a visual clear sheet and distribution via a projects brochure .

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1.2. Written communication about outcomes competency forecast by Flux50
Summary of the results of this share competency forecast by e-mail with the companies in the Flemish region battery value chain .

1.3. Contributions at industry events by the Steering Committee members and business organisations
Customized information , concrete and applicable _ available make and explain for the companies in the Flemish battery value chain by means of presentations at sector organizations .

2. External communication program unroll

2.1. Announcement and publication of the research report by Flux50
Results of the competency forecast audience make via the website and announcement via this publication using the Flux50 newsletter. Convert the published report nasty a visual clear sheet and distribution via a projects brochure .

2.2. Closing and Networking Event by Flux50 and business organizations
closing moment to organize in front of everyone involved _ is Bee this one competence forecast , including the relevant policy makers . This is not part of the project 's obligations , but Flux50 tries to link this at a relevant other event to maximize dissemination and network opportunities .

2.3. Article about the forecast in newsletters businesses by Flux50 and business organizations
The newsletter with results of this competency forecast dissemination through the communication channels of the companies in the Flemish battery value chain . This one sector communication also orientate on others profiles other than management and HR (eg production managers , foremen) .

2.4. Distribute article about the forecast to education and training providers by InnoEnergy, VOLTA and Syntra
The newsletter with results of this competence forecast , applied to the training , dissemination to the education and training providers and through the specific educational media . In this is becoming recommended to use the teaching jargon and specific points of attention nasty to slide forward . The partners of this project investigate the possibilities of translating the results to English to also to spread the communication within Europe .

2.5. Written communication about the training offer strengthen by VDAB, the education and training centers
Further building on previous action is meant here to provide support _ to the communication that the networks want to provide such as sharing the specific analysis of the training offer .

2.6. organizing a brainstorm with education and training providers by Flux50, EnergyVille and Volta
Using a consultation session explore how to respond to the results of this study in collaboration with all education and training providers. These organizations need to be treated differently as they are offering courses to 2 different target audiences and have difference in flexibility to react.

2.7. label/ award reach out by Flux50, knowledge institutions , federations
Putting innovation in the spotlight at the companies in the Flemish battery value chain by drawing specific attention to it by means of an award. Given the numerous initiatives already in place for this, it is recommended to explore existing awards as a platform and encourage them to focus on innovation in battery technology. Flux50 can offer access to the living labs for the winners and knowledge institutions can offer themselves as candidate jury members.6.2.2 Actions related to until reflect and deepen

3. **learning Network to organize by Flux50, Agoria , VOKA, Syntra**
Strengthen knowledge transfer and battery competences in companies by starting a working group with participating companies from the Flemish battery value chain. The agenda includes site visits to the

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members of the learning network, sharing information about the legal framework or technical evolutions, exploring foreign best practices, following up the action plan for this competency forecast, etc. The organization of this network can also fit within the activities of other European projects such as Interreg AMV ELC or EDI. The kick-off of this network could coincide with the closing event of this project.

6.2.3 Actions related to until educate

4. Existing educations

4.1. Updating professional qualifications based on forecast outcomes by the Education Department, VDAB, KULeuven-EnergyVille, Volta

Volta prepares these professional qualification files and indicates the need to draw up new professional qualifications for secondary education with descriptions of the specific safety aspects, technician renewable energy techniques, new professions related to EMS, charging stations and batteries. The advantage of the new professions is that CVO courses are possible, also for partial courses.

4.2. Linking training offer to new competence challenges by KULeuven-EnergyVille and Syntra

All knowledge and educational institutions can get started with these actions by taking into account the results of this competency forecast when drawing up their specific training offer.

4.3. Provide support in drawing up training plans by KULeuven-EnergyVille and Syntra

All knowledge and educational institutions can get started with this action by providing the necessary support in drawing up the training plans, whereby the recommendations from this competence forecast are shared and considered as valuable input from the sector.

4.4. Increase the possibility of internships by Schools, training centers, sector organizations, Volta, Syntra (Syntrum)

By offering internships at companies in the battery value chain, specific competencies can be taught, to strengthen the training, whereby the theory can be put into practice in real work environments equipped with the specific infrastructure and components.

4.5. Strengthening the intake in education and training through VDAB, training centers, sector organizations

Due to the rapidly evolving technological environment, the limited intake & insufficient knowledge of Dutch, this intake is a major challenge. Ambassadors for the curricula in schools are being considered. A partner such as Green Energy Park can support by offering up-to-date infrastructure.

5. New training programs

The preparation of new training programs requires the necessary time and resources and it is therefore recommended to look at other projects to support their realization. The ESF call for 'Training for the Future' and the Interreg project AMV ELC: 'Training routes for energy storage technology' are eligible for this.

5.1. Training basic electricity and electromechanics in combination with basic battery knowledge & energy management systems by education, training centers, VOLTA, Syntra, VDAB

The competency prognosis clearly shows that the greatest urgency lies in this basic training, both at the level of secondary education and further training. In the implementation of this training, attention

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is needed for different levels, competences and integration. The members of the Steering Committee advise adapting the content to the different target groups. Necessary components of this training are safety, standardization, tech writing, the context of the energy transition, sustainability and circularity.

5.2. Train the Trainer: basic electricity, electromechanics, battery knowledge & energy management systems by companies & knowledge institutions (content), education, training centers, sector organizations

The target group of the train the trainer training are people who want to teach and need retraining or additional training for this, the education providers but also large and medium-sized companies. It is possible to use e-learning platforms for this with instructions for future teachers, but also to use the infrastructure of VDAB or test beds for this.

5.3. Thematic (info) sessions on energy transition, sustainability and circularity by Flux50, all companies in the battery value chain, Green Energy Park, VOLTA, knowledge institutions, companies and subcontractors, training centers, companies, school boards, Schools of the Future, Schools 2030, "Warm Schools", VDAB , sector organizations

The intention is to broaden the target group and that is why this training offers a tailor-made offer, which will require regular updates. In this, VOLTA can be regarded as a structural partner for quality assurance. This action can be realized within the framework of several European projects in which this is explicitly addressed, such as the European Every1 project, the aforementioned AMVELC project and the VOBAT modules that are already being developed by Green Energy Park in collaboration with Volta and other partners. In terms of content, various modules are considered for the following topics: safety regulations, installation, integration of different products, different types of batteries, including supercaps, ...

5.4. Tech writing by companies, knowledge institutions, schools, training centers

This initiative aims at translating battery-specific information into clear hands-on instructions for executors such as employees, installers (subcontractors) on the basis of films, manuals, step-by-step plans, etc. It is important to mention that training for tech writing should ideally be acquired. will be drawn up in collaboration with the communication sciences, whereby a technology track will be started within this department.

5.5. Installation and service training by sector organization ESS, training centers

Specific training in STEM offerings aimed at installers who are responsible for monitoring the quality of battery systems and installations.

5.6. Inspection DC part, cabling, connections by inspection organizations, training centers

The purpose of this training is to eliminate hazardous conditions. The Steering Committee also recommends including everything related to standardization in this curriculum, which is also aimed at installers. However, this still requires work on a common standard of the installation companies

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6.2.4. Actions related to until succession

6. Follow-up actions

6.1. Continuation Steering Committee through Flux50 and wider
The members of the Steering Group are invited to participate in the Battery Working Group (the Learning Network see Action 3) to continue the valuable exchange within this Steering Group.

6.2. Developing a future-proof standard for companies by sector and enterprise organization.
This follow-up action aims to highlight the importance of interoperability: due to the many evolutions to be expected, it is not self-evident, but it is important in the context of storage systems and the broader system vision. and keep an eye on it. (See also action 5.6)

6.3. Continuation of the Learning Network by Flux50 and participants
In order to strengthen the knowledge transfer and battery competences in the companies in the battery value chain, a learning network in the form of a working group is established (the Learning Network see Action 3)

6.2.5 Additional actions that didn't make the final list

- **Actions related to informing and raising awareness: Rolling out external communication program**
  A section for the evening news or in the form of a weekly radio spot for a wide audience (in accordance with the BNP Paribas Fortis on radio 1). This requires significant resources to engage a specialized marketing agency. In terms of content, this can also be regarded as science communication, which falls under the competence of the Flemish government. It is possible that a link can be found with the 2nd part of the 'Mee met de Stroom' campaign, with Fluvius.
- **Actions related to training: Training for journalists**
  An information session for journalists in the form of a webinar, targeted articles or press releases does not seem superfluous to disseminate correct information about the complex energy theme through the various media channels. However, journalists are a difficult target group because the importance of the news value is great. Using charismatic BVs as discussion leaders may increase the willingness to listen. The members of the Steering Committee indicate that inviting the specialized press to energy events is a first step towards achieving this objective.
- **Training Actions: Product Training**
  For the companies in the battery value chain, product training can contribute to the development of the necessary competencies. By this the Steering Committee means product, sales and installation training with brand-specific information, offered by the manufacturers and suppliers. These courses are already offered but are limited due to practical barriers on the one hand, being the distance or the language of the courses. On the other hand, they are limited due to the specific brand vision and conditions, which means that the importance of interoperability between systems from different manufacturers is not given sufficient attention.

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7. ATTACHMENTS

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III. Process Competency List Development of the components
IV. Competency List of the Process Assembly Systems
V. Competency list of the process Technical Sales
VI. Process Competency List Control (monitoring) and optimization exploitation battery solutions
VII. Overview of the existing educations
VIII. Action plan
IX. Report Kick -off meeting of 23/11/2021
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XI. Report Steering group meeting 2 of 19/4/2022
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I. List of abbreviations

AI: artificial intelligence

ASB: the process Assembly (off the shelf) systems incl. repackaging (B2B, automotive: containers)

BMS: Battery Management System, battery management system

COE: the process Control (monitoring) and optimization exploitation battery solutions

CVO: Center for Adults Education

EBA: European Battery Academy

EMS: Energy Management System, Energy Management System

OCO: the process Development of the components of the EMS, converters , ... (hard- and software)

TVK: the process Technical sales (incl. system engineering) of a custom-made battery solution (B2B, automotive)

VLAMT: Flemish Labor Market Research of the Future

II. Bibliography

The Bibliography Below mention formed the basis for the quantitative and qualitative document analysis during desk research :

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III. Competency list of the OCO process

Development of the components of the EMS, converters , ... (hard- and software)

Process in which it is detailed what needs to be made, from identifying possibilities for product innovation or optimization over testing to a complete description of the product to be made.

In the battery value chain it is about the development process of the components that will later (in another process) be combined into an energy management system for a battery (solution).

With the software, product development and production are inextricably linked (one process); with hardware, development and production are two different processes – and production is not included in the current process.

It is therefore important to indicate during our discussion when it comes to hardware or software. It can be about parts, structures, electronic components and systems, tools, measuring equipment, etc. Technical watch, design parts/structures, measuring equipment/techniques, electronic components (power converters: dc/dc and/or dc/ac inverters) and control systems (different levels: BMS + EMS) / software development, quality standards and control, missing standards, safety aspects

OCO1	Can recognize and understand signals from the market or within the organization as gaps or shortcomings in the range of products (hard- and software) and translate them into functional product specifications
OCO2	Can define and document specifications and functionalities of the required raw materials, parts, technologies and the quality aspects to be checked
OCO3	Can define the desired architecture of a software/application to be developed
OCO4	Can detail non-analyzed aspects of a software/application to be developed
OCO5	Can derive relevant requirements that are not explicit, based on knowledge of the usage and technical environment in which the application is to operate
OCO6	Can program and generate executable code
OCO7	Can apply standards and company and project-related agreements, rules and conventions regarding the way code should look (e.g. naming variables, ...)
OCO8	Can understand the associated program documentation of a named piece of code, library, or program
OCO9	Can spatially elaborate and sketch designs
OCO10	Can build and document models and prototypes of parts or the complete product
OCO11	Can design (physical and virtual) test methods and describe protocols
OCO12	Can adequately handle test instruments and measuring equipment (calibrate, operate, interpret results)
OCO13	Can test the software/application or parts of it, based on certain test scenarios
OCO14	Can document in writing an instruction for - the use and installation - the internal construction - the possible issues of a software/ application (or any element of it)
OCO15	Can, within a certain strategy, contribute to the protection of intellectual property (e.g. via a technical description for a patent, conclusion of NDA…)
OCO16	Can take and apply appropriate measures related to cybersecurity and other risks related to information security when developing a new hardware or software application
OCO17	Can explore, set up and follow up collaborations with knowledge, product and service suppliers
OCO18	Can consult with various stakeholders and exchange development challenges, problems, insights and solutions
OCO19	Can estimate the required resources (in terms of working hours and lead time), taking into account own availability, capacities and (competitive) expectations from managers and projects

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OCO20	Can continuously update and apply his/her domain expertise
OCO21	Can do (executive) project management

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IV. Competency list of the process ASB

Assembly (off the shelf) systems incl. repackaging (B2B, automotive: containers)

Production process in which parts are purposefully combined into systems or containers (for automotive) according to a specific procedure.

It is about combining battery modules with a BMS, inverter, rectifier, charge controller, thermal management system, etc. The parts can be standard products or custom-made. Quality control and attention to safety aspects are also part of this process. Standard components or custom made, understanding work instructions and instruments, operating machines, quality control, attention to safety aspects.

ASB1	Can identify the raw materials and parts to be used, their specifications and functionalities and the quality aspects to be checked
ASB2	Can understand work instructions and technical resources related to assembly orders
ASB3	Can respect at all times the safety regulations required when handling the specific parts and assembled product itself
ASB4	Can bring together or connect parts of a product to be assembled on the basis of fine and/or gross motor manual actions, whether or not with the aid of tool parts provided for that purpose
ASB 5	Can set or adjust the way a machine or tool works in function of the assembly of a solution
ASB 6	Can operate (start, adjust, shut down) machines and tools for assembly jobs (incl. software and quality control)
ASB 7	Can prepare and set up the parts
ASB 8	Can put and fix the parts in the machine in time
ASB 9	Can supervise the processing parameters during the assembly process
ASB10	Can verify the expected quality standards for the parts to be processed and the finished product, whether or not on the basis of measurement and control systems
ASB11	Can unload the assembled product from the machines in time
ASB12	Can, spontaneously or thanks to the targeted follow-up of critical indicators, notice dangerous situations and any deviations or defects in the machine/installation or the production process
ASB13	Can identify and describe improvement opportunities and innovation ideas in terms of the product and production methods
ASB14	Can communicate verbally and/or in writing, possibly via formal registration tools, about the work performed, the process, the processed parts and the product produced
ASB15	Can keep the workplace, any machines, installations and tools clean and clean if necessary
ASB16	Can organize own work
ASB17	Can work in a team (communicate, provide assistance, take responsibility)
ASB18	Can sort and dispose of waste and by-products according to the applicable rules

V. Competency list of the TVK . process

Technical sales (incl. system engineering) of a custom made battery solution (B2B, automotive)

This is the process of designing a suitable battery solution for a specific application as part of the sales process.

The user's needs are analyzed, the solution is designed (with details of all necessary functionalities) and calculated (power, capacity, dimensioning, EMS applications, cost price, payback effects). A design may also describe the integration of the battery solution with other techniques or systems and should in any case also detail the desired steering of the solution. This process concludes with an agreement on the quotation (sale).

TVK1	Can keep abreast of relevant evolutions/innovations with regard to the offered technology, products and follow the applicable standards
TVK2	Can inform (potential) customers about how their own company works and how customer demand is further followed up
TVK3	Can question and gauge customers' needs and wishes
TVK4	Can read the technical description of the application into which the solution is to be integrated
TVK5	Can identify possible solutions on the basis of the collected information and the expectations of the customer, and on the basis of appropriate software
TVK6	Can explain, test and advise customers on technical solutions on various dimensions
TVK7	Can, whether or not using specific software, perform the necessary measurements with regard to the application (context) of the solution to be designed
TVK8	Can estimate the costs and benefits of the solution for the customer ('total cost of ownership')
TVK9	Can estimate the foreseeable lead time for the project from A to Z (production, installation, commissioning)
TVK10	Can formally describe and document a proposal of the most desirable solution, based on the collected information about the application (context) and the expectations of the customer
TVK11	Can elaborate a maintenance plan for the solution
TVK12	Can collaborate with fellow experts in the design of the solution, possibly in combination with other technology and/or infrastructure
TVK13	Can prepare a quote based on the formal description of the most desirable solution
TVK14	Can negotiate with customer based on proposed solution and quotation
TVK15	Can guide the customer in using the available subsidy measures and financing options
TVK16	Can guide the implementation of the sold project
TVK17	Can evaluate project implementation and solution
TVK18	Can create an internal project file and handle the paperwork of an the agreement
TVK19	Can communicate internally about the project and customer wishes in a smooth manner

VI. Competency list of the COE process

Control (monitoring) and optimization exploitation battery solutions

Service process in which the operation and optimization of the battery solution is central, including quality and safety checks, fine-tuning EMS, remote management, predictive maintenance and safety, reading BMS, evaluation (residual) value.

Also part of this process: defining, deploying and commercializing services that rely on data capture. Can be aimed at, for example, energy saving or building management, but completely other business cases are also eligible.

COE1	Can define, write out and execute the various parameters, quality and safety measurements necessary for the control and optimization of the operation
COE2	Can interpret (external) findings and (internal) test and analysis results and controls
COE3	Can fine-tune the various parts of or the data-generating system itself based on the analysis results and quality and safety checks
COE4	Can develop a maintenance plan for the solutions (remote management or otherwise, predictive maintenance)
COE5	Can read the data from a system
COE6	Can evaluate the residual value of the system based on the data
COE7	Can appropriately report (orally and in writing) internally on the analyses, quality and safety controls
COE8	Can consult and consult with the customer, own project team and third parties from different disciplines
COE9	Can identify and document (types of) available or collectable data
COE10	Can prepare manuals and/or instructions for the optimal exploitation of solutions
COE11	Can define an effective strategy to make the data generated by the system accessible to the users and administrators of the solution
COE12	Can develop and set up an appropriate communication infrastructure, as well as interfaces for the users and administrators of the solution
COE13	Can communicate with the customer about data driven services
COE14	Can define an efficient strategy for data storage and/or management of data collected through the systems operated
COE15	Can build and maintain datasets based on data collected (partially) through solutions and accommodate them in a suitable infrastructure for data storage and management
COE16	Can define new market opportunities or service and product optimizations and can describe and interpret the way documented data is used
COE17	Can keep abreast of relevant evolutions of technologies in the field of data collection, analysis, storage, management, communication and control, as well as trends in the related domains
COE18	Can define, plan and manage a project

VII. Overview of the existing educations

The last 4 columns refer to the 4 selected processes , see the list of abbreviations attached . _

Education	Setting (- stype)	Type of training	OCO	ASB	TVK	COE
Electric installations	Secondary Education	BSO		X		
automation installer (modular)	Secondary Education	BSO		X		X
Steering and security techniques (7y)	Secondary Education	BSO				X
Industrial electrical engineering . Installer	Secondary Education	BSO		X		
Industrial electricity	Secondary Education	BSO		X		
Maintenance Electrician	Secondary Education	BSO		X		
Residential electrical installer	Secondary Education	BSO		X		
Car	Secondary Education	BSO		X		
car electricity	Secondary Education	BSO		X		
Electric installations dual	Secondary Education	BSO dual		X		
Electrical engineer dual (7y)	Secondary Education	BSO dual		X		
Building automation installer dual (7y)	Secondary Education	BSO dual		X		X
Electricity - Electronics	Secondary Education	TSO		X		X
Electric installation techniques	Secondary Education	TSO		X		X
Electromechanics	Secondary Education	TSO		X		X
Electronic installation techniques	Secondary Education	TSO				X
Steering and security techniques (Se-n-Se)	Secondary Education	TSO				X
Automotive Techniques	Secondary Education	TSO		X		
electrical engineering dual	Secondary Education	TSO dual		X		
Electromechanics	Higher Education	PBA	X		X	X
Electronics -ICT	Higher Education	PBA			X	X
electrical engineering	Higher Education	PBA	X		X	X
Energy management	Higher Education	PBA			X	X
Energy technology	Higher Education	PBA			X	X
Applied Informatics	Higher Education	PBA			X	X
industrial sciences : electronics -ICT	Higher Education	ABA	X		X	X
industrial sciences : electromechanics	Higher Education	ABA	X		X	X
Engineering Sciences : Electronics and Information Technology	Higher Education	ABA	X		X	X
Engineering Sciences : Electrical Engineering	Higher Education	ABA	X		X	X
Industrial sciences : electronics and information technology	Higher Education	MA	X		X	X
Industrial sciences : electrical engineering	Higher Education	MA	X		X	X
industrial sciences : electromechanics	Higher Education	MA	X		X	X
Engineering Sciences : Electronics and Information Technology	Higher Education	MA	X		X	X
Engineering Sciences : Electrical Engineering	Higher Education	MA	X		X	X
Engineering Sciences : Energy	Higher Education	MA	X		X	X
internet of things	AP / Erasmus Hogeschool Brussel / HOWest / KdG / PXL / Thomas More / UCLL / VIVES	Graduate training (HBO5)		X	X	X

Renewable energy systems	UCLL / VIVES / PXL	Graduate training (HBO5)		X	X	X
Artificial Intelligence in Business and Industry	Higher Education	MAnaMA				X
Electricity	CVO	Professional education		X		X
Electric installations	CVO	Professional education		X		X
automation installer	CVO	Professional education		X		X
Building automation installer dual	CVO	Professional education		X		
Photovoltaic installer systems	CVO	Professional education		X		
Photovoltaic technician systems	CVO	Professional education		X		
Residential electrical installer	CVO	Professional education		X		X
Service engineer photovoltaic systems	CVO	Professional education		X		
board builder	CVO	DBSO		X		
Photovoltaic installer systems	CVO	DBSO		X		X
Installer-repairer of electrical and electronic equipment	CVO	DBSO		X		
Residential electrical installer	CVO	DBSO		X		X
Technician home automation	CVO	DBSO		X		X
Technician real estate	CVO	DBSO		X		X
Basic package residential electricity	VDAB	Professional education		X		X
Installer of structured cabling	VDAB	Professional education		X		
Residential electrical installer	VDAB	Professional education		X		X
Technician home automation	VDAB	Professional education		X		X
Electricity : basic concepts (several share)	VDAB (online)	Class		X		X
Basic education electricity	Syntra Antwerp	Professional education		X		X
Electrician	Syntra West Syntra general	Professional education		X		X
Electricity base	Syntra Central Flanders Syntra West	Professional education		X		X
Electric installations dual	Syntra Antwerp Syntra Brussels	Professional education		X		X
Electrical installer	Syntra general Syntra Brussels	Professional education		X		X
Certified installer of renewable energy - solar thermal installations - combi systems	Syntra Central Flanders	Class		X		X
full time day course electricity	Syntra general	Professional education		X		X
BA4 and BA5 - Safe to learn dealing with electricity	Syntra Brussels	Class		X		

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BA4 warned person	Syntra Antwerp Syntra Central Flanders Syntra West	Class		X		
BA4 warned person for non -electric educated	Syntra Central Flanders	Class		X		
BA5 Competent person	Syntra Antwerp Syntra Central Flanders Syntra West	Class		X		
Battery specialist	Syntra Central Flanders	Class		X		X
Electricity for the plumbing and heating installer	Syntra West	Class		X		
Electronics - Basic	Syntra West	Class		X		X
Energy management of buildings , what to do with the existing installation	Syntra Central Flanders	Class		X		X
Energy storage Today	Syntra Central Flanders	Class			X	X
photovoltaic systems - Installer renewable energy	Syntra West	Class		X		X
Renewable energy base - for clerks and salesmen	Syntra Central Flanders	Class			X	
Electrical installer charging stations	Syntra Brussels Syntra Central Flanders	Class		X		X
IoT for technicians	Syntra Antwerp	Class				X
IoT engineer smart buildings	Syntra Central Flanders	Class				X
Minimum requirements of electrical installations	Syntra Central Flanders	Class	X			
Risk analysis for electric installations	Syntra Brussels	Class	X			
Technician data cabling	Syntra West	Class		X		
Technician home automation systems	Syntra West	Class		X		
Update AREIA	Syntra Central Flanders	Class	X			
Solar thermal - combi systems - installer renewable energy	Syntra West	Class		X		
board builder	Syntra general	Syntra study time		X		
Electric installations dual	Syntra Central Flanders	Syntra study time		X		
Photovoltaic installer systems	Syntra general	Syntra study time		X		
Installer-repairer of electrical and electronic equipment	Syntra general	Syntra study time		X		
Residential electrical installer	Syntra general Syntra Brussels Syntra Antwerp Syntra Central Flanders	Syntra study time		X		
Technician home automation	Syntra general	Syntra study time		X		X
Technician real estate	Syntra general	Syntra study time		X		X
BA5 Refreshment safety electric installations	SBM	Class		X		
Basic education electricity in front of servants	SBM	Class			X	
Basic education renewable energy in front of servants	SBM	Class			X	
Club renewable energy	SBM	Class			X	

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Electronics applied with Arduino	SBM	Class				X
photovoltaic systems - Installer renewable energy	SBM	Class		X		
Certified installer VARTA storage	SBM	Class		X		
New ones norm fire detection	SBM	Class	X			
Remote control , regulation and monitoring of HVAC systems , internet of things , smart apps	SBM	Class				X
Update AREIA	SBM	Class	X			
Safe to work at electric installations	SBM	Class		X		
Solar thermal - combi systems - installer renewable energy	SBM	Class		X		
BVA PRO: Fire prevention : New legislation fire safety	SBM	Class	X			
The 3 pillars of energy management : Measurement - Logging -Analysis	SBM	Class				X
BA4 Basic Instructions safety in front of electric installations - warned	Volta	Class		X		
BA5 Electricians	Volta	Class		X		
Component knowledge - practical training	Volta	Class		X		
Structured data cabling	Volta	Class				X
The AREI - old and new household installations	Volta	Class	X			
Cable calculation of electrical LV installations	Volta	Class	X			
Short-circuit current calculation of LV electrical installations	Volta	Class	X			
Charging infrastructure - the missing link in electrical mobility	Volta	Class			X	
Grid systems	Volta	Class	X			
overflow protective devices in LV installations	Volta	Class	X			
Home battery and PV installation : link on the net	Volta	Class	X	X		X
graduate degree electricity	Qrios	Graduate training (HBO5)	X	X	X	X
automation installer	Qrios	Professional education		X		X
Residential electrical installer	Qrios	Professional education		X		X
Electric installations	Qrios	Professional education		X		X

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VIII. Action plan final version

	Explanation	*Target audience*	*Medium*	*Deliverables*	*Partners*
Platform 1	**Inform and raise awareness**				
1. ' Internal ' communication program unroll					
1.1. Feedback to companies	Share results of the competency forecast	Interviewee businesses	collective moment of reflection	Published report; Visual clear sheet	Flux50
1.2. Written communication about outcomes competency forecast	(Summary) outcomes competency forecast	Enterprises	Website and email	Published report; Visual clear sheet	Flux50
1.3. Contributions / presentations at industry events	Customized information , concrete , applicable _	Enterprises		Tailor- made topics	Steering committee , business organizations
2. ' External ' communication program unroll					
2.4. Announcement and publication of the research report			Website , newsletters , …	Published report	Flux50
2.5. Closing and Networking Event		Everybody involved at this project and broader , eg . policy makers			Flux50, entrepreneurial organizations
2.6. Article about the forecast in newsletters businesses	Industry sector communication also oriented on other profiles than management and HR (eg production managers , foremen)	Enterprises	Newsletters	Summary research	Flux50, entrepreneurial organizations
2.7. Distribute article about the forecast to education and training providers	Using ' educational jargon ', specific points of attention bet .	Education and training providers	Education media (Class , Klascement , newsletters domes , etc.)	Summary research applied to training ; Translation research results	InnoEnergy, VOLTA, Syntra
2.8. Written communication about the training offer strengthen	Support communication that the nets want to provide	Education and training providers	Education media (Class , Klascement , newsletters domes , etc.)		VDAB, training centers
2.9. brainstorm organizing with education and training providers	explore how to respond to the results of the forecast	Education and training providers (2 different target groups)	Live session / webinar		Flux50 with EnergyVille and Volta, training centers - in consultation with all parties
2.11. label/ award reach out	Innovation in the spotlight to make by means of a award ceremony	Enterprises	To link at existing awards like Factories of the Future, federations eg Tech link of awards for masters (KUL from 2023)	Attention for the battery value chain	Flux50, knowledge institutions (jury)
Track 2	**Reflect and deepen**				
3.12. learning Network to organize	Knowledge transfer and battery competences strengthening in companies : acquaintance , trust build up , selection theme	participating companies	Place visits by members of the learning network Assignment in the Interreg project AMV ELC T2: this role in EDI project	- Kick-off, thematic sessions , conclusion & follow - up ; J15Report Common challenges approaches and explore foreign best practices .	Flux50, Agoria , VOKA, companies inside and outside the battery value chain ; VLAIO: Call entrepreneurship (acceleration , implementation , beyond innovation). Syntra : learning network hydrogen in

						October (possibility to do this too in front of batteries to do)
	Track 3	**Educate**				
	4. Existing educations					
	4.13. Update professional qualifications based on forecast outcomes	Need of new professional qualifications (descriptions) secondary such as safety , technician HE techniques , new profession EMS/ charging stations / batteries /..	Where possible , link at bottleneck professions		Volta makes this one professional qualification files on: Advantage new profession : CVO courses possible , too in front of partial courses) - certification is professional qualification	Department Education , VDAB, KULeuven - EnergyVille Volta
	4.14. Training offer to link at new ones competency challenges	Thoreac such as GEP with heat networks / residential areas /KUL ' Flemish Resilience Building '				KULeuven - EnergyVille Syntra
	4.15. Support to provide when drawing up training plans					KULeuven - EnergyVille Syntra
	4.16. Increase the possibility of internships		Businesses , schools	Include in workgroup with companies		Schools , training centers , sector organizations Volta, Syntrum Volta work with Dual learning From level 2,3,4 - HBO 5: 1/3rd workplace learning
	4.17. Intake in education and training strengthen	Great challenge : fast evolving technological environment , limited intake & insufficient knowledge Dutch	Businesses , schools	Ambassadors/ lobbying for the curricula in schools ; _ Green Energy Park: offering up-to-date infrastructure		VDAB, training centers , sector organizations
	5. New educations					
	5.18. Basic electricity and electromechanics training in combination with basic battery knowledge & energy management systems	Necessary components: - safety - standards - tech writing - bigger picture : energy transition , sustainability , circularity	Secondary education & further training	Hands-on/e-learning Attention required in front of various levels , competences and integration . Content To adjust at target groups .	Diploma / Certificate	Education , training centers , VOLTA, Syntra , VDAB

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	5.19. Train the Trainer: basic electricity , electromechanics , battery knowledge & energy management systems	For retraining or further training	People who want teaching , large / medium companies , education providers	Hands-on/e-learning	Instructions in front of future teachers	Companies & knowledge institutions (content), education , training centers , sector organizations Syntra in collaboration with . manufacturers (eg Huawei) VOLTA in collaboration with . CNO (center after school training) Energyville ihkv . EBA program + annual teacher training VDAB: education can use infrastructure VDAB ,
	5.20. Thematic (info) sessions on energy transition , sustainability and circularity	Customized offer ; to be updated regularly Target group to be broadend Certification of modules passed	Good demarcation oftarget groups - learners - education and training providers - professionals , eg . customs officers - (new) employees - subcontractors - customers - broad audience	Probably to be placed in a follow - up project : good demarcation required target groups , companies , training needs , method of implementation , budgeting . Competency clusters develop core team set up , ... Within the framework of European projects Every1 project AMVELC project VOBAT modules	good , regular updated website Modules per topic, eg . about safety regulations , installation , integration various products , various types batteries , incl. supercaps Digital learning path : track progress and results Certificates	Flux50, all companies in the battery value chain , Green Energy Park, VOLTA, knowledge institutions , companies and subcontractors , training centers , enterprises , school boards , Schools of the Future , Schools 2030, Warme schools , VDAB, sector organizations VOLTA as structural partner for quality assurance Syntra T2 already with new educations busy Cf. MOOC, main challenge : quality assurance and keeping it up to date . To broaden target audience become info sessions Hospitalized by Volta
	5.22. Tech writing	translation of battery specific information for employees How to strengthen responsibility at the companies that develop the technology (user-friendliness)?	Employees , installers (subcontractors)	Videos / manuals / step- by-step plans / ...	Concrete , hands-on instructions Link with communication sciences : technology track set up ?	Companies , knowledge institutes , schools , training centers Mini- training by Volta: option ?
	5.24. Installation and Service Training	Specific training in STEM offer , follow -up quality installations	Installers	Written /online/ practical	Class	Sector organization ESS, training centers

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	5.26. Inspection DC part , cabling , connections	Take away dangerous circumstances ; Standardization is part of the basic training (still joint standard of the installation companies needed - CEB/BEC)	Installers	Oral / video	Class	Inspection organizations , training centers
	Track 4	**Succession actions and possibilities in front of continuation**				
	6. Follow-up actions					
	6.27. Continuation Steering group	Possibly minimum occupation , to follow action plan				Flux50 and wider
	6.28. Developing a future -proof standard in front of businesses	Importance of interoperability : by the still many to expect evolutions , not obvious but yes important and to keep an eye on .				Sector and business organizations
	6.29. Continuation learning Network	Knowledge transfer and battery competences strengthening in companies	Others series Attendees			Flux50 and wider

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IX. Report kick -off meeting 23/11/2021

1. Attendees

KULeuven/ Energyville

- Johan Driesen: ESAT, professor energy technology , European projects , EBA
- adinda Vandereyken : ESAT
- Bieke Demaeghdt: communication
- Kris Baert: Innovation manager
- Michel Huys: R&D manager

EIT InnoEnergy

- Jan Verveckken: project proposal , selection executor , steering committee , EBA

Flux50: promoter

- Frederik Loeckx : submission & steering committee
- Matilde Defraeije: practical organization and support

Mpiris : performer methodology strategic competency forecast

- Geert Van den B ossche: point of contact
- Johan Desseyn : contracts & steering committee

2. Context and expectations – *details in presentation Geert*

Call ESF SCOPE 2021: strategic competency forecast

- Impact of the transition on the labor market : need for future to map out competence needs
- Delineation : battery value chain in Flanders , from technician to master, reskilling & upskilling
- Fixed methodology : VLAMT in 3 phases & per phase reporting & steering committee consultation
    1. Preliminary investigation
    2. Analysis
    3. Decision
- Duration : from 1/11/2021 to 31/8/2022
- roles & planning in presentation slides 11-15

Expectations

- Follow-up project InnoEnergy BA
- living labs develop infrastructure for the necessary courses that partners will have in the future be able to to organize
- Results to be detailed , motivated , per process , based on companies in the sector and their strategic choices (by means of interviews)

3. Budget

Total budget of the project is €88,328.21. the part co-financing by Flux50 are the private resources and the part co-financing by KUL are the public resources .

Subsidy to down with about €8000: Frederik is trying to rectify this Action point Flux50

Mpiris & KUL couples a redistribution of time use for : *details slide 11-14*

- Fewer time in front of preliminary investigation given expertise at Energyville /KUL
- More time in analysis phase for interviews, less for the present map out training offer _ seen a lot knowledge Bee partners

- Fewer time in reporting phase

4. Contract

Contract with ESF not yet final , see up here so about budget waiting for custom contract proposal . Action point Flux50

Cooperation draw up between KUL & Flux50: financing table in annex To adjust once final . Action point Flux50

Subcontracting agreement between Flux50 and Mpiris compose with new table time use . Also this one resources come fully on account Flux50. Important in front of Mpiris to respect the maximum hourly rate of €125 . Action point Flux50

At sometime above administration met is can the first deposit receive become of the Flemish co-financing fund , their share then immediately becomes integral paid out .

Flux50 channels resources from ESF/WSE to KUL and provides reporting of timesheets in the platform. The hours of the partners ' project staff register : *link in presentation slide 21* .

5. Steering group

Importance of a strong steering group in front of wide support & strength . They to deliver eg input on for the preliminary examination , take part to the workshops and advise in the selection of the companies for interviews.

Compile & write to steering group (idem expertise cell) Action point

- List steering group members complete : see link

Organization	Name
EIT InnoEnergy	Jan Verveckken
EIT InnoEnergy	Wendy
Flux50	Matilde Defraeije
Flux50	Frederik Loeckx
Mpiris	Geert Van den Bossche
Mpiris	Johan Desseyn
Green Energy Park	Walter Schroven
KUL	Johan Driesen
Reset.Flanders	Vanya Verschoore
Synergrid	Berenice Crabs
Syntra -PXL/T2	Roald Swerts
VDAB	Stien Van Hevele
VLAIO	Vicky Wildemeersch
Volta	Benjamin Verfaillie
Volvo Car	Nico Van Den Broecke
WSE	Nika Goossens

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Inviting members : Matilde & Geert prepare mailing with expectations , planning meetings, invitation for workshop & to others to invite _
Time proposal _ in front of project management nasty control groups , to select these time to be able declare and to this time to be distributed equally among all partners per meeting . Check Frederik
This one kick-off meeting is becoming considered if first steering group consultation , to respect planning (slide. Schedule 4 more : end January , April , end June , end august . Practical : briefing & moderation by means of MPiris , organization & report by Matilde
The next steering group on 1 or 3 February : Action point doodle in invitation

- validation of the results of the workshop and the preliminary study
- selection of 3 processes to afterwards to plan targeted interviews
- 1 e deliverable : synthesis report KUL/ M p iris – details on slide 16

6. Preliminary investigation

Content input deliver to Geert and save to the G-drive .
Workshop on 6/01/2022 Action point Matilde

- half day
- to the members of the steering committee ask for contacts to pass on for the workshop : pioneers , innovative companies and experts such as Jeroen Busscher , Carlo Mol, representative Volta, Jochen Desmet Avere , …. Participant list replenish link
- Preparation schedule : consultation on 20/12 at 2 pm

7. Communication

ESF & WSE logos include in all project communication : see G-drive
Mention the project with logos on the websites of the various partners Action point
Download poster from platform and hang it Action point Matilde

8. miscellaneous

Explanation ask ESF about to what extent we account should take into account diversity (see proposal) & confirmation by e-mail. Action point Flux50
E- mail addresses deliver to Jan for online modules EBA Action Point Geert (is happened)
Plan a visit Energyville & T2 campus for Geert & Matilde Action point Matilde

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X. **Report of the Steering Committee meeting on 1/2/2022** (Teams recording)

16 participants :

Geert Van den Bossche	Mpiris	geert.vandenbossche@mpiris.be
Johan Desseyn	Mpiris	johan.desseyn@mpiris.be
Matilde Defraeije	Flux50	matilde.defraeije@flux50.com
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agenda

1. Presentation project , delineation and methodology
2. Role Steering group
3. Presentation Results preliminary investigation
    - Conclusions trends
    - Findings business scenarios
    - Findings processes
4. Preview analysis of competence and training needs
    - Detailed interviews
        - Various options
        - Process selection _
        - Preferred List businesses
    - Inventory training offer

1. Presentation project , delineation and methodology

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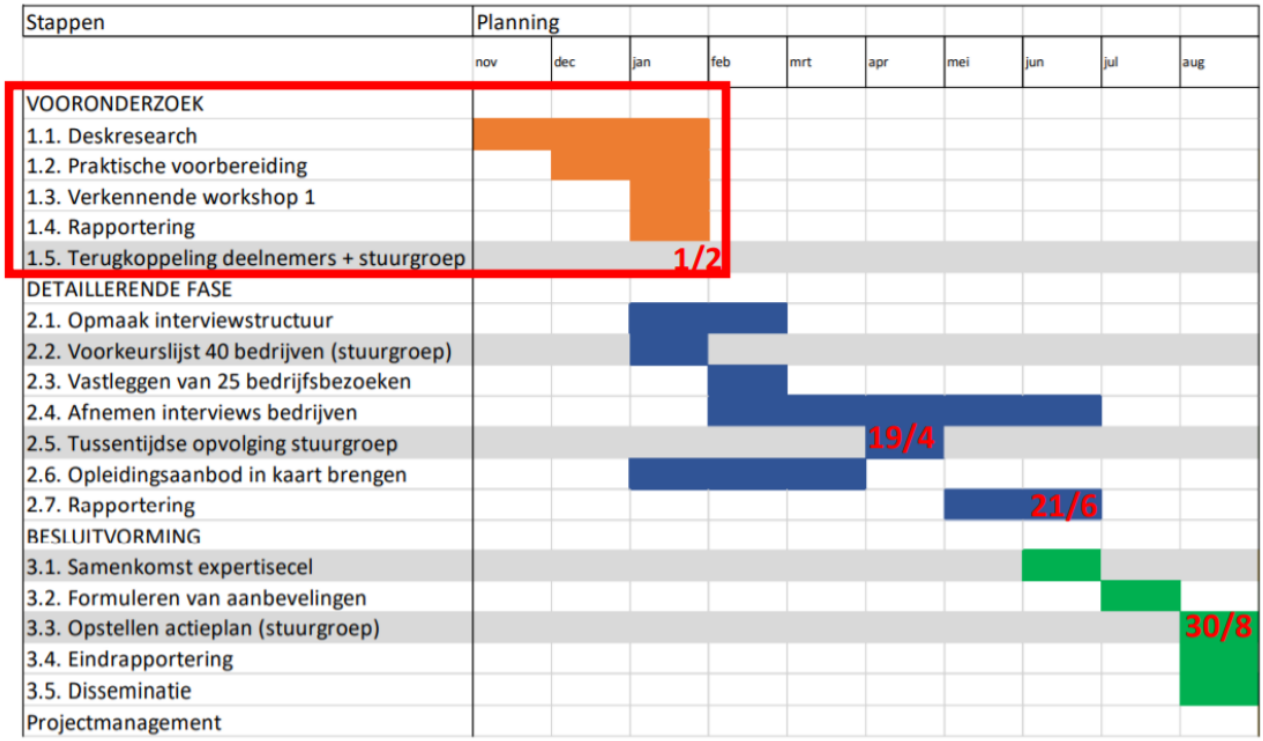
The aim of this project within the battery value chain in Flanders gain insight into the competences that will be needed in the future essential shall to be for the labor market . This is important to be able anticipating the dynamics of the labor market and improving the training and education offer on this better to leave connect .

The project runs from 1/11/2021 to . 31/8/2022 and the project partners are Flux50 (promoter) together with KU Leuven/ EnergyVille / InnoEnergy and Mpiris (subcontractor).

The scope of the project is if follows delineated :

- Industry: Flemish battery value chain , such as described and investigated in the LIFEBAT VIS feasibility study
- Level: battery technician (EQF level 5) to Master engineer (EQF level 9)
- Target group : re -skilling of the unemployed , up -skilling of employees

When performing the competency forecasts will be the VLAMT manual executed according to the process Below described , where as well as the planning of the various research phases is becoming displayed :



2. Role Steering group

The role of the Steering Committee plays on content flat and to maximize the uptake of the results .

In the VIS Study (2019) on Opportunities in front of Flemish Companies in the full life cycle of the (Lithium-Ion) Battery -LIFEBAT is the potential in front of innovation and market potential described . Repeatedly is becoming attention drawn to the emergency at training and education , for both technicians as well engineers . it is clear Which this one sector , and all Flemish players in this , for a great challenge stand nasty competences and training , which are now pressing becomes . For the support Bee this one create players and translate the

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results _ nasty concrete to realize actions on the ground , therefore sought nasty a representative composition of the Steering Committee whose participants _ to be found are on page 1.

This one Steering group shall during the implementation of the project 4 times getting together in front of validation of the results of the different research phases .

This one meeting has if aim to draw the conclusions of the preliminary investigation to submit _ to the Steering Committee and the next steps to validate the analysis .

3. Presentation Results preliminary investigation

The project want the competency changes for the Flemish battery value chain identify and existing training offer analyze to be able To adjust to the needs of the sector . For this the current trends that have an impact on the Flemish battery value chain map brought as well as the possible strategies of the companies if answer to these trends, being the different business scenarios .

The below described knowledge became built up by the partners in the project in the following way : desk research , professional literature , digital training EIT InnoEnergy (Battery Storage and the Energy Transition; Battery Storage Technology), Smart Energy Academy , site visit Bee EnergyVille & T2 Campus, Exploratory workshop with 13 companies and organizations with knowledge of the battery value chain .

The preliminary investigation happens based on a desk research and a exploratory workshop that took place on January 6 . As for the content played the Steering Group in here a important role . The practical organization became Hospitalized by Flux50, the methodological aspect was guarded by the performer Mpiris , while KUL - Energyville the substantive support delivered .

3.1 Trends

The Steering Committee validates the trends that are relevant on the basis of the preliminary study for the Flemish battery value chain :

Koolstofneutrale en circulaire economie

Disruptieve verandering, die steeds meer op de voorgrond komt

- Klimaatverandering
- Energie-efficiëntie
- Ontwikkeling einde-levensfase batterij meteen opgenomen in waardeketen

Nieuwe technologieën en digitalisering

Disruptieve en versnellende verandering

- Snel opeenvolgende innovaties
- Elektrificatie
- Digitalisering energiebeheer
- Thuis- en gemeenschapsbatterijen
- Steeds energiezuinigere woningen
- Methodes voor dataverzameling en -opvolging

Beleid/regelgeving

- European Green Deal
- Streven naar open strategische autonomie
- Onduidelijkheid bevoorradingszekerheid
- Subsidies en incentives
- Striktere normering
- Gedeelde standaarden?

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Economie

Shift naar diensteneconomie
Sterke groei elektromobiliteitsmarkt
Sterke groei statische toepassingen
Dalende prijzen batterijen
Grote vraag laadoplossingen
Nieuwe tariefstructuren
Energiegemeenschappen

Demografie

Vergrijzing ~ krapte arbeidsmarkt
Stijgend aantal huishoudens

Cultuur

Schonere, stillere leefomgeving
Bewustzijn klanten
Aansprekebaarheid, verantwoordelijkheid en aansprakelijkheid

Corona

Versnelt trends (digitalisering)
Versterkt bewustzijn risico grondstofschaarste en kwetsbaarheid supply chains

3.2 Business scenarios

The business scenarios are the internal business decisions that are made taken according to these trends . Those scenarios refer to the strategic choices that companies be able to making for the future . _ The Company Choices determine how processes become filled in and which one competency requirements to it linked become .

The preliminary investigation defines next one business scenarios for the battery value chain :

1	Eigen digitale platformen en systemen creëren in het kader van gebruiksvriendelijkheid
2	Inzetten op modulariteit
3	Inzetten op beheermonitoring batterijsystemen
4	Inzetten op gebruik AI
5	Inzetten op totaaloplossing
6	Inzetten op energiediensten
7	Aanbieden dienstverlening na verkoop, nazorg, opvolging
8	Inzetten op specialisatie
9	Inzetten op strategische partnerships
10	Streven naar circulariteit

Because this one business scenarios fairly generic and thus may not be workable in the detailed interviews of phase 2, it was a important part of the exploratory workshop (January 6 , 2022) dedicated to the discussion of the above list , with if the objective of deepening and refining the definition of the scenarios , possibly dividing it into concrete (er) scenarios , missing add , etc . _ _

This leads until the next conclusion : the battery value chain in Flanders is still to that extent a sector under development that it's not possible is to put the business scenarios in a realistic way to define . Additionally is it hard to grasp how changes in competencies be able to become defined inside like this a young sector .

Below is the coupling of the trends to possible business scenarios displayed . At the workshop this turned out to be a difficult exercise just through the fast evolving sector . the performance illustrates the conclusion up here described :

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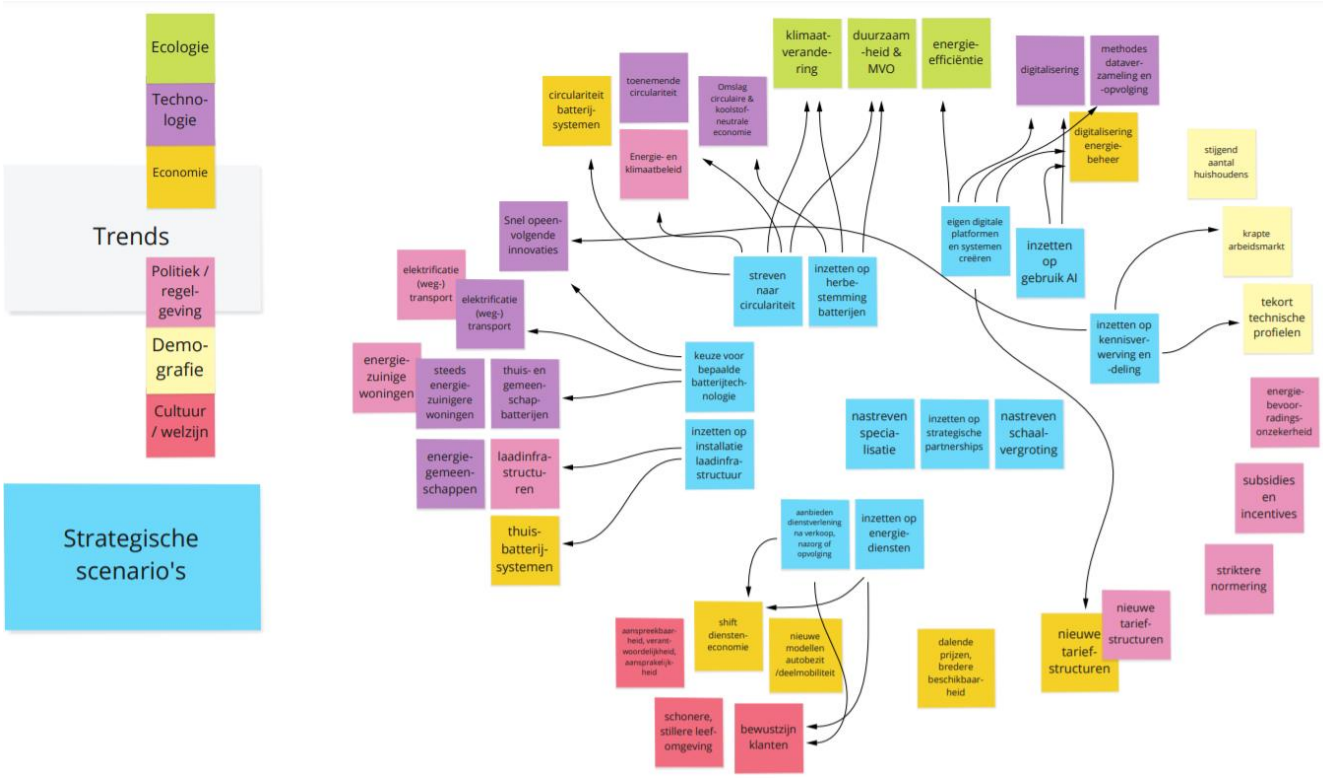

Research agency Mpiris has this one conclusion submitted to the Steering Committee , with as additional ask whether the research on this basis is the most relevant and urgent results would bring to the sector . With other words had to become considered whether the research design , such as original set up , well can become realistic performed . Coming to paragraph '4.2 Analysis phase ' we on this back .

3.3 Processes

The Steering Committee validates the processes relevant in the Flemish battery value chain , such as Below listed and valued in function of the research question by means of means of a Mentimeter mood during the workshop on 6 January .

Important is that the selection of processes account take into account the impact on the employment of highly skilled workers .

	Processes	Sector specificity	Employment total	Employment Higher educated	Strategic interest	Knowledge intensity	subjection at change	Overall average
1	Trade in battery raw materials and building blocks	3	1.94	2.25	2.88	3.62	3.75	2.91
2	Design electrodes	4.47	1.2	4.13	2.27	4.3	4.2	3.43

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3	Electrode synthesis	4,25	1,83	3	2,42	3,08	3,83	3,07
4	Cellenassemblage & moduleassemblage	3,92	2,67	2,25	3,25	2,75	2,82	2,94
5	Assemblage (off the shelf) containers/systemen (incl. repackaging)	4,08	3,38	2,69	4,31	3,54	3,69	3,62
6	Development EMS inverters , converters , ... (hard- & software)	4.15	3.46	4.31	4.31	4.69	4.46	4.23
7	Production of hardware components	Completed after vote						
8	Presales (' evangelism ')	Completed after vote						
9	Technical sales (incl. system engineering) of custom made battery solutions (excl . automotive) (B2B)	4.36	3.71	3.57	4.36	4.29	4.23	4.09
10	Technical sales (incl. system engineering) of battery solutions for automotive applications	3.71	1.57	4	2.43	3.71	3.69	3.19
11	(Technical) sales commodity battery solutions / charging stations (B2C)	3.47	3.8	2.2	3.4	3.13	3.27	3.21
12	Reassembly and installation custom made battery solutions (incl. safety inspection / commissioning / adjustment - programming control) (B2B)	4.13	3.13	2.93	3.73	3.87	3.8	3.60
13	Assembly batteries in automotive equipment	3.93	2.47	2.27	2.87	2.8	3.13	2.91
14	Installation commodity solutions (B2C) (e.g. charging stations , home batteries)	3.33	4.07	1.67	3.67	2.73	3.21	3.11
15	Control (monitoring) and optimization exploitation battery solutions	4.54	3.38	3.92	4.46	4.08	4.42	4.13
16	Transport & storage batteries (and battery components)	3.54	2.54	1.23	3.46	2.38	2.77	2.65
17	disassembly battery solutions and extraction materials / raw materials	3.67	2.67	2.33	3.75	3.5	3.67	3.27

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In process 12 and 16 , still packing the batteries _ taken . Depending on the environment where the batteries installed become , this process _ subject at changing and ever stricter regulations . This has for example impact on the insurance of the installation or the building .

4. Conclusions & preview

4.1 Conclusion preliminary investigation

The Steering Committee validates the conclusions from the preliminary investigation : Batteries to be a key technology in front of a carbon neutral mobility and energy storage in the electricity system .

- There are many local employment opportunities around the value chain , especially in the product and use phase .
- there is Lake attention required in front of system and usage aspects :
    - strong grow electromobility market .
    - strong grow static applications .
    - Great ask nasty battery solutions .
    - Already development end-of-life phase : circularity in processes
    - Always attention in front of safety , specific transport and storage rules , monitoring, etc .
- Further market development _ asks qualified workers with specific competences , indicating the relevance of the research project and specifically the competence prognosis confirms .
- The multidisciplinary aspect of the ' battery -world ', allowing this one difficult if 1 sector can become delineated and the context has a _ sector in full development .

4.2 Analysis phase

Research agency Mpiris asks whether the research design well can become realistic performed in the context of a sector in full development . Inside like this a young sector the business scenarios and changes in competences can not be realistic way defined become .

Mpiris suggested therefore next to the classic one competency forecast two alternative research avenues for : on the one hand , drawing up competence profiles and on the other hand , research towards the sector-specific and thus future - oriented focus of equivalent processes from Others sectors .

This one three research avenues were detailed _ presented and explained to the Steering Committee . The summary of the options became if follows presented :

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	Voordelen	Aandachtspunten
Optie 1. Klassieke competentieprognose	• Standaardmethodologie • Competentie**veranderingen** in de komende tien jaar in gevolge de business-scenario's	• Realistisch? Meest interessante (urgente) output? • BS niet goed gedefinieerd • Open bevraging • 3 processen (rest niet onderzocht) • 8 interviews nodig per proces: voldoende bedrijven?
Optie 2: Competentieprofielen opstellen	• Sluit beter aan bij de ontwikkelingsfase van de sector • **Competentieprofielen** (die nog niet bestaan) met toekomstgerichte aanvulling	• Geen gedetailleerde impact BS • Zeer open bevraging • Max. 2 processen (rest niet onderzocht) • Minstens 12 interviews nodig per proces: voldoende bedrijven?
Optie 3. Sectorspecifieke focus geïnformeerd vanuit equivalente processen andere sectoren	• Sluit beter aan bij de ontwikkelingsfase van de sector • **Sectorspecifieke** competenties met toekomstgerichte aanvulling • Standaardmethodologie • Meer processen mogelijk • Meer gefocuste bevraging • Betere koppeling bedrijven	• Geen gedetailleerde impact BS

In the discussion on this followed , became the following arguments under consideration taken :

- The current development phase of the battery value chain in Flanders , being in full growth .
- The aim to achieve optimal research results , _
- are relevant in front of this much possible companies in so many possible links of the chain .
- Specific business scenarios are not (yet) sharp become defined .
- In fact handle all involved companies now one generic future scenario , namely ' betting on the use of batteries '.
- It is important to have a maximum number of to investigate processes ,
- Causing a broad fan at businesses throughout the _ chain in the investigation become involved .
- A sector-specific focus offers the best guarantee to extend the value chain with the research output maximum support in his _ further development .
- Relevance in front of in - or retraining of (classic skilled) profiles from Others industries to use the battery -specific interpretation of the competences a learning path to draw out nasty a forward-looking sector .
- Relevance to the training and education offer to find leads to battery -specific accents to allow entrance find .
- There can be provide a _ additional forward-looking supplement , by adding the additional _ to ask a question which business scenarios , on which companies in the future be able to deployment , competence development shall influence (without examining that impact in detail) .
- Research agency Mpiris has experience with a of such research approach in the context of a SCOPE competency forecast : at the study for IBN Composites (2019) became also the sector-specific implementation of existing processes (from the metal industry) detailed by zooming in on the impact

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of the forward -looking scenario of a transition of metal nasty composite (as here ' betting on the use of batteries ').

The Steering Committee gave at that (1) the classic competency forecast indeed not realistic at this point in the development of the battery value chain is . additional the meeting decided that (2) the selection of only two processes would be too restrictive . In conclusion chose the Steering Group **unanimous for (3) the sector-specific option** because the research output more relevant shall to be in front of a wider segment of companies in the battery value chain .

The research bureau Mpiris gives at Which this slope as different approach to the project proposal must become submitted to ESF for approval . Mpiris has experience in adjusting the research approach during the course of the project . The Steering Committee determines emphatically Which hair unanimous choice depending on the sector-specific focus is of the approval of ESF.

4.3 Selection processes for the analysis phase

Because the Steering Committee suggested has to merge process 9 and 10 for the in- depth interviews (with a this much possible equal division of companies active in sales battery solutions, whether automotive or not, there is still a fourth process become selected . Because the Steering Committee agrees was with the prioritization of the workshop, it will be fourth selected process 5 assembly (off the shelf) of containers/ systems (incl. repackaging).

The Steering Committee decided to select the 4 processes below for further analysis based on the company interviews .

	Bevindingen workshop: Processen							Algemeen gemiddelde
6	Ontwikkeling EMS, inverters, converters, … (hard- & software)	4,15	3,46	4,31	4,69	4,31	4,46	**4,23**
15	Controle (monitoring) en optimalisatie exploitatie batterijoplossingen	4,54	3,38	3,92	4,08	4,46	4,42	**4,13**
9	Technische verkoop (incl. system engineering) van custom made batterijoplossingen (excl. automotive) (B2B)	4,36	3,71	3,57	4,29	4,36	4,23	**4,09**
5	Assemblage (off the shelf) containers/systemen (incl. repackaging)	4,08	3,38	2,69	3,54	4,31	3,69	**3,62**
10	Technische verkoop (incl. system engineering) van batterijoplossingen voor automotive toepassingen (B2B)	3,71	1,57	4	3,71	2,43	3,69	**3,19**

Although process 9 and 10 emphatically if various processes became appointed in the workshop, the Steering Committee decides to focus on the technical sales (incl. system engineering) and 9 and 10 so if a process to consider . Mpiris then suggests to the earlier distinguish workable in the selection of the companies that will become interviewed for this process : if half _ active is in the automotive (in broad meaning , so inclusive freight and bus transportation , not limited until electric wagons), becomes also in front of Which part of the battery value chain the process specifically investigated .

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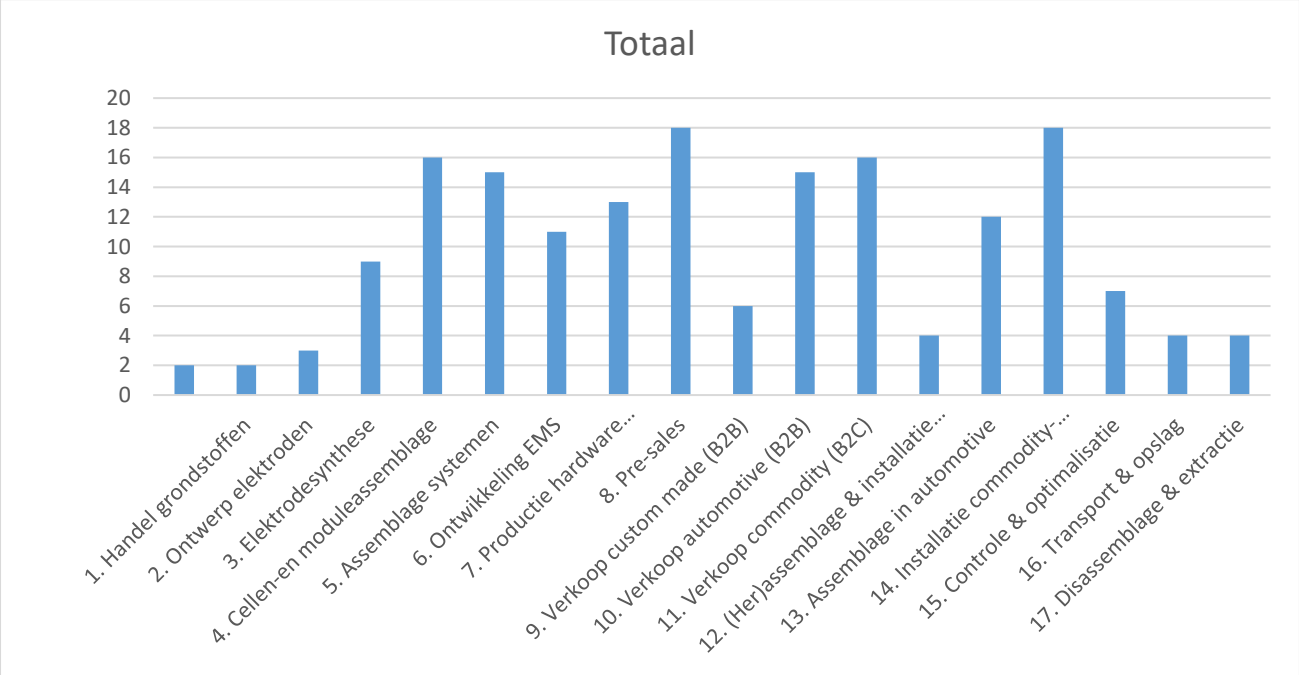
Mpiris is doing a for the time being proposal with examples from the aerospace sector and lighting applications and will further supplement based on the selection of the Steering Group with the most relevant equivalent processes used in previous competency forecasts to be investigated .

Hereby must become mention that 's not all processes that are currently proposal to be included , will become investigated : of the eight that are now provisionally to be listed , there will be a maximum of four investigated . See the selection of the Steering Group before :

1. **Design and product development** (2. Design electrodes ; 6. EMS development (hard- and software)
2. **Assembly** (4. Cells & Module Assembly ; 5. Assembly Systems)
3. **Installation & commissioning** (12-13-14. Installation custom made and commodity battery solutions (B2B, automotive, B2C))
4. **Data driven services** (15 Control (monitoring) and optimization exploitation battery solutions)

4.4 Companies

The list of companies active in the Flemish battery value chain became at the beginning of the meeting supplemented by the members of the Steering Committee . Also their role in the value chain became indicated by linking the companies _ to the processes . In this way you can we the relevant businesses in front of identify further analysis . Below Overview illustrates thus the importance of each process in the Flemish value chain .



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1. Trade raw materials

Bebat , Novali

2. Design electrodes

Audi, Nevalic

3. Electrode Synthesis

Audi, Exide , Novalic

4. Cells and Module Assembly

Audi, 247 Energy, Alfen , Altreonic , BatterySupplies , Exide , Novali , Posetron Energy, Watt4Ever

5. Assembly systems

Volvo, Audi, Posetron Energy, CET Energrid , Alfen , 247 Energy, Futech , Altreonic , BatterySupplies , Exide , iLumen , Izen , Novali , SDME, Sunbat , Watt4Ever

6. Development of EMS

Audi, Alfen , Futech , Posetron Energy, CET Energrid , iinno Benelux, Izen , Octave Energy, ReVolta , Volvo, 247 Energy, Altreonic , aug-e , Lifepower , SDME

7. Production hardware components EMS

Alfen, Posetron Energy, CET Energy, Volvo, Octave Energy, SDME, Lifepower, Futech, Audi, Altreonic, 247 Energy

8. Pre-sales

Alfen, Posetron Energy, Octave Energy, Futech, CET Energrid, Altreonic, 247 Energy, Riello UPS, Izen, inno Benelux, Bluesky, Aug-e, Audi

9. Verkoop custom made (B2B)

Alfen , CET Energrid , Altreonic , 247 Energy, Posetron Energy, Octave Energy, Lifepower , Futech , Watt4Ever,
Sunbat , SDME, Novali , Izen , iLumen , iinno Benelux, Bluesky , BatterySupplies , aug-e

10. Automotive sales (B2B)

Volvo, Audi, Alfen , Novali , iinno Benelux, 247 Energy

11. Sale commodity (B2C)

Futech , Alfen , Posetron energy , Izen , 247 Energy , Riello UPS , Octave Energy , Lifepowr , BatterySupplies ,
CET Energrid , iinno Benelux, iLumen , Volvo, Bluesky , Audi

12. (Re)assembly & installation custom made solutions (B2B)

Futech , Alfen , 247Energy, Watt4ever, Volvo, Posetron Energy, Novali , iLumen , iinno Benelux, Audi, batterySupplies , Sunbat , CET Energrid , Octave Energy, aug-e , Altreonic

13. Assembly in automotive

Volvo, Audi, Bluesky Energy, Alfen

14. Installation commodity solutions (B2C)

Posetron Energy, Izen , iinno Benelux, Futech , Volvo, Octave Energy, Lifepowr , iLumen , Audi, Altreonic , Alfen , 247 Energy

15. Control & Optimization

Futech , CET Energy, Audi, Lifepower , Alfen , Volvo, SDME, Posetron Energy, iLumen , iinno Benelux, GEP, Altreonic , Bebat , Riello UPS, Fluvius , Octave Energy, aug-e , 247 Energy

16. Transport & storage

Bebat , Volvo, Audi, Watt4Ever, inno Benelux, Futech , Alfen

17. Disassembly & extraction

Bebat , Watt4ever, Sunbat , Volvo

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Without process

Rensol , Hoppecke , CKS, Bright Energy

5. Preview analysis

With this decisions of the Steering Committee is phase 1 of the project , the preliminary investigation , has been completed . The output of this consultation is becoming incorporated in the reporting .

Based on the selected processes and companies 24 interviews planned to determine the specific competencies needed in this mapping processes . _ _ _ For this the interviews are divided among the project partners and scheduled . The research bureau makes a interview guide .

In addition is the training offer examined Which meets to the necessary competencies in the battery value chain . For this makes EnergyVille an analysis of the training offer and will this one present to the Steering Committee on the following meeting .

The following Steering group meeting state scheduled on April 19 and try we to organize physically .

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XI. **Report of the Steering Committee meeting on 19/4/2022** (Brussels, Teams recording)

8 participants :

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agenda

1. State of affairs and review of activities ever since previous Steering committee meeting (1/2)
2. Provisional Results
    - Processes EnergyVille
    - Processes Mpiris
3. Analysis training offer
4. Looking ahead Steering group meeting 21/6

1. State of affairs and review of activities ever since previous Steering committee meeting (1/2)

detailing phase : Analysis future competence and training needs

This one analysis stage constitutes the actual investigation of the focus study . What in the first phase on the surface brought was , will now be detailed analyzed with a view to changing competence and training needs . The information about the competence needs is becoming first collected on the basis of company visits and interviews , the approach and working methods of which prior to emphatically became worked out . In order to meet competence needs in the future , it is necessary to to analyze the training offer and then compare it with the results of the interviews.

Methodology competency forecast

The Steering Committee decided on the previous meeting (dated 1/2/2022) that the classic competence forecast not realistic at this point in the development of the battery value chain is . Therefore chose the Steering Group for the sector-specific research option because the research output more relevant shall to be in front of a wider segment of companies in the battery value chain .

Sector-specific focus informed from equivalent processes Others sectors	• Close at at the development stage of the sector • Battery specific competencies with future -oriented supplement • Standard methodology • More focused inquiry • better clutch businesses • Detailed information about four processes • (None detailed impact BS)

This one research choice became submitted to ESF through a note on 15/2. After additional explanation on 8 -11/3 became this one approach approved by ESF on 23/3.

Selected processes

Next 4 processes became by the Steering Committee at its February 1 meeting selected :

1. Development of the components of the EMS, converters , ... (hard- and software)

Process in which detailed is becoming what created must become , of possibilities until product innovation or optimization identify about testing until sufficient description of how to make product .

2. Assembly (off the shelf) systems incl. repackaging (B2B, automotive: containers)

Production process whereby components according to a particular procedure goal oriented combined become until systems or containers (for automotive).

3. Technical sales (incl. system engineering) of a custom made battery solution (B2B, automotive)

Process whereby if part of the sales process a design is becoming made of a appropriate battery solution in front of a specific application .

4. Control (monitoring) and optimization exploitation battery solutions

Service process in which the operation and optimization of the battery solution central state , among others . quality and security controls , fine- tuning EMS, remote management, predictive maintenance and safety , reading BMS, evaluation (residual) value .

Company interviews

Based on the processes and companies selected 24 interviews were planned by the Steering Committee (dated 1/2/2022) to discuss the specific competencies needed in this mapping processes . _ _ _ The interviews are distributed among the project partners and all scheduled in March , April and May :

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Development components EMS	Assembly	Technical sales	Control and optimization
iinnoBenelux (Hasselt, 22/3)	Volvo Trucks (Ghent, 1/3)	Altreonic (Heverlee , 17/3)	iinnoBenelux (Hasselt, 10/3)
CET Energrid (Genk, 23/3)	247Energy (Antwerp, 3/3)	Octave Energy (Brussels, 8/4)	iLumen (Tessenderlo, 18/3)
ReVolta (Brussels, 25/3)	Near Grid Solutions (Lokeren, 8/3)	247Energy (Antwerp, 12/4)	CET Energrid (Genk, 18/3)
Enervalis (Houthalen , 14/4)	CET Energrid (Genk, 23/3)	Alfen (Ghentbrugge, 6/5)	Audi (Brussels, 11/4)
Condogo (Antwerp, 21/4)	Alfen (Ghentbrugge, 6/4)	Volvo Trucks (Brussels, 10/5)	Lifepowr (Antwerp, 14/4)
Posetron Energy (Peer, 27/4)	CKS (Dilsen-Stokkem, 15/4)	Bluways (Leuven, 31/5)	Posetron Energy (Peer, 27/4)

The research bureau has a interview guide drawn up to support the project partners in achieving the desired output . additional was done per process a competency list prepared on the basis of parallel processes in a Others sector (details about this in the report of the meeting dated 1/2/2022). 1 process per interview discussed on the basis of the generic competencies from the competency list that go over 1 by 1 be with the question what the battery specific interpretation of this competence is .

On the date of April 19 became already conducted 18 of the 24 interviews , amply more than foreseen half of the total number of interviews (12/24). The research partners indicate on the basis of the interviews conducted that it is fascinating and instructive exchanges to be valuable experiences in front of both parties . It turns out well necessary to improve the methodology and competence thinking well framed and explained _ _ _ what 's the point is of the non- battery specific competencies that become submitted . And last but not least to give businesses at to be curious what about the results of this research? shall happen . Flux50 takes on the dissemination of the project results and will about this nasty all relevant parties in the fall communicate .

Based on the interviews, recordings and notes are the competences , influences & selected business scenarios identified . This one become reported in advance lined up reporting grid , what allows to make an analysis of the lines of force per process , the elements that again nasty above come during the interviews. The reporting of the competencies and influences in the grid will result in a user-friendly dynamic pivot table and chips with detailed explanations per competency .

2. Provisional Results

lines of force development of the components of the EMS (hard- and software)

1. Mutual needed insight into hardware and software
2. Hardware related : Importance flexibility of designs
3. Software related : Both embedded as cloud- based programming + modelling competences , increase interest information security
4. Need efficient collaboration (modularity , documentation)
5. Need testing takes please , because of increase complexity and risks

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6. Interest communication skills about development teams , often international spread
7. Development of " manuals " for installers: who ?

Main lines of assembly (off the shelf) systems incl. repackaging (B2B, automotive: containers)

1. Taller weight at knowledge and respect of safety regulations
2. The mastery of manual assembly techniques stays necessary (classic , limited number)
3. Degree of automation hangs depending on choice battery technology , degree of development business and assembly volumes
4. maybe shift to English as common language
5. Communication about the work process , in particular monitoring and testing , requires basic digital competences
6. Education is becoming a standard part of the job
7. Competency Differentiation within teams
8. Partnerships broaden the scope at competencies

lines of force technical sales (incl. system engineering) of a custom made battery solution (B2B, automotive)

1. Basic knowledge if building block of fast learning ability
2. Multitude of solutions and application domains requires flexibility
3. Decisions take in the absence of templates and protocols gets more complex
4. Complexity and Variability require strong communication and collaboration skills
5. the unknown at the customer increases the importance of building a _ trust relationship

lines of force control (monitoring) and optimization exploitation battery solutions

1. Quality control follows safety regulations (battery technology specific)
2. The importance of the competence to process complex data takes please
3. The knowledge of privacy legislation is becoming more important
4. Competencies in front of customer or data driven services are different
5. Partnerships broaden the scope at competencies
6. Fast evolving market : importance of internal knowledge sharing , agility and regulations

General additions :

The work environment gets more complex on the 3 big axes : safety , automation , digitization . Differentiation of the competences in the teams can be a way of dealing with this .

Everywhere coming back that there are many soft skills required be , what opportunities offers in terms of employment . Non- technical but rather commercial profiles be able to possibly with a technical refresher training eligible come for this .

Business scenario's

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After going over and discussing the competency list is becoming a additional list of business scenarios presented with the question for the top 3 company choices for the company , for the next 10 years . _ _ Finally , _ asked whether these internal choices meet the competence needs shall influence .

Selection business scenarios

All involved businesses by definition rely on batteries . It is on the basis of that scenario that the talks become lined . In the below table stand the lake specific business scenarios with the sum of the choices made by the companies make . This one outcome validates the research choice of the Steering Committee for the sector-specific research option : the fan on which companies in the next ten years expect to bet , is very wide . This reflects the fact that the sector still in full development is . Naturally want Which also say Which if you bet on a other (or additional) strategic choice , there is also an impact on the competences shall be .

BS1	**Betting on batteries**	**18**	**18**
		Choice top 3	Impact Competencies
BS2	Own digital platforms and systems create in the context of user-friendliness	3	3
BS3	**Betting on modularity**	**7**	7
BS4	Focus on management monitoring battery systems	4	4
BS5	Betting on the use of AI	4	4
BS6	**Bet on total solution**	**9**	8
BS7	Bet on energy services	4	4
BS8	Offer after -sales service , aftercare , follow -up	6	5
BS9	Bet on specialization	4	4
BS10	**Bet on strategic partnerships**	**7**	7
BS11	To strive nasty circularity	6	6

3. Analysis training offer

The training offer Which meets to the necessary competencies in the battery value chain is becoming examined by means of Energyville . For this is becoming watched to the courses on the one hand and the educational institutions and training centers on the other hand . In this analysis , internal company training So Outside consideration left . Relevant training that highlights _ _ come on the basis of the company visits , be content-related further researched , as well as best practices abroad . Due to the current training offer with the future competency needs will be compared we a better sight get on which educations are missing which competencies fail become learned .

Structure educational institutions and training centers

- regular Education
  - Secondary : BSO [VKS3] + TSO [VKS4]
  - “HBO5”, “ graduate degree ” [VKS5]
  - Professional bachelor [VKS6]
  - Master [VKS7]

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    - Industrial + Civil engineer
    - economic profiles at sales? eg . commercial engineer /TEW
- Education and courses
    - Centers: Syntra , VDAB, ...
    - Sectoral : Volta, …

Findings

- General (open door): large shortage technical profiles
- wide discipline field , implementation-oriented
    - Electrical Engineering , Electronics & Energy
    - Computer science/software, data science
    - Construction / Assembly
    - Automation
    - “Sales”
    - Not: Chemistry
- Often returning question : emergency at elementary knowledge electrical engineering
    - basic electrical engineering , power electronics , sensors , thermal problems , (simple) modeling , units and orders of magnitude know
    - Basis for safe to work
- Interested in front of offer “the bigger ” picture ” of the energy transition - background knowledge
- Knowledge with installers _ insufficient : basic knowledge , AREI, safety
- What about garages ?
- Foreign best practices
    - Example : EKF (Elektrofachkraft)
    - Basic education electrical engineering : quantities of knowledge , basic laws , networks , calculations , simple risks & safety
    - Couple of to dawn until couple of weeks , dep . of depth
    - Need to “tech writing ”?
    - communication skills for developing eg . _ _ manuals
    - Nut internships

Additions Steering group :

- European offer from EBA (ism Energyville & Eit inno energy): digital modules
- Education pure electromechanics add (eg . for welding of containers)
- E-learning modules VOLTA: eg . on charging infrastructure – events with Fluvius about energy transition for installers
- BSO/TSO: broad train to reason logically , not yet so _ battery specific ; Well possible in dual learning , market in front of professional qualification must wide enough be , to in front of short not yet before battery storage ; split domestic & non- household

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- HBO5 level: yet nothing found but there sit potential in front of specialization charging stations , batteries , ... (exists in front of renewable energy technology with a focus on solar panels , heat pumps , EMS, ….). Split into intelligent heating techniques & electrification specializations
- Train the trainer (possibly in combination with the students)
- Also target audience teachers consider , they to have refresher training need , who shall this one courses give ? teachers can the VOLTA courses for free follow & get access until teaching platforms + 10 days VDAB regulation : material to use if they education followed have to work with it
- ASO transfer- oriented education : how warm up students in front of this one industry ?
- A lot emphasis on VOICE
- T2/ Syntra – VDAB: battery training courses
- Educam offer

4. Looking ahead Steering group meeting 21/6

the coming to soften the remaining interviews (another 6) and the reporting further finished . Simultaneously depth Energyville the analysis of the training offer further out . The following Steering group meeting state planned on June 21 and organizing we physically in Brussels with the agenda below :

- Presentation final results interviews
- Preparation action plan
    - Cross bottlenecks that action require
    - Brainstorm about the actions that possible bottlenecks a solution be able to offer

We call all drivers to physically to be present on June 21 because you a valuable contribution be able to to deliver to the possible actions to address the bottlenecks to tackle emerging from the results _ turn out . You presence is important to _ a behave action plan to come with which the sector along can get started .

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XII. **Report of the Steering Committee meeting on 21/6/2022** (Brussels, Teams link)

13 participants

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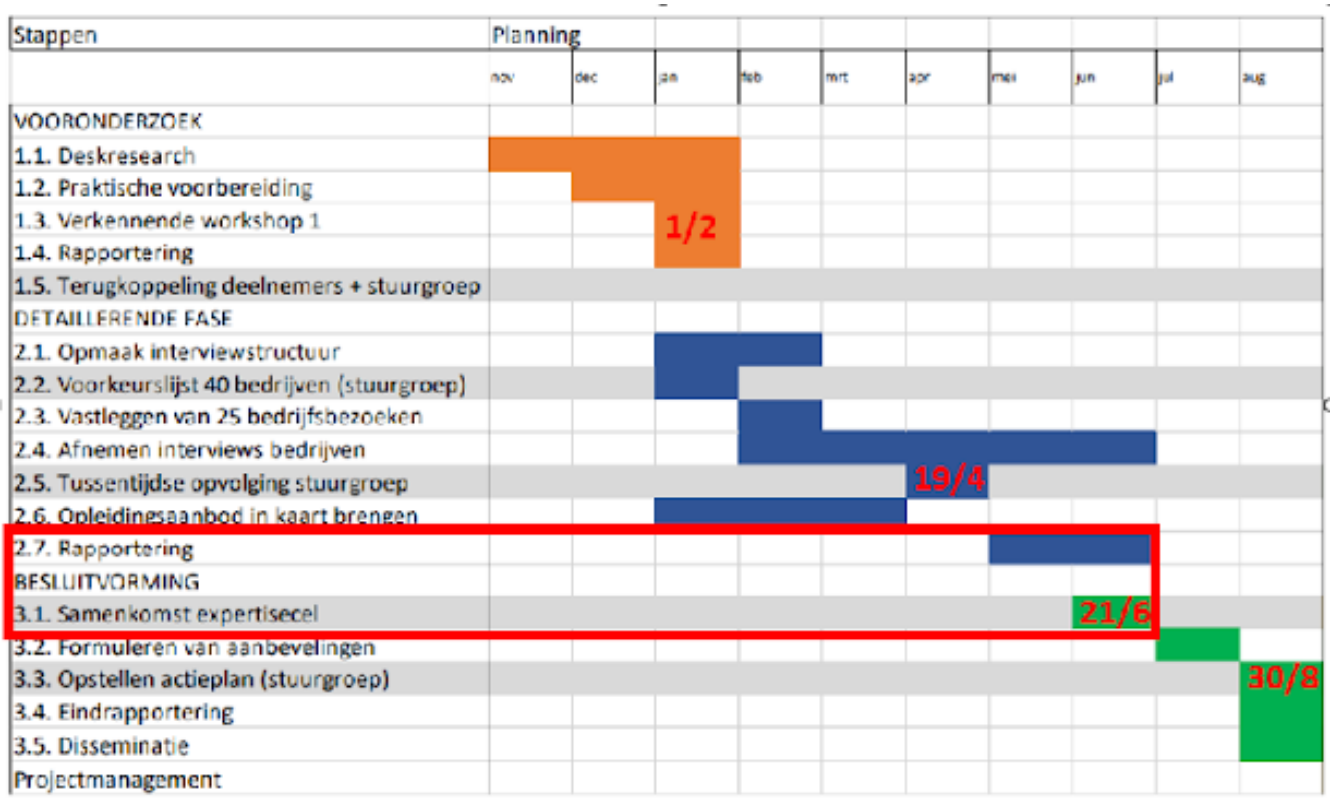
agenda

1. State of affairs and review of activities ever since previous Steering group meeting (19/4)
2. Feedback and validation detailed Results research
    a. Influences interviews (fiches & pivot table)
    b. Analysis training offer (slides & Excel)
3. Findings direction action plan
    a. Power lines per process
    b. Summary selection business scenarios
    c. Main lines of analysis training offer
    d. ESF call ' Training ' for the Future '
4. Brainstorm about possible actions (workshop)
5. Plenary feedback
6. Looking ahead (Steering Committee meeting 30/8)

State of affairs and review of activities since the last one Steering group meeting (19/4)

Since the last Steering group (19/4) are 6 more interviews have been conducted , the reporting of all 24 interviews has been realized and the training offer has been completed analyzed , with which the detailing phase is now completed .

Below you will find the general overview of the project and the phase in which we are now sitting , and the overview of the interviews conducted per process :



Conducted interviews

Development components EMS	Assembly	Technical sales	Control and optimization
iinnoBenelux (Hasselt, 22/3)	Volvo Trucks (Ghent, 1/3)	Altreonic (Heverlee , 17/3)	iinnoBenelux (Hasselt, 10/3)
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ReVolta (Brussels, 25/3)	Near Grid Solutions (Lokeren, 8/3)	247Energy (Antwerp, 12/4)	CET Energrid (Genk, 18/3)
Enervalis (Houthalen , 14/4)	CET Energrid (Genk, 23/3)	Alfen (Ghentbrugge, 6/5)	Audi (Brussels, 11/4)
Condogo (Antwerp, 21/4)	Alfen (Ghentbrugge, 6/4)	Volvo Trucks (Brussels, 10/5)	Lifepowr (Antwerp, 14/4)
Posetron Energy (Peer, 27/4)	CKS (Dilsen-Stokkem, 15/4)	Bluways (Leuven, 31/5)	Posetron Energy (Peer, 27/4)

Results interviews (short)

24 interviews were conducted . Thereby are 96 influences captured , what results in 347 links in the reporting grid and 719 lines in the pivot table .

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The added value of a competency forecast is in the detail . This is hard on a meeting to display , causing _ a wrong impression of generalities might _ become awakened . Hence it is available in advance setting up the records.

With the **sample sheet** the fixed structure of the chips is explained :


Controle monitoring en optimalisatie exploitatie batterijoplossingen

IDI49 Batterijspecifieke vereisten voor generalistisch projectmanagement

Conceptueel gezien verschilt de rol van een projectmanager in de batterijsector niet van die in andere sectoren. Telkens als er verschillende partijen (klant, het eigen projectteam, (externe) installateurs en technici, enz.) betrokken zijn, zijn communicatie en overleg cruciaal. Hiervoor is een eerder commercieel profiel met een hoge doelgerichtheid vereist. Maar in een batterijgerelateerd project wordt ook kennis van de energiemarkt verwacht om de noden van de klant te kunnen koppelen aan features die meerwaarde creëren voor de oplossing, bv. met extra data driven services, en vragen en bezorgdheden omtrent de optimalisatie met de nodige "authority" te kunnen beantwoorden. Bijkomend is er ook voldoende technische kennis vereist om de batterijspecifieke veiligheidseisen van de kwaliteitscontrole te kunnen adresseren. Dit houdt onder meer in dat deze generalist kan fungeren als het aanspreekpunt voor technici en voor hen de vertaalslag kan maken van een op papier (vaak) streng veiligheidsplan naar instructies die realistisch zijn voor de locatie van de batterijoplossing. Zijn/haar verwachte inlevingsvermogen is ook vereist om de vaak externe partijen te overtuigen van de noodzaak om mogelijks nieuwe veiligheidsinstructies in de eigen werkmethodes te integreren.

Overzicht strategische keuzes die aanleiding vormen

Overzicht betrokken competenties

Kan de klant, het eigen projectteam en derde partijen uit verschillende disciplines consulteren en met hen overleg plegen

Kan een project definiëren, plannen en beheren

- At the top do you always find the questioned process (one of four);
- below it first the influence code , then the influence title (the change from comparable _ processes in other sectors , battery specific or not);
- Explanation of the captured change , with reference to the necessary competences ;
- Overview strategic choices (or business scenario): is in this competency forecast always ' Betting on batteries ', in accordance with the previous choice of the Steering Group to be in the first place to capture the development of the sector ;
- Overview of the concerned competencies , from the list competences given to the companies during the interviews became submitted .

All components of the chips are also reflected in the **pivot table** , which is at the meeting is becoming explained .

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- This concerns a dynamic form of reporting , where with different filter the results flexible and tailor-made be able to become picked up . So shall a company earlier interested are in the processes in which the company yourself active and thus the filter of the process at the top place ; a education provider shall earlier leave from the competences and those at the top put . With the addition of extra filters is becoming Lake detail of the investigation released .
- Important note : information about the interviewee businesses is on no can be found in some way in the chips or the pivot table . In the reporting has each company received a code that does the necessary links allows , but also cares for the anonymization in the final reporting – with which to the (justified) concern of some interviewees fully met is .

Results analysis training offer (short)

be here too for the sake of necessity detail the overview of the training offer and a number of findings about this , available in advance made (Excel and slides).

There are 120 courses inventoried . This concerns 9 education providers and 13 levels :

- SO: TSO (6), TSO Dual (1), BSO (9), BSO Dual (3), DBSO (6)
- HO: Graduate degree (HB05 - 3), PBA (6), Ma (6), ABA (4), Manama (1)
- Courses (47), Vocational Training (21), Syntra apprenticeship (7)

If the courses examined per process become classified , this yields the following overview on:

- To design components EMS: 25
- Assembly: 77
- Technical sales : 25
- Control and optimization : 65

Feedback Steering group on the results of the survey

A number of Steering group members express their appreciation from for the very telling descriptions , with very detailed descriptions of the necessary competences to improve the battery value chain to develop further .

When asked whether training providers with this getting started _ can , is the response that this for them trusted language use is . VDAB confirms this _ points out that these are very different profiles goes , who still further shall should become described , including their possible clutch at bottleneck professions . This will be part of the further exercise that on it focused must to improve the battery value chain in Flanders Lake to make visible , sure also in front of potential employees .

From the meeting is becoming on top pointed out that in many cases the retraining of existing profiles necessary is , current installers of solar panels for example , or people who are now employed are in auto mechanics .

The basic need nasty a general training to be able to use electricity safely to work comes in zo good if all chips for . This base was in the new final objectives of secondary education education , because in the field of

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education people convinced is of necessity but with the deletion of them by the Constitutional Court prevails in the field a lot uncertainty .

Also the need for teachers to be retrained (TSO, BSO , electro and electromechanics) at bid .

The results are called " useful and useful " and " valuable " because they expose what 's possible is in the sector , in particular that the field to reach people and to the sector to lead , much _ wider is than what one was before had thought .

Conclusion : The Steering Committee validates unanimously the results of the investigation . This one Results shall like they became proposed at the Steering Committee meeting , are included in the final report for ESF.

After the validation by the Steering Committee of the detailed research results follows a short explanation like Below described about the lines of force per researched process , the lines of force that result chosen from the top 3 business scenarios and from the gap analysis of the training offer .

lines of force development of the components of the EMS (hard- and software)

1. Mutual needed insight into hardware and software
2. Hardware related : importance flexibility of designs
3. Software related : both embedded as cloud- based programming + modelling competences , increase interest information security
4. Need efficient collaboration (modularity , documentation)
5. Need testing takes please , because of increase complexity and risks
6. Interest communication skills about development teams , often international spread
7. Development of " manuals " for installers: who ?

Main lines of assembly (off the shelf) systems incl. repackaging (B2B, automotive: containers)

1. Taller weight at knowledge and applications safety regulations
2. Control manual assembly techniques stays necessary (classic , limited number)
3. Degree automation hangs depending on choice battery technology , degree development business and assembly volumes
4. Evolution nasty common language (English)
5. Communication about the work process , in particular reporting and testing , requires basic digital competences
6. Collaborate with subcontractors facilitates market development
7. Knowledge transfer and assurance become organizational competence

lines of force technical sales (incl. system engineering) of a custom made battery solution (B2B, automotive)

1. Basic knowledge if building block fast learning ability
2. Commercial / Economic profile ifv . knowledge (international) market , application domains , technological and energy trends
3. Trust and network relationship (still more) crucial
4. Require complexity and variability (in the absence of history) Lake flexibility , communication and collaboration skills

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5. Standards , legislation and safety should known to be within the team
6. Internationalization (partly) determines the competence needs
7. Unpleasant evangelism /(mobility) consultancy

lines of force control (monitoring) and optimization exploitation battery solutions

1. Quality control follows safety regulations (battery technology specific)
2. Specialist knowledge ifv . dummy proof quality control (data)
3. Collaborate with subcontractors facilitates market development
4. Knowledge building and assurance become organizational competence
5. More interdisciplinary communication necessary
6. Evolution nasty common language (German)
7. Fast evolving market : importance customer-driven services , agility and regulations

Summarized are there two general draw conclusions _ from the research :

On the one hand are there any number of competencies identified that emphatically battery specific are and who can focus to shape both in front of companies that _ further want proficient in certain processes or parts of that , if in front of education providers who, with the inclusion of this specific competencies in existing or new training courses , the development of the battery value chain in Flanders along be able to support .

On the other hand are there any whole range of non- battery specific needs identified , what Bee some interviewees any concern caused . This one conclusions to be however also competence-oriented and giving at that the battery value chain also need has at Lake general competencies (often referred to as 'soft skills ' , such as communication and collaboration skills). Also this one conclusions are relevant to the _ developing sector because a whole series profiles in the picture come where one before maybe did n't at thought . By comparison with comparable _ processes in other sectors to be shifts in competencies identified who can participate in the recruitment process in the battery value chain send .

This one twofold conclusion is a strong foundation for the action plan about which the Steering Committee members later in the meeting shall brainstorming (see below).

Summary top 3 chosen business scenarios

BS1	Betting on batteries	24		24
		Top selection	In top 3	Impact on competencies
BS2	Own digital platforms and systems create in the context of user-friendliness	1	3	3
BS3	Betting on modularity	6	9	8
BS4	Focus on management monitoring battery systems	2	5	5
BS5	Betting on the use of AI	3	6	6
BS6	Bet on total solution	2	12	11
BS7	Bet on energy services	4	7	7
BS8	Offer after -sales service , aftercare , follow -up	2	9	8
BS9	Bet on specialization	-	4	4

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BS10	Bet on strategic partnerships	3	9	8
BS11	To strive nasty circularity	1	8	8

The result of the (limited) survey about business scenarios confirms the previous choice of the Steering Committee not to define the research on the basis of strategic choices , but all to offer space at the fan at possibilities that the yet plenty developing sector exploring _ _ is .

This one conclusion reflects themselves in the broad choice of interviewee companies , which demand nasty their top 3 in the coming five year hard to answer found : about all business scenarios come in it for . One in two businesses named ' total solutions ' , 9 companies ' energy services ' (what points to the choice to go broader than pure battery technology) and ' strategic partnerships' (including a important role in front of subcontractors and non- battery companies that participate services be able to develop). ' Circularity ', that only once all the way at the top is put , becomes well by means of one in three of the interviewee put companies in the top 3 – what again the ongoing _ _ exploration of forward -looking development opportunities by the industry confirms .

In terms of impact on the necessary competencies will be all over the line confirmed : any strategic choice shall influence have on the requirement competences for the sector to let go growing , competence development is thus where the battery value chain if whole must bet .

lines of force Gap analysis training offer

1. Need at elementary knowledge electrical engineering & safety
2. Need to 'tech writing ' (for manual)
3. Interested in front of offer “the bigger ” picture ” of the energy transition

Actions resulting from this would be able to ensuing are : _

- Support STEM campaigns
- Update curricula secondary Education
- Usage existing offer (limited performance due to lack of trainers)
  - In training centers
  - In daytime education (modules)
- New offer : basic module ' energy transition '

ESF call ' Training ' for the Future '

THE ESF call for Training for the future ' to finance is a opportunity to join the Battery Academy to implement action plan to practice . _ This one call stilt if condition to use the results of a competency forecast to get started . _ _

through a Expression of interest (fill in until June 30) wishes to inform ESF which education of the future should tackled be and can give input be to the call specific to shape . _ This one round of questions is without obligation , the project call will follow in September and project proposals can be done in October via the ESF application become submitted . The start of the project is planned in January 2023 with a term of 1 year .

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there is interest at the Battery Academy project participants Syntra , Volta, Energyville , Green EnergyPark to answer the ESF call . Contact them in to a project submission to be discussed in more detail . The recording of the ESF info session about this project call can be found here review .

Brainstorm about possible actions

When drafting a _ _ action plan is it important to do the three possibilities that a competency forecast offers , to use . it goes hereby about:

1. Realizing actions in the companies , _
2. Realizing actions _ _ for the (future) employees ,
3. Creating or adapting training courses . _

When it comes to brainstorming about possible actions , there are (at least) three categories eligible actions _ come , namely :

- Inform and raise awareness
- Reflect and deepen
- Educate
- Other ?

what kind a action is it?	Communication campaign , Learning Network , webinar, return talks , mentorship in companies , training , …
Target group ?	Entrepreneurs , education providers , broad audience , differentiation based on . position labor market , age , …
Medium?	Oral , written , video , podcast, …
Deliverables ?	Which tangible result must out of action come forth ?
Possible partners ?	Companies , sector funds , education providers , associations , …

Based on the above frame define the present Steering group members the following actions :

1. Training : basic electricity / electromechanics + basic battery knowledge in front of secondary education and further training . The combination is important because this is precisely what is missing and can arouse interest in this sector to get started and vice versa _ from the sector also get the basics . In the form of video and training material . Possible collaboration with Volta/ Syntra / schools /VDAB

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2. Energy transition in combination with sustainability & circularity , people through entrepreneurs reach ; medium: by means of recurring mailings, brochures via one of the project partners , webinars; covenant that entrepreneurs sign confirming their commitment to do so to get started ; _ _ in collaboration with . VOKA + knowledge institutions + knowledge transfer from own enterprises ; push too nasty entrepreneurs to participate , for example through testimonials – press _ from Europe)

Supplement from the meeting : this is also possible nasty a other goal audience focused become , the broad audience for example or for sure also education . _

3. Courses to be quickly out of date, there is no total offer nor a tailor- made offer , there are fail trainers : so there is an emergency at inform and raise awareness : Answer : YouTube (or other platform) Energy Channel Vlaanderen = Training Center for installers, for internal employees in the companies and other stakeholders, such as end consumers ; composed by the sector , eg . quarter of an hour per matter , filled in by the corporate world ahh . monthly fairy at channel ? Type of menu in which the modules themselves chosen become depending on needs ; thus be able to specific items/ movies updated become without the whole offer to have to tackle , for example about the capacity rate , subsidy schemes , ... Community manages , filters , stores quality , ... via core team / companies . focused announce .

4. Deepen : journalists to inform because she a reach have , apostles > information evenings in front of this one target audience , charismatic trainers / figures (can also be in channel see 3.)

5. Can to indicate when someone electricity expert is : certification ?

6. Trainings for 3 target groups needed : R&D & Production (higher education), entrepreneurs (for sales profiles , product and sales training), installation & service (assembly, installers, after - sales service) via all relevant training centers ? How : online and practice .

7. Immersion of young people and teachers in technology in function of the energy transition : combination of hands-on and e-learning; through social media channels (see idea 3) (Energy Channel, TikTok of the Energy)

8. Physical immersion days in testing grounds : all partners here _ table plus Schools of the Future , Schools 2030, Warme Schools ... All organizations involved are with the transition of education , …

9. Energy transition the bigger picture : with video etc., supported by means of various partners : school boards , Energyville , Green Energy Park, Flux 50, VOLTA, etc.; in front of all stakeholders: new employees , customers , …..; online, short pieces : basic and in - depth .

10. Before a broad information campaign (“ parish halls ”) is the conclusion of the Steering Committee that it is not (yet ?) the right thing climate is : there is too much distrust and polarization . what maybe well possible is , is something like that as the BNP Paribas radio spot on radio one , where every time a specific topic during five minutes is becoming explained for the news , so suitable for a general to inform the public .

11. Learning network from companies now involved to be , to share knowledge : must possible to be because there is few shielding from each other _ due to the growth in the sector , the competition is limited , there are a lot possibilities . This could be a option are for the emergency to further explore tech - writing (manuals) .

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12. Train the trainer: educators who want this giving : retraining & retraining , everyone educator each in its own strength ; instructions in front of potential trainers , various working fields to increase reach , and so on fast possible this much possible reach people . _

13. Inform customs officers : know supercaps not, specialized , targeted documentation ?

14. Sector organization ESS: target group business and education ; succession quality installations ; with the companies if partner

15. Deploy standard in front of energy storage systems : for business and education , via website ; quality installations ; possible partners : ESS companies

16. Inspection DC part , cabling , connections : for the sector , companies and education , oral , removal of dangerous circumstances ; partners : inspection companies

Call : do you still have Lake ideas ?

delivery they to Geert (according to the above frame : what kind action is it? Target group ? Medium? Deliverables ? Possible partners ? ...)

Looking ahead next one Steering group meeting on 30/8 in Brussels

- Discussion action plan
- Possibly sophistication

In the meantime writes Mpiris in consultation with Flux50 a Lake detailed action plan out . You will receive this in the **first mid - August** , with the emphatic ask for **feedback** on the formulated _ actions . Based on your feedback , the action plan is then further developed refined in preparation for the next one Steering Committee Meeting .

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XIII. **Report of the Steering Committee meeting on 30/8/2022** (Brussels)

11 participants

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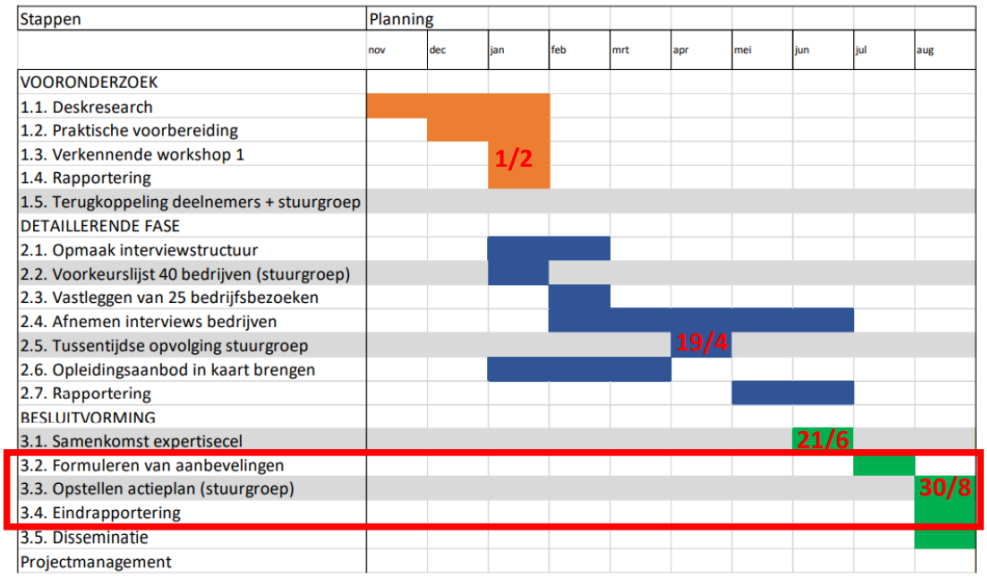
agenda

1. State of affairs
2. Validation final research results
3. Action plan Finalize & Validate
4. Looking ahead

1. State of affairs

We to be arrived in the last phase of the project where the action plan by the Steering Committee is becoming discussed , supplemented and validated . Subsequently follows the final report .



2. Validate research results

after the last one meeting of the Steering Committee on June 21 became the definitive reporting of the detailed interviews forwarded , being the competency sheets and the pivot table . The recommendations became defined and based on this could a first version of the action plan made up become .

For the final report is becoming requested to the members of the Steering Committee to validate the research results , ie the recommendations and the action plan .

The most important recommendations became extensive described in the previous report of the Steering Committee meeting on 21/6 and his Below summarized :

- Recommendations per process
- Battery specific competencies
- Non- Battery Specific competencies
- Competency needs that recur in all processes
    - Basic knowledge electricity , safety in battery and energy storage systems
    - Tech writing
    - Flexibility , learning ability and willingness

Members of the Steering Committee validate this one conclusions of the detailing phase .

3. Action plan finalize & validate

The Steering Committee 's comments on the preliminary action plan to be processed in the final version , added if attachment ; This final action plan was at the end this consultation unanimous validated became by the attendee members of the Steering Committee .

The Steering Committee advises a limited but doable action plan whereby ideas that are not enough specific are not included become . This one action points that do not make it such as 2.10, 5.21, 5.25 (from the preliminary version of the action plan published in August became sent around), are for your information well at the bottom of recorded and described .

Flux50 as promoter of this project takes a number of actions and records himself for this one maximally integrate into the implementation of other related European projects in which cooperated with partners who are also on the Battery Academy Steering Committee sit . Thus , the valuable collaboration continued become and sufficient capacity in time and resources deployed become in front of a effective elaboration of the actions . Below couple of examples of projects in which the actions of Battery Academy be able to framing :

- VOBAT training modules on batteries to be launched in 2022 elaborated by Green Energy park and VOKA. The first modules will be offered in the autumn of 2022 .
- EDI-H project , Energy in the build environment , drawn by VITO with educational institutions and the Flemish Confederation Construction . At the time of this writing is this project still in the approval phase but with a view to a positive Evaluation is becoming a launch event scheduled for January 2023.
- AMVELC (INTERREG), Labor Market Demand driven Energy Learning Community - massive open online training on storage technology , application pending .

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- MERIC (ERDF), Mobile extended Reality for Installation companies , as implementation of training courses for VR applications drawn by means of eitInnoEnergy , GEP and VOLTA. The investments to be to provide for the spring of 2023.
- EVERY1 (HorizonEurope), Education in front of broad raising awareness about the energy transition , digitization and renewable energy , with a international consortium.
- Education of the future (ESF), 2 new ones educations to provide in front of Energy Community Coach on the one hand by means of Evergi and Green Energy park and about batteries dor VOLTA and Green Energy Park.
- AP-COVE (Erasmus+), Training center on digitization in the building sector , +), final submission in September 2022 with Thomas More.

The actions from the validated action plan become Below described with reference to the project partners who indicate to to take action . _ _ They to be structured according to 4 major themes :

Spoor 1	Informeren en sensibiliseren
	1. 'Intern' communicatieprogramma 2. 'Extern' communicatieprogramma
Spoor 2	Reflecteren en verdiepen
	3. Lerend Netwerk
Spoor 3	Opleiden
	4. Bestaande opleidingen 5. Nieuwe opleidingen
Spoor 4	Opvolging acties en mogelijkheden tot vervolg
	6. Opvolgacties

Actions related _ until inform and raise awareness
1 Internal communication program unroll

Feedback nasty companies by Flux50
Results of the competency forecast share with the interviewee companies in the Flemish battery value chain middle a collective reflection moment . Convert the published report nasty a visual clear sheet and distribution via a projects brochure .

Written communication about outcomes competency forecast by Flux50
Summary of the results of this Share competency forecast by email with companies in the Flemish region battery value chain .

Contributions at industry events by the Steering Committee members and business organisations
Customized information , concrete and applicable _ available make and explain for the companies in the Flemish battery value chain by means of presentations at sector organizations .

2 External communication program unroll

Announcement and publication of the research report by Flux50

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Results of the competency forecast audience make via the website and announcement via this publication based on the Flux50 newsletter . Convert the published report nasty a visual clear sheet and distribution via a projects brochure .

Closing and Networking Event by Flux50 and business organizations
closing moment to organize in front of everyone involved _ is Bee this one competence forecast , including the relevant policy makers . This is not part of the project 's obligations , but Flux50 tries to link this at a relevant other event to maximize dissemination and network opportunities .

Article about the forecast in newsletters businesses by Flux50 and business organizations
The newsletter with results of this competency forecast dissemination through the communication channels of the companies in the Flemish battery value chain . This one sector communication also orientate on others profiles other than management and HR (eg production managers , foremen) .

Distribute article about the forecast to education and training providers by InnoEnergy, VOLTA and Syntra
The newsletter with results of this competence forecast , applied to the training , dissemination to the education and training providers and through the specific educational media . In this is becoming recommended to use the teaching jargon and specific points of attention nasty to slide forward . The partners of this project investigate the possibilities of translating the results to English to also to spread the communication within Europe .

Written communication about the training offer strengthen by VDAB, the education and training centers
Further building on previous action is meant here to provide support _ to the communication that the networks want to provide such as sharing the specific analysis of the training offer .

brainstorm organizing with education and training providers by Flux50, Energyville and Volta
medium a consultation session explore how to respond to the results of this forecast in consultation with all education and training providers offering 2 different target audiences to shape given the difference in flexibility to _ to enter actions .

label/ award reach out by Flux50, knowledge institutions , federations
Innovation in the spotlight to make at the companies in the Flemish battery value chain by here specific to draw attention to by means of a awards . Given the numerous initiatives that already exist for this is becoming recommended to existing awards to investigate as platform and them encourage focus on innovation in battery technology . Flux50 can access to the testing grounds offer for the winners and knowledge institutions be able to himself offer if candidate jurors .

Actions related _ until reflect and deepen

3 **learning Network to organize by Flux50, Agoria , VOKA, Syntra**
Knowledge transfer and battery competences strengthening in companies by means of a start working group with participating companies from the Flemish battery value chain . Be on the agenda site visits among the members of the learning network , sharing information about legal _ framework or technical evolutions , explore foreign best practices , follow up on the action plan of this competence forecast , etc. The organization of this network can also to suit within the perform _ _ activities of other European projects such as Interreg AMV ELC or EDI. The kick-off of this network could be coincide with the closing event of this project .

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Actions related _ until educate

4 Existing educations

Update professional qualifications based on outcomes prognosis by Department Education , VDAB, KULeuven- EnergyVille , Volta

Volta makes this one professional qualification files and indicates the need to new _ professional qualifications for the secondary with descriptions of the specific _ safety aspects , technician renewable energy techniques , new professions around EMS, charging stations and batteries . The advantage at the new professions is that CVO courses possible be , too in front of partial courses .

Training offer to link at new ones competency challenges by KULeuven- EnergyVille and Syntra

All knowledge and educational institutions can with this action getting started _ by means of take into account the results of this competency forecast in the drafting of their specific training offer .

Support to provide when drawing up training plans by means of KULeuven- EnergyVille and Syntra

All knowledge and educational institutions can with this action getting started _ by the necessary provide support _ when drawing up the training plans where the recommendations from this one competency forecast shared and considered become if valuable input from the sector .

Increase the possibility of internships by means of Schools , training centers , sector organizations , Volta, Syntrum

By offering internships _ _ Bee companies in the battery value chain be able to specific competencies learned to strengthen the training , whereby theory can be put into practice _ be in real work environments equipped with the specific infrastructure and components .

Intake in education and training strengthen by VDAB, training centers , sector organizations

Because of the fast evolving technological environment , the limited intake & insufficient knowledge of Dutch forms this one influx a great challenge . There is thought to ambassadors for the curricula in schools a partner as Green Energy Park can support by offering up-to- date infrastructure .

5 New ones educations

Drafting new _ _ educations asks the necessary time and resources and therefore is becoming recommended to watch nasty Others projects to realize to support this like up here already explained . For this are eligible for the ESF call ' Training ' for the Future ' and the Interreg project AMV ELC: ' Training trajectories in front of energy storage technology '.

Basic electricity and electromechanics training in combination with basic battery knowledge & energy management systems by means of education , training centers , VOLTA, Syntra , VDAB

The competency forecast gives clear again that the biggest urgency is in this basic training , both at secondary level education & further training . In the implementation of this education is attention required in front of various levels , competences and integration . Members of the Steering Committee recommend the content to adapt _ to the different target groups . Necessary components of this education to be safety , standards , tech writing , the context of the energy transition , sustainability , circularity .

Train the Trainer: basic electricity , electromechanics , battery knowledge & energy management systems by means of companies & knowledge institutions (content), education , training centers , sector organizations

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The target group of the train the trainer training to be people who want teaching and retraining or further training for this required have , the education providers but also large and medium companies . The possibility exists to e-learning platforms to use with instructions _ in front of future teachers but also for the infrastructure of VDAB or living labs to use for this .

Thematic (info) sessions on energy transition , sustainability and circularity by Flux50, all companies in the battery value chain , Green Energy Park, VOLTA, knowledge institutions , companies and subcontractors , training centers , enterprises , school boards , Schools of the Future , Schools 2030, Warme schools , VDAB, sector organizations
The intention is to broaden the target audience and therefore offers this one education a tailor- made offer on , who regularly an update will require . In this , VOLTA can as structural partner considered become for quality assurance . This one action can be realized be carried out in the context of some European projects in which this explicitly at bid coming such as the European Every1 project , the earlier mentioned AMVELC project and the VOBAT modules already by Green Energy Park in collaboration with Volta and others partners developed become . Content-related is becoming thought at different modules for the following topics: safety regulations , installation , integration various products , various types batteries , incl. supercaps , …

Tech writing by companies , knowledge institutions , schools , training centers
With this the aim is to translate battery - specific information nasty clear hands-on instructions in front of performers like employees , installers (subcontractors) based on videos , manuals , step -by- step plans, etc. Important hereby is to report Which a education for tech writing to acquire competences ideally in collaboration with the communication sciences is becoming lined up whereby inside this one department a technology track is becoming started up .

Installation and Service Training by means of sector organization ESS, training centres
Specific training in STEM offer focused to the installers who must stand for monitoring the quality of battery systems and installations .

Inspection DC part , cabling , connections by means of inspection organizations , training centers
These education has until aim to be dangerous circumstances to take away . The Steering Committee orders also at to include everything about standardization in this curriculum that also focused is to the installers. However , for this must yet work created become a _ joint standard of the installation companies .

6 Follow-up actions

Continuation Steering group by Flux50 and wider
Members of the Steering Committee become invited to participate _ _ to the working group batteries (learning network see Action 3) to get the valuable exchange inside this one Steering group to continue . _

Developing a future -proof standard in front of businesses by means of sector and business organizations
This one follow-up action wants to emphasize the importance of interoperability in the paint put : by the still many to expect evolutions is n't it evidence but yes important in the context of storage systems and the wider system vision . and keep an eye on it . (See also action 5.6)

Continuation learning Network by Flux50 and participants
To strengthen the knowledge transfer and battery competences in the companies in the battery value chain is becoming a learning network in the form of a workgroup founded (the learning network see Action 3)

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additional actions that didn't make it have in the final action plan

- **Actions related _ until inform and raise awareness : External communication program unroll**

A column for the evening news or in the form of a weekly radio spot in front of a wide public (in accordance with BNP Paribas Fortis on radio 1). For this to be considerable resources need to get a specialized hire a marketing agency . This is also possible in terms of content considered become if being science communication what falls under the competence of the Flemish government falls . There may be a connection found it be with the 2nd part of the ' Mee met de Stroom ' campaign, with Fluvius .

- **Actions related _ until to train : Education in front of journalists**

disseminate correct information about the complex energy theme through the different media channels seems a information session in front of journalists not superfluous , in the form of a webinar, targeted articles or press releases . Journalists to be however a difficult target audience because the importance of the news value big is . charismatic bvs Bet if facilitators may increase the willingness to listen enlarge . Members of Steering Group to give at that inviting the specialized press on energy events already a first step is for this achieve the objective .

- **Actions related _ until training : Product training**

For the battery companies _ value chain be able to product training pitch in to the development of the necessary competencies . The Steering Committee means with this product , sales and installation training with brand- specific information , offered by the manufacturers and suppliers . This one educations are already offered but are limited due to practical Bumps on the one hand being the distance or the language of the workouts . On the other hand to be they limited due to the specific brand vision and conditions making the importance of interoperability among systems of different manufacturers fail attention gets .

4. Looking ahead

Flux50 is responsible as promoter for the final report that ends October delivered is becoming to the subsidy provider and shared with the partners of this project . Like described in the above actions Flux50 also takes on the task of reviewing the research results to be widely shared with the relevant target groups .

Members of the Steering Committee shall invited be to participate _ _ at a follow -up event in January 2023 to discuss follow -up actions and the realization of the action plan . This one occasion shall used be asked to also join the working group on batteries , such as described in 6.1, boot .

This is the last report of the Steering Committee and all members emphasize on this last meeting the smooth and productive collaboration between the different project partners . In particular , the openness and cooperation of the companies as well as the educational institutions is becoming appreciated and has until a pretty result led with valuable insights and recommendations . Members of the Steering Committee thanked also expressly the research bureau Mpiris for the professional implementation of this competence forecast .

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