EUROPEAN CLIMATE, INFRASTRUCTURE AND ENVIRONMENT EXECUTIVE AGENCY (CINEA)

CINEA.C - Green research and innovation
C.4 - Innovation Fund

Innovation Fund Knowledge Sharing Closed-door workshop Energy Storage

Key takeaways and best practices implemented to reach Financial Close

10 October 2023, Brussels

1. Background

To contribute to de-risking and accelerated commercialisation of clean technologies across Europe, the Innovation Fund (IF) encourages knowledge-sharing among projects and stakeholders on clean-tech solutions.

On 10 October 2023, the European Climate, Infrastructure and Environment Executive Agency (CINEA) organized a closed-door workshop between large scale (LS) and small scale (SS) projects developing energy storage technologies that focused on sharing the experiences and knowledge acquired in relation to reaching financial close. The workshop was attended by thirteen Innovation Fund (IF) projects and three projects funded by other EU programmes (Connecting Europe Facility - CEF, LIFE and Horizon 2020) from across Europe with approximately 60 representatives present in person.

Reaching Financial Close (FC) is a crucial milestone in the project development cycle. It is the moment at which all project and financing agreements have been signed and all required conditions have been met for the start of the construction phase, such as the granting of relevant permits, and the completion and approval of basic engineering studies.

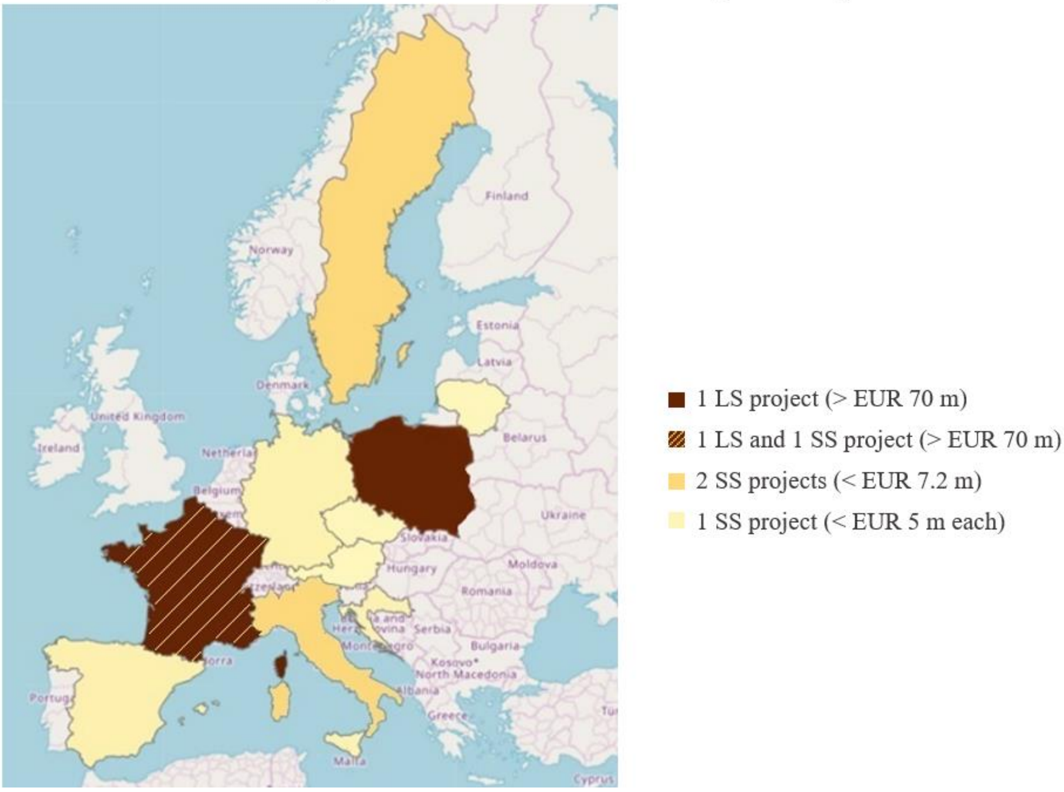
At the time of the event, six IF energy storage projects had reached financial close. Additionally, two more projects were expected to reach this milestone by the end of 2023, while the remaining projects expect to reach Financial Close in 2024 and 2025. Small-scale projects plan to reach financial close relatively faster, which correlates with their lower investment costs and usually simpler financial structure.

2. UNVEILING KEY INSIGHTS FROM THE IF ENERGY STORAGE PROJECT PORTFOLIO:

The storage-related IF projects present at the workshop covered various segments of energy storage system value chains. Some projects aim to facilitate market penetration of intraday storage and grid stability services and addressing the risks in their implementation, others cover demand-side response measures by applying smart grids or virtual power plant solutions or offer thermal and electrical storage services that improve sector integration. Yet another type of projects implement manufacturing processes for new battery-related components, sustainable reuse of electric vehicle batteries in stationary storage solutions, or recycling of critical raw materials that contribute to the EU circular economy and more resilient value chains.

While the scope of the IF covers all EU Member States, Iceland and Norway, the thirteen energy storage projects are located mostly in Western, Southern and Northern Europe. Concretely, they are located in Austria, Croatia, Czech Republic, France Germany Italy, Lithuania, Norway, and Spain, with total IF Grant amount allocated as per Figure 1.

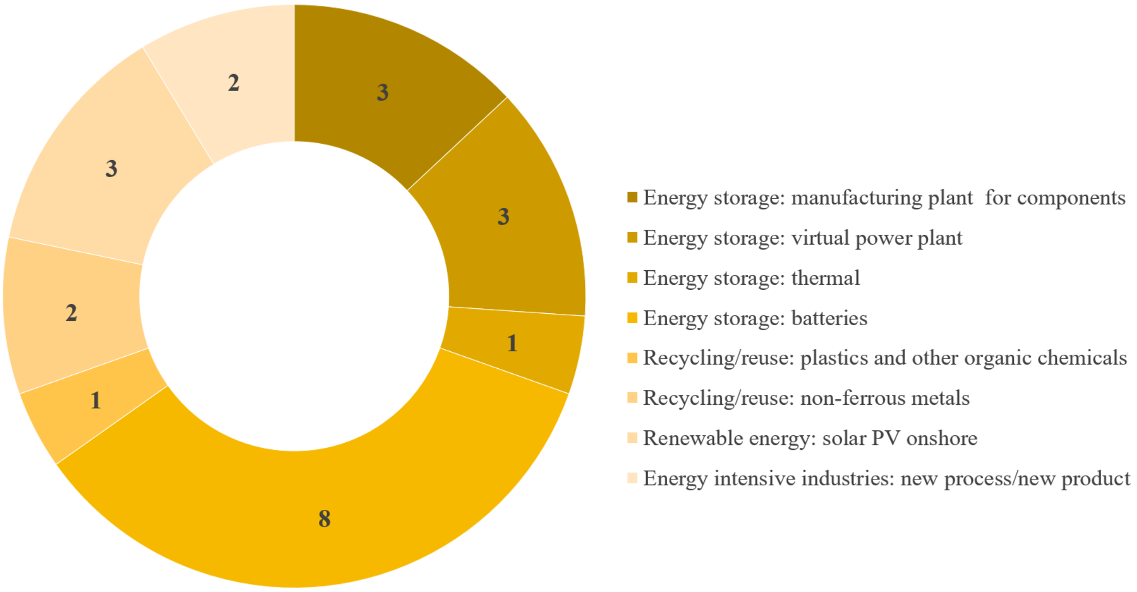
Figure 1: Total EU Grant allocated per country



The first emissions reductions can be delivered in the course of 2024 with the expected entry into operation of seven IF energy storage projects, most of them awarded within the framework of the 2020 small-scale projects call. At the time of the event, the IF projects presented at the workshop had the potential to avoid in absolute terms around 78,29 kt of CO_2eq until 2037 (over the 10 years of operation for each project).

These projects employ eight different climate mitigation technology pathways with batteries being the most frequent element of the energy storage concepts (Figure 2).

Figure 2: Number of IF projects per Climate Mitigation Technology Pathways



3. BEST PRACTICES ADDRESSING CHALLENGES IN IF ENERGY STORAGE PROJECTS

The projects illustrated practical solutions to overcome challenges and offered valuable insights based on their experience. Within the Innovation Fund's energy storage portfolio, projects fall into two primary groups: (1) those dedicated to establishing manufacturing processes for energy storage-related components and (2) initiatives centred around providing local or grid storage services.

Given the distinct goals of those two primary groups, the discussions were initially organized into four sessions, with slightly differentiated discussion topics among the two groups. The morning sessions centred on projects aiming to implement manufacturing lines. The first session explored challenges faced and measures taken by these projects to obtain the necessary permits, investments, and state aid support. The second session examined solutions provided for these projects to secure supply contracts and address challenges due to competing technologies in the market.

In the afternoon, the focus shifted to energy storage projects serving local customers and/or providing services to the electricity grid. The first session not only highlighted challenges faced by these projects, such as securing renewable energy supply agreements, equipment contracts, and obtaining necessary permits but also shared measures taken to overcome them. The subsequent session explored the difficulties and solutions associated with revenue generation, bank loans/equity, and investments undertaken by the projects. Nevertheless, it became evident from the conclusions that the challenges discussed across all sessions could be effectively categorized into three key blocks.

Irrespective of the project type, participants consistently identified (1) permitting and regulatory frameworks, (2) securing project financing, and (3) ensuring supply contracts as the key challenges that needed to be addressed.

3.1. Obtaining required permits and regulatory framework

Most of the energy storage projects face challenges either in the permitting process or the regulatory framework.

For example, second-life battery manufacturing and battery metal recycling projects face significant challenges in the environmental permitting process, especially with regards to potential chemical leaks during repurposing or dismantling of used batteries. Careful consideration of safety and environmental impacts due to treatment and disposal of hazardous materials and possible soil and water contamination, makes the permitting process more complex and thus a possible stumbling block to successfully implement the project. The specifics can vary depending on the project's characteristics, the involved chemicals, and the potential environmental impacts identified during the permitting process or specific details related to the land. For instance, one project faced delays in obtaining environmental permits due to the occupation of the land by migrants, influenced by its geographical location.

In addition, as for all project types, compliance with local land use requirements that are sometimes a moving target is essential to obtain environmental and operational permits. Project beneficiaries stressed the need to actively engage with regional authorities to streamline administrative procedures for obtaining operating and environmental permits. For example, in France the legislation has recently changed and the Dossier de Demande d'Autorisation d'Exploiter - DDAE (exploitation permit) has become the Dossier de Demande d'Autorisation Environnementale - DDAE (environmental permit). It is now composed of several documents and studies (e.g. project description, notes, impact studies, ICPE hazard studies, maps, mass plan, etc.) that can take at least a year to compile and require a detailed engineering assessment delaying the Final Investment Decision (FID).

Grid-connected storage projects faced delays due to administrative overload of administrations in the midst of the renewable energy boom and the physical limitations of the grid, which resulted in insufficient connection capacity for some of these projects. Furthermore, projects shared the crucial role that consulting firms with expertise in issues related to the siting and operation of battery charging and discharging stations play in obtaining these permits. For example, setting up medium voltage installations proved to be a significant challenge due to a lack of expertise within the regulatory authorities. The specific requirements for compliance were unclear, leading to difficulties in the installation process. A similar situation arose when dealing with fire safety regulations. Lessons learned from these challenges are contributing to improvements, especially for new installations. Participants highlighted that it is an ongoing learning process both for project partners and regulatory authorities.

In particular, the internal electricity market Directive 2019/244[1] introduced provisions to ensure fair competition in the market and to facilitate direct consumer access to electric vehicle (EV)[2] charging services either through a trading company or an "aggregator", which is a new actor independent from the trading companies. Member States had to develop a regulatory framework to allow these players to enter the market.

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[1] Directive 2019/944/EC of the European Parliament and of the Council of 5 June 2019 concerning common rules for the internal market for electricity, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019L0944

[2] 'Electric vehicle (EV)' shall mean an electric vehicle as defined in Article 2, point (2) of Directive 2014/94/EU of the European Parliament and of the Council

The situation varies from country to country, but often the regulation of energy storage and its interaction with the electricity grid or district heating is insufficiently developed, posing a challenge for distribution operators in terms of interoperability standards and grid code compliance. For example, the provisions for collaborative power generation in Norway (from October 2023) only allow sharing up to 1 MW within the same ownership area.

The gradual transposition of this Directive among Member States introduced limitations related to the ownership and operation of EV storage and recharging systems for the emerging EV battery charging market that mainly affected distribution system operators (DSOs). This is mostly due to the challenge of regulating the contractual relationship between the supplier and the independent aggregator[3].

The recent and future developments in energy storage technologies would require that electricity storage facilities and electricity transformers could be considered as redistributors when supplying electricity, in order to avoid the risk of double taxation (see Article 22(4)(2nd subpar.)[1].

Participants mentioned that they were affected by the associated risk of double payment incurred to end-customers when providing flexible services (subject to authorisation by national regulators). It was mention that this can lead to a situation where customers receive payments for their services, but these payments are not offset against their electricity bills, resulting in a form of double payment or taxation.

To circumvent this risk, as most of EV charging stations are decentralised and small in size, bi-directional charger projects for EV implemented a "behind-the-meter (BtM)"[4] optimisation of fleet charging schedules that also avoided simultaneous periods of high demand and maximised self-consumption of self-produced renewable energy, while adapting their energy consumption to price signals (Energy Arbitrage on Tariffs -bill management). The fact that they are "behind-the-meter (BtM)" does not prevent them from participating in energy markets. However, participants considered that it hinders their participation in electricity grid balancing because project developers need to be able to set up aggregators and virtual power plants to interact with the markets.

It was mentioned that the responsibility to develop the full potential to ensure flexibility and security of supply of the future electricity system[5] is shared between the authorities (with the participation of grid operators[6]) and the project developers. As the authorities should provide price signals that allow for "implicit demand response"[7] for example through dynamic time-of-use tariff structures, to better optimise demand on the grid and reduce costs related to peak-energy consumption during fast charging (Demand Charge Management).

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[3] The actions of independent aggregators affect suppliers and the Balancing Responsible Party (BRP) designated by the supplier. The BRP can be the supplier itself or a third party. EUI Working Paper RSC 2021/53, https://cadmus.eui.eu/bitstream/handle/1814/71236/RSC%202021_53.pdf?sequence=1&isAllowed=y

[4] Behind-the-meter installations consist of placing energy generation and storage systems on the consumer side of the utility meter. This allows users to generate, consume and store energy locally without relying solely on the grid.

[5] COM/2020/789 final, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0789

[6] In Europe, "Grid operators" are divided into transmission system operator (TSO) and distribution system operator (DSO).

[7] Implicit demand response" corresponds to adapting the load to price signals. This requires time-of-use pricing (dynamic or not), which is not yet widespread enough in Europe. At the moment, only UK and Nordics have (choice/offers of) hourly household tariffs, it's flat rate in almost all EU countries

“Explicit demand response”[8] corresponds to direct participation in energy markets, such as reserve markets (Energy Market and Balancing Market Participation). This requires an aggregator and a regulatory framework that allows this aggregator to operate with multiple decentralised units without an excessive administrative burden. For example, the Member States that are most advanced in developing a regulatory framework for independent aggregators apply the perimeter correction[9]. However, this practice is not fully extended among the Members States and this is why most project developers have found it easier to optimise their system locally while waiting for dynamic tariffs to arrive.Furthermore, beneficiaries discussed the need for consistent guidelines and specifications, particularly in areas such as product delivery, technology development, and final product characteristics. For example, the Energy Performance of Buildings Directive[10] encourages the installation of smart recharging and bi-directional charging infrastructure in buildings, where electric vehicles park regularly for long periods of time. However, ssuch “vehicle-to-grid” (V2G) chargers, are not yet universally standardized and its implementation with fast charging poses still some challenges (hardware and design complexity, and battery degradation concerns).

The development of European standards on metering and sub-metering systems ensuring interoperability and access to real-time monitoring data should be intensified in order to facilitate the rapid deployment of behind-the-meter storage such as V2G chargers. In addition, the participants of the event also advocated boosting European competitiveness with carbon border adjustment mechanisms to ensure a fair price for batteries entering the EU, ETS CO2 emission allowances related to the production processes used, the battery passport and adherence to environmental, social and governance (ESG) criteria.

In addition, the new Battery Regulation (EU 2023/1542)[11] includes important provisions to harmonise requirements, minimise environmental impacts and encourage recycling and reuse of batteries. However, beneficiaries highlighted that the increasing percentage of recycled metals required from EU manufacturers of new batteries (closed loop battery recycling process) and the performance requirements for metal recycling may be difficult to achieve due to the inherent performance of black mass metal recovery processes and the fact that the Regulation does not specify the type of salt in which the metal must be accessible or its degree of purity. This is important because each metal salt has a different degree of metal purity and requires a different chemical process with different stages, chemical reagents, efficiency and energy consumption.

As an illustration, the battery Directive[12] mandates a 95% recovery target for nickel (Ni) and cobalt (Co) by 2030. Pyrometallurgical processes for generating black mass from spent batteries exhibit a recovery rate ranging between 95% and 97%. Furthermore, the refining of black mass (entailing impurities removal and metals recovery) can achieve a metal

[8] Depending on national legislation, BtM energy storage systems installations can actively participate in both the energy market and the balancing market, offering valuable services to the grid such as frequency stability and voltage stability.

[9] A straightforward way to correct the imbalance of the supplier’s Balancing Responsible Party (BRP) due to the actions of the independent aggregator is through a so-called ‘perimeter correction’. With a perimeter correction, the imbalance of the supplier’s BRP is corrected with the metered volume of energy activated by an independent aggregator’s action. This corresponds to an extension of the imbalance adjustment to third party BSPs, including for bids in markets other than the balancing energy market. The correction is done ex-post, in most cases by the TSO.4 As such, the supplier’s BRP is not held responsible for actions it cannot act upon. EUI Working Paper RSC 2021/53, https://cadmus.eui.eu/bitstream/handle/1814/71236/RSC%202021_53.pdf?sequence=1&isAllowed=y

[10] COM/2021/802 final, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021PC0802&qid=1641802763889

[11] Regulation (EU) 2023/1542 of the European Parliament and of the Council of 12 July 2023 concerning batteries and waste batteries, https://eur-lex.europa.eu/eli/reg/2023/1542/oj

recovery efficiency of 96% to 97%. In combination, these two processes result in a total recovery rate of 91% under the worst-case scenario and 94% in the best-case scenario, both below the 95% required.

In addition, to support the recycling process of closed-loop batteries required by Article 8 of the same Regulation[11] (increasing the percentage of recycled metals in the active materials) it is important to specify the type of salts in which the metal should be accessible or their degree of purity. In other words, the projects involving batteries recycling lines must produce the type of high purity metal salts that the manufacturers of cathode active materials (CAM) and precursor products (PCAM) demand from the market. Otherwise, the chemical processes for the production of these high purity metal salts have an additional intrinsic efficiency rate, which further reduces the overall metal recovery rate and consequently hinders the required closed-loop battery recycling process.

3.2. Securing project financing structure and fostering investor appetite

Workshop participants plunged into the multiple challenges of defining viable business models for the deployment of energy storage systems projects (e.g. thermal storage in district heating systems and V2G station deployment), second-hand batteries repurposing projects and end-of-life battery recycling projects, which can provide predictablerevenues.

Heterogeneous and uncertain markets due to limited volumes of feedstocks (second-hand and end-of-life batteries) until 2030 and the lack of reference prices for raw materials (recycled in Europe), make business models for these types of projects risky and difficult to define. To secure sources of funding, it is necessary to reduce the risk inherently associated with these business models. The fierce competition from foreign manufacturers of long-life batteries prompts projects to explore mechanisms to level the playing field. For example, indexing resource costs to the London Metal Exchange (LME) is crucial to secure aluminium costs.

Participants commented that binding agreements with off-takers provide stability and confidence to potential investors. However, the high level of uncertainty in returns makes potential partners reluctant to commit. To overcome this challenge, most of the projects presented a simplified approach to financing, by investing own funds (equity), in addition to a debt facility and the application for EU grants.

In addition, specifically, second-hand battery reuse projects, end-of-life battery recycling projects and V2G-related projects also presented an approach to de-risk their business models by consolidating partnerships along their value chain (integrating equity partners, banks, suppliers, transporters and other intermediaries in their consortium). This initiative has proven to be useful in reducing the risk of such investments and, in addition, to increase harmonisation in technology development (e.g. of the bi-directional charging stations) and final product specifications (e.g. in terms of purity and volume of metal salts).

The reflections also underlined the importance of setting EU standards (battery passport) for products on the market to ensure efficient recycling and reduce costs. For example, competitors in China have developed new electric cars that integrate batteries into their chassis, increasing the cost of dismantling them. EU standards, in line with the Regulation (EU) 2019/1020[12] on market surveillance and compliance of products, would play a strategic role for the EU manufacturing sector by supporting a business model that brings

[12]Regulation (EU) 2019/1020 on market surveillance and compliance of products, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019R1020

"added value" to the products the EU supplies and thus stimulating EU investment. This will make EU manufacturing processes less costly and production volumes of recycled raw materials from second-life batteries can drive down prices.

On the other hand, participants that plan to earn revenue from the services provided by deploying energy storage system projects (e.g. thermal and electrical storage), in addition to using their own funds (equity), adopted an SPV ownership model to implement their solutions. All of them featured "behind-the-meter"[4] configurations with small capacity virtual power plants (VPPs) that featured a financing flow based on savings for the end consumer through leases, shared savings agreements, power purchase agreements and avoids the payment of network charges on each electricity transaction made with the VPP. These installations, including shared self-consumption models, provide greater control over energy use, reduce dependence on external sources, and contribute to a more decentralised and resilient energy infrastructure.

Participants presented diversified revenue streams involving different actions to ensure revenue stability that encourage customers to charge EVs off-peak, and prioritising proximity to customers and suppliers. In the context of the Italian legislation, BtM export to the grid is not yet possible, limiting the project to the provision of market-related services that could potentially be stacked together with the existing revenue streams, increasing the profitability of the project. In this case projects presented a tolling agreement[13] with the electricity distributor, structured as a fixed monthly remuneration and a variable remuneration depending on the market results achieved in the off-contract hours of fast-track reservation with transmission system operator (TSO). Although this type of set-up had little impact on the grid balance, which limits revenues through services provided to the grid.the new dispatching model TIDE (Integrated Text on Electricity Dispatching)[14], currently in consultation and that will enter into force by the beginning of 2025, will likely open new opportunities for BtM BESS participation in markets in Italy.

Storage-based services with different technologies require different business models depending on their characteristics and applications. The case presented by the projects using thermal storage as a source of revenue was finally dissociated and treated separately due to the specificities linked to national regulations.

Participants commented that heat as a service is mainly linked to customer specifications, as in this type of projects they have to mitigate the challenges often posed by national regulations. For example, in countries such as Denmark, upsides on market revenues are limited due to regulated margins Therefore, the revenue streams presented come from the sale of heat to a specific customer with whom a tailor-made agreement has been signed. This makes projects more dependent on a specific customer as the main revenue and a technology supplier tailored to the customer's needs, which impacts negatively on their risk profile.

Heat as a service-related projects also explored other ways to reduce their risk profile by receiving an additional revenue stream from the activation/deactivation of the heat pump

[13] In an energy storage tolling agreement, the seller develops, owns, and operates the energy storage system, while the offtaker supplies charging energy. Therefore, the energy in the system belongs to the offtaker. As part of an energy storage tolling agreement, the seller is usually required to arrange for separate station service in order to not use the offtaker’s electricity. Charging and dispatch operations may be controlled by the offtaker, or managed by the seller, depending on the agreed-upon principles of the contract.

[14] ARERA Press Release: Electricity: more security, participation and efficiency at lower cost with new dispatching rules, https://www.arera.it/fileadmin/EN/PRESS/230728eng.pdf

to provide control to the grid, however this revenue only represents a small proportion of the total revenue. These project adopted diversified funding sources, including crowdfunding and bank loans, as effective solutions to secure the financing structure of these projects.

3.3. Market evolution and ensuring supply agreements

A predominant trend recognised by all projects is the cost escalation across the energy sector from 2020 onwards, primarily attributed to shortages of critical items and materials across various supply chains. In particular, projects offering thermal and electrical storage services focused on virtual power plants reported shortages and delays in the procurement of critical equipment essential to maintain the efficiency and reliability of the electricity and heat distribution network, such as transformers, heat exchangers or power electronics and control systems. Supply chain disruptions and increased demand influenced the prices of copper, aluminium, steel and semiconductors, affecting the cost of electrical equipment. The most popular approach to overcome this challenge was to place particular emphasis on advance procurement planning, local sourcing, contingency planning and maintaining a strategic stock of critical items.

In addition, projects providing services to the grid or to a local customer opted for a strategic adjustment of initial plans to align them with more realistic and manageable options. The solutions presented envisaged adjusting the initial capacity of the transformers or reducing the size of the initial designs to fit the project objectives and maintain costs. In other cases, the projects chose to modify the initial solution adopted by integrating new and second life batteries or transitioning from nickel manganese cobalt battery systems to lithium iron phosphate battery systems, driven by considerations of lower long-term costs and higher availability.

Lithium-ion batteries experienced supply chain challenges (both in manufacturing and consenquently in the supply to end-users). Shortages of materials such as lithium and cobalt, coupled with increased demand from electric vehicles and renewable energy storage led to higher costs. The most critical issues that projects using, reusing or refurbishing lithium-ion batteries (both new and second life) had to address to maintain project objectives were uncertainty about the origin of batteries, state of health, warranties and contractual conditions with the battery suppliers. In addition, projects reported an 11-15% increase in recycling equipment costs (hydrometallurgical processes) and an overwhelming 900% increase in lithium carbonate prices. Most energy storage projects had to improve their procurement practices to cope with reduced manufacturing capacities and rising costs of critical components by exploring pragmatic changes and adopting a more proactive approach.

In essence, the competitive nature of the second-life battery market favours projects that can generate large orders. At the same time, second-hand battery suppliers, aware of the competitive landscape and potential risks, preferred the security and structure provided by formal long-term contracts with their customers. This put smaller companies at a disadvantage, as they struggled to get contracts. To reduce the impact of unstable supply chains, projects had to stay constantly informed about market dynamics and involve the strength of a parent company or group.

In addition, the projects implemented rigorous risk assessment strategies that included continuous monitoring of the market through various channels, and alertness to new technologies. This allowed them to evaluate the level of innovation and the benefits that these new technologies offered to consumers, as well as the potential impact on their own projects, and to proactively participate in the promotion of new processes and their own products through demonstrators and prototypes.

Participants argued that Europe's strong focus on electric vehicles has led to the growth of energy storage systems being dependent on external players. Particularly, the oversupply of Chinese batteries has influenced market trends and potentially caused a delay in the expected growth trajectory of energy storage systems in the European market.

4. CONCLUSIONS:

Knowledge sharing between projects helps reduce the costs and risks of technology implementation and commercialization by sharing lessons learned. This can assist new projects related to energy storage to be better structured from the early stages of the project.

There is a certain degree of heterogeneity in how energy storage is regulated and integrated into energy systems across different Member States. Some Member States have more established and supportive frameworks for energy storage, while others are in the early stages of developing such regulations, with ongoing efforts to address the complexities (for example on V2G and battery recycling) of this rapidly advancing sector needed. Energy storage projects face regulatory challenges, particularly regarding environmental permits, safety compliance, and administrative delays. The regulatory landscape varies between countries, affecting distribution operator interoperability and network compliance. Concerns include double charges for flexibility services, the need for incentives in the electric vehicle charging market and challenges in achieving recycling targets under the new Battery Regulation[4].

In addition, storage regulations, incentives, and business models are often shaped by each country's unique energy transition goals, market conditions, and political considerations. Participants highlighted the importance of reducing risks in their business models to ensure external investment. Simplified financing approaches (primarily relying on its own capital) and market standardization (on V2G interoperability and battery passporting), in addition to consolidated partnerships along the value chain and "behind the meter" configurations helped mitigate the business and financial risks. Uncertain markets, especially for second-hand batteries and recycling, complicate revenue prediction, so establishing EU standards for marketed products is necessary and crucial for efficient battery production and recycling.

In summary, the workshop advocated for a collaborative effort to enhancing European competitiveness and addressing environmental and societal concerns associated with battery technologies. For example, regulatory bodies, government agencies, industry associations, and collaborative initiatives involving stakeholders from the energy and environmental sectors need to be informed faster and more comprehensive about the importance of regulation based on life-cycle assessment principles that support the business model and thus stimulate investment.

The key takeaways emphasized the importance for stakeholders to keep high adaptability, flexibility, and staying at the forefront of technology to effectively steer challenges and uphold project objectives in an ever-evolving energy landscape. The EU needs to play a vital role by fostering a framework of vigilance, providing support mechanisms, and implementing standardized approaches to ensure a cohesive and forward-looking energy sector. Continuous engagement with industry developments, proactive participation in standardization initiatives, and collaboration with regulatory bodies to enable stakeholders to stay at the forefront of the evolving energy landscape are crucial.

As the Innovation Fund project portfolio expands, the knowledge sharing among projects and stakeholders on clean technology solutions is poised to have a greater impact. Notably, the solutions implemented by the projects outlined below demonstrate shared courses of action and strategies across diverse initiatives, underscoring the impetus for similar knowledge-sharing events in the future.

Looking ahead, the European Climate, Infrastructure and Environment Executive Agency (CINEA) and European Commission's DG Climate Action plan to regularly host energy storage knowledge-sharing events. These events serve as a platform for exchanging insights, knowledge and lessons learnt among various projects throughout their different project phases and thus accelerating commercial penetration of important storage technologies and solutions.