



ORGANISED BY EUROPEAN UNION IN COOPERATION WITH
MINISTRY OF HEAVY INDUSTRIES AND NITI AAYOG

WEBINAR ON MANUFACTURING AND DEPLOYMENT OF
BATTERY STORAGE



DECEMBER 16, 2021

PROCEEDINGS

Webinar on “Manufacturing & deployment of battery storage in India”

On 16th December 2021, the European Union (EU) - India Clean Energy and Climate Partnership (CECP) project in cooperation with the Ministry of Heavy Industry (MHI) and NITI Aayog organized a webinar on the topic “Manufacturing & deployment of battery storage”, which was attended by close to 190 participants, representing policy makers, regulators, power system operators, battery manufacturers, electricity trade organizations, utilities, think tanks, consultants, and academia.

1.1. Inaugural Session

HE Mr. Ugo Astuto, Ambassador of the European Union to India welcomed the participants and discussed the following points:

- Progress on storage is essential for the clean energy transition. We need to implement the Paris Agreement, we need to implement the current promises made and then aim higher. Experts estimate that if we implement all the pledges made at COP26, we are on path of increased global warming by 1.8 degree to 2.4 degree Celsius. This is not enough and we must not exceed the cap of 1.5 degree Celsius fixed during Paris Climate Agreement.
- Both EU and India have very ambitious targets for renewable energy. Storage will play an important role, including battery storage for promoting electric mobility.
- Possibility for EU and Indian stakeholders to learn from each other. The EU and India have actively been working together under the 2016 Clean Energy and Climate Partnership in the areas of energy efficiency and renewable energy. The EU is committed to decrease 55% of carbon emissions by 2030 and achieve carbon neutrality by 2050.

Mr. Arun Goel, Secretary, Ministry of Heavy Industries (MHI), Government of India gave a brief about India’s NDC targets, roadmap to achieve it and summed up the Performance Linked Incentive (PLI) scheme and the key elements of the scheme. Following points were discussed:

- Hon. PM Narendra Modi has advocated for Panch amrit (5 nector elements) in Glasgow summit which are essential for a bright future of future generations to live a prosperous and secure life. Various initiatives are taken by India to help combat climate change ranging from creation of International Solar Alliance; Coalition for Disaster Resilient Infrastructure; One Sun, One World, One Grid initiative. In August 2021, India has crossed 100 GW of RE installed capacity ranking 4th in the world. Non fossil fuel energy has increased by more than 25% in the last 7 years and reached 40% of energy mix.
- The manufacturing sector will play a key role in achieving desired targets. With increasing per capita consumption, there has been surge in demand of consumer electronics, where devices need Advance Chemistry Cell (ACC) Batteries. Batteries play a key role in improving energy security situation. India imports 80% of crude requirements amounting to approx. USD 100 billion. As per govt. data India imported more than USD 1 billion worth of Lithium ion cells in 2021. Battery demand in India is expected to reach 230 GW annually by 2030. Currently all demand for ACC batteries is met through imports and there is an urgent need to promote domestic manufacturing. This would help establish India as a global leader in domestic manufacturing and achieve COP 26 targets.
- Govt. of India launched Production Linked Incentive (PLI) scheme for various sectors with an outlay of over 2 lakh crore (approximately € 23 billion) in coming 5-7 years to focus on 13 major sectors like batteries, solar PV modules, automobiles, Semiconductors, among others. Domestic manufacturing of batteries and solar PV modules is expected to grow by CAGR of 25% and 12% respectively by 2026. Indigenisation and self-reliance is the key.

- In May 2021, govt approved PLI scheme for ACC batteries at an estimated outlay of INR 18,100 crore (approximately € 2 billion) for 5 years from the start of manufacturing. The scheme envisages setting up 50 GWh of ACC battery manufacturing and an additional capacity of 5 GWh for niche ACC technologies. This will ensure LCOE cost of battery manufacturing globally competitive. Beneficiaries will be free to choose suitable advance technology. Bidding process has already been initiated and pre bid conference was held on 12th December, 2021. More than 100 people from around 20 companies participated in the same.
- FAME scheme for e-mobility, PLI schemes for auto and auto components and PLI for ACC batteries amount to total of INR 55,000 crore over next 5 years. Private sector should participate at large scale to achieve the desired results.

Mr. Sudhendu J. Sinha, Adviser (Infrastructure Connectivity – Transport and Electric Mobility), NITI Aayog, Government of India explained how this scheme will disrupt the entire value chain in a positive manner and following points were discussed:

- The program is very aspirational as it talks about GW scale manufacturing. Minimum support is 5 GW and maximum support is 20 GW with a cumulative target of 50 GWh.
- Niti Aayog has looked at how ACC battery manufacturing is deployed and supported across the globe and learnings have been incorporated in the program.
- Transparency is key to such large scale initiatives and the entire program follows such principles. Best of international players are encouraged to come to India and manufacture. FDI regime is most liberal now and India is a key market for global players.
- Best of the quality standards are looked into while drafting this program. Tripartite arrangement is being planned up with the states to provide comfort to bidders. India is also focusing on R&D and an ecosystem is being developed.

1.2. Panel Discussion

Mr. Randheer Singh, Director - Electric Mobility & Senior team member for Advanced Chemistry Cells Program, NITI Aayog, Govt. of India gave detail on batteries and briefed on incentives available in India like FAME-2 scheme (<https://fame2.heavyindustries.gov.in/>). Following points were also discussed:

- Globally battery prices are reducing and fell to about \$134/KWh as of present date. Fiscal and non-fiscal measures of Govt. of India are also aiding to reduce the prices. India needs this revolution to address the 3 main issues:
 1. To address pollution issues- around 14 out of 20 most polluted cities are in India as per WHO report.
 2. Reduce import dependency on crude oil- In automotive sector, around 99.6 % Gasoline and 67% of diesel demand is imported.
 3. Manufacturing growth- Solar PV and telecommunication sector manufacturing has to be ramped up to ensure self reliance and GDP growth.
- In India, the majority of vehicle sales are from two wheelers with 81% of vehicle population with an average run of around 17 km/day. In FAME-2 scheme, there was demand incentive of Rs. 10,000 Crore (approximately € 1.2 billion) in which approved range was minimum 80 km which means that vehicles need not to be charged daily. It can be charged through 5 Amp/15 Amp sockets available in the house. So, we need charging points and not charging stations atleast for 2 wheelers. These charging points are very cheap and costs around INR 4500. FAME-2 has provision of INR 1000 Crore (approximately € 120 million) for charging infrastructure alone.

- Ministry of Power has already notified that the charging tariff will be limited to Average cost of supply (ACoS) + 15% premium. MoP has already released the guidelines that on either side of highways at every 25 km there will be minimum 1 slow charger and on 100 km on either side there will be at least 1 fast charger. Oil Marketing Companies (OMC) are also targeting to put up charging stations at their gasoline stations. Around 22,000 such stations have been targeted. Charging infrastructure has been made a delicensing activity and can be offered as a service.
- In 1991, first commercial introduction took place to Lithium Ion batteries. First era was 1991-2016, in which the rate of price reduction was 13% annually whereas from 2016-2021, price reduction increased to 17% annually. We are fastly reaching the point where batteries can be cheaper than Internal Combustion engines in vehicles.

Mr. Gonzalo Fernandez Costa, Policy officer, Directorate-General for Energy, European Commission discussed policy and regulatory framework for storage in EU, energy storage case study and its market assessment and following points were discussed:

- He discussed the key role of energy storage as it can facilitate electrification of economy, increase flexibility and security of energy system, lowering electricity prices during peak load.
- He discussed the case study conducted in 2020 regarding energy storage's contribution to the security of electricity supply in Europe. (https://www.euneighbours.eu/sites/default/files/publications/2020-09/MJo319322ENN.en_.pdf)
- For ensuring system flexibility in 2030 and by 2050; batteries, pumped hydro storage, electrolysers, electric vehicles and thermal storage will play a key role.
- Legislation on Electricity market design was adopted in 2019 where non discriminatory electricity markets were introduced and participation of energy storage in the market was promoted.
- Cross cutting relevance and initiatives include system integration, hydrogen, e-mobility, raw materials and supply chain, research and innovation, taxonomy, energy taxation, public funds among others.
- Development of future proof energy storage and short to medium term and long term storage options are being looked at.

Mr. Sujit Jena, Lead - PPP and batteries, NITI Aayog covered all essential aspects of the scheme along with timelines and discussed future battery market in India and following points were discussed:

- Battery global market is expected to increase by 12 % CAGR. Nearly 62% of lithium battery market is captured by China. India as a country is still lacking and nearly 65-70% solar PV modules, mobile phones and battery cells are being imported i.e. nearly INR 20,000 crore (approximately € 2.5 billion) is being charged as import duty.
- India imported 10 GWh of Lithium Ion battery in 2019 which is expected to grow to 135 GWh of Lithium Ion battery at US\$ 14 billion by 2025.
- For ACC programme, transparent bidding is planned under Quality and Cost Bases Selection (QCBS) mechanism. It is targeted to achieve 25% value addition by 2 years and 60% value addition by 5 years.
- The main aim of the ACC scheme was to boost domestic manufacturing, to promote large scale investment of USD 6 billion, to promote high value cell manufacturing and deliver manufacturing for affordable battery supply.
- 5 GW manufacturing facility costs around INR 3000-4000 crore (approx. € 350-450 million), hence net worth criteria to play a significant role.
- MHI released bid on 22nd October 2021 and bid due date is 31st December 2021 and Letter of Award (LOA) is expected by February 2022.
- India is providing support by providing capital subsidies, low interest rate loans, support in land acquisition, R&D support, Tax breaks, import protection duties and market development initiatives.

- For developing e mobility value chain, for component manufacturer, there is battery manufacturing incentive scheme of USD 2.4 billion. For OEM plants, there is Auto and Auto component incentive scheme for USD 3.6 billion. For dealership/customer, there is incentive of amount worth USD 1.4 billion for customers on EV purchase. For finance, there is vehicle loan supported by SBI with world bank first loss guarantee. For end of cycle/recycle, there is battery recycling policy under discussion.

Mr. Thore Sekkenes, Program Director, European Battery Alliance (EBA) gave details on lessons that can be learnt from how the European battery market has developed:

- European Battery Alliance (<https://www.eba250.com/>) is a group of 700+ member which includes companies, organizations associated with the sector. Overview of organization was presented
- Continued efforts are needed to fill gaps in value chain. Other than this we are on right pace to achieve 2025 and 2030 targets. However, recycling of batteries have to be taken into consideration and similar schemes should come up. Even Europe lacks behind in achieving the desired result in recycling of batteries as per the pace required.
- Lessons learned building a new battery industry and the key success factors include the need for an unified European strategy, circular and green batteries, large scale from beginning, strategic alliances along value chain, attracting best skills globally and attracting public/private/industrial financing.

Mr. Patrick Clerens, Secretary General, The European Association for Storage of Energy (EASE) discussed EU storage market, status of energy storage in Europe and key developments:

- Showed how the energy system will be in 2050 and the shift required and the capacity addition needed. Further, he discussed the importance of energy shifting and key developments for EU energy storage.
- Curtailment can be minimized by demand side management, using interconnectors and energy storage options. As per the case study in UK, installing only 20 GWh of energy storage has halved the curtailment of wind and enabled the use of 1.8 TWh of electricity instead of wasting it.
- In the UK there is more push on time of tariff, dynamic price contract, etc. There exists EU recovery and resiliency facility. Nearly 723.8 billion pounds will be pushed in loans and grants. There is climate target of 37% for each member state's recovery and resilience plan. 3 out of 7 'flagship areas' for investment and reforms are of particular interest for energy storage.
- Energy storage can be rolled out at an early stage by enabling energy storage market to scale, reducing overall costs, help derisk the market for investors.
- Dispatchable Renewable Energy Sources are necessary to ensure the secure and cost effective operation of the network. Investments to secure energy supply and infrastructure will be required to reduce imbalances and disruptions. Stopping fossil fuel subsidies will help the uptake of RE energy. New measures are to be taken and there is a huge market for energy storage.

Mr. Reji Pillai, President, India Smart Grid Forum (ISGF) detailed on role of storage for grid integration and round the clock supply from RE sources:

- To limit the temperature within 1.5 degree celsius, it is required to add 1 TW of renewable energy to the grid globally. Annual addition of 630 GW of solar and 390 GW of wind by 2030 will be required.
- Analysis was done to calculate energy storage capacity required in each state to achieve 40 GW of solar rooftop by 2022 which was presented. As per another calculation which was presented, India would require around ~9.39 GWh by 2022, ~23 GWh around 2027, ~32.7 GWh by 2032 to support all RE technologies. For grid support, nearly 2.4 GWh of storage by 2032 is estimated.
- Energy Storage Integration Tool (ESIT) tool was formulated by ISGF to simulate the energy storage and RE installations.

- (+-) 85% flexibility is required in Indian Power System by 2040. Battery will play a key role to help attain flexibility in the grid.
- It is required to replace DG sets with Battery Energy Storage Systems (BESS). In India, it is estimated that there is over 70 GW of large size DG sets in India. Electricity from diesel costs around INR 29/KWh while power from BESS will be around 15.40/KWh (if bought from grid @ INR 8/KWh and stored in BESS).
- In the last decade (2010-2022), it is estimated that we have around 745 GWh of energy storage around the world. In this decade it is estimated to touch 3 TWh as per Morgan Stanley report.
- It is predicted that Lithium metal battery will be the next generation battery. LFP batteries are coming up due to thermal issues with other batteries. Batteries are to be made commercially viable to help accelerate deployment in India.

Mr. Rahul Walawalkar, President, India Energy Storage Alliance and Chair, Global Energy Storage Alliance discussed on opportunities in Energy Storage and EV sector for accelerating low carbon transition:

- As of now only ~7% of generated energy is traded. Out of which ~4% is traded on power exchanges and ~3% in bilateral Power Purchase Agreements (PPAs).
- In 2018, Ministry of New and Renewable Energy (MNRE) set up a commission on National Energy Storage Mission. In 2019, Niti Aayog launched National Mission for Transformative Mobility and Advanced Battery Manufacturing. In 2021, National Hydrogen Mission was also launched by Govt. of India.
- As per energy storage market scenario of 2020-2027, total demand is around 328 GWh for stationary applications and another ~335 GWh for e mobility applications.
- There is a huge demand of energy storage applications for Commercial and Industrial customers as they are paying INR 10-12/units and cross subsidizing other sectors.
- Mini commercial customers have started to look at 4 hour storage while large grid scale projects managing deviation settlement mechanism or forecasting management are looking for 1 hour storage. Tariff for 1 hour storage has already reached below INR 4/unit. While for 4 hour storage also, it is expected to reach closer to INR 4/unit as levelized tariff for RE+storage.
- As of now, there is a very strong insistence from some companies to rely on thermal power for balancing the renewables. However solution in form of storage is always more lucrative keeping Indian conditions and constraints in mind.
- E-mobility has started growing but as of data of last financial year around 90% of the batteries which was used for e-vehicles in India were Lead acid batteries mainly driven by low speed electric 2 wheelers and 3 wheelers. Investments are coming in electric 2 wheelers while in 4 wheeler segment more push is needed. FAME 2 scheme has increased market demand of e-2 wheelers by 5-10%.
- Solutions like battery swapping can be a way forward. As of now, market has roughly 50% share each of stationary storage and e mobility. But from 2030 onwards, market will be dominated by e-mobility.
- IESA is looking for international and national partnerships in skill development and in other similar fronts.

Mr. Amit Kumar, Team leader-EU CECP Project and Leader- Energy at PwC India was the moderator of the event and thanked all the panelists for their deliverables and taking part in this very important webinar.

1.3. Questions and Answers

There were few questions asked by the moderator, based on the questions received from participants, from the panelists.

- **Question** – What are the notable benefits which can accrue with integration of grid storage mainly with renewable energy and what learnings can be drawn from European experience?
 - **Response from Patrick Clerens:** India has a very strong push towards renewable energy. As per our case study, we utilized 1.8 TWh of energy by a mere 20 GWh of energy storage. So, it is cost efficient and an attractive option.
- **Question** – Smart grid being the back bone to integrate renewables, how is the performance of pilot projects which are going on in India? Another question is on the importance of integration of battery and other systems to make it more viable.
 - **Response by Reji Pillai:** Among the pilot projects which were done in the past (2013-1018), solar and wind projects were not part of it. One such energy storage trial was done in Puducherry by Powergrid corporation of India. For 40 GW of rooftop installation, ~10 GWh of storage integration will be required. Hence, it is very important to integrate battery with the existing RE infrastructure.
- **Question** – What has been the response from the market in this sector?
 - **Response from Rahul Walawalkar:** Very pleased with response. We were expecting 70-80 GWh of bid, however based on current interest of participants, it is estimated that more than 100 GWh bid will come. Also, there is very much interest in market for niche ACC.
- **Question** – Whether this scheme is technology agnostic? Is the government planning to increase the capacity further from 50 GWh?
 - **Response from Sujit Jena:** We tried to bring the players who are in the same pace with us. Incentives were also provided. But just to keep the program running and in order to be impartial and transparent to all, decisions are taken in everyone's good faith. We can be hopeful that if this program succeeds, there can be additional 30-40 GWh or so depending on the outcome and results. Niti Aayog is open to it but right now, it is 50 GWh.

1.4. Closing remarks

Mr. Matthieu Craye, International Relations Officer, DG ENER, European Commission, thanked all the panelists for the presentations and rich discussion:

- The session was very informative and interesting; the fundamental role of storage was discussed in great depth.
- India has successful experience in tendering process of the renewables and similar learnings are also being used while tendering of battery projects. He also discussed the future aspects and gaps which are needed to be addressed.
- It is important to focus on market conditions (particularly regulations) that are conducive to growth of the sector as well as on the skills needed.
- The webinar gave us a chance to look at the importance of energy storage solutions and the cost effectiveness and benefits that come along with it apart from getting aligned with COP 26 commitments.