985

Giga-scale battery manufacturing in India: Powering through challenges in domestic production

Niti Aayog

Strictly Private and Confidential

pwc

Acknowledgement

This study was carried out with the Financial support of Niti Aayog, Government of India, and Conducted by PricewaterhouseCoopers Private Limited, 17th Floor, Tower C, Building No-10, DLF Cyber City, Gurgaon 122002, Haryana, India.

Table of contents

Contents

List of tables

List of figures

1. Executive summary

Several countries worldwide are prioritising the issue of climate change, as unpredictable climate variations can pose a serious threat to global socio-economic development, economic growth and long-term poverty reduction goals. The transition from a carbon-intensive global economy to a low-carbon future comes with a plethora of challenges and opportunities for a developing country like India. At the Conference of the parties (COP) 21 held in Paris in FY 2015, close to 200 countries[1] pledged to take measures to keep the increase in global average temperature to below 2° Celsius above pre-industrial levels and promised to put in efforts towards limiting the global temperature increase to 1.5 degrees Celsius. To achieve these targets, countries will need to develop a well-defined pathway towards low-carbon emissions and promote climate-resilient development overall, by inculcating innovative technology measures and improving adaptability of sectors to adverse climate change impacts.

Energy storage in the context of climate change is projected to play a major role in assisting India to not only meet its clean energy commitments, but also help in improving the overall energy security situation of the country, by reducing dependence on oil imports. Globally, energy storage has evolved a lot in terms of applicability, including the diverse range of advanced cell chemistries employed, to make such storage applications a reality. In India, segments like electric vehicles (EVs), stationary storage[2] and consumer electronics are projected to be major demand drivers for adoption of battery storage. The total cumulative potential for battery storage in India is 1116[3] GWh, considering a base case scenario, with EVs making up for a large chunk of this projected demand. While the market for increase in these technologies and their implementation is enormous, harnessing the potential of such magnitude would require pragmatic steps in the right direction.

Developing concrete solutions in-house by revamping domestic manufacturing supply chains will provide the foundation to meet the rising demand of battery storage in India. The battery manufacturing sector in India is still in its nascent stages, with a majority of the players engaged in assembling and packaging of batteries. This translates into negligible manufacturing value being captured within India. Low availability of raw materials is a major impediment, hindering the growth of domestic vertical integration.

Design and implementation of a stable, long-term, forward-looking and investor-friendly policy landscape can provide the much-needed impetus towards scaling up domestic battery manufacturing in India. A sustainable domestic battery manufacturing sector will be capable of meeting local requirements and also boost of export competitiveness, further reducing the country's trade deficit burden. NITI Aayog, through its 'National Mission on

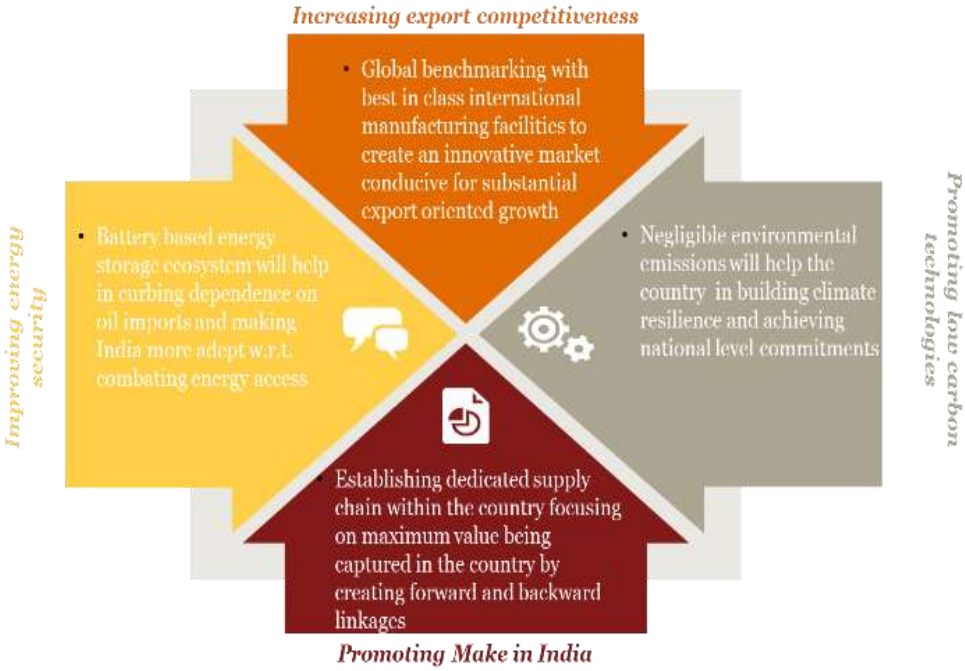


Figure 1: Framework to support battery manufacturing in India

[1] https://unfccc.int/news/finale-cop21
[2] Largely includes utility scale applications
[3] Rocky Mountain Institute (RMI)

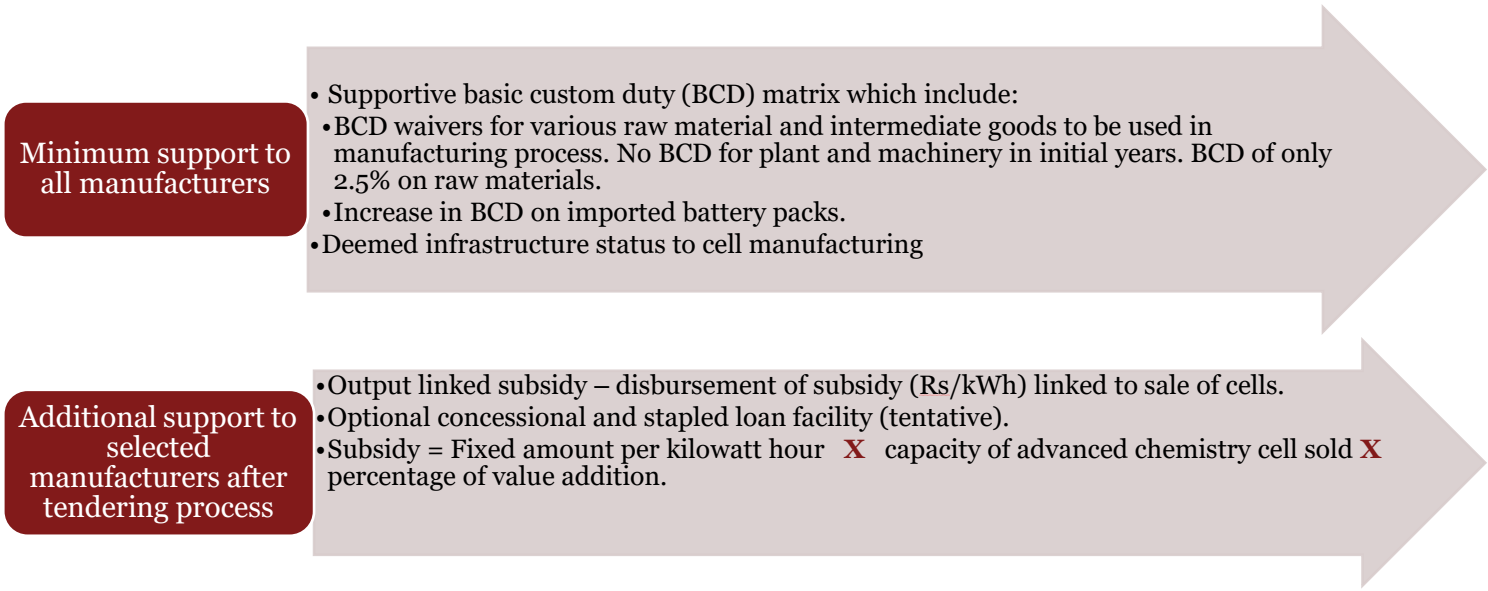
Transformative Mobility and Battery Storage',[4] has come up with a programme framework to support the establishment of 'giga-scale factories' in India, focusing on number of innovative initiatives, as highlighted in the figure.

The mission will be a cross-cutting/multi-disciplinary platform which will consider the perspectives and feedback of the various concerned ministries. The other important ministries/departments that are part of the inter-ministerial steering committee include the Ministry of Road Transport and Highways, Ministry of Power, Ministry of New and Renewable Energy, Department of Science and Technology, Department of Heavy Industry, Department for Promotion of Industry and Internal Trade and Bureau of Industrial Standards.[5]

The policy instrument undergoing design will have provisions for establishing cell manufacturing facilities in India. Incentives in the form of output-linked subsidies and tax benefits (direct and indirect) are being considered. State governments will also be major contributors in ensuring the success of the programme, and states will be encouraged to provide additional incentives to shortlisted investors (through a tendering process) for setting up manufacturing facilities. Such steps taken by states are expected to result in economic growth and employment opportunities. NITI Aayog has also organised round-table discussions to be held at its premises, to initiate dialogues with industry-wide stakeholders, including major cell and battery manufacturing companies in India and abroad. Representatives of various companies shared their views about current challenges, requirements for government support, future perspectives on the sector and more. The inputs from industry experts will be pivotal in drafting the policy document.

NITI Aayog will release a Request for Selection (RFS) to invite Indian and global investors to set up giga-scale cell manufacturing plants in India. The tender will be technology agnostic; however, cells manufactured must meet the criteria of 'advanced cell[6]'covered in this report. Private manufacturers are free to choose suitable technologies to set up cell manufacturing plants for EVs, stationery storage for grid applications, and consumer electronics. Though there will not be any assured purchase of manufactured batteries by the government and market risks must be borne by investors, the government will launch multiple programmes to create demand for energy storage for EVs and stationary storage for grid applications.

The proposed programme will provide two levels of support, i.e. pan-support for all cell manufacturers and additional support to select manufacturers, based on competitive ranking after the tendering process. Pan-support includes import duty waivers for various raw materials and intermediate goods to be used in the manufacturing process. Additional government support will include output-based subsidy disbursal (per kWh



[4] https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1567807
[5] Niti Aayog
[6] Advanced cells shall be defined as new generation cells like lithium polymer, lithium iron phosphate, lithium cobalt oxide, lithium titanate, lithium nickel manganese cobalt, lithium manganese oxide, metal hydride, zinc air, zinc bromine, sodium air, nickel zinc, lithium air, sodium sulphur or vanadium redox. The list of battery technologies here is representative and not exhaustive.

basis) and optional stapled loan facility. Subsidy support will be limited to 50 GWh annually for cell manufacturing capacities in India, up to 2030. A single entity cannot bid for more than 20 GWh of cell manufacturing facility. Also, minimum bid capacity will be 5 GWh. The government will not extend financial support beyond 2030, as by then domestic manufacturing is expected to become globally competitive, without external support. The key facets of the proposed incentive scheme have been highlighted below.

Under the said programme the prescribed QCBS mechanism shall comprise of two-envelope system comprising of technical bid and a financial bid. Following shall be the weights assigned to the respective criteria:

- Technical Bid- 80% Weightage
  - ACCs value capture in India: 70% Weightage
  - Scale of ACC production/proposed capacity: 30% Weightage
- Financial Bid- 20% Weightage
  - Base-subsidy (specified benchmark): 100% Weightage

The participants shall be ranked based on their proposals submitted and the ACC capacities shall thereby be allocated in the order of their ranking, with the entity ranked 1st being allocated the capacity first, followed by entity ranked 2nd, and so on till a cumulative capacity of 50 GWh per year has been allocated. (subject to a minimum and maximum cumulative allocation for a single applicant) A higher weightage has been offered for value capture component to encourage manufacturers to integrate vertically and promote indigenization of key components in the value chain. The third parameter, i.e. the base-subsidy requirement shall be specified by the applicant in the form of the subsidy benchmark INR per kWh. Under the said programme, the base subsidy (benchmark amount) shall be capped at INR 2,000 per kWh of ACC sold subject to the year to year phasing.

Additionally, to create and develop an ecosystem to manufacture battery storage in India, import of batteries and lithium (Li)-ion cells must be discouraged. One of the mechanisms to curb imports is increasing the rate of basic customs duty (BCD) on import of finished or semi-finished goods in a phased manner. As part of this exercise, a detailed BCD matrix has been prepared, suggesting revisions in the existing BCD regime, from FY 2020 to post FY 2030. While BCD for raw material used for setting up the advanced chemistry cells (ACCs) such as lithium, copper, graphite, cobalt, nickel is proposed at 2.5%, the plant and machinery required for processing of these raw materials is kept at 0% BCD, to encourage promotion of these industries.

Under the programme, the Govt. of India is not planning to offer any additional incentive to the battery pack segment of the industry on a standalone basis, as battery pack assembly is already happening in India. The additional incentive in the form of cash subsidy is intended to support domestic manufacturing of ACCs with emphasis on value capture. The cash subsidy disbursement shall commence once the domestic value addition and actual sale of ACCs begins. It shall be phased out over a 10-year window from the appointed date (i.e. AD+10 years) or 31st March whichever is earlier. The proposed mechanism is expected to incentivize the beneficiary firms to expeditiously invest into production capacity and greater domestic value addition for manufacturing ACC in order to avail maximum benefits under the programme. Additionally, the total cash subsidy to be disbursed by the GoI will be capped at 20 GWh per beneficiary with cumulative capacity of 50 GWh under Phase-1 of the programme.

To be eligible for this programme the beneficiary firm would have to commit to set-up an ACC manufacturing facility with value addition of minimum 25% at the Mother Unit level and minimum 60% overall. To ensure a single window mechanism for the potential investors, a state level grand challenge will be initiated to invite state government and take their offer on suitable incentive package, including provision for encumbrance-free land, trunk infrastructure facilities, power at rationale rate to the potential investors for attracting project in their states.

Utilisation of ACC is expected to boost the nation's economy strongly, with an economic internal rate of return (IRR) of 24%. India is already providing a substantial push through an expeditious approval process for foreign direct investment (FDI) in battery-related segments, to develop a complete domestic supply chain in India and boost FDI. Total corporate tax collection from 50-GWh projects is estimated to be approximately INR 16,000 crore, while the net impact on indirect taxes, due to changes in total Goods and Services Tax (GST) collection, will be approximately INR 58,000 crore.

In order to ascertain the financial viability of a giga-scale battery manufacturing project, a detailed financial model has been prepared. The model includes capital expenditure (capex) phasing, revenue and cost forecasting, cash flow projections and profitability assessment for a 10-GWh advanced cell manufacturing facility (considering NMC 622 as the base technology). The subsidy calculations have been done considering various scenarios (aggressive, conservative and most likely). The capex, source of funding, cost breakdown and all other assumptions have been explained in detail in the chapter on project and financial assessment.

The major component of overall cell manufacturing plant is expected to be contributed by plant and machinery required for various value chain activities i.e. cathode manufacturing, anode manufacturing, electrolyte manufacturing, separator manufacturing, cell assembly. Soft cost comprising of components such as IDC, financing cost, contingency, insurance, pre-operative cost, etc. have also been considered to determine the overall capital cost.

In the financial model, cell prices have been considered in line with Bloomberg New Energy Finance (BNEF) cell prices. However cell manufacturers will presumably invest continuously in R&D and asset maintenance to strive for better cell technology, allowing them to stay ahead of competition and also be eligible for a bonus subsidy under the central government programme run by NITI Aayog. Due to higher technology adoption, it is considered that from 2025, cell prices will reduce at half the rate of the BNEF price forecast[7].

The financial model of the considered subsidy (in most likely scenario) is shown in the table below:

Table 1: Subsidy considered in the financial model

	Mar-22	Mar-23	Mar-24	Mar-25	Mar-26	Mar-27	Mar-28	Mar-29	Mar-30
GWh	15	25	35	50	50	50	50	50	50
Expected subsidy Rs/kWh	570	722	857	1271	1144	915	922	553	277
Value capture	30%	40%	50%	65%	65%	65%	65%	65%	65%
Subsidy (in crore)	855	1805	3001	6353	5718	4574	4611	2767	1383

It is to be noted that the subsidy figures, highlighted above are only indicative, and the actual subsidy component will be derived after a competitive bidding process.

[7] PwC Assessment

2. Introduction

2.1. Background

The Government of India (GoI) has plans to improve the energy situation in the country by focusing on clean energy sources and reducing dependency on imported oil, two areas in which India has consistently underperformed. Some of the most polluted urban areas in the world are in India[8]. The country's energy security situation is very fragile, which is reflected in the fact that 80% of the country's oil demand is being met by imports.[9] To reduce reliance on thermal energy and lessen the severity of air pollution, the government announced its target to achieve 175 GW[10] of renewable energy (RE) by 2022. Additionally, the Union Cabinet approved the National Mission on Transformative Mobility and Battery Storage in March 2019, to promote clean mobility. Energy storage technologies and infrastructure will enable the government to meet the above targets of RE and clean mobility. Stationary energy storage solutions for grids are required to achieve large-scale RE integration and advanced battery technology with higher energy density will be required for efficient and reliable operation of EVs.

The government's ambitious plans to adopt clean energy in order to transition towards a low-carbon economy offers a lucrative set of opportunities for energy storage in India. The evolving technological landscape of the energy sector, coupled with effective cost-cutting strategies across the supply chain, has made battery storage a reality. Developing application-specific customised storage solutions, which were complex and demanding a few years ago, have eventually become feasible with the advent of ACCs. Co-ordinated public and private sector action can shape up a disruptive battery manufacturing ecosystem for the future.

The recent market dynamics in the energy storage market are highlighted below.

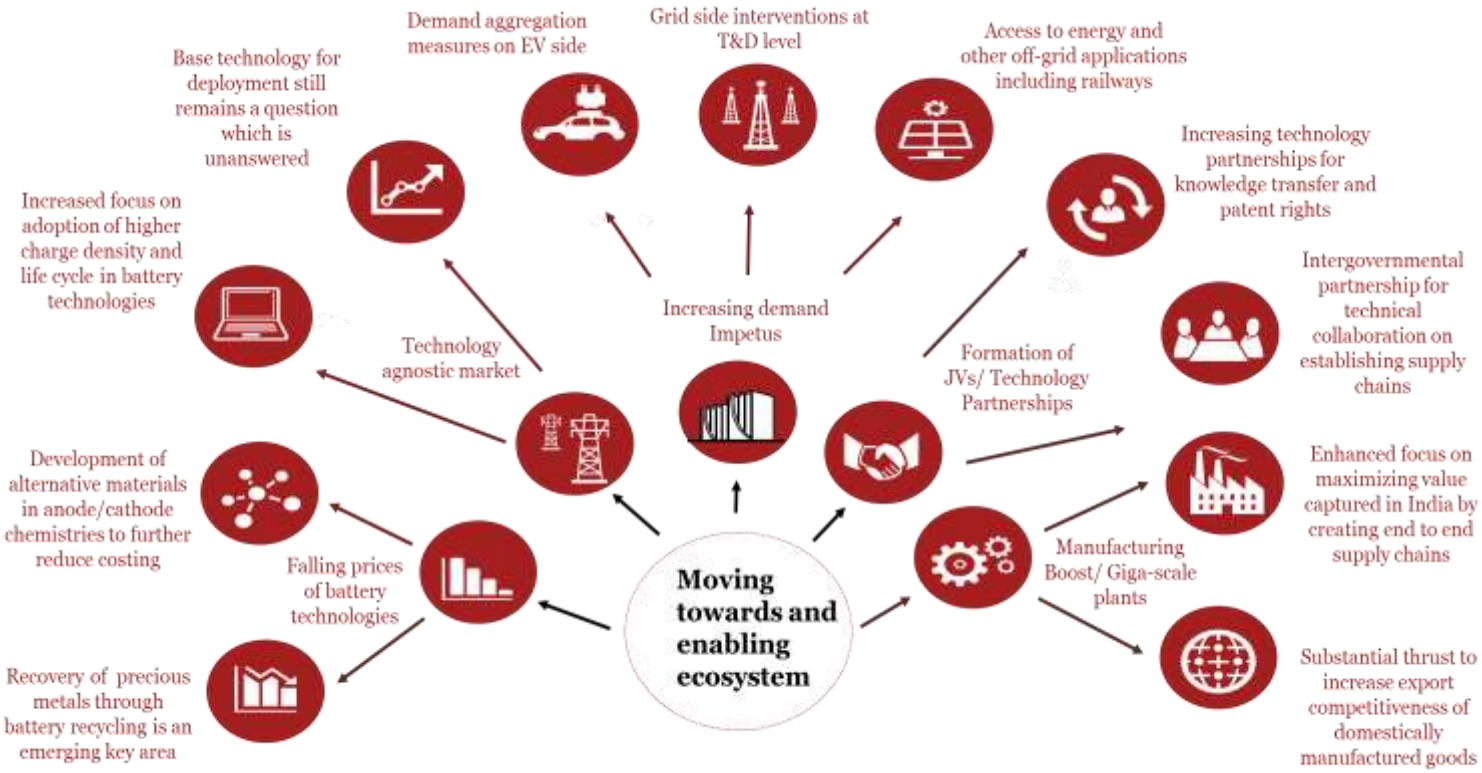


Figure 2: Key developments in the energy storage segment

[8] https://www.weforum.org/agenda/2019/03/7-of-the-world-s-10-most-polluted-cities-are-in-india/
[9] Petroleum Planning and Analysis Cell
[10] https://mnre.gov.in/file-manager/annual-report/2018-2019/English/pdf/chapter-1.pdf

The falling price of Li-ion batteries has been instrumental in pushing the market for battery storage globally. In the last 8 years, Li-ion battery pack prices have been reducing at a compound annual growth rate (CAGR) of 20%, primarily due to economies of scale, technology maturity and learning curve[11]. As per BNEF estimates, battery prices are further expected to fall to USD 100/kWh by FY 2024 and USD 65/kWh by FY 2030 respectively, making the Li-ion technology a clear winner amongst its peers. There are numerous cell chemistry variants within Li-ion batteries, such as Lithium-Titanate (LTO), Lithium Ferro phosphate (LFP), Lithium Cobalt oxide (LCO), Nickel Cobalt Aluminium (NCA) and Li-ion Manganese Oxide (LMO), but the one which is expected to dominate the Indian market is the nickel manganese cobalt (NMC) type, owing to its superior charge density and overall performance for different applications. Additionally, the declining share of cobalt in these cell chemistries, from NMC 111 to NMC 532 and finally to NMC 811, further reduces the supply chain pressure of availability of cobalt. In India, with battery technology still being in its developmental stages with respect to adoption, investors and domestic players are bound to be circumspect about the technology and hence, formation of joint ventures (JVs) for manufacturing and supply is the preferred mode.

Segments like EVs, stationary storage and consumer electronics are anticipated to be major demand drivers for adoption of battery storage in India. This huge potential across these segments till FY 2030 has been highlighted below.

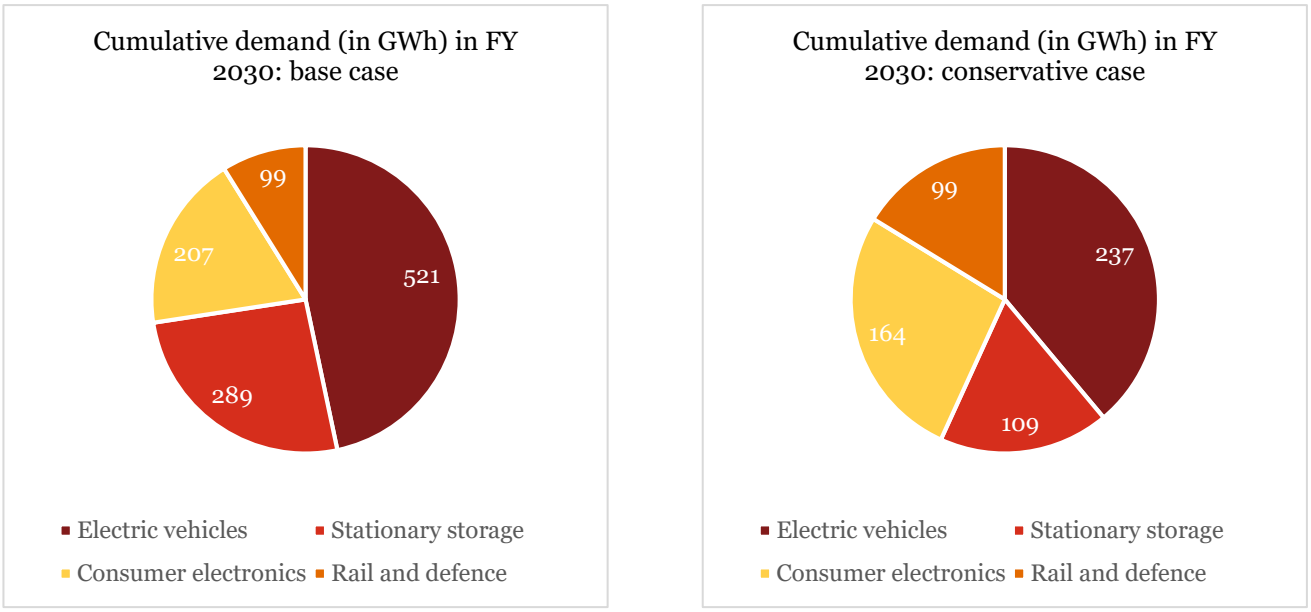


Figure 3: Potential of battery storage across various segments

(Source: RMI)

The emerging electric vehicles (EV) mobility paradigm is an important opportunity to foster Make-in India for advanced cell chemistries and its components. EVs are the key component of the overall estimated demand for battery storage requirement and are expected to be the primary driver of ACC battery storage production over the next decade.

2.2. Import of ACCs

Advanced battery value can be broadly divided (at the sales end) into the battery pack and the advanced chemistry cells (ACCs). India has resources and expertise to build both the battery packs and cells. While several companies have already started invested in battery pack assembly, the capacities of these facilities are too small when compared to global averages. Investments in manufacturing and overall value addition for ACCs are still negligible in India. Hence, almost entire domestic demand for ACCs is still being met through imports.

[11] https://about.bnef.com/blog/behind-scenes-take-lithium-ion-battery-prices/

Overall market for advanced cells, especially Li-ion, has grown exponentially since 2016, with the bulk of the growth coming from use of Li-ion cells in EVs. Additionally, there has been an increase in demand of Li-ion batteries in consumer electronics as well. The graph below illustrates imports of Li-ion primary cells.

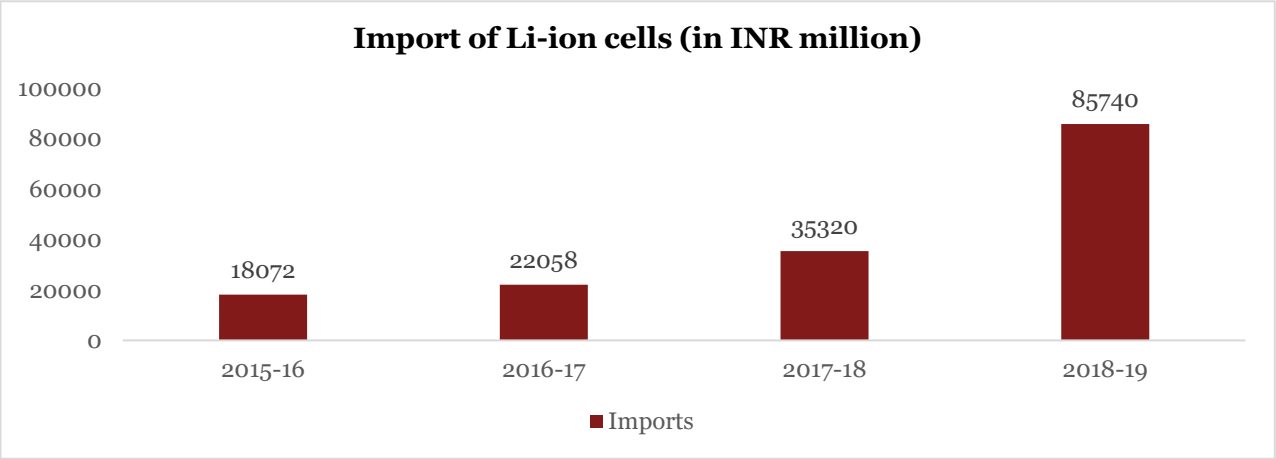


Figure 4: Li-ion cells import trend

In terms of import dependency, India is heavily reliant on China, which accounts for 63% of India's Li-ion cell imports. Other countries from where India imports Li-ion cells include Hong Kong (22%), Vietnam (9 %) and the USA (2%). It is evident from the graph above that Li-ion cell imports have increased drastically in the recent couple of years. The trend is expected to continue and if domestic cell manufacturing facilities do not get established, India will remain largely dependent upon imports. Such high dependency on imports will lead to trade deficit, resulting in second and third-degree economic impacts, such as currency depreciation and loss of job opportunities.

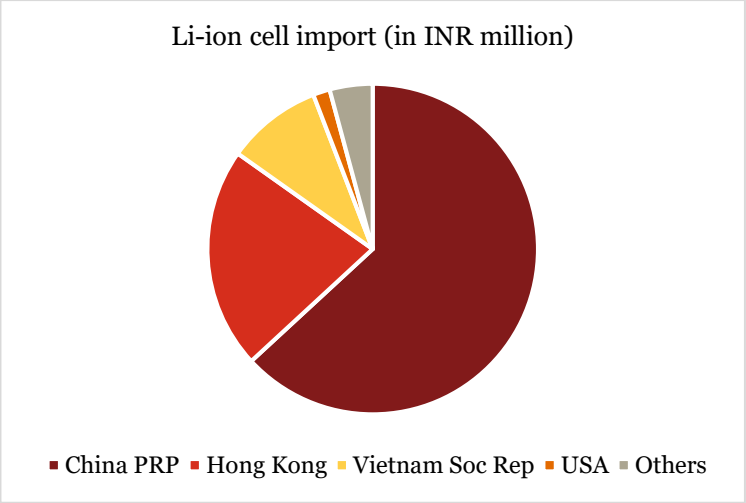


Figure 5: Li-ion cell import by country

Secondly, once the ecosystem of battery manufacturing kick starts in India, it will certainly lead to increase in export competitiveness of the industries once they have met the domestic demand, thereby reducing the burden on trade deficit. Additionally, once the vertical integration starts and cell manufacturing facilities are established, the reliance on imported Li-ion battery packs, will also be reduced considerably. The focus will be on acquiring direct raw materials (which are not available in India), such as Lithium, Cobalt and Nickel, for establishing a dedicated and sustainable supply chain.

Furthermore, setting up of few integrated advanced chemistry cell and battery storage manufacturing facilities of Giga-scale in India shall create significant opportunity for direct and highly skilled employment. As per the estimates provided in EU Commission -Policy report on Li-ion battery for E-mobility and stationary storage applications, it is noted that establishing a competitive Li-ion cell and battery manufacturing facility in EU is expected to create between 90-180 direct jobs per GWh per annum production volume. In India, with relatively lower cost of labour, emphasis on automation of functions is also relative lower and hence the effective job creation shall be on higher side compared to EU. Furthermore, the downstream application of battery storage shall create many more direct and indirect jobs in renewables, electric vehicles, etc.

Also, according to the estimates provided in the note on FAME Scheme of the government, the demand side for ACCs would generate in excess of 30 Lakh jobs in total considering fresh investments being made in

manufacturing EVs and the support infrastructure. Higher indigenous manufacturing of cells, and other battery components will create opportunities for new skills and jobs in areas across the value chain.

2.3. Purpose of the report

Advanced battery manufacturing represents one of the largest economic opportunities in the 21st century, with companies settling in for their chance to own a slice of one of the most lucrative markets of the new millennium; whichever countries or companies are able to create and manufacture the dominant battery technologies will control some of the world's largest growth sectors such as consumer electronics, EVs, advanced electricity grids, and more. Billions of dollars are pouring into battery research at this critical juncture, and India has the capabilities to step into an advantageous position.

Furthermore, it is anticipated that over 450 GWh of new ACC and battery storage manufacturing capacity shall be built around the globe in next 3-5 years. Most of these upcoming manufacturing capacities are today increasingly concentrated in a handful of countries including China, South Korea, USA, Japan and Thailand. Moreover, these countries are expected to account for about 90% of ACC production by FY 2021. These countries today are offering a vast bouquet of fiscal and non-fiscal incentives, both at end consumption and at manufacturing level, in order to create an enabling ecosystem for promoting investment in newer technologies and commercial production of advanced chemistry cells and batteries at giga scale.

For India to exploit the tremendous market potential for energy storage, the advanced cell chemistry (ACC) manufacturing segment needs to be revamped, which is still in its embryonic stages and largely driven by imports.

It is imperative to acknowledge that though giga-scale manufacturing of advanced chemistry batteries is a globally sunrise industry, but in the existing market conditions the ACCs are expected to compete and replace the dominant and well-established applications like Internal Combustion Engine (ICE) vehicles, energy storage (like pumped hydro, gravity storage, etc.) Hence to enable ACC's giga scale domestic manufacturing and promote widespread commercial application of the same, globally various countries including USA, China, Eurozone, etc. are extending suitable incentives to ACC manufacturers and for the demand creation.

Most domestic players in India are engaged in battery packaging of imported cells, which is the last stage of battery manufacturing supply chain and is a very small portion of actual manufacturing value captured. Hence, the focus should be to not only improve export competitiveness, but also to realise the potential high value of battery manufacturing in India. Given India's strong track records in research, manufacturing and entrepreneurship, India can rise to a dominant position in the world. But this will not happen in vacuum. Ambitious goals, concerted strategies, government support, and a collaborative approach will be necessary. There is no existing central sector scheme or programme that is applicable for extending suitable fiscal incentives to the manufacturers towards ACC manufacturing in India. The existing framework of FAME-II scheme incentivizes the procurer of EVs in India and doesn't specifically targets the ACCs only.

In order to stimulate growth in domestic ACC manufacturing and encourage development of dedicated giga-scale battery manufacturing capacities, NITI Aayog is drafting a policy to incentivise advanced chemistry cell manufacturing in India. The policy proposes to offer incentives in the form of subsidies to domestic manufacturers, to help lower the selling price of cells and be globally competitive. Successful implementation of the policy will help India become a global entity in advanced chemistry storage manufacturing.

This report brings out the essence of the much-needed impetus towards scaling up battery manufacturing in India, by providing a stable, unambiguous and investor-friendly policy framework without any loopholes for misuse. The report analyses the proposed framework and the roles different nodal agencies are to play, and studies the suggested interventions in the form of taxation and subsidy incentives. A base financial model for domestic cell manufacturing was prepared to further substantiate financial assessment and subsidy calculations.

The report also analyses existing support to domestic manufacturing of batteries at both state and central level to further streamline cell manufacturing efforts in the right direction. Additionally, NITI Aayog arranged for

one-on-one discussions with potential interested manufacturers, and held two stakeholder meets to take the manufacturer perspective into account while drafting the policy framework.

During the preparation of this report, comments from various ministries were invited and the feedback received was incorporated after discussions with NITI Aayog. Though India lacks large-scale battery manufacturing capacities at present, India's battery market is large enough to pave the way for setting up giga-scale manufacturing capacities in future. The growth of large-scale domestic battery manufacturing will also help India meet its RE goals. Furthermore, the initiative will:

- Facilitate Make in India: Greater emphasis on value capture
- Reduce petroleum import dependance: The programme by supporting EV adoption will translate into net savings of INR 300,000 Cr on account of oil bill reduction
- Improve air quality in India's highly polluted cities: 14 of the top 20 most polluted cities in the world are in India. Transformative mobility has the potential to tackle the increasing level of vehicular and ambiet pollution

A functional domestic battery manufacturing sector will help reduce India's dependency on imports and cater to the country's future market needs.

3. Existing regulatory and policy framework

Policy and regulatory frameworks are the biggest drivers towards mobilising market penetration for adoption of battery manufacturing technologies. A favourable and stable long-term policy framework is one at the central level with minimal amendments, providing adequate support mechanism for investors to plan and develop their entry strategy for Indian markets. State-level assessments are also equally crucial, considering the plethora of enablers provided by state governments in the form of electronic, industrial, EV and energy storage policies and taking decisions on appropriate site selection for setting up battery manufacturing facilities. These two assessments, critical at central and state levels, have been presented below.

3.1. Central level

At the central level, the government has launched programmes like Make in India, the National Policy on Electronics (NPE) and the Modified Special Incentive Package Scheme (MSIPS) to push the agenda of domestic manufacturing in India. The electronics market in India is expected to reach USD 400 billion[12] by FY 2020. The electronics system design and manufacturing sector (ESDM) is envisaged to achieve 'net zero imports 'by FY 2020, strengthening the focus on Make in India. The government's focus is to help build an ecosystem of domestic manufacturing and R&D, with strict focus on 100% value captured being realised in India. NPE, released in February 2019, stressed on promoting domestic manufacturing and exporting in the entire value chain of ESDM for economic development, with a target to achieve a turnover of USD 400 billion by FY 2025. The National Energy Storage Mission (NESM) also agreed on the need to create policy and regulatory frameworks for battery manufacturing growth, scaling supply chain strategies and scaling of battery cell manufacturing.[13]

The GoI's policy framework in the recent past aims to upgrade the manufacturing sector for it to work towards practical solutions to add value and create new products, thereby developing a niche market. The GoI's intention is to create forward and backward linkages in manufacturing to create a string multiplier effect in the economy, in addition to driving export competitiveness.

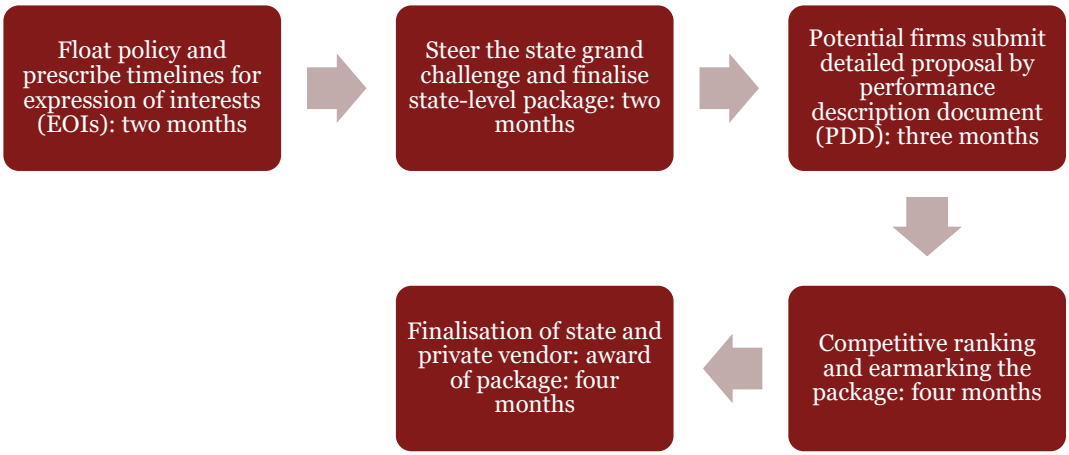
3.1.1. National Mission on Transformative Mobility and Battery Storage

The National Mission on Transformative Mobility and Battery Storage is a central government programme aiming to boost mobility solutions and encourage development of a competitive domestic manufacturing ecosystem, focusing on maximum value capture within India. The cabinet approval for the mission was given on 7 March 2019, with the programme being chaired by NITI Aayog. The mission will serve as a cross cutting/ multi-disciplinary platform and take feedback of concerned ministries. The other key ministries part of the inter-ministerial steering committee are the Ministry of Road Transport and Highways, Ministry of Power, Ministry of New and Renewable Energy, Department of Science and Technology, Department of Heavy Industry, Department for Promotion of Industry and Internal Trade and Bureau of Industrial Standards.[14] The vision includes developing a phased manufacturing plan (PMP) for implementation of giga-scale integrated cell and battery manufacturing plants, focusing on global benchmarking to ensure export competitiveness, transparent procurement and domestic demand creation for five years. The broader goal is to establish a PMP for localising production for EV supply chain till FY 2024.

The key processes and subsequent timelines associated with the plan include:[15]

[12] Make in India Initiative
[13] https://pib.gov.in/newsite/PrintRelease.aspx?relid=181698
[14] https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1567807
[15] NITI Aayog

Processes:



Timelines:

Table 2: Timelines for subsidy programme and shortlisting of potential players

	Action points	Month 1	Month 2	Month 3	Month 4-6
		Steering committee and inter-ministerial consultations/approvals			
1	**Conducting financial modelling and finalise incentive package**				
2	**Developing PMP template and programme documents**			Cabinet approval	
3	**Rolling-out state grand challenge**			Ground validation	
4	**Finalising states and state-level subsidy package**	State-level negotiation			
5	**Rolling-out programmes for selection of battery manufacturer**	Consultation process			
6	**Selecting private manufacturers**				

(Source: NITI Aayog)

3.1.2. FAME policy

EVs are being regularly developed in India with cutting-edge technologies, providing the much needed traction in the segment. While technology has been crucial in bringing down costs, a conducive policy framework has also played its part in commercialisation of many EV models in India. Much of the success needs to be attributed to the Faster Adoption and Manufacturing of (Hybrid) and Electric Vehicles (FAME) scheme implemented by the Department of Heavy Industries (DHI). [16]

Under the FAME scheme, over two lakh EVs[17] have been sold, resulting in average fuel saving of over 50,000 litres/day and an estimated CO2 reduction of over 130,000 kg/day. Phase-II of the FAME scheme[18], which is currently in progress (April 2019-22), proposes to introduce more EVs in public transport and increase penetration levels through market creation and demand aggregation. The second phase envisages a holistic growth of the EV industry, including provisions for charging infrastructure, R&D and push towards domestic manufacturing. The scheme also stresses on demand incentives to be given to the end consumers in the form of an upfront-reduced purchase price of EVs, to be reimbursed to the original equipment manufacturer (OEM) by the central government. Under the scheme, a demand incentive of INR 10,000/kWh for all vehicles, excluding

16 https://dhi.nic.in/writereaddata/UploadFile/Fame_India_Revised_270415.pdf
17 https://www.fame-india.gov.in/
18 https://dhi.nic.in/writereaddata/UploadFile/publicationNotificationFAME%20II%208March2019.pdf

public buses, is being proposed. For public transport buses, a demand incentive of INR 20,000/ kWh is being proposed, subject to competitive bidding among OEMs on operating expense (OPEX) model. The key elements in the policy have been highlighted below.[19]

Table 3: FAME policy elements (phase-II)

S. no.	Vehicle segment	Maximum number of vehicles to be supported	Approximate sizes of batteries (kWh)	Total approximate incentive at INR 10000/kWh for all vehicles and INR 20000/kWh for buses and trucks	Maximum ex-factory price to avail incentive (in INR)	Total fund support from DHI (in INR)
1	Registered e-two-wheelers	1000000	2	20000	1.5 lakh	2000 crore
2	Registered e-three-wheelers	500000	5	50000	5 lakhs	2500 crore
3	E-four-wheelers	35000	15	150000	15 lakhs	525 crore
4	Four-wheeler strong hybrid vehicle	20000	1.3	13,000	15 lakhs	26 crore
5	E-buses	7090	250	50,00,000	2 crore	3545
Total demand incentive						**8596 crore**

The amount of incentive per kWh will be reviewed with declining battery costs, which will eventually involve further reduction in vehicle prices. The breakup of fund allocation has been presented below.[20]

Table 4: Fund allocation (in INR crore) under phase-II of FAME

S. No.	Parameters	2019-20	2020-21	2021-22	Total fund requirement
1	Demand incentives	822	4587	3187	8596
2	Charging infrastructure	300	400	300	1000
3	Administrative expenditures including publicity, ICE activities	12	13	13	38
4	Committed expenditure of phase-I of FAME	366	0	0	366
Total		1500	5000	3500	10000

(Source: DHI)

The EV market in India has grown since the implementation of FAME-I in 2015. The key point of the scheme is setting up of adequate public charging infrastructure through participation and involvement of government agencies, industries and public sector enterprises. Charging infrastructures needs to be established as per guidelines set by the Ministry of Power (MoP), titled 'Charging Infrastructure for EV-Guidelines and Standards'. [21]

3.1.2.1. Localisation efforts within FAME

To promote indigenous manufacturing of EVs, assemblies and sub-assemblies, a PMP has been notified to increase localisation efforts and value addition in India.[22] The DHI has come up with a BCD revision proposal,

[19] https://www.fame-india.gov.in/WriteReadData/userfiles/file/FAME-II%20Notification.pdf
[20] https://www.fame-india.gov.in/WriteReadData/userfiles/file/FAME-II%20Notification.pdf
[21] https://powermin.nic.in/sites/default/files/webform/notices/scan0016%20%281%29.pdf
[22] https://dhi.nic.in/writereaddata/UploadFile/DHI%20OM%20on%20Phased%20Manufacturing%20Programme%20PMP.pdf

along with timelines for localisation of component manufacturing to increase domestic value capture. These details have been analysed in the following sections.

- Phase-II of FAME offered an incentive **@ INR 10,000 per KWh for EVs (except buses) and INR 20,000 per KWh for electronic buses**. To qualify for the incentive, the hybrid/EV, including its variants and versions, should be locally manufactured or have certain percentage of localisation, as notified from time to time.

  An internal draft notification circulated to industry players by the DHI states:

  "*To avail incentive under FAME India Scheme* ***localization content level should be at initial level of 40% for Buses and 4Ws and 50% for 2Ws and 3Ws*** *subjected to review from time to time.*"

- **Roadmap for indigenisation of EV parts:** Specifies the timelines for achieving localisation of different components involved in EV manufacturing.

Localisation in FAME phase-I

- In FAME phase-I, dated 12 September 2017, incentives were offered for electric buses, linked with localisation:

Table 5: Localisation in FAME phase-I

Bus	Category of Central Motor Vehicles Rules (CMVR)	Incentive level 1	Incentive level 2
Fully electric bus	M2 and M3	60% of purchase cost or Rs. 85 lakh, whichever is lower **In case localisation of minimum 15% is achieved**	60% or purchase cost or Rs. 1 crore, whichever is lower **In case localisation of minimum 35% is achieved**

Notes attached with the gazette notification also defined localisation as:
"Localisation will be calculated based on ex-factory price.
OEM/supplier to issue self-certification about localisation contents; however, DHI retains the right to get the same validated from specialised expert agencies."

- Through gazette notification no. 1958, DHI notified incentives for low-speed three-wheelers through FAME, available to only those vehicles which are manufactured in India and **have at least 35% value addition in India**.

3.1.3. Why MSIPS could not achieve intended targets

MSIPS policy: Analysis of key elements

MSIPS was a revolutionary step undertaken by the central government in FY 2012, followed by series of amendments in the form of support extended and the applicability of policy, ultimately ending on 31 December 2018. MSIPS provided a subsidy to manufacturing companies for capital expenditure of 20% for investments in a special economic zone (SEZ) and 25% in other places. High capital investment projects could avail benefits such as reimbursement of excise, tax and duties on capital equipment. For battery manufacturing, the following incentive package was available under the consumables and accessories.

Table 6: MSIPS policy benefits

Category	Investment threshold (in INR crore)			Financial incentives	
	Fab	Assembly, testing, marking and packaging (ATMP)	Manufacturing	SEZ	Non-SEZ
Consumables and accessories such as mobile phones and IT accessories- batteries	NA	NA	1	20% of capex	25% of capex+ reimbursement of excise/countervailing duty (CVD) on capital equipment

Despite offering capex subsidy and other incentives, MSIPS could not garner positive response from investors. MSIPS was initially extended to FY 2020 as per an amendment, but the lukewarm reaction from the industry resulted in the timelines for the last application being cut short to 31 December 2018. The number of investment proposals came down to 238 in April 2018 from 269 in April 2017, with only a handful of companies showing interest. Investors said the slow pace of approval of disbursal of incentives and tedious demands in documentation and eligibility criteria were the main reasons why many of them opted out. Additionally, amendments like putting a cap on the maximum incentive (INR 100 billion) to be given, reducing timelines for availing the incentive from 10 years to 5 years and making it mandatory for companies to give an undertaking, post availing the subsidy, compulsory commercial production by a unit for a minimum of 3 years, further resulted in low investments in this segment.

(Source: https://meity.gov.in/writereaddata/files/msips_notification.pdf)

3.2. State level

Many states in India have been very pro-active in offering lucrative and customised packages to investors (super-mega projects) to increase competitiveness among them. States often offer investors to set up industries in favourable locations such as a special economic zone (SEZ), domestic tariff zone (DTZ), Electronic Manufacturing Cluster (EMC), Coastal Economic Units (CEU) or in the vicinity of ports, which offer strategic advantages to maximise the overall efficacy of industrial operation. Each area is already endowed with a number of sectoral industries, which enjoy numerous benefits and in-house facilities in terms of superior-quality infrastructure (24*7 water availability, electricity, and communication), incentivised business frameworks (capital subsidies, power subsidies, land rebates, tax concessions, etc.), connectivity to both domestic and international markets and streamlined logistics networks (proximity to container ports, inland container depots (ICDs), internal road network, including cost of labour. These incentives at state levels can be primarily categorised into industrial, electronic, EV and storage segments. These state-specific attributes for some of the leading states for establishing battery-manufacturing facility have been presented below.

3.2.1. State-level electronics policies

State-level electronics policies supporting electronic manufacturing clusters (EMCs) and electronics system design manufacturing (ESDM) has led to investments in the electronics sector. State policies provide a plethora of fiscal and non-fiscal incentives in the form of R&D subsidy, capital subsidy, interest subsidy, exemption duties, and land benefits, including tax-based waivers. Some states are also supporting skill upgradation and training of local labour. The policies are generally amended after a period of five years. Typically, investors leverage the sectoral policies to seek additional incentives under different heads or incremental higher incentives under the same heads of capital/operational incentives. An overview of incentives offered by states has been provided below.

Table 7: State-wise incentives

	Incentive	Andhra Pradesh	Tamil Nadu	Maharashtra	Karnataka	Gujarat
Capital incentives	Exemption of registration and stamp duty	👍	**NA** (The state is in the process of drafting an electronics policy.)		👍	👍
	Capital subsidy	👍		👎	👎	👍
	R & D subsidy/incentives	👍		👍	👍	👍*
	Interest subsidy	👍		👍	👍	👍
	Infra subsidy for green measures taken by firm	👍		👎	👍	👎
	Land rebate	👍		👍	👎	👎
Operational incentives	Indirect tax concession	👍		👍	👍	👍
	Power subsidy	👍		👍	👍	👍
	Incentive related to employment	👍		👎	👍	👍
	Entry tax exemption	👎		👎	👍	👎
Bespoke incentives package based on investment size		👍		👍	👍	👍

*Assistance in the form of patent filing (both domestic and international)

3.2.2. State-level industrial policies

States have been instrumental in driving investments on the industrial front through establishment of manufacturing hubs for both import and export. These policies offer incentives depending upon the scale of investment, along with meeting the criteria of local employment generation. Some states like Gujarat and Maharashtra also offer customised tailor-made support packages for ultra-mega projects which have sizeable investments and potential to generate employment. Additionally, there are increased benefits in areas like SEZs, ports and DTZs in terms of waivers and exemptions. A detailed analysis of industrial policies followed by few states is given below.

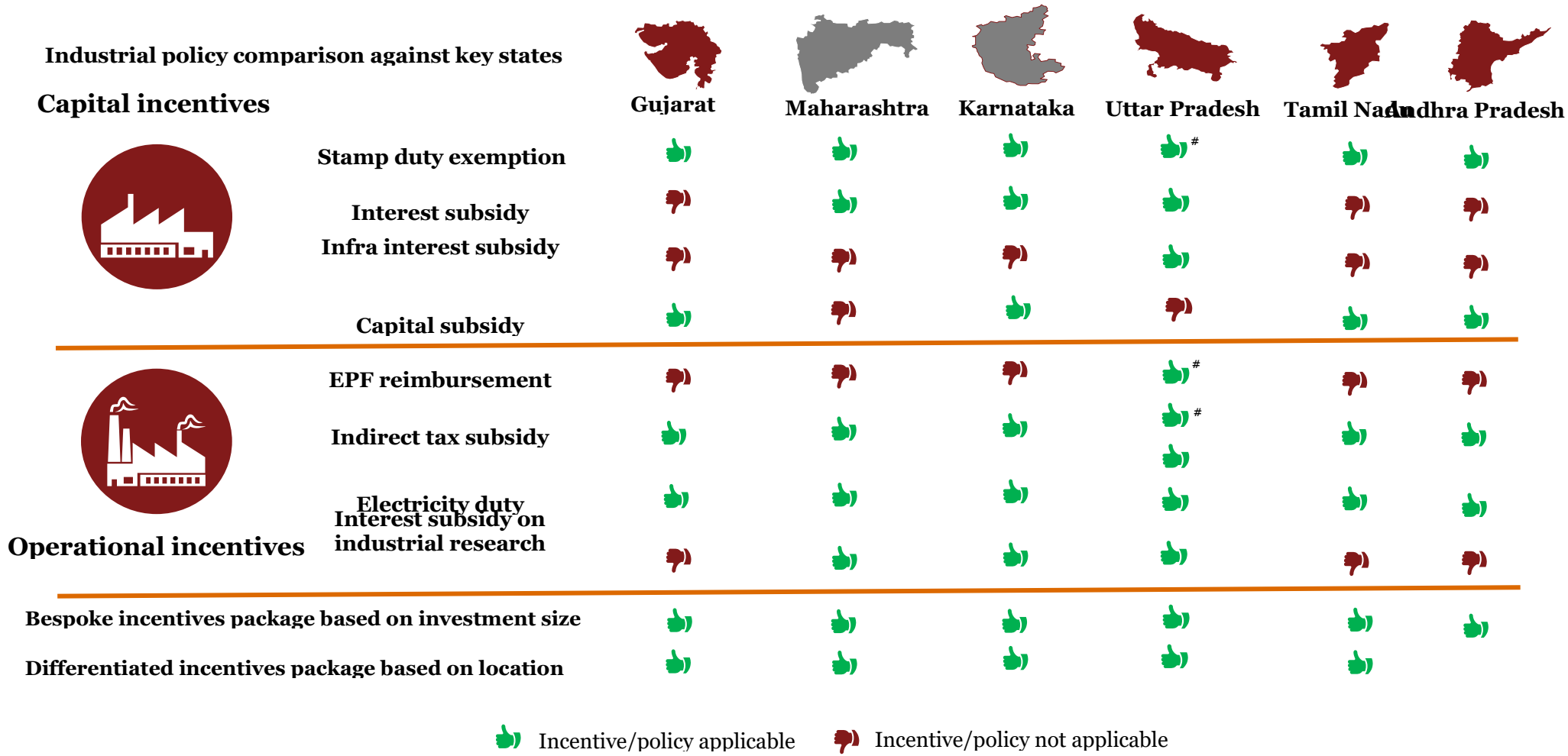


Figure 6: Comparison of industrial policies across states

3.2.3. State-level EV and storage policies

Several states are coming out with specific policies and schemes for manufacturing EVs and energy storage. Many of these policies are in drafting stage, like in case of Gujarat, but others have come up with firm incentives in the form of stamp duty exemptions, state GST (SGST) reimbursements, concessional registration charges, power subsidies, land conversion fee reimbursement, research subsidy and interest subsidies. Delhi, Kerala and Uttarakhand have also come up with specific policies related to promotion of manufacturing of EVs and related services infrastructure.

The upcoming EV policies need to be reshaped, so that incentives are also allocated towards encouraging battery manufacturing in India, along with R&D-based support framework. States can also work towards making policies more fruitful, by forming separate parks (like in case of Uttar Pradesh), especially dedicated to setting up of battery-based small plants. Details of major states having dedicated policies for EVs have been analysed below.[23]

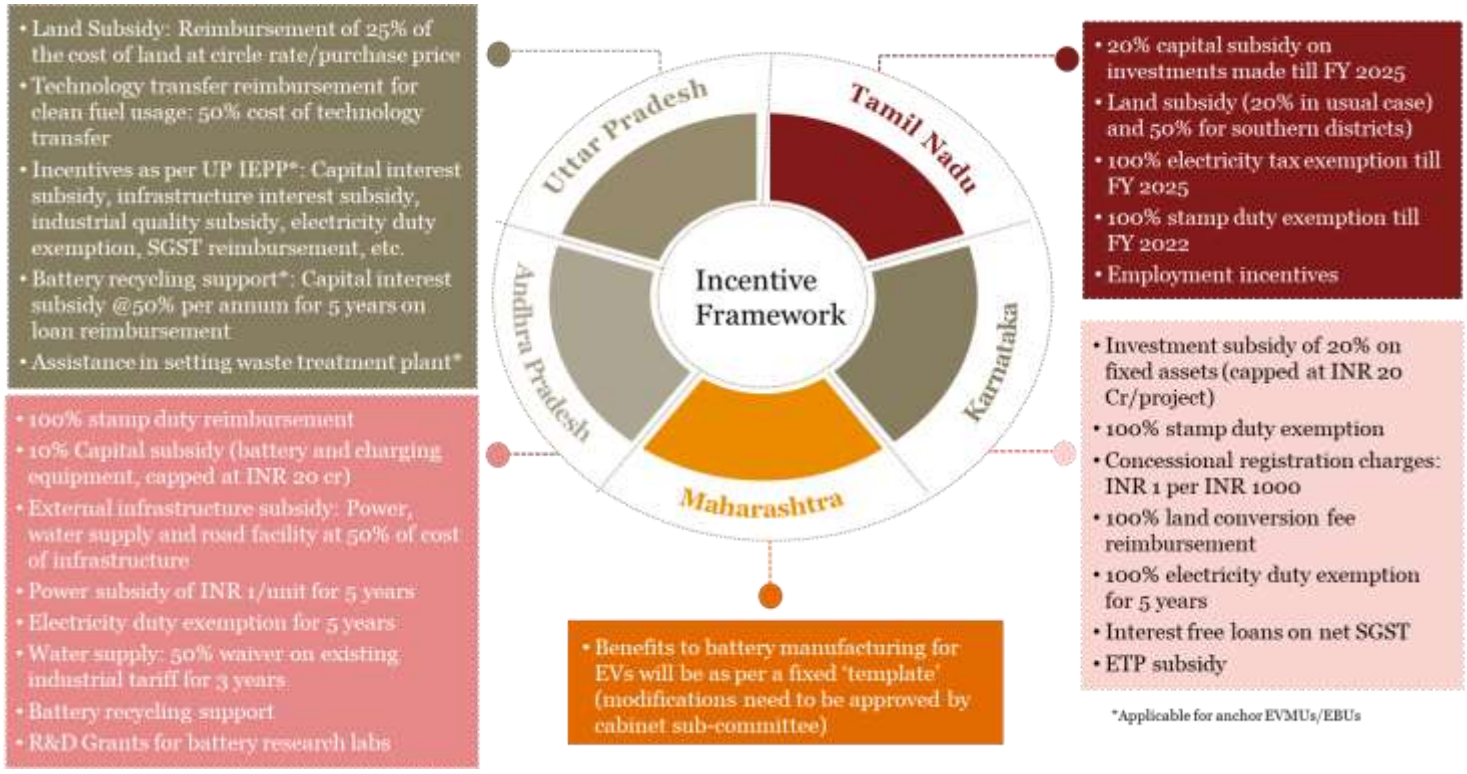


Figure 7: States with dedicated policies for EVs

[23] State-level EV and storage policy incentive analysis based on policy instruments of various states

3.3. Some examples of international support

China has been at the forefront in promoting battery manufacturing facilities by extending number of different policy instruments and tax incentives. Some crucial decisions undertaken by the Chinese government include:

- release of revised industry standards for vehicle power batteries by providing subsidies to only those players which have 8-GWh of Li-ion battery production capacity, thereby promoting domestic interests (only companies like BYD and CATL qualify)
- restricting providing incentives to only those vehicles whose batteries are manufactured in China, thereby forcing foreign investors to partner/form joint ventures with local Chinese players for availing subsidies. The table below had details of incentives offered to some of the battery manufacturing facilities across the globe.

Facility and location	Battery production (GWh)	Examples of industrial policy support[24] actions
BYD (Shenzhen, China)	30 GWh (2020)	• Exemption from battery consumption tax • USD 35 million in subsidies from central authorities for R&D of Li-ion batteries since FY 2015
CATL (Ningde, China)	50 GWh (2020)	• Exemption from battery consumption tax • USD 13 million in central special funds, used to support innovation technology of new energy vehicle industry since 2015 • 100 million-yen (USD 15 million) in subsidies from central authorities for national key R&D programme
Tesla/ Panasonic (Nevada, US)	35 GWh (2018)	• Transferable tax credits which can be invested further • 100% sales tax abatement for 20 years • 100% property tax abatement for 10 years • 100% modified business tax abatement for 10 years
LG (Michigan, US)	3 GWh (year)	• USD 151 million federal stimulus grant to finance 50% of USD 303 million plant • USD 125 million in state tax credits, with the condition of employing at least 300 people

Table 8: Industrial policy support actions

[24] Source: ICCT - International Council on Clean Transportation

4. Challenges in setting up integrated cell and battery manufacturing facilities

India in the past has missed multiple opportunities to tap the potential of 'Make in India' in various sunrise industries. These opportunities have been lost to other globally competitive industrial countries that have timely extended suitable incentives and provided requisite infrastructure for such industries to thrive and consequently attract investments. It is important to investigate risks and devise an optimal strategy to minimise risks before developing an enabling ecosystem for domestic battery manufacturing. Key risks in the form of technology transfer, including advancing cell chemistries, development of alternatives and ongoing R&D in material science, are a major focus area. Policy and regulatory barriers in the form of inconsistencies, applicability and sudden reduction or removal of particular incentive/benefit can hamper investments. Moreover, battery manufacturing in India, represents a paradigm shift in technology and hence, availability of low-cost financing may become a barrier for comparatively smaller domestic players. Other issues like availability of ample land, proximity to ports for easy movement of logistics, overall connectivity and regional level approvals and clearances must also be accounted for.

The sections below provide an elaborate view, covering all major roadblocks towards setting up battery manufacturing facilities in India, which require further deliberation and requisite action.

4.1. Key risk assessment

There are several risks associated with setting up battery manufacturing plants in India. Establishing the entire value chain of battery manufacturing in India itself is a big constraint, given the rapidly evolving battery chemistries. This is a risk for investors, due to no precedents on what works and what does not work in India for battery manufacturing. Lack of technical expertise and knowledge about the sector, especially when it comes to hiring local people for plant operations and maintenance could pose an operational risk. Bankers/financial institutions will not find it feasible to provide low interest financing to a technology, which is looking to establish its footprint for the first time. On the contrary, they may charge a relatively higher interest rate to minimise risks for themselves.

Policy and regulatory landscapes undergo continuous amendments and revisions with changing governments, thereby shifting the market dynamics and preferences. Major areas of concern surrounding the setting up of integrated and cell battery manufacturing facilities in India have been identified below.

Raw material availability

- For capturing a large portion of value for battery manufacturing supply chain in India, raw material sourcing is the biggest concern. India currently has extremely low reserves of in-house materials like lithium, cobal and nickel, which are key constituents for manufacturing cathode and electrolyte. Additionally, the country also does not have battery grade graphite (annode material) and imports it from China.
- India does not have the requsite infrastucture in the form of advanced metal processing and refining capital machinery, which is essential for processing the raw material procured to ensure that differenct materials are used in proper concentration.
- Dominance of China in controlling the overall supply chain by engaging in local tie-ups/collaborations with lithium producing countries like Australia, for establishing processing plants, has further increased Chinese influence in controlling raw material sourcing.
- India does not have a major partnership or a bilateral agreement with other raw material producing countries like Australia (nickel and lithium), Chile (lithium), Brazil (nickel) and Congo (cobalt) to ensure a steady supply.

Policies and regulations

- Keeping in mind long-term investments, policy uncertainity remains a crucial challenge. In the past, policy changes such as discontinuaton of tax holidays, reduction of accelerated depreciation benefit from 80% to 40% impacted the growth of the clean energy sector. Additionally, regional level industrial, electronics, EVs and storage policies provide benefits in the forms of capital subsidies, electricity duty exemption, SGST reimbursement, R&D subsidies, power subsidies, etc. All these state-level policies provide these incentives only for a certain period (mostly five years), post which these support mechanisms can become subject to amendment/revisions. Hence any unfavourable change in supportive policy decisions, can drastically impact the viability of a project and financial returns.
- At regional level, many states do not have EV and storage policies in place and even if they have, many do not have a dedicated component to support indigenous battery manufacturing
- Absence of any assured offtake is another area of concern. Battery manfuacturing is being encouraged in India anticipating huge demand in areas of storage, EVs and consumer electronics. However, the demand creation itself is subject to vagaries of policy and regulatory decisions and hence is uncertain.

Technology and material science

- The battery market is an evolving market with battery chemistries being repeatedly altered with more and more advancements in material science. Globally, variety of Li-ion NMC batteries like NMC-111, NMC-621 and NMC- 811 are being developed to reduce the proportion of cobalt, which is costly. R&D is being conducted on using silocon as annode instead of graphite. Identification of the kind of 'battery technology' ideally suited for Indian markets becomes a key investment decision.
- Lack of appropriate technology transfer and exchange of information due to technology patents is also a key concern, limiting the technical expertise gained at local levels
- India currently lacks high-quality R&D infrastructure to research in detail on advanced cell and battery manufacturing.

Financing

- Availability of low-cost financing may be an issue for smaller investors. Banks/finacial institutions (FIs) may be reluctant to provide loans for a new technology due to lack of technical expertise, standard evaluation templates and a standardised financial model. Moreover, from a bankers' perspective, there will be huge uncertainity or security related concerns when it comes to re-sale value of the technology (if the asset or technology becomes obselete).
- The lack of assured offtake and a guaranteed market, further aggravates the issue of financing. To compensate for this, banks/FIs may be forced to charge a higher rate of interest for a comparitively newer technology to minimise risks for themselves.
- Lastly, financial institutions will not be aware about the actual pricing dynamics of batteries (upfront costing involved considering Indian market scenario) and how to measure the output of battery production.

Miscellaneous

- There are significant chances that a boom in the Li-ion battery manufacturing market can hamper the livelihood of players in the supply chain of lead acid technology.
- Identification of an ideal site suited for battery production when it comes to land availability at cheaper rates, proximity to contained and ICD ports, connectivity, energy availability, uninterrupted power and water supply and land readiness are the most vital components. Hence, the investor needs to plan for at least 2-3 good sites, considering he may lose out on a preferred site.
- The battery manufacturing market is heavily reliant on the EV market to step up and generate high quantum of demand in the future (more than 50%). However, if the demand doesn't pick up, then battery manufacturing businesses will suffer.
- Additionally, developing technical skills of local manpower working in battery manufacturing plants is another major operational risk, which the investor needs to account for while planning.
- There must be provisions for protection against cheap and superior quality of Chinese imports, specially when the industry is at a nascent stage.

4.2. Developing risk mitigation measures

To reduce various risks related to battery manufacturing, it is important that central and state governments set up a strong collaborative framework to encourage battery manufacturing in India. Since lack of a guaranteed market is a key concern, it is important for the government to form new and innovative policies which will fuel growth of demand.

Boosting domestic manufacturing

- Despite India being the second largest producer of graphite, battery-grade graphite is imported from China. To kick start anode manufacturing in India, establishing battery-grade graphite processing industries is a primary step to be taken.
- Policies must be formed to stimulate battery manufacturing at both central and regional levels. States' EV and storage policies must necessarily include direct benefits in the form of capital subsidies, interest subsidies, electricity duty exemptions and other benefits.
- The government must work towards enhancing technical capacities, including plant operations, related to advanced battery chemistries.
- State governments should provide long-term assurances to investors, pertaining to amendment of laws and policies, so that investors are confident and willing to invest further.
- Ensuring protection in the initial stages, especially from Chinese players, by providing safeguarding and anti-dumping measures

Demand creation measures

- Demand for batteries should be created by forming favourable policies and regulatory mechanisms. At both central and state levels, policy instruments for EVs and storage, must be designed to support both buyers and manufacturers of Li-ion batteries.

Formation of bilateral agreements

- For acquiring the necessary raw material needed to encourage domestic battery manufacturing, India should consider signing MoUs with countries like Chile, Australia, Congo, Bolivia for uninterrupted supply of processed raw materials, particularly nickel, lithium and cobalt. Public sector companies such as NALCO, MECL, Hindustan Copper have already visited Argentina, Bolivia and Chile in FY 2019 to scout for raw materials. Argentina has offered full support for sharing geological information for mining of lithium.

Research and development in battery recycling

- Battery recycling is necessary when there is lack of domestic availability of dedicated raw material. R&D related to recovery of precious metals such as lithium and cobalt can assist in bringing down the cost of battery. Ensuring lesser wastage of raw material will also help in reducing dependency on imports.
- Regulations and standards pertaining to battery recycling must be drafted.

Technology partnership and formation of JVs

- Local Indian manufacturers must form JVs with international players to get access to patented technology.
- Local JVs must also be promoted to research on advanced chemistries catering to Indian environment, including undertaking pilot projects. NMC variants are expected to dominate the Indian markets and gradual reduction of usage of cobalt, the major raw material, should be planned (for example, ISRO is commercialising its research and looking to partner with domestic players).
- A technical committee at the centre, consisting of experts on battery technology and advanced chemistries, should be formed. The same committee can also take up the task of capacity building at both central and state-level departments like state nodal agencies (SNAs) and DISCOMs.

5. Proposed interventions by the Government of India

5.1. Background

Climate change, increasing energy requirements, rising fossil fuel prices and the perceived depletion of fossil fuel supplies have been the main causes why India is looking to shift to cleaner energies. Rapidly evolving battery technologies, coupled with clean energy solutions, have increasingly become central towards reducing regular use of renewable energy and supporting EVs. As per BNEF estimates, India may become the third largest country in terms of energy storage installation by 2040.[25]

Battery manufacturing for advanced chemistries is at a very nascent stage in India, where the battery industry constitutes of primarily assembling and packaging. Domestic manufacturing must be provided impetus, so that maximum value of battery manufacturing is captured within India. NITI Aayog has been at the forefront of designing a framework for giga-scale manufacturing in India and promoting the right set of policy instruments to bring investments in the domestic battery manufacturing sector and reduce dependency on imports of final products. The Union Cabinet has given its approval on the mission and the programme is proceeding smoothly, through rigorous discussions with various line ministries, investors, sector and technology experts, regional level officials and other concerned entities.

5.2. Role of NITI Aayog and steering committee

NITI Aayog is acting as the nodal agency for the policy formulation by co-ordinating with various ministries of the GoI. The policy instrument will provide support for establishing cell manufacturing facilities in India. Incentives in the form of output-linked subsidies, tax benefits (direct and indirect) are being considered to encourage investments. States are also expected to provide additional incentives to shortlisted investors (through tendering process). Doing so will also contribute to economic growth and employment generation for states.

NITI Aayog has also organised round table discussions at its premises to initiate dialogues with industry-wide stakeholders, including major cell and battery manufacturing companies in and outside India. In the round table discussions, representatives of various companies shared their views on current challenges, requirements of government support, future perspectives on the sector and more. These pivotal inputs from industry are being considered in drafting the policy document.

Additionally, NITI Aayog is coordinating with various ministries to assess demand for stationery storage, EVs, etc. The table below summarises some of the current efforts envisaged for demand creation of energy storage in India.

Table 9: Demand creation measures

Recommendations for demand creation
Implementation of a soft loan facility to state discoms/transmission companies to deploy energy storage and battery solutions.
Provide fiscal incentives for co-located battery storage and rooftop solar, micro-grids, telecommunication towers and other backup applications.

25 https://economictimes.indiatimes.com/industry/energy/india-may-emerge-the-third-largest-energy-storage-installation-country-by-2040/articleshow/70485052.cms?from=mdr

Establish a firm bid trajectory for renewable energy and battery storage tenders by the Solar Energy Corporation of India (SECI).
Develop policies that support the replacement of diesel generator-sets on islands and isolated areas with renewable energy and battery storage systems, including army cantonments/outposts, etc.
Enable demand creation under the Kisan Urja Suraksha evam Utthaan Mahabhiyan (KUSUM) scheme for solar pumps and small-scale solar projects.
Revise regulatory frameworks to enable adequate compensation for stationary storage providing spinning reserves, frequency management (fixed band) for network stabilisation, and other ancillary services.
Establish a firm national target and vision for EVs by 2030.
Facilitate demand creation of e-buses/e-cabs/e-autos, backed with MoUs and firm-contracts with state transport units (STUs)/cab aggregators and operators/railways.
Develop a framework to support electrification of locomotives and other stationary applications associated with railways.
Produce and implement guidelines for standardisation of charging infrastructure and battery swapping in India for EVs.

The figure below shows role of battery storage systems for providing grid management activities and improving system reliabilities.

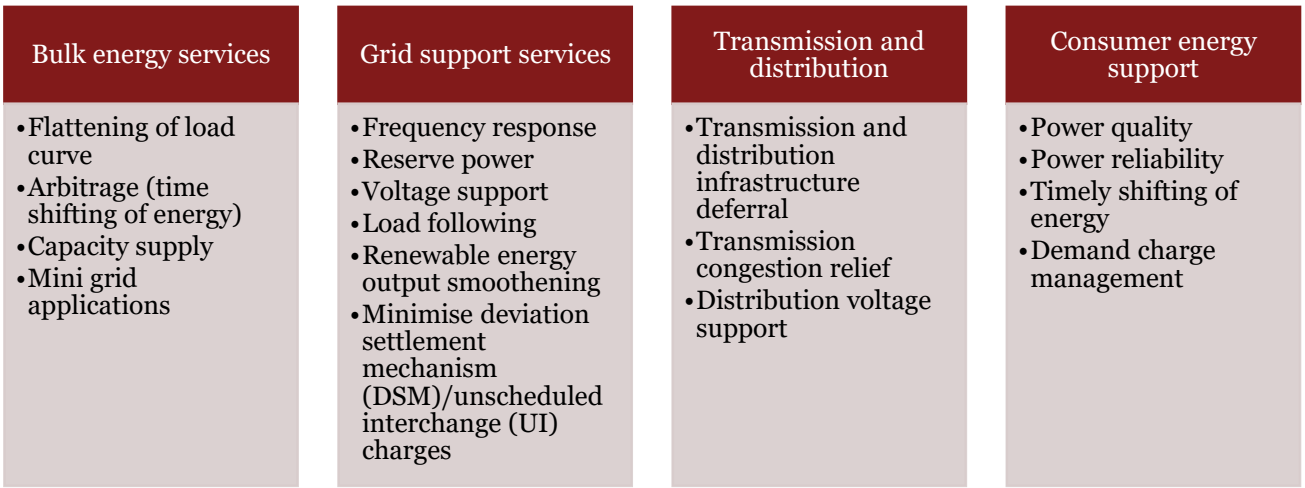


Figure 8: Role of battery storage systems for providing grid management activities

Battery energy storage system (BESS) can thus play a multi-function role in the electric supply network to manage resources effectively.

Additionally, NITI Aayog will formulate a technical sub-committee to oversee how batteries could be manufactured for multiple technologies and used for multiple purposes. The committee will devise recommendations to advance research on battery reuse and recycling. It will also work to modify the standards and specifications to ensure quality of the final product.

5.3. Phased manufacturing programme details

The proposed PMP for cell manufacturing will be a central level programme, run by NITI Aayog. The programme will focus on incentivising advanced cell manufacturing in India, supported adequately by states to encourage investors. Battery pack assembly will not receive any incentives under this programme.

NITI Aayog will release an RFS to invite Indian and global investors to set up giga-scale cell manufacturing plants in India. The tender will be technology agnostic; however, manufacturers' produced cells must meet the criteria of 'advanced cell.'26 Private players are free to choose the suitable technology to set up cell manufacturing plants for EVs, stationery storage for grid applications and consumer electronics. There will not be any assured offtake by the government and market risk must be borne by investors. However, the government will launch multiple programmes to create demand of energy storage for various applications.

The proposed programme will provide two levels of support i.e. pan-support for all cell manufacturers and additional support to selected manufacturers based on competitive ranking, after completion of the tendering process. Pan-support includes import duty waivers for various raw materials and intermediate goods to be used in manufacturing. Additional support will include output-based subsidy disbursal (per kWh basis), and optional stapled loan facility.

Subsidy support will be limited to 50-GWh annual cell manufacturing capacities in India up to 2030. A single entity cannot bid for more than 20-GWh cell manufacturing facility. Also, minimum bid capacity will be 5 GWh. No financial support by government is envisaged beyond 2030 as it is expected that by then domestic manufacturing will become globally competitive, without external support.

5.3.1. Subsidy disbursement mechanism

The scheme has been drafted to incentivise cell manufacturers of ACCs like Li-ion cells to come and set up large-scale cell manufacturing facilities in India.

As the capacity on offer is 50 GWh, submissions against the request for proposal (RFP) with a cumulative capacity of 50 GWh shall be allocated the requisite capacities, subject to a maximum cumulative capacity of 20 GWh for a single entity. Should the total capacity requested from qualified investors exceed 50 GWh, the allocation shall be carried out through a transparent ranking process, based on total capacity sought and value capture targeted by 2025; and a financial parameter on subsidy requirement (per KWh basis) quoted by the beneficiary.

The participants shall be ranked on the basis of their submissions and manufacturing capacities shall be allocated in the order of their ranking, with the entity ranked one allocated the capacity first, followed by entity ranked one, and so on till a cumulative capacity of 50 GWh per year has been allocated; subject to a minimum allocation of 5 GWh and a maximum cumulative allocation of 20 GWh to a single entity. A higher weightage has been offered for value capture component, to encourage manufacturers to integrate vertically and promote manufacturing of key components in the value chain.

The method of selection of beneficiaries also finds precedent under the General Financial Rules 2017; Procurement of Goods and Services, Rule 192 "Quality and Cost Based Selection (QCBS)", recommended for procurement of consultancy services, where quality of consultancy is of prime concern. The proposed disbursement method ensures better utilisation of available funds as beneficiaries are now submitting their competitive bid. This also enables more beneficiaries to benefit, while ensuring that larger capacities are deployed. The disbursement method is in accordance with Rule 230 (3) of General Financial Rules 2017 specifying "*Award of Grants should be considered only on the basis of viable and specific schemes drawn up in sufficient detail by the institution or organisation. The budget for such schemes should disclose, inter alia, the specific quantified and qualitative targets likely to be attained against the outlay*. In the cases of the schemes where *Grants are given as part of the expenditure on reimbursement basis (i.e. the expenditure has already been incurred on*

26 Advanced cell shall be defined as new generation cells like lithium polymer, lithium iron phosphate, lithium cobalt oxide, lithium titanate, lithium nickel manganese cobalt, lithium manganese oxide, metal hydride, zinc air, zinc bromine, sodium air, nickel zinc, lithium air, sodium sulphur or vanadium redox. The list of battery technologies here is representative and not exhaustive.

approved project/scheme and reimbursement from the Government in the form of Grant/Subsidy etc. is due) the same will be treated as the Central Financial Assistance (CFA) and no Utilization Certificate shall be required in such cases of reimbursements."

Rule 232 (vi) under General Principles for award of Grants-in-aid for Centrally Sponsored Schemes also prescribes that "*The Ministries or Departments should focus attention on the attainment of the objectives and not on expenditure only. A mechanism for avoiding release of large part of funds towards the end of the year should be devised and incorporated in the Scheme design itself*."

Companies will have until 2025 to complete the pre-specified value capture and the proposed capacity in India. Subsidies will be effective till 2030 and total subsidies under this programme are capped at 50-GWh annual deployment capacities. All subsidies will be given to the mother unit on a kWh basis. In addition to output-linked subsidy, selected manufacturers will be eligible for reduced BCD on imported material and state-level incentives.

The amount of subsidy to be distributed to the eligible unit may be given as the fixed amount linked to the following factors of the self-certification:

- capacity of advanced chemistry cells sold (in per kilowatt hour)
- value capture[27] within India. The percentage of value addition may also include the value addition by ancillary units or domestic suppliers manufacturing in India.

In other words, the amount of subsidy to be disbursed would be calculated as:

Fixed amount per kilowatt hour **X** capacity of advanced chemistry cell sold **X** percentage of value addition

Failure by the manufacturer to achieve the value capture milestone defined in the proposal shall lead to imposition of penalties. The parameters to monitor the scale of production or value addition to disburse subsidies are defined below.

5.3.2. Value capture

There should be a minimum 50% of value addition to the cell manufacturing ecosystem in India by the manufacturer by 2025 to be eligible for subsidy. Subsidy disbursement shall initiate once the sales begin and will continue till 2030.

Value addition is to be validated by the statutory auditor, based on the following parameters:

- The eligible unit on its own should achieve a minimum value addition threshold of 25% to be eligible for subsidies. Subsidies would be disbursed to the eligible unit once its value addition exceeds the aforesaid threshold
- The eligible unit shall establish a facility to manufacture Advanced Chemistry Cell with a minimum production capacity of 5 (five) GWh or as quoted by the selected bidder in its Bid and investment of minimum USD 30 (thirty) Million per GWh (excluding the cost of land);
- Ensure Value Capture to be at least 25% (twenty five percent) and minimum 50% (fifty percent) of overall domestic Value Capture;
- The minimum value addition (i.e. 25%) should be achieved by the eligible unit; and

[27] The term "value addition" may be construed as the percentage of manufacturing activity undertaken in India to manufacture advanced chemistry cells, either on its own or through ancillary units or via domestic suppliers.

- Value addition should be achieved as a result of change in Harmonized System of Nomenclature (HSN), as per the Customs Tariff Act, at six digit level (of the final product vis-à-vis the goods procured for the manufacturing activity) due to manufacturing by the eligible unit, ancillary unit or domestic suppliers
- The final process of manufacture must take place in India
- Value addition[28] in respect of the goods (battery cells) may be denominated as the ratio of 'actual value added' to the sale value[29] (net of returns, price adjustments, discounts etc.) of the said goods (battery cells), excluding indirect taxes, if any paid on the goods. The 'actual value added' may be calculated based on financial records (including turnover reported in GST returns) as per the following formulae:

The 'actual value added' may be calculated on the basis of financial records (including turnover reported in GST returns) as per the following formulae:

- Sale value of the said goods, excluding indirect taxes, if any, paid on the goods
- **Less:** Cost of raw materials and packing materials consumed in the said goods (i.e. in the sale price of the goods sold) to be calculated in terms of generally accepted costing principles
- **Less:** Cost of fuel consumed, if eligible for GST input credit
- Less: Any Material whose Origin cannot ascertained beyond prescribed threshold
- **Less:** Expenses incurred in foreign currency for royalty and technical know- how as debited in the Income statement
- **Add:** 'Actual value added by the ancillary units or domestic manufacturers' attributable to sale value of said goods

'**Actual value added by the ancillary units or domestic manufacturers'** is actual value added (as per the above formulae) by such units/ suppliers in relation to supplies made (to the Beneficiary Firm) and sale considered by the Beneficiary Firm (for computation of the 'actual value added' by the beneficiary firm).

The onus to validate the value addition by business premises, ancillary units or third parties or domestic suppliers would remain on such eligible unit.

- Additionally, where the eligible unit is also engaged in manufacture of battery packs and a value addition till the cell stage cannot be determined with the abovementioned approach, the percentage of value added calculated (as above) should be reduced by 34%, to calculate the percentage of value added to manufacture battery cells. For example, if the value capture at the battery level is x%, then the value capture at the cell level shall be (x-34)/(100-34)%.
- The certificate from the Statutory Auditor may not be required where value addition by the ancillary unit or the domestic suppliers is less than 2% (viz. calculated as percentage of actual value added by domestic supplier to the sale value of ACC's manufactured by Mother unit) or INR 200,000 (Gross amount), whichever is lower, in the corresponding period.
- Following documents may also be considered for validation of subsidy claims:
  - Document issued by the concerned Director of Industries, confirming the commencement of commercial production;
  - Certificate by a Statutory auditor certifying the quantity and value of finished goods procured;

[28] A similar procedure has been prescribed by the central government in the notification no. 01/2010 – Central Excise, dated 6 February 2010
[29] Updated as per inputs from Mr. Aman (& as per discussions with MeitY)

- Certificate by a Statutory auditor certifying the reconciliation of value and quantity of battery cells manufactured, traded, sold as scrap, stock transferred and GST paid vis-à-vis the amount reported in financial statements and GST returns;
- Unit level audited accounts for the relevant financial year, where the eligible unit is operating through various ancillary units.
- The audited accounts and company's GST audit report for the relevant financial year.

The proposed incentives may be reviewed annually or on periodic basis by the concerned department of the government, based on price trends for various components, demand and market parameters.

5.4. State support

State governments will also play a major role towards the success of the programme. States will be encouraged to provide incentives to shortlisted investors for establishment of local battery manufacturing facilities. NITI Aayog will brief state governments about the final programme design and work with them to create an investment-friendly environment. States will benefit from strong economic and employment growth by enlisting in the programme.

State governments can provide support under various categories, including infrastructure support and making provisions for subsidised utilities, such as electricity. State governments can provide additional financial incentives, under the PMP. Some of the possible fiscal/policy supports that may be considered by state governments are tabulated below:

Table 10: Possible support from state government

Categories	Description
Trunk infrastructure	The primary purpose of ready trunk infrastructure is to encourage investments in the state. State governments should develop trunk infrastructure to attract cell manufacturing. Trunk infrastructure may include ready common facilities to be used by manufacturing such as: I. road and transport facilities II. availability of utilities such as power, gas, and water III. electricity and water distribution network IV. water and sewage treatment plants V. common effluent treatment plant (CETP) VI. public parks and land for community facilities.
Provision of land	State governments can provide land at concessional rates, with good connectivity and lower/exempted stamp and registration fee. State governments can provide possible subsidies such as: I. encumbrance free land of minimum 200 acres II. 6% circle rate (stamp duty and concessional registration) for a period of 99 years III. land connectivity IV. access to national highways (within 5 kms) V. proximity to ports (preference for container or cargo port) VI. capital subsidy on infrastructure development

	VII. stamp duty exemption VIII. concessional registration charges IX. reimbursement of fee charged for converting agricultural land to industrial land.
Provision of utilities	State governments can also make provisions for utilities and provide concessions to industries accessing such utilities. Some utilities state governments can provide are: I. adequate water/industrial water II. subsidised power supply III. subsidised water supply IV. provision of open access with transmission, wheeling, and banking charges only V. electricity duty exemptions VI. net-metering and banking facilities for rooftop solar projects.
Tax incentives	States can reimburse net SGST within a pre-specified duration, after commencement of commercial production.
Additional incentives/ concessions by the state government	States can also provide several additional subsidies and concessions to battery manufacturing industries. Some such concessions state can offer are: I. subsidy on technology upgrade II. interest subsidy on INR loan for capital investments and/or working capital loan for plant operations III. subsidy on the expenses incurred for quality certification IV. subsidy on clean/green production measures V. R&D encouragement VI. reimbursement of expenses incurred in R&D, patent registration fees exemption VII. subsidy on laboratory testing facility establishment to encourage R&D VIII. subsidy on expenses incurred on training and skill enhancement. IX. subsidy on recycling of chemical and plastic waste X. encourage export by means of state export oriented units/SEZs policy.
Clearances	State governments can also work towards speeding up the process of granting clearances to industries. Some steps states can take to ensure smooth and speedy clearance processes are: I. in-principle upfront clearance/issuance of no objection certificate (NOC) as condition precedents II. having a single-window clearance system in place III. having an e-platform, for facilitating all necessary clearances for starting and operating an industry within a pre-specified time period

	IV. ensure time bound approvals and escalation at various levels for regular monitoring.

5.4.1. Immediate and long-term benefits to state economies

States which come forward in support of the programme will benefit from GDP push, job growth and positive investment outlook in front of key global investors. Some other benefits for states are given in the figure below.

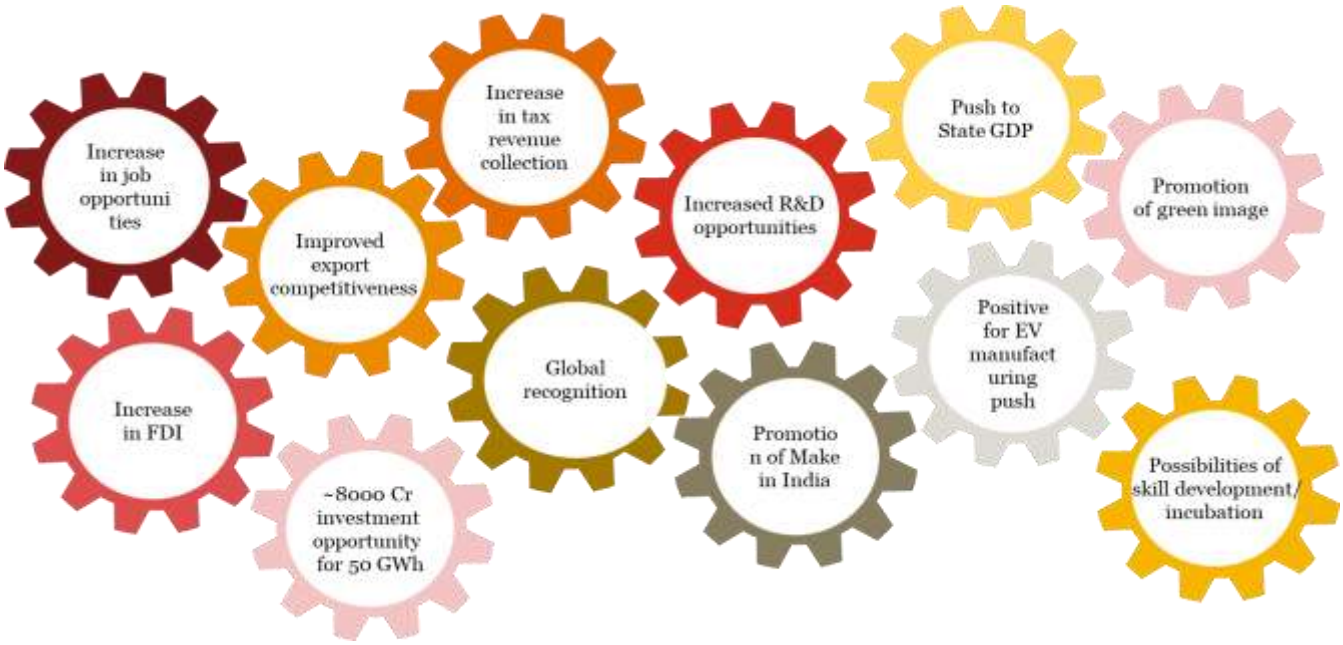


Figure 9: Benefits to state economy

5.5. Competitive ranking and selection criteria

NITI Aayog shall issue a Request for Selection (RFS) to invite domestic and global investors to set up Giga-scale cell manufacturing plant in India and apply for incentives under the scheme. The tender will be technology agnostic hence the investors are free to choose suitable technology and the corresponding plant & machinery, raw material and other intermediate goods for setting up cell manufacturing plant to cater to any end use application.

It must be noted that already commissioned projects will not be considered under this scheme. Projects under construction or projects which are not yet commissioned can, however, be considered, in case these projects are not already a part of any other central or state schemes.

Pre-qualification criteria has been drafted to ensure that only credible investors with a credible track record of delivery will get to avail the benefits under the scheme. The criteria cover technical eligibility, which is to be illustrated through previous experience in manufacturing batteries and financial eligibility, so that only financially capable investors get to apply for incentives under the scheme. The table below covers major selection criteria of cell manufacturers:

Table 11: Qualification criteria

S. no.	Categories	Criteria

1	Qualification criteria (financial)	• The Bidder shall have a corporate long-term credit rating of at-least CRISIL AA+ or ICRA AA+ or at-least S&P BB+ or FITCH BB+ or Moody's Ba1 from at-least 2 (two) credit rating agencies. • The Bidder shall have a minimum Net Worth of USD 30 (thirty) Million per GWh (the "**Financial Capacity**") as an average of the last 3 (three) financial years, i.e., FY 2016-17, FY 2017-18 and FY 2018-19. • The applicant can be a single entity or a lead member of a group of companies (consortium). In case of a Consortium, number of members in a consortium shall not exceed 3 (three) ▪ In case of a Consortium, the aforementioned qualification of the Lead Member, who shall have an equity share of at least 26% (fifty-one per cent) in the SPV, should satisfy the above conditions of eligibility. The Bidder will deposit a Bid Security in accordance with the provisions of the RFP. Net worth to be considered shall be the total net worth as calculated in accordance with the Companies Act, 2013 and any further amendments.

The minimum scale of production shall be 5 GWh of cell manufacturing by the terminal year, i.e. March 2025, and the manufacturers shall specify the targeted value capture within India, which in no case shall be below 50% by the terminal year. Subsidy disbursement shall initiate once the production begins and will run up till 2030, with disbursement of total subsidies capped for a cumulative capacity of 50 GWh. Subsidies to be disbursed shall be capped basis the annual capacity and value addition proposal submitted. All subsidies shall be disbursed only to the applicant or the beneficiary on a kWh basis. **The government will provide no financial support beyond 2030, as it is expected that by then, domestic manufacturing will reach a stage where it is globally competitive without external support.**

As the total capacity on offer in the proposed tender is 50 GWh hence the submissions against the RFS, with a cumulative capacity of 50 GWh, shall be allocated the requisite capacities subject to a maximum cumulative capacity of 20 GWh for a single entity. Should the total capacity requested from qualified investors exceed 50 GWh, the allocation shall be carried out through a transparent ranking process, based on the total capacity sought, value capture targeted by 2025 and subsidy requirement (per KWh basis).

The selection of investors will be based on both technical and financial parameters. Total weightage to technical parameters shall be 80%, which would be further segregated into 70% weightage to value capture and with 30% weightage to scale of production. Weightage to financial criteria shall be 20%. The division of weightage to technical and financial parameters is as follows:

- technical parameters – 80% weightage
  - value capture (implementing PMP) in India – 70% of 80% i.e. 56%
  - scale of production/proposed capacity – 30% of 80% i.e. 24%
  - financial parameter – 20% weightage Subsidy requirement

Value capture has been given a higher weightage to encourage manufacturers to integrate vertically and promote indigenisation of key components. The third parameter i.e. the base subsidy requirement shall be specified by the applicant in the form of the subsidy benchmark of INR per kwh. Under the said programme, the base-subsidy shall be capped at INR 2,000 per kWh of the ACC sold, subject to the year-to-year phasing.

The applicant is expected to submit the bid ('x' being the financial bid parameter) in the format provided below. The beneficiary can manufacture the ACCs with any combination of the cycle life and energy density, as eligible in the subsidy window and beyond.

The third parameter, i.e. the variable subsidy requirement shall be specified by the bidders in the application in the form of the subsidy benchmark (***x***) per KWh

	INR per ACC in KWh	**Energy density (Wh/kg)**				
Cycle life		>=50	>=125	>=200	>=275	>=350
	>=1000	***N.A.***	***N.A.***	***N.A.***	***x***	***x* 1.2***
	>=2000	***N.A.***	***N.A.***	***X***	***x* 1.2***	***x* (1.2^2)***
	>=4000	***N.A.***	***X***	***x* 1.2***	***x* (1.2^2)***	***x* (1.2^3)***
	>=10000	***X***	***x* 1.2***	***x* (1.2^2)***	***x* (1.2^3)***	***x* (1.2^4)***

The lowest quoted benchmark is given the maximum financial score of 1. The formula for determining the scores of all other proposals is calculated as following:

Score = 1 * minimum quoted benchmark/quoted benchmark of respective bidder

The table below illustrates upper limit of subsidies at various values of cycle life and energy density:

Table 12: Energy density benchmarks

	INR per ACC in KWh	**Energy density (Wh/kg)**				
Cycle life		>=50	>=125	>=200	>=275	>=350
	>=1000	***N.A.***	***N.A.***	***N.A.***	***2000***	***2400***
	>=2000	***N.A.***	***N.A.***	***2000***	***2400***	***2880***
	>=4000	***N.A.***	***2000***	***2400***	***2880***	***3456***
	>=10000	***2000***	***2400***	***2880***	***3456***	***4147***

Even within advanced cell technologies, there are niche technologies which are really at the forefront of higher performance and are the future of cell technologies. These are either at the pre-commercialization stage with number of start-ups or at early stage of commercialization. Their application is also currently limited due to high cost but as the costs come down these technologies are going to find more and more mainstream applications.

Therefore, the business case for incentivizing higher charge density needs to be strengthened, considering the developments in advancing cell chemistries globally. Additionally, higher energy density is crucial for enabling high performance products such as electric cars with longer driving range, electric planes or Unmanned Ariel Vehicle (UAV) applications. Currently, there are only few technologies (Lithium sulphur and solid state batteries) with 350+ Wh/kg, which are mostly in early stage of commercialisation and exhibit limited cycle

life. Design improvements are likely to improve the cycle life significantly in the next 5 years. Moreover, their production costs are also higher owing to their small scale of manufacturing, which implies advanced technologies would tremendously benefit from higher levels of subsidy. From the Indian perspective, it is the appropriate time to attract developers of these next generation technologies to set up their manufacturing base in India.

An illustrative example of ranking, based on value capture and capacity phasing for two companies (X and Y) has been illustrated below:

Table 13: Illustrative example for value capture, phasing and subsidy calculation

Technical Bid (80%)							Price Bid (20%)	
1. Phasing for Value Capture (70%)				2. Scale of Production (GWh) Operational in Year (30%)			3. Cash Subsidy (20%)	
Year	Weight	Company X	Company Y	Weight	Company X	Company Y	Company X	Company Y
Year 1	-	-	-	-	-	-		
Year 2	4	30%	50%	4	3	2		
Year 3	3	-	30%	3	-	-		
Year 4	2	-	-	2	2	-		
Year 5	1	70%	20%	1	1	4		
Weight		4*0.3 + 1*0.7 = 2.7	4*0.5+ 3*0.3 1*0.2 = 3.1		4*3 + 2*2 + 1*1 = 17	4*2 + 1*4 = 12	1800	2000
Standardized		0.87	1		1	0.71	1	0.9

SCORING:

- Technical Score: Company X = (70% x 0.87) + (30% x 1.0) = 0.91
- Technical Score: Company Y = (70% x 1.00) + (30% x 0.71) = 0.91
- Financial Score for Company X = 1.00
- Financial Score for Company Y = 0.90

- Overall score for Company X = 80% x 0.91 + 20% x 1.00 = 0.93
- Financial Score for Company Y = 80% x 0.91 + 20% x 0.90 = 0.91

The total score is calculated by weighing the scores and adding them as per the formula and instructions specified above. The bidders achieving the highest combined score will be allocated the capacity first.

Failure to achieve the value capture milestone defined by the manufacturer in the proposal shall lead to penalties being imposed.

1. Penalty for failing to meet the scale of production shall be estimated by the deficit in committed and actual production. The deduction in subsidies shall be calculated and the deficit shall be deducted from disbursement of subsidies in the same quarter.

   For example, if 10 GWh was committed, and only 8 GWh produced, this will result in a subsidy cut of 2*(10-8) = 4. Thus, subsidies will be paid on only (committed capacity-penalty), or (10-4) = 6-GWh of capacity, even though 8 GWh has been produced. The penalty shall be levied each quarter, for the previous quarter of deficit in deployment of committed production.

2. Penalty for failure to meet required value capture shall be estimated by the deficit in value capture committed and actually realised. The retrenchment in subsidy (subsidy at value capture committed – actual subsidy disbursed) shall be calculated and this deficit shall be deducted from disbursement in the same quarter.

   For example, if 50% value capture was committed, and only 40% realised at the end of a quarter, this will lead to a retrenchment in subsidy. The retrenchment shall be (subsidy at 50% value capture-subsidy at 40% value capture), say an amount *y*. In the quarter, the amount *y* shall be deducted from the subsidy to be disbursed in the quarter.

In case an entity is penalised for eight consecutive quarters due to a non-achievement of committed scale of production and/or the committed value capture, the subsidy disbursement shall be stopped immediately. However, NITI Aayog can offer a two-year grace period to such entities for exogenous factors such as market demand, technology issues and raw material risks.

5.6. Termination clause

Advance cell manufacturing program envisages to mitigate investors' risk and exposure in case the program is scrapped by the government after the appointment date. In such scenario, the manufacturer will receive NPV[30] (Net present value) of subsidy in line with following scenarios and calculations-

Scenario 1: If program is scrapped between AD +2[31] and AD + 5
In such case, manufacturer is eligible to receive NPV of subsidy for a period of next three years. The year-wise subsidy will be calculated as per the value capture and scale of production achieved by the manufacturer in the previous year. For example, if program is scrapped in (AD + 3), manufacturer will receive NPV of next three years of subsidy calculated as per the value capture and capacity achieved in the year AD + 3.

Scenario 2: If program is scrapped after AD + 5

In such scenario, manufacturer is eligible to receive NPV of remaining years' subsidy as per the program document. The subsidy will be calculated as per the value capture and scale of production achieved by the beneficiary in the year AD + 5 i.e. the maximum value capture and capacity to be achieved as mentioned by the manufacturer in the technical proposal. If there are any increase in value capture and capacity post AD +5, it will not be considered for subsidy calculation. The utilization factor achieved in AD + 5 shall be treated as constant for the purpose of estimating subsidy for future years.

5.7. Subsidy revision clause

If the demand for the Advanced Chemistry Cell falls short of the Committed Scale of Production as a result of a low market demand and for reasons not attributable to either Party for 3 (three) consecutive Financial Years, the Beneficiary Firm may by way of request the government to re-negotiate the Subsidy.

Upon receipt of the Subsidy Revision Notice, the Government may ask the Beneficiary Firm to provide a certificate specifying the CUF of the Facility for capacity that has been operational for a full Financial Year to support the Beneficiary Firm's claim. The Beneficiary Firm agrees that to be eligible to claim Subsidy revision, the Beneficiary Firm's CUF shall be less than 60% (sixty per cent) of the total Committed Scale of Production for 3 (three)

[30] NPV calculation will be carried out at SBI Marginal Cost Based Lending Rate (MCLR) on the date of computation of NPV
[31] No subsidy will be provided if program is scrapped before AD + 2. Beneficiary Firm shall not be eligible to receive any Compensation Payment in the event the Beneficiary Firm has not commenced production and manufacturing of the Advanced Chemistry Cells.

Financial Years. The Beneficiary Firm shall not be entitled to issue a Subsidy Revision Notice prior to March 31, 2025.

If the Government is satisfied with the Subsidy Revision Notice, it shall have the right to remove the discounting factor on the Subsidy for the subsequent 3 (three) Financial. Also, beneficiary firm shall be eligible to claim re-negotiated Subsidy, if not less than 2 (two) other battery manufacturers under the Policy Document claim such revision in Subsidy within a period within certain months from the Beneficiary Firm's claim as per RFP document.

The the Government shall have a right to reduce Subsidy by limiting such Subsidy at 20% of the battery price in the Advanced Chemistry Cell, in the event that the Subsidy is greater than 25% (twenty-five per cent) of battery price for 4 (four) consecutive quarters due to a drop in the cost of manufacturing of the Advanced Chemistry Cell in the market.

Also, if the Subsidy exceeds 25% (twenty-five per cent) of the battery price of Advanced Chemistry Cell for a period 4 (four) consecutive quarters as a result of Change in Law, Firm shall, in addition to the remedy available under Article 14, be entitled to receive revised Subsidy in accordance with provisions of this Clause.

6. Taxation recommendations

6.1. Indirect tax side interventions

Broadly, the indirect tax-related inputs have been discussed and analysed under:

- GST
- The Customs Act.

6.1.1. Goods and Services Tax

GST became effective in India from 1 July 2017 and has replaced erstwhile central and state taxes such as excise duty, service tax, value added tax (VAT), central sales tax (CST), entry tax to mitigate double taxation and cascading of taxes.

GST is levied on sale (supply) of goods or services, unless specifically exempted from tax. It is a destination-based tax and follows a multi-stage collection mechanism. The tax paid on procurement is available as input tax credit to the purchaser and can be utilised to off set the tax payment liability on its outward supplies.

In GST, intra-state sale of goods or services are covered under central GST (CGST) and state GST (SGST), whereas interstate sale of goods or services (including imports), are subject to integrated GST (IGST).

The rate of GST on goods or services supplied depends upon the nature and type of goods or services. At present, goods and services come under five GST slabs, that of 0%, 5%, 12%, 18% and 28%. Following are some examples of how goods and services are divided under their respective slabs.

- 0%: fruits, vegetables, food grains, essential medicines, etc.
- 5%: essential items of mass consumption used by common people
- 12%: concessional rate of tax for goods or services
- 18%: standard rate for goods and services
- 28%: higher rate for luxury, demerit, and sin goods. Further, GST cess is also applicable on certain goods and services taxable under 28%, such as luxury cars, aerated beverages, tobacco, etc.

6.1.2. Customs

Import of goods into India is governed by the Customs Act of 1962 and the Customs Tariff Act of 1975, and is subject to customs duty. Customs duty can be broadly classified into the following:

- BCD
- IGST
- Social Welfare Surcharge (SWS).

Customs duty is levied on goods at the rates specified under the Customs Tariff Act, depending upon their respective classification in terms of HSN.

IGST levied at the time of custom clearance is available as credit and does not becomes a cost. However, BCD and SWS paid upon import of goods into India is a cost to be borne by the importer.

Table 14: Illustrative computation of customs duty

Particulars	Rate	Amount	Cost in supply chain
Value of imported goods		10,000	
BCD	5%	500	Yes
SWS (10% of BCD)	10%	50	Yes
Total Value After Duty (1+2+3)		10,550	
IGST (18% of total value after duty)	18%	1,900	No
Landed cost of goods		12,450	

6.1.3. Current tax structure on battery storage

At present, Li-ion batteries in India are subject to customs duty and GST as provided below:

Table 15: Current custom duty rates on Li-ion batteries and its components

HSN	Goods	Particulars	Current rate structure
8507	Finished goods	Batteries or battery packs for electrically operated vehicles	5%
		Li-ion batteries of cellular mobile phones	15%[32]
		Li-ion batteries for manufacture of goods under Chapter 8471	0%[33]
		Li-ion batteries for other than mentioned above	10%[34]
8507 6000	Semi-finished or processed goods	Li-ion cell for manufacture of Li-ion accumulator, except battery pack of cellular mobile phones and power bank	5%
85 or any other chapter		Parts of batteries (except Li-ion cell and printed circuit boards), viz. anode, cathode, electrolytes, and separators	0%
Any chapter	Raw material	Goods required to manufacture parts of Li-ion cells such as graphite, cobalt, lithium, nickel, copper.	0%
Chapter 84 or 85	Capital goods	Plant and machinery required to set up a manufacturing facility	7.5%[35]

Batteries or Li-ion cells, when imported into India are subject to 24.50%[36] of total customs duty, (wherein 19% duty is available as credit [i.e. amount of IGST] and the balance 5.5% duty becomes a cost in the chain).

However, parts of batteries (except of Li-ion cells) and raw material (viz. for manufacturing such parts) are only subject to IGST of 18% or 28%, as BCD is not levied[34] on import of such goods into India.

[32] In terms of the S. No. 17 of the notification no. 57/2017 – customs dated 30 June 2017.
[33] In terms of the S. No. 39 (i.e., all goods required for manufacture of goods under Chapter 8471 – computers or laptops) of the notification no. 24/2005 – customs dated 1 March 2005.
[34] In terms of the S. No. 16 of the notification no. 57/2017 – customs dated 30 June 2017.
[35] This rate of BCD varies depending upon the classification and nature of goods. However, in general the rate of BCD is 7.5%.
[36] BCD at 5%, SWS at 10% and IGST of 18% in terms of the notification no. 50/2017 – customs, dated 30 June 2017 as amended by notification no. 03/2019 – customs, dated 29 January 2019.

Similarly, effective customs duty on import of capital goods into India is ~ 28%[37] (wherein ~ 20% duty is available as credit [i.e. amount of IGST], whereas 8% duty is a cost for the importer (i.e. amount of BCD and SWS).

Further, on inter-state or intra-state supply of batteries or parts of batteries or raw material, GST is applicable at the rate of 18% or 28%(viz. varying rates on batteries, its parts and raw material used for manufacturing such parts) . When these batteries are sold to persons registered under GST law (i.e. B2B sales), GST charged is not a cost in the chain. However, upon selling them to end customers, (i.e. B2C sales), GST is a considered as a cost in the chain.

6.1.4. Proposed indirect tax incentives

India has the potential to develop a robust battery manufacturing industry capable of meeting domestic demands and eventually competing and exporting in the global market. Manufacturing of battery packs involves the following components or processes:

- battery pack assembly
- cell manufacturing
- anode manufacturing
- electrolyte manufacturing
- cathode manufacturing
- separator manufacturing
- raw material processing.

To create an environment for battery manufacturing in India, domestic facilities for the aforesaid processes need to be built. The indicative phasing of the aforesaid facilities, as per NITI Aayog's assessment is proposed below:

Table 16: Indicative phased value capture

Capability	***India (Indicative Phasing)***		
	2020	2022-23	2024-25
Raw material processing	X	X	X
Separator manufacturing	X	X	✓
Cathode manufacturing	X	✓	✓
Electrolyte manufacturing	X	✓	✓
Anode manufacturing	X	✓	✓
Cell manufacturing	X	✓	✓
Pack manufacturing	✓	✓	✓
Value chain captured	<20%	40%-60%	60% +

Based on the above indicative example, India is expected to have a wholesome battery pack manufacturing framework in place by 2020. This would be followed by manufacturing of cells, cathodes, electrolytes and anodes in India by 2022–23 and thereafter, manufacturing of separators by 2024–25 to fully integrate the entire

[37] Basis the assumption, BCD is applicable at 7.5%, SWS at 10% and IGST at 18%.

manufacturing of Li-ion batteries in India. At present, battery manufacturing in India is in a nascent stage, wherein parts and components of pack manufacturing (i.e. Li-ion cells, battery separators) are imported.

To create and develop an ecosystem to manufacture battery storage in India, import of batteries and Li-ion cells must be discouraged. Imports can be curbed by increasing the rate of BCD on import of finished or semi-finished goods in a phased manner. However, imports must not be overly curbed in the early phases of the programme, before significant domestic cell manufacturing capacity becomes operational in India. A phased approach to increasing BCD on the import of finished cells is recommended to enable healthy growth of the EV market as domestic manufacturing gathers steam. Additionally, the BCD on raw materials required to manufacture finished or semi-finished goods may remain at 0%. Once 100% value integration happens in India, the domestic industry will be globally competitive and the BCD on imports may be lowered to make the same at par with global rates.

Similarly, an exemption from BCD on import of capital goods (plant and machinery) required to set up manufacturing could be given initially to encourage investment in India.

Table 17: Illustrative phasing of BCD

Phasing of basic customs duty								
S. no.	**Goods**	**HSN**	**2020-22**	**2022-23**	**2023-25**	**2025-27**	**2027-31**	**2031 - onwards**
1a	Batteries or battery packs of ACC,[38] including batteries of EVs, except for 1b and 1c	8507	5%	15%[39]	15%[40]			15%
1b	Li-ion batteries of cellular mobile phones		15%[41]					
1c	Batteries used to manufacture goods under chapter 8471 of the custom tariff heading		0%[42]					
1d	ACC batteries for medical and surgical instruments, apparatus, appliances		10%[43]					
2	ACC for manufacture of battery packs	8507	5%	10%	10%	10%	10%	10%
3	Parts required to manufacture advanced chemistry cells, such as anode, cathode,	85 or specific tariff heading to be notified	2.5%	2.5%	5%	10%	10%	10%

[38] ACC would cover batteries such as lithium-ion, nickel manganese oxide (NMC), lithium iron phosphate (LFP), lithium nickel cobalt aluminium oxide (NCA), lithium titanate oxide (LTO), lithium cobalt oxide (LCO), lithium manganese oxide (LMO).
[39] In the PMP proposed by the DHI, to promote indigenous manufacturing of EVs, the Ministry of Heavy Industries and Public Enterprises has proposed levying BCD of 15% for 2021-22 (in terms of FAME policy). Refer notification number F.No 12(31)/2017-AEI dated 6 March 2019. In case of any revision/change in the FAME Policy, the rate of BCD may be aligned with the FAME policy for the period beyond 2021-22.
[40] Suggested by Niti Aayog in consultation with Ministry of Finance
[41] The Ministry of Electronics and Information Technology (MEITY), to promote indigenous manufacturing of cellular mobile handsets, has introduced PMP. The rate of BCD may be kept in alignment with PMP of MeitY. Refer notification no.57/2017 – customs dated 30.06.2017, as amended by notification no. 22/2018 — Customs dated 2 February 2018. In case of any revision/change in the PMP by Meity, the rate of BCD may be aligned with the said policy framework for the period beyond 2021-22.
[42] The government, in accordance with the Information Technology Agreement has exempted BCD on import of goods under Chapter Heading 8471 of Customs Tariff i.e. laptops or computers. Moreover, the government has exempted all the goods required to manufacture such goods under Chapter 8471 of the customs tariff heading i.e. laptops or computers vide notification no. 24/2005 – customs dated 1 March 2005. The rate of BCD on such goods should continue to remain same in accordance with the Information Technology Agreement of GoI and accordingly, may be revised in case of any revision/change.
[43] Suggested by Niti Aagyog in consultation with Ministry of Finance

Phasing of basic customs duty								
S. no.	Goods	HSN	2020-22	2022-23	2023-25	2025-27	2027-31	2031 - onwards
	electrolytes and separators							
4	Goods (processed and unprocessed) required to manufacture parts of advanced chemistry cells, such as graphite, cobalt, lithium, nickel, except for copper, and any other product as may be notified	Specific tariff heading as may be notified[44]	2.5%					
5	Machinery[45] required to set up a manufacturing plant for advanced chemistry cells	As may be notified	0%	0%	0%	5%		7.5%

Additional notes:

- BCD rates from 2022 onwards may not be published and could be released later, subject to review of actual situation
- The proposed BCD phasing may be reviewed annually or on periodic basis by the government, based on price trends for various components, demand and other relevant parameters.

India has entered into bilateral trade agreements (i.e. free trade agreements and preferential trade agreements) with many countries (for e.g. Japan, Korea, Singapore etc.). Under these trade agreements, import of battery packs and Li-ion cells or parts of battery could be imported to India at the concessional BCD rates (0%, 2%, 5%, etc.).

The proposed BCD phasing may be reviewed annually or on periodic basis by the government, based on price trends for various components, demand, and other parameters.

6.2. Direct tax side interventions

Income tax is levied in India under the Income-tax Act, 1961, enacted by the central government. Income Tax (IT) Rules, 1962 lay down the procedures to be followed in compliance with the provisions of the Act. These rules are administered by the Central Board of Direct Taxes (CBDT), which operates under the aegis of the Union Finance Ministry.

Indian companies are required to pay corporate tax on the income computed as per normal provisions of the Act. Such taxes are normally calculated at the rate of 30%, plus applicable surcharge and cess. However, in certain cases, tax rate of 25% is also applicable. Additionally, the Indian tax laws permit levying of Minimum Alternate Tax (MAT). MAT is calculated at the rate of 15% (plus applicable surcharge and cess) on book profits computed after making certain adjustments to accounting profits. If the tax payable under normal provisions is less than MAT, the company shall be liable to pay MAT. The excess of MAT payable over normal tax is available as credit over next 15 years and can be adjusted against tax calculated under normal provisions.

[44] It is suggested that the exemption should be availed basis the certificate issued by the concerned ministry of the GoI and should be subject to Customs (Import of Goods at Concessional Rate of Duty) Rules, 2017.
[45] Plant and machinery required to set up facility to manufacture batteries and its components could be prescribed and the exemption could be availed basis the certificate issued by the concerned ministry of GoI. Also, it is suggested that the exemption should be subject to Customs (Import of Goods at Concessional Rate of Duty) Rules, 2017.

Indian tax laws also provide for various incentives, which are essentially designed to attract investments to specific industries, promote the development of economically lagging regions and encourage exports of goods and services. The country offered and continues to offer a number of benefits, including tax and non-tax incentives for specific sectors like infrastructure facilities (power, port, highways etc.), electronic or software, state-specific and SEZ investments for export purposes.

Further, the government is has launched various programmes to make India an attractive manufacturing hub and attract global investment. India's endeavour is to become a global investment destination and it is necessary to simplify the country's tax structure, provide incentives and reduce corporate tax to attract global investment.

Direct tax incentives that should be considered by the government for the promotion of battery manufacturing are discussed below:

6.2.1. Tax holiday benefits

The government has provided tax holidays under sections 80IA, 80IB, etc., of the IT Act to various sectors, with the intention to attract investors. As per these provisions, the income of the entities from activities in those specified sectors is exempt from taxation. Such tax holidays are generally provided for a block of 10 years out of initial 15/20 years.

Since the government is looking to promote manufacturing of cells and batteries, such tax holidays should be extended to manufacturers of batteries in India by the government.

Recommendation

It is important that tax holidays be introduced for battery manufacturers (as was provided for the infrastructure sector under section 80IA) to provide 100% tax exemption on profits earned from manufacturing batteries for a period of 10 out of 20 years.

However, the government is gradually moving away from the concept of tax holidays. While tax holidays are still available to entities which qualified earlier, new entities are no more eligible for tax holidays due to applicability of a sunset clause. While tax holidays may provide impetus for the growth of battery/cell manufacturing in India, the government may not be keen to extend the tax holidays to this sector.

6.2.2. Accelerated depreciation

Under the tax laws, depreciation is a deductible expense for computing taxable income and taxpayers are allowed depreciation on the written down value (WDV) of assets at the rates specified in the law. Rates of depreciation generally range from 10% to 40%. The general rate of depreciation specified for plant & machinery at present is 15%.

Recommendation

Accelerated depreciation of 40% (current rate for renewable sector on machineries used for manufacturing batteries should be considered. This specific rate of depreciation is currently available for plant and machinery used in renewable power generation or electrically EVs. This would help in improving the cash flow and encourage further investment.

However, the government is not extending the benefit of accelerated depreciation to new sectors. Further, the rate of accelerated depreciation has also been reduced from 80%/60% to 40%. Therefore, the government may not extend the benefit of accelerated depreciation to plant and machinery for any new sector.

Since the government is phasing out tax holiday and accelerated depreciation, those benefits may not be extended. Instead of those, the government could provide the following benefits.

6.2.3. Weighted deduction of capital expenditure under section 35AD

Many sectors which were earlier eligible for tax holidays are now eligible for deduction under section 35AD, under which they can avail 100% deduction of capital expenditure in the first year of operation. Prior to amendment by the Finance Act of 2016, the section provided a weighted deduction of 150% of capital expenditure incurred. However, from FY 2017-18, the deduction had been reduced to 100%.

Recommendation

It is therefore suggested that cell manufacturing be included under the definition of 'specified businesses' as a sector eligible for deduction under section 35AD.

The following points should be considered by cell operators:

- while the loss on account of deduction under section 35AD can be carried forward indefinitely, such loss cannot be set-off against any other income
- if there is a change in shareholding resulting in change in voting power by more than 49%, the losses claimed under section 35 AD will not be carried forward for set-off.

6.2.4. Lower rate for MAT

While tax holidays, if provided, will result in tax exemption under normal provisions of the Act, there will still be a substantial cash outflow on account of taxes payable under MAT, once the entity starts generating book profits.

The initial years of operation are most important for any business entity as there can be major concerns on account of a cash crunch situation. The sustainability of a business becomes more vulnerable when it is involved in production/manufacturing of evolving technologies which are yet to see large-scale demand. Advanced cell manufacturing is one such business and for it to thrive, support mechanism in initial years will help in its sustainability.

Recommendation:

The MAT rate notified by the government for battery manufacturing companies should be reduced to 9%. This reduction can be provided by a process of registration, wherein selected entities can avail a reduced MAT rate, and any non-compliance or ineligibility for subsidy shall lead to a de-registration, following which the normal MAT rate shall be applicable.

Similar reduction in MAT was recently introduced in 2017 for units in International Financial Services Centre and it may go a long way in making India globally competitive and self-sufficient in this sector.

Moreover, reduction in the MAT rate will not affect total tax collection. Only the tax collected in initial years will be low, which will get compensated later. If reduced MAT rate is introduced for cell manufacturers, the amount they save in initial years will give them cushion to tackle various initial year challenges such as operational stability, technology and R&D expenses, demand uptake.

6.2.5. Section 35 (2AB): accelerated R&D for future /emerging technologies

R&D is a definite requirement to source raw materials locally and develop substitutes or changes in cathode composition (NMC ratio variations) for different cell chemistries suited for Indian markets. Additionally, R&D on supply chain would also be required to realise larger value addition in India to get a higher proportion of subsidy share. R&D would also be required in later stages, to minimise costing across the supply chain by devising solutions of recycling and reusing costlier raw materials.

Section 35 (2AB) of the Income Tax Act provides a weighted tax deduction of 150% on expenditure incurred by a specific company, on scientific research (not expenditure incurred through any building or land) in in-house R&D, centres as approved by the prescribed authorities.[46] As per the guidelines, these entitled companies are eligible to claim weighted deduction of capital investment on R&D of more than INR 10 million in the preceding financial year of application for section 35 (2AB). The key eligibility requirements include:[47]

- well-defined R&D programmes, including provisions for documentation of such programmes
- recognition of the R&D centre by the Department of Scientific and Industrial Research (DSIR)
- the R&D centre must be located in a dedicated building with exclusive manpower for conducting R&D
- separate accounting for R&D expenditures, duly audited by statutory auditors.

Recommendation

The battery manufacturing facilities in India will initially be primarily involved in establishing the facilities and a dedicated supply chain for raw material procurement. to realise maximum value in India. However, with increase in production capacities, rise in material constraints as cell chemistries evolve, there will be a huge impetus for R&D, including the scope for battery mineral recycling and building in effective cost cutting strategies. Hence, it is suggested that battery manufacturing facilities can look to establish in-house R&D facilities which will make them liable for availing tax benefits under Section 35 (2AB).

6.3. Monitoring mechanism

The following parameters would be the basis to monitor the disbursal of cash subsidies to the beneficiary firm:

a) The beneficiary firm shall set up a manufacturing unit (hereinafter referred to as the "mother unit"), ensuring minimum USD 30 million of investment (excluding the cost of land) per ACC GWh committed capacity under a single-roof structure and on the books of the SPV till Appointment date + 2 years or FY 2022, whichever is later.

   The beneficiary firm shall ensure production of the committed ACC capacity and overall value addition as per the proposal submitted to the government, with at least 5 GWh of ACC manufacturing facility with minimum value addition at the mother unit till AD + 5 years or FY 2025, whichever is later.

b) The term value addition shall be defined as the percentage of manufacturing activity (manufacture ACC) being undertaken in India, by the beneficiary firm either on its own or through ancillary units or domestic suppliers. The same may be validated as basis for the certificate of value addition given by the statutory auditor. The following parameters may be considered to calculate the value addition in India:
   I. To be eligible for disbursement of subsidy, the beneficiary firm shall ensure an overall value addition of at least 50% of the ACC being sold till AD+5 years or 2025, whichever is later. A minimum value addition threshold of 25% must be achieved by the mother unit under a single-roof structure on the books of the SPV. The disbursement to the beneficiary firm would begin once the value addition by the mother unit exceeds the aforesaid minimum threshold. The beneficiary firm shall not be eligible for availing any additional incentives on undertaking trading of finished ACCs from the mother unit and where the criteria prescribed are not fulfilled including subject to other conditions as prescribed under the programme.

[46] https://www.pwc.in/assets/pdfs/news-alert-tax/2017/pwc_news_alert_20_september_2017_updated_guidelines_for_approval_of_in_house_rd.pdf
[47] http://www.dsir.gov.in/#files/12plan/bird-crf/FI_G_2016_E.html

II. The minimum value addition should be achieved as a result of change in HSN (as per the Customs Tariff Act, 1975) at the six-digit level (of the final product manufactured vis-à-vis the goods procured for the manufacturing activity) on account of manufacturing activity undertaken by the eligible unit, ancillary unit or by the domestic suppliers, respectively.

III. The final process of manufacturing must take place in India. Reference to the term "manufacture" may be drawn from section 2(72) of the Central Goods and Services Tax Act, 2017 manner that results in emergence of new product having a distinct name, character and use.

IV. Value addition[48] in respect of the goods (battery cells) may be denominated as the ratio of 'actual value added' to the sale value[49] (net of returns, price adjustments, discounts etc.) of the said goods (battery cells), excluding indirect taxes, if any paid on the goods. The 'actual value added' may be calculated based on financial records (including turnover reported in GST returns) as per the following formulae:

a) Sale value of the said goods, excluding indirect taxes, if any, paid on the goods

b) Less: Cost of raw materials and packing materials consumed in the said goods (i.e. in the sale price of the goods sold) to be calculated in terms of generally accepted costing principles

c) Less: Cost of fuel consumed, if eligible for GST input credit

d) Less: Any Material whose Origin cannot ascertained beyond prescribed threshold

e) Less: Expenses incurred in foreign currency for royalty and technical know- how as debited in the Income statement

f) Add: 'Actual value added by the ancillary units or domestic manufacturers' attributable to sale value of said goods

g) Actual value added by the ancillary units or domestic manufacturers' is actual value added (as per the above formulae) by such units/ suppliers in relation to supplies made (to the Beneficiary Firm) and sale considered by the Beneficiary Firm (for computation of the 'actual value added' by the beneficiary firm). The absolute value may be validated on basis of the statutory auditor's certificate received from the respective ancillary unit or domestic supplier.

I. The certificate from the statutory Auditor may not be required where value addition by the ancillary unit or the domestic suppliers is less than 2% or INR 200,000 (gross amount), whichever is lower, in the corresponding period.

II. The onus to validate the value addition by ancillary units or third parties or domestic suppliers would be on the beneficiary firm

III. Additionally, where the eligible unit is also engaged in manufacturing of battery packs and a value addition till the cell stage could not be determined with the abovementioned approach, the percentage of value added calculated (as above) should be reduced by at least 34% to calculate the percentage of value added to manufactured ACC. For example, if the value capture at the battery level is x%, then the value capture at the cell level shall be (x-34)/ (100-34)%.

IV. for the purpose of validation of subsidy claim, following documents may also be considered:

a) document issued by the concerned Director of Industries on the commencement of commercial production;

b) certificate by a Statutory auditor, certifying the quantity and value of finished goods produced;

[48] A similar procedure has been prescribed by the central government in the notification no. 01/2010 – Central Excise, dated 6 February 2010

[49] Updated as per inputs from Mr. Aman (& as per discussions with MeitY)

c) certificate by Statutory auditor, certifying the reconciliation of value and quantity of ACCs manufactured, traded, sold as scrap, transferred as stock and GST paid vis-à-vis the amount of reported in financial statements and GST returns;
d) unit level audited accounts for the relevant financial year, where the eligible unit is operating through various ancillary units; and
e) audited account and GST audit report for the relevant financial year.

6.4. Penal provisions

Failure to achieve the committed milestone defined by the manufacturer in the RFS proposal, shall result in imposition of the following penalties:

a) Performance security –

The beneficiary firm will be required to furnish a performance security for an amount of certain fraction of expected capital cost per GWH. It will be computed as below:

Fraction of performance security * Capital cost * Percentage value addition committed * overall committed capacity (GWh)
Performance security will be subject to following ceiling – INR 50 Crores upto 5 GWh, INR 75 Crore upto 10 GWh and INR 100 Crores upto 20 GWh of annual ACC committed capacity. The government shall have a right to invoke the performance security in the manner as follows –

1. If within 2 years from the appointed date, the beneficiary fails to invest USD 30 Million per GWh and establish cell assembly facility with at least 25% value capture at the mother unit level on the books of the SPV. However, if the beneficiary achieves the abovementioned milestones and achieves completion of targets specified in the RFP (for commensurate milestones) the performance security would remain in force.
2. The other milestone would be 5 years from the appointed date, when beneficiary would be required to achieve completion of all targets specified in the RFP. If the beneficiary fails to achieve this target, the authority would have a right to levy penalties from the subsidy payable.
3. If any of the above shortfalls continues for a period for certain number of consecutive quarters, the authority shall have a right to appropriate the performance security.

b) Failure to meet the committed capacity:

The penalty for capacity provision will be linked to actual implemented capacity and committed capacity (under the RFS) by the beneficiary firm at the mother unit level and include penalising the beneficiary firm for two times (committed minus actual implemented) capacity, based on the milestones. For example, if 10 GWh was committed, and only 8 GWh was produced, a subsidy cut of 2* (10-8) = 4 will be implemented. Thus, the subsidy will be paid on only (committed-penalty, i.e. 6 GWh) GWh of capacity, even though 8 GWh has been produced. The penalty shall be levied in same quarter or in case of any shortfall, shall be carried forward to be adjusted with future cash subsidy disbursements. The penalty on account of failure to install ACC manufacturing capacity shall be levied till the terminal year i.e. five years from the appointed date or FY 2025, whichever is later.

c) Failure to meet the committed value capture:
The penalty for value addition provision shall be estimated by the deficit in value addition committed and actually realised by the beneficiary firm. The retrenchment in subsidy (subsidy committed as per the

proposal minus the actual subsidy disbursed) shall be calculated and this deficit shall be deducted from disbursement in the same quarter or in case of any shortfall, be carried forward to be adjusted with future cash subsidy disbursements. For, example, if 50% value capture was committed and only 40% realised at the end of quarter, it will lead to a retrenchment in subsidy. The retrenchment shall be (subsidy at 50% value capture minus subsidy at 40% value capture), say an amount X. X will be deducted from the subsidy to be disbursed in the same quarter, based on actuals, or in case of any shortfall, be carried forward to be adjusted with future cash subsidy disbursements. The penalty on account of failure to meet the committed value addition of the ACCs being sold by the beneficiary firm shall be levied till FY 2030 or ten years from the appointed date, whichever is later.

In case if the penalty is levied for six consecutive quarters owing to non-achievement of committed scale of production and/or the committed value capture, the subsidy disbursement and the other financial incentives can be terminated.

7. Economic impact of domestic cell manufacturing

7.1. Economic cost-benefit assessment

Output-linked subsidy has been calculated to arrive at a healthy equity internal rate of return (IRR) for a cell manufacturer. ACC manufacturers who meet minimum energy density and cycle life criteria will be eligible for this subsidy, hence no bonus incentives will be considered in this scenario. Additionally, the project will be economically viable for the government on account of the following benefits:

- Reduction of battery cell import on account of domestic manufacturing facilities which will come up after subsidies and incentives.
- India is heavily dependent on oil imports and Indian economy is vulnerable to volatility of global crude oil prices. Increase of crude oil prices often result in oil subsidy by the government to reduce the market prices because if increase in prices is passed on to the end consumer, then other second and third-degree economic indicators start to worsen. Such direct and indirect damage to economy can be avoided by reducing oil imports. Advanced cell manufacturing will enable EV deployment and reduce oil imports to a great extent. As per an estimate by Rocky Mountain Institute (RMI), total reduction on oil imports will be valued at INR 300, 000 crore due to EV manufacturers using 50 GWh cells
- Due to increase in EV deployment, there will be reduction in emission of harmful greenhouse gases (GHG), which have deteriorated air quality, especially in metros and Tier-1 cities. There are also various second-degree positive effects of reduction in air pollution, such as reduced health expenditure. Advanced cell manufacturing will result in reduction in carbon emission and societal cost implication for the same. The social cost of carbon is associated with damage to human health and property, adverse impact on the climate and the eco-system. The Dynamic Integrated Model of Climate and Economy (DICE), one of the most prevalent global models, estimates the social cost of carbon emissions in India to be around USD 10.44/ton
- Advanced cell storage adoption at grids will enable RE integration. RE is infirm and it causes disturbance in grid parameters i.e. frequency and voltage. Storage application at generation and transmission will enable RE injection and ultimately reduce dependency on thermal power plants, reducing import of coal and improvement of air quality

Considering the above parameters, advanced cell manufacturing will have various direct and indirect economic benefits. Hence, promotion of domestic manufacturing of cells will be an economically viable investment for the government.

For Economic IRR calculation, we have only considered savings due to reduction in advanced cell import. Although, there will be savings in oil imports and benefit to society on account of reduced carbon emission however these benefits will also accrue if battery cells are imported instead of manufactured in India hence these are not considered in economic IRR calculation. The economic IRR is calculated to adjust future cash outflows such as capital and operational expenditure with avoided costs of reduction in advanced cell imports. Considering the above parameters, advanced cell manufacturing has an economic IRR of 24% and will contribute greatly to the Indian economy.

7.2. FDI impact

As per the consolidated FDI Policy of 2017, FDI comes primarily through two routes, government or automatic. For sectors in which FDI comes through the automatic route, no prior approval from GoI is required for the investment. [50]

In India, FDI in battery-related ecosystem covering manufacturing of auto components, automobiles, electronic systems, mining and exploration of metal/non-metal ores (barring, mining and mineral separation of titanium bearing minerals and ores, its value addition and integrated activities which are 100% directed through the government route), ports and shipping industries are all directed through the automatic route. Hence, there is already an existing mechanism in the country to expedite in FDI in battery-related segments to develop complete supply chain in India.

The automobile component industry is expected to account for 5% to 7% of India's by 2026 from current 2.3%, with component manufacturing for EVs expected to lead this transition.[51] The automobile industry has attracted USD 21.4 billion FDI between April 2000 to March 2019, accounting for 5.1% of the total FDI inflows (7.5% contribution to GDP).[52]

Along similar lines, the share of domestic electronics production in India's GDP has reached 2.3%. The FDI inflows in electronics in India for FY 2019 were valued at USD 451.9 million compared to USD 196.9 million in FY 2018.[53] The National Policy on Electronics (NPE), [54]2019, targets to promote domestic manufacturing and export in the entire value chain of ESDM and achieve a turnover of USD 400 billion by 2025.

Such initiatives by GoI are encouraging foreign investment in the automobile sector, allowing for 100 per cent FDI under the automatic route.

7.3. Direct and indirect tax collection[55]

Total corporate tax collection from 50-GWh projects will be approximately INR 16,000 crore. The net present value (NPV) of total corporate tax collection exceeds INR 3500 crores.

On the indirect tax front, the programme proposes increase of BCD on import of finished goods imports i.e. battery packs (from current BCD of 5% to 15% in year and 2022-2030 thereafter). Also, we have proposed increase of BCD on intermediate goods such as cells (from current BCD of 5% to 10% in within years 2024-2030 and 5% thereafter). This increase of BCD is proposed in order to discourage imports of intermediate or finished goods and promote domestic manufacturing. BCD on raw material is proposed to remain at 2.5%. Hence, there will be revenue accrual to government on part of proposed increase on BCD on various intermediate and finished goods. The quantum of change cannot be computed at this point due to uncertainty in demand and level of value capture to be achieved in India.

Net impact on indirect taxes due total GST collection from 50-GWh projects will be approximately INR 58,000 crore. NPV of total GST collection is expected to approximately INR 22,000 crore.

[50] https://dipp.gov.in/sites/default/files/CFPC_2017_FINAL_RELEASED_28.8.17.pdf
https://www.investindia.gov.in/foreign-direct-investment
[51] http://www.makeinindia.com/sector/automobile-components
[52] Invest India
[53] http://www.makeinindia.com/sector/electronic-systems

[55] Tax calculation after considering latest amendment in tax laws. In initial years, MAT is considered at 7.5%. It is assumed that after the tax benefits due to 35AD get exhausted, the entity will switch to new tax rates i.e. 22% base corporate tax rate.

Overall, total direct and indirect tax collection is expected to exceed INR 74,000 crore and NPV of total collection is expected to be more than INR 25,000 crore.

If only the subsidy period is considered, on account of the proposed tax incentives to the advanced battery manufacturing industry, the net impact due to changes in direct taxes (total corporate tax collection from 50-GWh projects during the subsidy window, i.e. till FY 2030) will be approximately INR 800 crore. The net impact due to changes in indirect tax (total GST collection from 50-GWh projects during the subsidy window i.e. till FY 2030) will be approximately INR 22,000 crore.

Figures in INR crores		NPV	Absolute
Only subsidy years calculation	IDT	11890	22044
	DT	373	863
Project life calculation	IDT	21998	58,067
	DT	3580	16159

7.4. Multiplier effect by establishing energy storage facilities

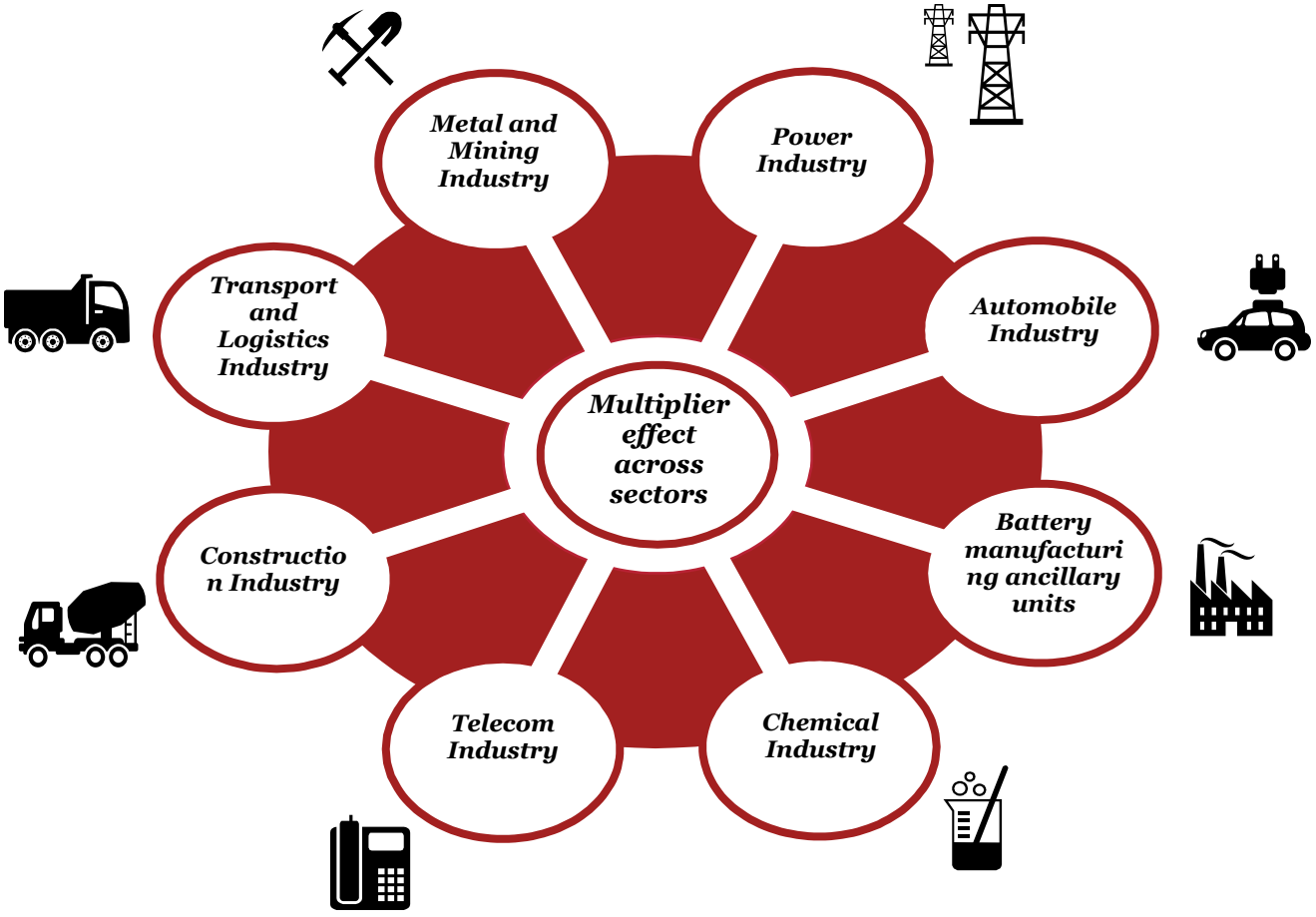
Establishing battery storage facilities is anticipated to bring in number of socio-economic benefits, apart from environmental advantages in terms of reducing GHG emissions, reliance on conventional fuel sources and oil imports. The benefits can be broadly classified across the following main sub-heads.

Benefit Category	Key benefits
Environmental	• Promotion of green image for entities • Reduction of GHG and CO2 emissions, that would have resulted due to deployment of conventional fuel options • Assistance in meeting environmental/sustainability targets of GoI
Social	• Increasing number of employment opportunities • Promotion of Make in India Campaign • Global recognition in terms of leading by example • Increasing opportunity for skill development, incubation centres and entrepreneurship programmes • More effective learning opportunities with foreign technical entities, leading to more R&D opportunities
Economic	• Improved State GDP • Increase in FDI, with an investment opportunity of INR 8,000 Cr • Improved export competitiveness • Increase in tax revenue collection

Because battery manufacturing industry has substantial links with so many other sectors throughout the economy, its output can spur considerable economic activity. Some of these have been analysed below.

- As the battery manufacturing output grows, it will require more input raw materials from metal and mining industries to feed its increasing demand, pushing further growth of the mining sector
- Similarly, with penetration of increasingly large amounts of renewables into the grid, the power industry (utilities) would also require energy storage to ensure a stable and flexible power system operation, leading to more number of T&D solutions coupled with battery being implemented across the country.
- Thirdly, battery manufacturing will also provide the much-needed impetus to growth of EV based automobile sector in India, leading to increased number of sales and purchasing transactions done for EV vehicles.

- Another, industry which will gain profitability due to advent of battery storage facilities is the transport and logistics segment, which will face an increased demand due to the much needed swift movement of necessary raw material inputs.
- The construction industry will also reap the benefits of such a change due to more number of infrastructural facilities such as R&D labs, testing laboratories, metal refining and recycling facilities being established in the country
- Telecom industry, which currently employs expensive diesel generators for meeting energy requirements, would eventually switch over to more cost-effective battery-based solutions. This will also improve the telecom tower business expansion, making it more reliable and less capital intensive. (OPEX is lower for battery-based solutions)
- The demand for local materials for electrolyte manufacturing, separator manufacturing and other chemicals will also lead to more economic growth for the chemical industry
- Lastly, several foreign investors looking to establish battery manufacturing facilities in India, will try to reduce their dependence on imports and create their own supply chain here, through setting up of ancillary units, providing support to main production unit. This will further lead to improved manufacturing growth figures in India.



7.5. Rationale of giving subsidies to encourage cell manufacturing in India

In the last eight years, Li-ion battery pack prices have reduced worldwide at a CAGR of 20% due to factors driven by operations, technology and market. These factors are explained in the illustration below.

Operations	Markets	Technology
•Operations-driven factors such as reduction in per unit cost of material while purchasing in bulk, labour economies, improvement in production technology, marketing economies by distributing the total cost over a larger number of units will drive the cost down.	•A major reason of price reduction is oversupply of Li-ion batteries in the market. Battery and cell manufacturers, loaded with overcapacity, are reducing price in order to sign long term supply contracts with auto companies.	•Advancements in terms of cell chemistry, production technologies will lead to cost reduction. For example, solid-state batteries are seen as responsible for the biggest innovation in the space sector. That is because the solid-state electrolyte can lead to as much as a 40% increase in the energy density of a cell, as pure lithium anodes can be used.

Li-ion battery prices have gone down from USD 1160/kwh in 2010 to USD 176/kWh in 2018. The figure below shows a trajectory of Li-ion battery prices.

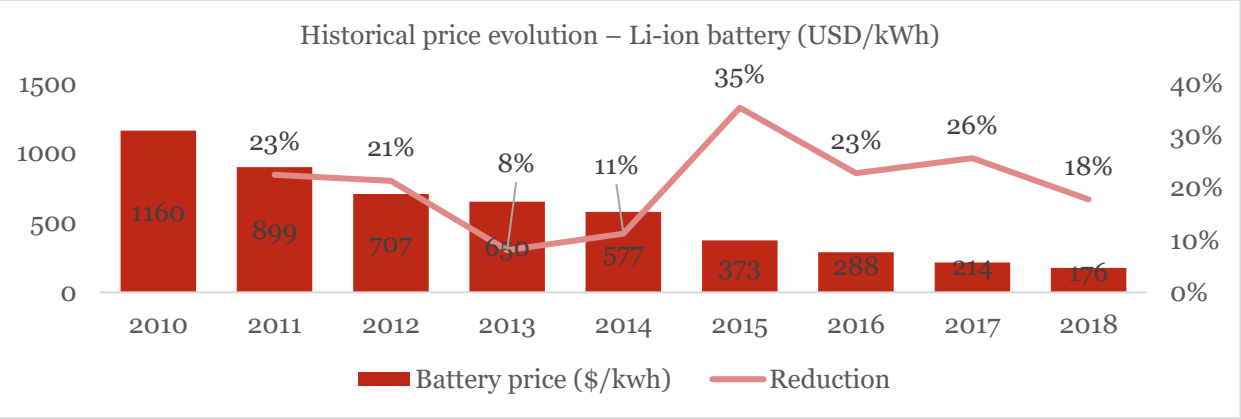


Figure 10: Li-ion battery price trends

As per a price forecast by BNEF, battery prices are expected to fall further, i.e. below USD 100/kWh by 2024 and below USD 65/kWh by 2030.

Based on a financial assessment by PwC India, it was found that domestic cell manufacturing business becomes unprofitable if BNEF prices are considered due to high cost of manufacturing. In order to encourage domestic manufacturing, output-linked subsidy component is required (in terms of Rs/kWh) to ensure domestically produced cell prices are globally competitive in line with the BNEF forecast.

To calculate subsidies, a detailed financial model has been prepared by us which includes capex phasing, revenue and cost forecasting, cash flow projections, profitability assessment of a 10-GWh advanced cell manufacturing plant. In the calculation, cell prices have been considered in line with BNEF cell prices.[56]

[56] It has been assumed that cell manufacturers will continuously invest in R&D and asset maintenance in order to strive for better cell technology to stay ahead in competition and also be eligible for bonus subsidy under the central government programme run by NITI Aayog. Due to higher technology adoption, it is considered that cell prices from year 2025 will reduce at half the rate of BNEF price forecast.

8. Project and financial assumptions

8.1. Capital expenditure

The major expenditure component of a cell manufacturing plant is plant and machinery required for various value chain activities such as cathode manufacturing, anode manufacturing, electrolyte manufacturing, separator manufacturing, cell assembly. Soft cost comprising components such as Interest during construction, financing cost, contingency, insurance, pre-operative costs add to the overall capital cost. Currently, capital cost of USD 120 million/GWh is considered for establishing a cell manufacturing plant. For calculation purposes, land lease is considered as an annual outgo on recurring basis and hence not considered a part of capital cost.

8.2. Source of funds

For base case calculation, it has been assumed that debt-equity ratio is 50%-50%. Domestic source of funding has been considered in base case scenario. The capital structure with high equity has been assumed to be on conservative side, considering that the large-scale cell manufacturing for advanced cells such as Li-ion is a relatively new technology for domestic banks and risk perception of bankers may be initially high. Moreover, there is not any assured offtake by the government and market demand is still evolving, which exposes such a project to market risk. It is to be noted that debt-equity ratio may be better than this considering the strong market outlook for battery applications. The cost of debt and other terms are as per the table below:

Table 18: Assumptions for source of funding

Assumption head	Sub-head	Unit	Value
Financing assumptions	Debt	%	50%
	Equity	%	50%
Interest rates	Debt	%	10%
Loan tenure	Debt	Years	12, moratorium period – 1 year

In addition to above, assumptions and financial assumptions required to undertake financial feasibility of a cell manufacturing plant have been summarised in the table below.

Table 19: Assumptions for financial feasibility

Assumption head	Sub-head	Unit	Value
Plant size	Capacity	GWh	10
Timelines	Deployment timelines	Months	12
	Project life	Year	20
Plant utilisation factor	Initial five years	%	80%
	6th year onwards	%	95%
Interest rates	Debt	%	10%
Loan tenure	Debt	Years	12, moratorium period – 1 year
Taxes and depreciation	Income tax	%	15% base rate + surcharge and cess (17.16%)
	MAT	%	Not applicable
	Book depreciation rate	%	4.5% for useful life of 20 years
	Salvage value	%	10%

8.3. Cost breakdown

Costs of raw material in cathode manufacturing, anode manufacturing, electrolytes and separators contribute to 53% of the total cost of setting up a cell manufacturing plant. Depreciation, which denotes upfront capex, contributes to only 11% of the total cost break-up, which indicates that operating a cell manufacturing plant is much costlier than setting it up.

Other expenses such as labour and electricity are much lower than overall raw material expenses. The chart below indicates the cost breakdown of various components of a cell manufacturing plant.

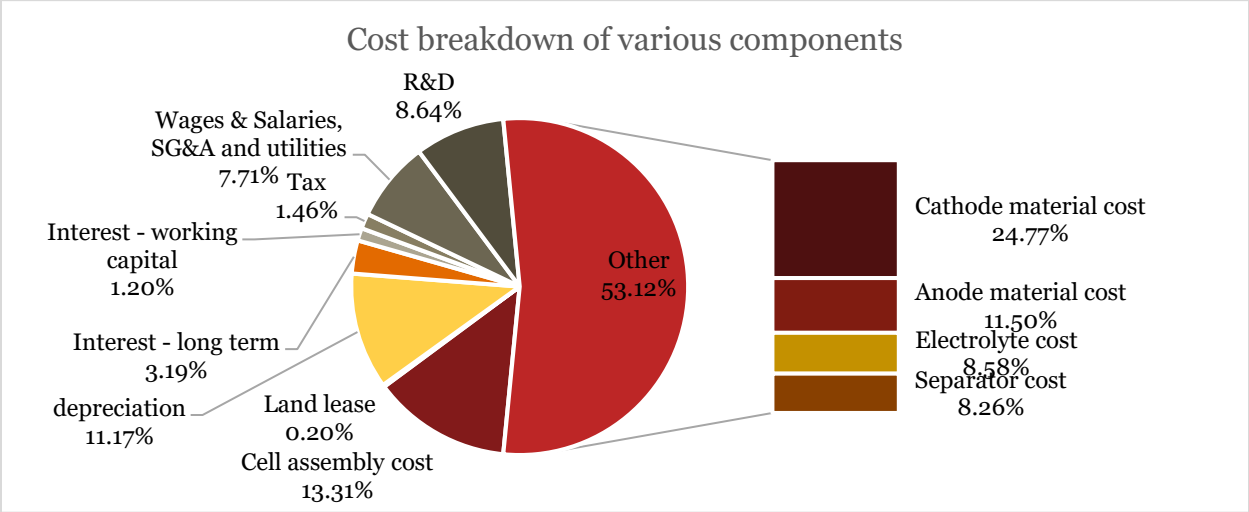


Figure 11: Cost breakdown of various components

8.4. Financial viability

In order to ascertain financial viability of a cell/battery manufacturing project, a detailed financial model has been prepared, which includes capex phasing, revenue and cost forecasting, cash flow projections and profitability assessment of a 10-GWh advanced cell manufacturing plant.

In the calculation, cell prices have been considered in line with BNEF cell prices. However, it has been assumed that the cell manufacturer will continuously invest in R&D and asset maintenance to achieve better cell technology to stay ahead in competition and also be eligible for bonus subsidy under the central government programme run by NITI Aayog. Due to higher technology adoption, it is considered that cell prices from year 2025 will reduce at half the rate of the BNEF price forecast.

The subsidy considered in the financial model are shown in the table below:

Table 20: Subsidy calculations

	Mar-22	Mar-23	Mar-24	Mar-25	Mar-26	Mar-27	Mar-28	Mar-29	Mar-30
GWh	15	25	35	50	50	50	50	50	50
Expected subsidy Rs/kWh	570	722	857	1271	1144	915	922	553	277
Value capture	30%	40%	50%	65%	65%	65%	65%	65%	65%
Subsidy (in crore)	855	1805	3001	6353	5718	4574	4611	2767	1383

It is to be noted that the subsidy figures are only indicative and actual subsidy component will be derived after the competitive bidding process.

Overall, on the basis of financial model, cell prices and subsidy trends for subsidy window, i.e. 2022-2030, is shown in the figure below.

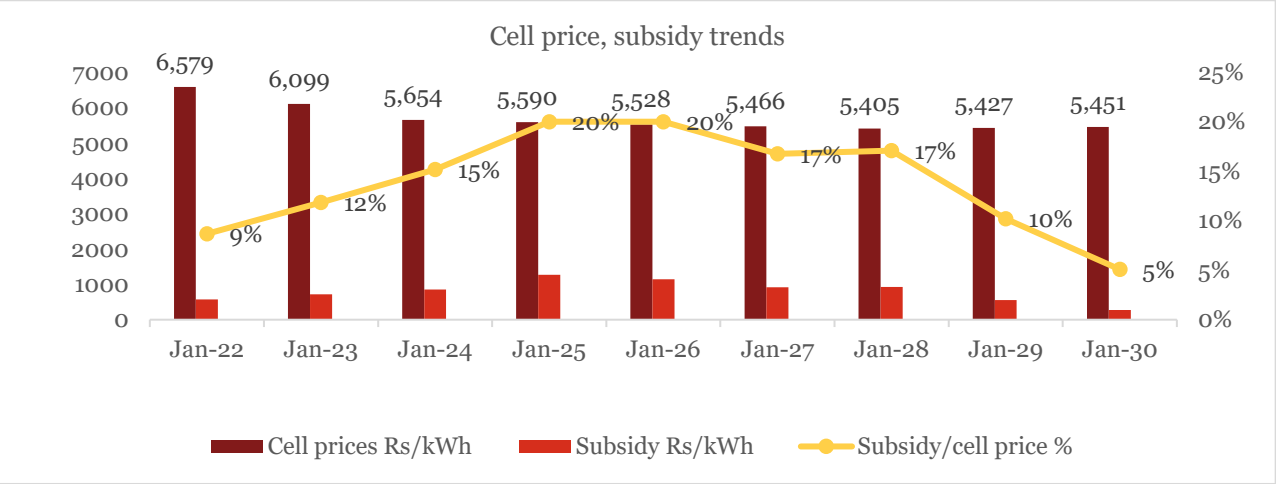


Figure 12: Cell price, subsidy trends

It is clear from the graph above that in any year, subsidy will remain below 20% of the cell price.

8.5. Subsidy calculation in various scenarios

There can be multiple scenarios of total subsidy disbursement by the government, if maximum subsidy and overall value capture of domestic cell manufacturing in India are considered. Based on stakeholder consultations and assessment, three scenarios have been prepared, i.e. conservative, aggressive and most likely. The table below illustrates the year-wise subsidy requirement for value capture and maximum subsidy that is likely to be disbursed in all three scenarios.

Table 21: Subsidy calculations in various scenarios

NPV (INR crores)	Absolute sum (INR crores)	Scenario	Parameter	Year	Mar-22	Mar-23	Mar-24	Mar-25	Mar-26	Mar-27	Mar-28	Mar-29	Mar-30
				GWh	15	25	35	50	50	50	50	50	50
12514	19746	Scenario-1 (Conservative)	Maximum subsidy	Rs/kWh	1900	1805	1715	1629	1466	1173	821	493	246
			Value capture	%	30%	40%	50%	60%	60%	60%	60%	60%	60%
			Expected subsidy	Rs/kWh	570	722	857	977	880	704	493	296	148
			CUF	%	80%	80%	80%	80%	80%	95%	95%	95%	95%
			Total subsidy	Crores	684	1444	2401	3910	3519	3343	2340	1404	702
46500	70505	Scenario-3 (Aggressive)	Maximum subsidy	Rs/kWh	3940	3743	3556	3378	3040	2432	1702	1021	511
			Value capture	%	80%	80%	80%	80%	80%	80%	80%	80%	80%
			Expected subsidy	Rs/kWh	3152	2994	2844	2702	2432	1946	1362	817	409
			CUF	%	100%	100%	100%	100%	100%	100%	100%	100%	100%
			Subsidy (Crores)	Crores	4728	7485	9955	13511	12160	9728	6810	4086	2043
19239	31067	Scenario-4 (Most likely)	Maximum subsidy	Rs/kWh	1900	1805	1714.8	1955	1759	1407	1419	851	426
			Value capture	%	30%	40%	50%	65%	65%	65%	65%	65%	65%
			Expected subsidy	Rs/kWh	570	722	857	1271	1144	915	922	553	277
			CUF	%	100%	100%	100%	100%	100%	100%	100%	100%	100%
			Subsidy (Crores)	Crores	855	1805	3001	6353	5718	4574	4611	2767	1383