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REPORT ON

INDIAN BATTERY INDUSTRY: PRIMARY & SECONDARY BATTERIES

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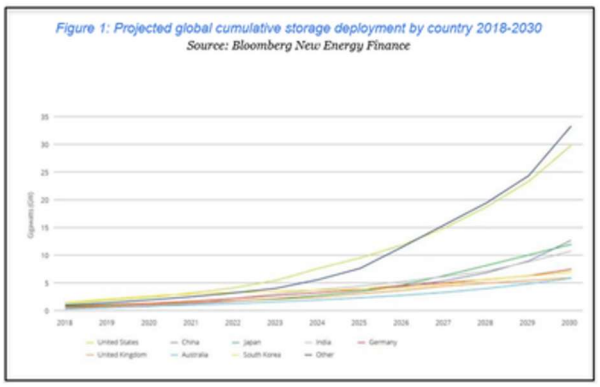
Table of Contents

Chapter I – Introduction

Energy security is a matter of concern for all nations, especially when climate change is in play. With a growing need for transitioning to renewable energy, batteries play a crucial role. They act as vital storage tools to facilitate this energy transition.

As can be seen from the following graph, the demand for battery storage has witnessed exponential growth in recent years, and is only going to increase in the coming years.



Post 2023-24, the growth for the majority of the nations is steadily increasing. In the case of India, and for other nations, excluding those mentioned in the graph, the demand growth will go up to 30-35 Gigawatts. The Asia-Pacific region is expected to be the largest regional market for Battery Energy Storage Systems.

At present, there are two main battery types that are prevalent in the industry. These are Lithium-ion batteries and Lead-acid batteries. The Lithium-ion batteries are used, for example, to power things such as our phones, and electric vehicles. Lead-acid batteries are used to start cars with internal combustion engines, and store power for the car's lights, radio and other devices (World Economic Forum, 2021). These batteries come under the umbrella of Secondary batteries, batteries that are rechargeable. On the other hand, there are primary batteries, batteries that are not rechargeable. Examples of Primary batteries include Dry cell and Alkaline batteries, such as those used to power electronic gadgets like remotes, wall clock, watches, and many others. With increasing penetration of EVs and growing importance of renewable energy in the global market, it can be implied that a major application of Battery Energy Storage is in the industrial sector.

In this report, we provide an overview of the global battery market and the Indian battery market. Furthermore, we identify certain gaps and challenges and suggest how they can be overcome. We also describe certain government initiatives that aim at ameliorating growth in this industry.

Chapter II – Global Market Outlook

In this chapter, we seek to understand how the global battery market has fared so far, and how it will grow in the coming years.

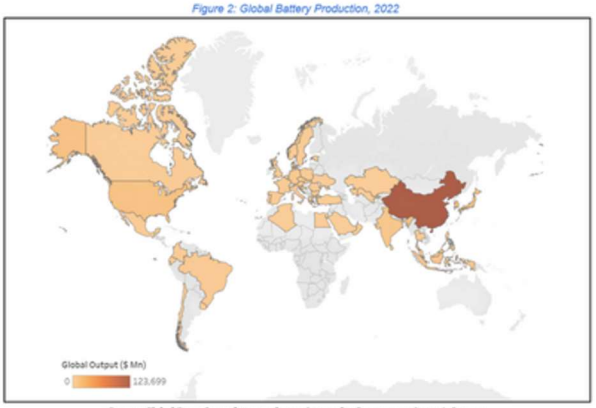
2.1 Battery Production in the World

According to data from the United Nations Industrial Development Organization (UNIDO) and International Monetary Fund (IMF), the global battery production stood at $197,407 Mn in the year 2022. The industry has been growing consistently at an average growth rate of 4.47%.

A total of 46 countries are known producers of batteries. These countries, as shown in the figure below, include Algeria, Austria, Belgium, Brazil, Bulgaria, Canada, Chile, China, Colombia, Croatia, Czech Republic, Denmark, Ecuador, Egypt, Estonia, Finland, France, Germany, Greece, India, Indonesia, Italy, Japan, Kazakhstan, Korea, Malaysia, Mexico, Norway, Oman, Philippines, Poland, Portugal, Romania, Saudi Arabia, Slovak Republic, Slovenia, Spain, Sri Lanka, Sweden, Thailand, Turkey, Ukraine, United Kingdom, United States, Uruguay, and Uzbekistan. Together, these countries accounted for $187,007 in 2022.

As shown in the map below, China alone accounted for 62.6% ($123,699 Mn). China has consistently outperformed the other countries in terms of production, having an average growth rate of 6.76% between 2018 and 2022.

Figure 2: Global Battery Production, 2022



Source: Global Batteries and Accumulators Output, by Country, 2018-2026, Statzon

It has been projected that by 2026, the industry will reach a global output of $244,244 Mn, growing at an average growth rate of 4.96%. Of the $244,244 Mn, these forty-six countries will account for $230,718 Mn. Similar to the present, in 2026, China is projected to be the largest producer of batteries, accounting for 66% ($161,369 Mn) of the global total.

2.2 Top Five Global Producers

The top five producers of batteries in the world are China, Korea, Japan, the United States of America, and India, as shown in Table 1. These countries have consistently been the top producers since 2018. Together, they accounted for 83% ($164,229 Mn) in 2022.

Table 1: Top 5 Global Battery Producers, 2022

2022	
Country	Production (USD Mn)
China	123699.61
Korea	14177.37
Japan	11477.02
United States	9263.39
India	5612.25

Source: Global Batteries and Accumulators Output, by Country, 2018-2026, Statzon

The table below shows the projected top five producers of batteries for the year 2026. China, Korea, Japan, the United States of America, and India, will remain the top five producers. It is forecasted that by 2026, these countries will account for 84% ($205,301 Mn) of the global total.

Table 2: Top 5 Global Battery Producers, 2026

2026 (Forecasted)	
Country	Production (USD Mn)
China	161369.09
Korea	18120.84
Japan	11295.34
United States	7926.85
India	6589.38

Source: Global Batteries and Accumulators Output, by Country, 2018-2026, Statzon

From the above tables, it is clear that growth in this industry is largely driven by the Asia-Pacific region, and the region will continue to do so, given their continued dominance in manufacturing capabilities, further supported by favorable policies.

2.3 International Trade Dynamics

With the growing importance of usage of renewable energies, batteries will play a crucial role in transitioning to renewable energy everywhere. Therefore, it is important to understand the trade dynamics of this industry in recent years.

In 2021, Batteries were the world's 382nd most traded product, with a total trade of $91oo Mn. Between 2020 and 2021, exports in this industry grew by 8.26%, from $8400 Mn to $9100 Mn. Trade in batteries represented 0.043% of total world trade.

In the same year, the top exporters of batteries were China ($2830 Mn), Singapore ($775 Mn), United States ($757 Mn), Germany ($690 Mn), and Indonesia ($556 Mn). Between 2020 and 2021, the exports of batteries grew the fastest in China ($243 Mn), Japan ($123 Mn), Netherlands ($72 Mn), France ($57.4 Mn), and Germany ($57.4 Mn).

In 2021, the countries that had a larger trade value in exports than in imports of batteries were China ($2540 Mn), Singapore ($476 Mn), Indonesia ($394 Mn), Japan ($301 Mn), and Israel ($75.4 Mn). (UN Comtrade Database)

Similarly, in 2021, the top importers of batteries were the United States ($1220 Mn), Germany ($711 Mn), Hong Kong ($449 Mn), Poland ($326 Mn), and Netherlands ($325 Mn).

Between 2020 and 2021, the fastest growing importers of batteries were the United States ($164 Mn), Germany ($126 Mn), Netherlands ($98 Mn), China ($77.2 Mn), and Poland ($60.4 Mn).

In 2021, the countries that had a largest trade value in imports than in exports of batteries were the United States of America ($464 Mn), Hong Kong ($324 Mn), Mexico ($208 Mn), Canada ($172 Mn), and Italy ($158 Mn).

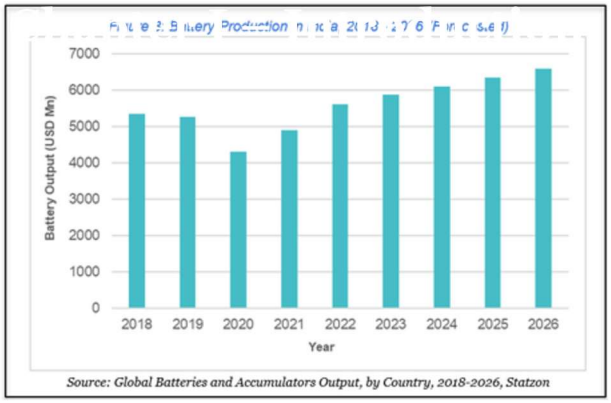
As it can be observed from the previous sections, China is not only dominant in battery production, but is also the leading exporter in this industry. On the contrary, although India is one of the top producers in the world, it is not the largest exporter or importer. In the case of the United States of America, like India and China, the USA is also a top producer, however, it is also the largest importer of batteries.

Chapter III - Indian Market Outlook

In this chapter, we explore the Indian battery market with respect to production, trade, and a state-level analysis of employment prospects and profitability.

3.1 Battery Production in India

It is now known that India is one of the top five producers of batteries globally. As observed in the figure below, in 2018, India's production stood at $5339.96 Mn. Due to the COVID-19 pandemic, India's production fell to $4306.42 Mn. After the lockdowns were lifted, the industry saw a growth in the production, which surpassed the 2018 production level in 2022, with an estimated production of $5612.25 Mn.



Source: Global Batteries and Accumulators Output, by Country, 2018-2026, Statzon

It has been forecasted that India's production is set to reach $6589.38 Mn by the year 2026. Between 2018 and 2026, the country's production is estimated to grow at an average growth rate of 3.13%.

3.2 How India compares to the World

It is important to understand where India stands with the world, in terms of battery production. The table below illustrates India's production as a percentage of the global production since the year 2018.

Table 3: Indian Production as a Percentage of Global Production

Year	Indian Output (USD Mn)	Global Output (USD Mn)	Indian Production as a % of Global Production
2018	5,339.96	165,874.67	**3.22**
2019	5,266.14	175,423.90	**3.00**
2020	4,306.42	177,690.10	**2.42**
2021	4,890.16	184,277.66	**2.65**
2022	5,612.25	197,406.73	**2.84**
2023	5,869.72	209,096.03	**2.81**
2024	6,091.90	220,801.93	**2.76**
2025	6,348.16	232,396.31	**2.73**
2026	6,589.38	244,244.70	**2.70**

Data Source: Global Batteries and Accumulators Output, by Country, 2018-2026, Statzon

The table suggests that India's battery production has consistently accounted for over 2.5% of the global production. Before the COVID-19 pandemic, India's production accounted for over 3% of the global total. In the year 2020, India contributed only 2.42% of the global total. After the lockdowns were lifted, India's share began increasing, and has been inching towards 3%. It is projected to reach 2.0% by the year 2026. Between 2018 and 2026, the country is poised to account for approximately 2.8% of the global battery production.

3.3 India's Battery Trade

India is neither the largest exporter, nor the largest importer of batteries. For this section, the data has been gathered from the Ministry of Commerce and Industry. The HSN Code for Primary cells and Batteries is 8506. Similarly, the HSN Code for Secondary Batteries is 8507. These codes are used to uniformly and systematically classify goods across the globe.

Table 4 provides an overview of India's trade in primary batteries. For exports, there is no linear trend that can be observed. In 2017-18, exports of primary batteries stood at $3 Mn, which increased to $18 Mn by 2019-20. Due to the COVID-19 pandemic, there was a fall in exports by 38%, to $11 Mn. In 2021-22, the exports grew by 90%, to reach $21 Mn. Thereafter, in 2022-23, exports fell again, by 28.5%, to $15 Mn.

For imports, similar to exports, there is no linear trend that is observed. In 2017-18, imports of primary batteries stood at $38 Mn, which increased by 115.7%, to $82 Mn in 2018-19. Thereafter, they fell to $60 Mn in 2019-20. Contrary to what was observed worldwide during the pandemic, imports of primary batteries increased from their previous level in 2020-21. Imports reached $80 Mn in the year 2022-23, a 27% increase from 2021-22.

The table also suggests that the industry experiences a trade deficit in primary batteries.

Table 4: India's Trade in Primary Batteries

Year	Exports ($ Mn)	Imports ($ Mn)	Trade Balance ($ Mn)
2017-18	3	38	-36
2018-19	10	82	-73
2019-20	18	60	-42
2020-21	11	64	-53
2021-22	21	63	-42
2022-23	15	80	-66
2023-24 (Apr- May)	3	15	-12

Source: Ministry of Commerce and Industry, India

Table 5 provides an overview of India's trade in secondary batteries. For exports, except for the year 2020-21, there seems to be a linear growth. In 2017-18, exports of secondary batteries stood at $73 Mn, which increased to $407 Mn by 2019-20. Due to the COVID-19 pandemic, there was a fall in exports by 2.45%, to $397 Mn. In 2021-22, the exports began rising again. This year registered a rise of 59.44% ($633 Mn). This further grew to $792 Mn in 2022-23.

For imports, similar to exports, a linear growth trend was observed, except for the fall in the year 2020-21. In 2017-18, imports of secondary batteries stood at $337 Mn, which increased by 407.7%, to $1711 Mn in 2018-19. Thereafter, they fell to $1701 Mn in 2019-20. During the pandemic, in 2020-21, imports of secondary batteries fell by 10.2% to reach $1526 Mn. After the lockdowns were lifted, imports rose too. By 2022-23, they rose to $3532 Mn.

The table also suggests that the industry experiences a trade deficit in primary batteries.

Table 5: India's Trade in Secondary Batteries

Year	Exports ($ Mn)	Imports ($ Mn)	Trade Balance ($ Mn)
2017-18	73	337	-264
2018-19	376	1711	-1335
2019-20	407	1701	-1294
2020-21	397	1526	-1130
2021-22	633	2302	-1668
2022-23	792	3532	-2739
2023-24 (Apr- May)	129	672	-543

Source: Ministry of Commerce and Industry, India

As seen in Tables 4 and 5, India's trade in batteries has always been in a deficit. Although, the deficit seems wider with respect to secondary batteries than primary batteries. It can be observed from the above tables that exports of secondary batteries are greater than those of primary batteries. It is evident that the demand for secondary batteries is greater for secondary batteries than primary batteries. This can be attributed to an increasing penetration of EVs in the Indian market, and the transition to renewable energy, among other factors. Overall, the data also shows that India is heavily reliant on imports of both, primary and secondary batteries.

Export Partners

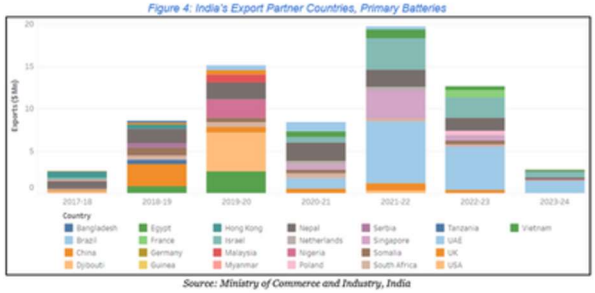
The following figure visualizes India's export partners for primary batteries between 2017-18 and 2023-24. During this period, India exported to 26 unique partner countries.

According to the data from the Ministry of Commerce and Industry, between 2017-18 and 2023-24, the United Arab Emirates (UAE), Nepal, Israel, and the United Kingdom (UK) have been the four largest export partner countries of India for primary batteries. India exported $15.25 Mn worth of primary batteries to the UAE, $10.45 Mn to Nepal, $7.77 Mn to Israel, and $5.18 Mn to the UK.

Consistent export partners include Nepal, the UK, and South Africa. India has exported primary batteries from these countries in every year considered for this report. Other countries include Somalia, Israel, the UAE, Egypt, the USA, Singapore, Brazil, and Hong Kong.

Interestingly, India has also exported primary batteries to China twice in this period.

Figure 4: India's Export Partner Countries, Primary Batteries



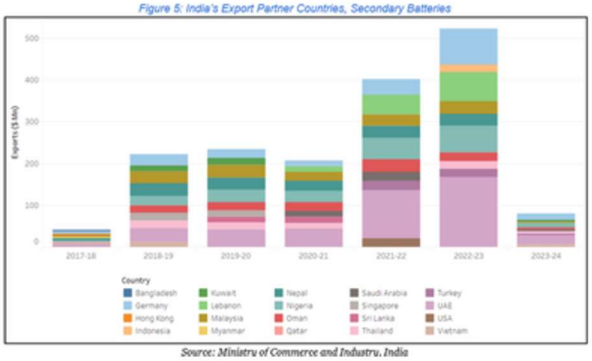
Source: Ministry of Commerce and Industry, India

The following figure visualizes India's export partners for secondary batteries between 2017-18 and 2023-24. During this period, India exported to 20 unique partner countries.

According to the data from the Ministry of Commerce and Industry, between 2017-18 and 2023-24, the United Arab Emirates (UAE), Nigeria, Germany, and Malaysia have been the four largest export partner countries of India for secondary batteries. India exported $430.46 Mn worth of primary batteries to the UAE, $209.91 Mn to Nigeria, $207.08 Mn to Germany, and $147.23 Mn to Malaysia.

Consistent export partners include the UAE, Nigeria, Germany, and Malaysia. India has exported primary batteries from these countries in every year considered for this report. Other countries include Nepal, Oman, Thailand.

Figure 5: India's Export Partner Countries, Secondary Batteries



Source: Ministry of Commerce and Industry, India

Import Partners

Figure 6 visualizes India's import partners for primary batteries between 2017-18 and 2023-24. During this period, India imported from 14 unique partner countries.

According to the data from the Ministry of Commerce and Industry, between 2017-18 and 2023-24, China, Hong Kong, Singapore, Japan, Germany, Indonesia and the USA have been the seven largest import partner countries of India for primary batteries. India imported $193.91 Mn Mn worth of primary batteries from China, $62.14 Mn from Hong Kong, $23.71 Mn from Singapore, $15.86 Mn from Japan, $15.37 Mn from Germany, $13.14 Mn from Indonesia, and $13.05 Mn from the USA.

These seven countries consistently import to India. India has imported primary batteries from these countries in every year considered for this report. Other countries include Korea, Vietnam, France, the UK, Israel, Malaysia, and Thailand.

Figure 6: India's Import Partner Countries, Primary Batteries

Source: Ministry of Commerce and Industry, India

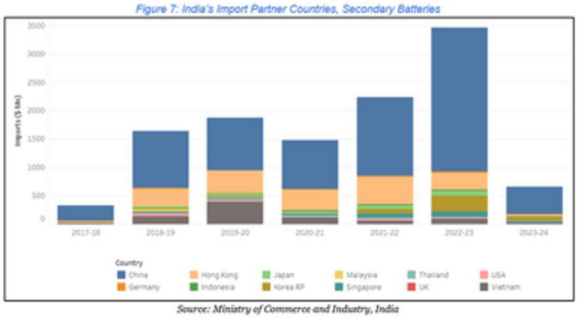
Figure 7 visualizes India's import partners for secondary batteries between 2017-18 and 2023-24. During this period, India imported from 12 unique partner countries.

According to the data from the Ministry of

Commerce and Industry, between 2017-18 and 2023-24, China, Hong Kong, Vietnam, Korea, and Japan have been the five largest import partner countries of India for secondary batteries. India imported $7449.75 Mn worth of secondary batteries from China, $1883.15 Mn from Hong Kong, $859.57 Mn from Vietnam, $501.92 Mn from Korea, and $277.83 Mn from Japan.

These five countries consistently import to India. These countries have imported secondary batteries in each year considered for this report. Other countries include Singapore, the USA, Thailand, Indonesia, Germany, Malaysia, and the UK.

Figure 7: India's Import Partner Countries, Secondary Batteries



Source: Ministry of Commerce and Industry, India

3.4 States' Contribution to the Industry

In order to truly understand the Indian market, it is important to understand the ground reality, which, in our case, can be understood with a state-level analysis of the battery industry in India. The data for this section has been gathered from the Annual Survey of Industries (ASI), 2019-20. The ASI uses the National Industrial Classification (NIC) code to classify manufacturing activity in India. The NIC does not segregate batteries into primary and secondary batteries. According to the NIC, batteries are classified under the **Code 272**, which stands for **Manufacture of batteries and accumulators.**

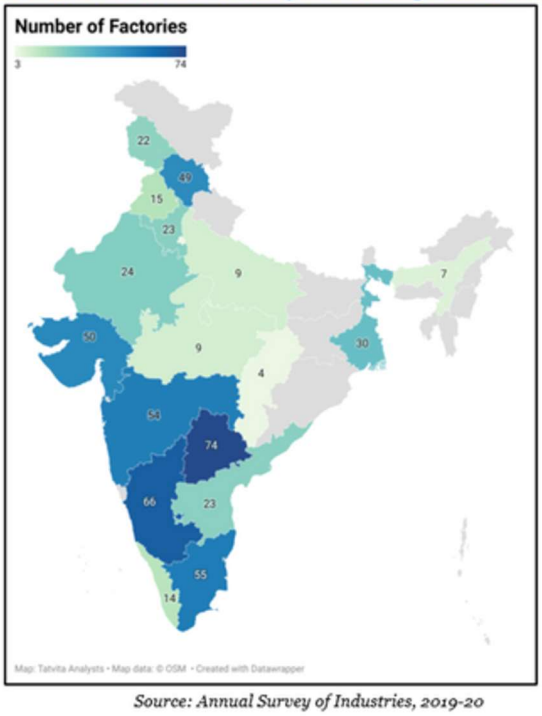
Number of Factories

The following figure depicts the number of battery manufacturing factories in each state in India. There are 19 States/UTs that have factories that manufacture batteries in India.

As per the data, the state of Telangana has the highest number of battery manufacturing factories, 74. Telangana is followed by Karnataka (66), Tamil Nadu (55), Maharashtra (54), and Gujarat (50). Alternatively, states with the least number of factories are Madhya Pradesh (9), Uttarakhand (9), Assam (7), Chhattisgarh (4), and Delhi (3).

It is evident from the figure ab0ve that most western and southern states have at least 50 manufacturing factories, whereas, few northern and north-eastern states have the least number of factories.

Figure 8: State-wise Number of Battery Manufacturing Factories in Ind



Source: Annual Survey of Industries, 2019-20

Employment Prospects of the Industry

This section assesses the state-wise employment prospects of the industry in the country.

The following table ranks States/UTs according to their employment prospects. Employment prospects is a proportion of the number of workers and total output of the factories present in respective State/UT. Higher employment prospects are found where the number of workers and total output produced are both higher. On the contrary, lower employment prospects can be seen where the number of workers and output produced from the factories is limited.

According to the table, Delhi offers the highest employment prospects, where each unit of the total output was accounted for by 0.6% of the workers. Similarly, in Uttar Pradesh, Karnataka and West Bengal, each unit of the total output was accounted for by 0.9% of the workers. The number of workers is relatively higher than others. Additionally, these states have access to new and advanced technologies. This, coupled with the employment prospects for these states, suggests that the cost of production in these states is low.

Table 6: Employment Prospects of the Industry

Rank	State/UT	Employment Prospects
1	Delhi	0.602
2	Uttar Pradesh	0.918
3	Karnataka	0.931
4	West Bengal	0.945
5	Andhra Pradesh	1.002
6	Haryana	1.181
7	Himachal Pradesh	1.218
8	Assam	1.326
9	Maharashtra	1.469
10	Rajasthan	2.007
11	Madhya Pradesh	2.198
12	Telangana	2.234
13	Uttarakhand	2.371
14	Punjab	2.476
15	Gujarat	2.513
16	Kerala	2.515
17	Chattisgarh	2.586
18	Tamil Nadu	4.823
19	Jammu & Kashmir	17.241

Source: Annual Survey of Industries, 2019-20

On the contrary, states such as Gujarat, Kerala, Chhattisgarh, Tamil Nadu, and Jammu & Kashmir offer the least employment prospects.

In Gujarat, Kerala, and Chhattisgarh, each unit of the total output was accounted for by 2.5% of the workers. Each unit of output in Tamil Nadu, ranking 18th, was accounted for by 4.8% of the workers. Jammu & Kashmir offers the lowest employment prospects of all states. Here, each unit of the total output is accounted for by 17.24% of the total output. Contrary to the higher ranking states, in these states, due to the low number of workers, the cost of production is relatively higher.

Profitability of the Industry

This section assesses the state-wise profitability of the industry in the country.

The following table ranks States/UTs according to their profitability. In this report, profitability is calculated on the basis of the net profit and total invested capital. It essentially calculates the return on investment for each of these nineteen States/UTs.

Of all the States/UTs, only Assam and Chhattisgarh, ranking 1st and 2nd, have the highest profitability. Profitability in Assam stood at approximately 58%, followed by Chhattisgarh, where profitability stood at 57.47%. Himachal Pradesh, Uttarakhand, and Karnataka rank 3rd, 4th, and 5th respectively. Profitability in Himachal Pradesh stood at 15.29%. Similarly, in Uttarakhand and Karnataka, profitability stood at 14.62%

and 14.58% respectively.

Table 7: Profitability of the Industry

Rank	State/Uts	Profitability
1	Assam	57.962
2	Chattisgarh	57.475
3	Himachal Pradesh	15.294
4	Uttarakhand	14.629
5	Karnataka	14.587
6	West Bengal	13.890
7	Andhra Pradesh	10.202
8	Maharashtra	8.513
9	Madhya Pradesh	6.269
10	Tamil Nadu	6.111
11	Haryana	3.172
12	Kerala	2.082
13	Punjab	2.009
14	Rajasthan	0.972
15	Jammu & Kashmir	0.943
16	Gujarat	-1.612
17	Delhi	-2.710
18	Telangana	-5.276
19	Uttar Pradesh	-15.826

Source: Annual Survey of Industries, 2019-20

The States/UTs that are the least profitable are Jammu Kashmir, Gujarat, Delhi, Telangana, Uttar Pradesh, ranking 5th to 1st, respectively.

Profitability in Jammu Kashmir stood at 0.94%. Profitability in the bottom four States/UTs is negative, i.e., these States/UTs suffer from losses. Gujarat's losses stood at -1.61%, Delhi at -2.71%, and Telangana at -5.27%. Uttar Pradesh is the least profitable, having a loss of -15.82%.

Interesting findings emerge from the previous sections. Uttar Pradesh and Delhi, both have low number of factories, offer higher employment prospects, and yet, are the least profitable of all States/UTs. Although Gujarat has 50 factories and offers reasonable employment prospects, it is also among the least profitable States/UTs. On similar lines, Telangana has the most number of factories (74), offers reasonable employment prospects, and yet is unprofitable.

Assam, on the contrary, has only 7 factories, offers somewhat reasonable employment prospects, and is the most profitable of all. Similar is the case for Chhattisgarh. However, Chhattisgarh offers poor employment prospects, indicating that the cost of production here must be high. Qualitative differences among these States/UTs must be studied to understand these manufacturing dynamics in these States/UTs.

Chapter IV - Gaps and Challenges

In this chapter, we identify some gaps in and challenges faced by the Indian battery market at large.

As the demand for battery-powered products continues to grow, the challenge of scaling up battery production to meet this demand has become increasingly critical. Scaling up battery production involves increasing production capacity, reducing production costs, and ensuring supply chain stability. However, this process is not without its challenges.

1. High Import Dependence for Raw Materials: A key challenge faced by the industry is the sourcing of raw materials. Important raw material resources required, such as lithium and cobalt, are scarce and need to be imported. Approximately 70% of Lithium is imported from China. This dependence on imports is due to several factors, such as limited local manufacturing capacity and limited access to raw materials, refining capacities, and so on.

Moreover, there is no established supply chain for electrode materials and components yet in India. India does not

have reserves of some of the most important Li-ion components including lithium, cobalt, nickel, and copper. Hence, reliable supply, not just of the raw materials but also of processed functional materials used in the anode and cathode, poses a challenge.

2. Rising Raw Material Costs: Supply of raw materials, such as Lithium and Cobalt depend on geopolitical and market forces. With ongoing conflicts in the world, such as the Russia-Ukraine war, there are frequent supply chain disruptions, which create bottlenecks, making prices for such raw material high. Moreover, many of these raw materials are not abundant in supply. Therefore, with ever-increasing demand and limited supply, the prices of raw materials are high. However, technological changes in the production process can help reduce the costs of such materials.

3. Infrastructure, R&D and Skilled Workers: Battery production requires specialized equipment, manufacturing processes, and skilled workers, which can be costly to acquire and develop. Battery manufacturers must continually invest in research and development to create more efficient and sustainable battery materials and production processes. Expanding the domestic battery manufacturing capacity will require significant investment in research and development (R&D) and infrastructure. To increase the manufacturing of batteries, India needs to establish a robust battery value chain, including raw material production, cell manufacturing, and module assembly.

4. Logistical Challenges: Scaling up battery production presents logistical challenges like transportation, storage, and distribution. Batteries are often large and heavy, making them difficult and expensive to transport over long distances. Additionally, battery manufacturers must ensure that their production facilities are located close to the markets they serve, reducing transportation costs and lead times.

5. Lack of Coordination among Stakeholders: Strong coordination between various stakeholder groups in cell manufacturing and battery assembly can support the development of a robust and competitive battery manufacturing supply chain in India. Key stakeholders in the battery manufacturing ecosystem include material suppliers, battery manufacturers, vehicle manufacturers, local and central governments, research institutes, and think tanks. Coordination among these parties can help to define technology pathways, align investment strategies and timing, and guide policies to help achieve India's climate targets. The absence of this coordination amongst key stakeholder groups is a key barrier to streamlining efforts by different industries and organizations in building India's battery manufacturing supply chain.

6. High perceived risk: Due to the uncoordinated efforts by different stakeholder groups and the relatively nascent stage of battery manufacturing in India, investment risks in this sector are considered to be high. Due in part to the absence of clear long-term policies for manufacturing and uncertainty around future battery technology, battery and

vehicle manufacturers hesitate to make significant investments. Consistent and transparent policies can help address this barrier.

Scaling up battery production to meet growing demand is a complex process that involves a range of challenges, including raw material availability, infrastructure investments, and logistical considerations. While these challenges are significant, they can be overcome through investments in research and development, sustainability initiatives, and collaborations with supply chain partners. As the demand for battery-powered products continues to grow, it is crucial for battery manufacturers to prioritize sustainability, social responsibility, and innovation to ensure a positive impact on both the environment and society.

Chapter V - Government Initiatives

In this Chapter, we explore some government initiatives and support for battery manufacturing in India, namely, the Goods and Services Tax, the Production-Linked Incentive Scheme for Advanced Chemistry Cell Battery Storage, and the Viability Gap Fund.

5.1 Goods and Services Tax (GST)

The applicability of GST on batteries depends on the type of battery, place of supply of battery, and the use of the battery. At present, GST applies to most types of batteries, like lead-acid batteries, lithium-ion batteries, etc. The rate of GST depends on the use of the battery and the type of battery.

For instance, GST on inverter batteries is charged at 28% in India. On UPS batteries (static convertors), the GST is 28% as well. Lithium-ion batteries, typically used for laptops, personal computers, mobile phones, and tablets, attract a GST rate of 18%. The figure below provides an overview of the different types of batteries, their HSN Codes, and the GST rates they attract.

Figure 9: GST Rates for Different Battery Types

Product	HSN Code	GST Rate
Primary cells and Primary batteries	8506	18%
Lead-Acid accumulators	8507	28%
Nickel-Cadmium accumulators	8507	28%
Lithium-ion batteries	8507	18%
Lithium-ion accumulators (other than batteries), including lithium-ion power banks	8507	18%
Waste and scrap of primary cells, primary batteries, and electric accumulators	8548/8549	18%

Source: Cleartax

5.2 Production-Linked Incentive Scheme for Advanced Chemistry Cell (ACC) Battery Storage

The Government approved Production Linked Incentive (PLI) Scheme 'National Programme on Advanced Chemistry Cell (ACC) Battery Storage' is aimed at achieving manufacturing capacity of Fifty (50) GigaWatt Hour (GWh) of ACC for enhancing India's Manufacturing Capabilities with a budgetary outlay of ₹18,100 crore. Under the program, the manufacturing facility would have to be set up within a period of two years. The incentive will be disbursed thereafter over a period of five years on sale of batteries manufactured in India.

Reliance Industries Ltd's (RIL) New Energy arm, Ola Electric Mobility Private Limited and Rajesh Exports Limited are the three companies that have signed the

Program Agreement under (PLI) Scheme for Advanced Chemistry Cell (ACC) Battery Storage.

This PLI scheme for Advanced Chemistry Cell (ACC) (₹18,100 crore) along with the already launched PLI Scheme for automotive sector (₹25,938 crore) and Faster Adoption of Manufacturing of Electric Vehicles (FAME) (₹10,000 crore) will enable India to leapfrog from traditional fossil fuel-based automobile transportation system to environmentally cleaner, sustainable, advanced and more efficient Electric Vehicles (EV) based system.

5.3 Viability Gap Funding for development of Battery Energy Storage Systems (BESS)

In September 2023, the Union Cabinet approved the Scheme for Viability Gap Funding (VGF) for development of BESS. The scheme envisages development of 4,000 MWh of BESS projects by 2030-31, with a financial support of up to 40% of the capital cost as budgetary support in the form of Viability Gap Funding (VGF).

This move is expected to bring down the cost of battery storage systems, thereby increasing their viability. By offering VGF support, the scheme targets achieving a Levelized Cost of Storage (LCoS) ranging from Rs. 5.50-6.60 per kilowatt-hour (kWh), making stored renewable energy a viable option for managing peak power demand across the country.

The VGF shall be disbursed in five tranches linked with the various stages of implementation of BESS projects. To ensure that the benefits of the scheme reach the consumers, a minimum of 85% of the BESS project capacity will be made available to Distribution Companies (Discoms). This will not only enhance the integration of renewable energy into the electricity grid but also minimize wastage while optimizing the utilization of transmission networks. Consequently, this will reduce the need for costly infrastructure upgrades.

Chapter VI - Conclusion

In conclusion, the global battery market is witnessing substantial growth, driven primarily by the Asia-Pacific region, particularly, China. China dominates both production and exports. The demand for battery energy storage is escalating worldwide, fueled by the imperative of transitioning to renewable energy.

India, as one of the top global battery producers, faces several challenges, and opportunities in this dynamic landscape. The Indian battery market, though contributing significantly to global production, grapples with trade deficits, particularly, in secondary batteries. The sector exhibits promise with an estimated growth rate of 3.13% in production by 2026.

State-level analyses reveal variations in the industry's footprint across India, with states like Telangana leading in the number of manufacturing factories. Employment prospects and profitability, however, vary widely. Assan and Chhattisgarh were observed to be the most profitable, while Delhi and Uttar Pradesh face challenges.

Identified gaps and challenges in the Indian battery market include high import dependence for raw materials, rising raw material costs, infrastructure and skilled workers constraints, logistical challenges, and a lack of coordination among stakeholders. Addressing these challenges is crucial for scaling up production to meet the growing demand for battery-powered products.

In response to these challenges, the Indian government has initiated several schemes, such as the PLI Schemes for ACC Battery Storage and the Viability Gap Funding for BESS. These initiatives aim to incentivize domestic manufacturing, reduce import dependence, and promote sustainability.

As the demand for battery-powered products continues to surge, overcoming these challenges will require collaborative efforts, sustained investments in R&D, and adopting a strategic approach to align policies, technologies, and stakeholders. Ultimately, the success of the Indian battery industry will depend on its ability to navigate these challenges and leverage government initiatives to emerge as a key player in the global battery market.

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