

Giga Factories

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Manifest pedagogy

India is taking a big leap forward in terms of gigafactories in the pursuit of energy security and combating air pollution. This topic is important because gigafactory is a path breaking approach. The working and science behind it are important for Prelims while its implementation and evaluation is for Mains

In news

- NITI Aayog has proposed the establishment of gigafactories in India for the manufacture of lithium-ion batteries in the next couple of years

Placing it in syllabus

- Indigenisation of technology

Static dimensions

- Working of gigafactory

Current dimensions

- Mobility transformation in India
- Giga factories across the world

Content

Niti Aayog has proposed that only electric (lithium-ion or other advanced battery chemistry only) three-wheelers would be sold in the country after March 31, 2023, and all new sales of two-wheelers below 150cc would be electric post March 31, 2025. It has also proposed that gigafactories be established for making lithium-ion batteries in India and at least three-four factories to be set up in the next two-three years. As

this is a sunrise industry, India need to start building capabilities to become a globally competitive player in this area



However the two-wheeler industry has strongly opposed the Aayog's proposal to stop selling ICE (internal combustion engine) 150cc two-wheelers, as the move would disrupt the industry that was already reeling under stress. Batteries are expensive and India would be importing lithium-ion batteries from China for its electric vehicles

Recently, the LIBCOIN consortium with Magnis Energy Technologies Limited holding 20 per cent of non-dilutive ownership along with state-owned BHEL finalised a deal with the Government of India, Ministry of Heavy Industries and Public Enterprises, to build '**India's first Lithium-ion Battery Gigafactory**'. Country's maiden gigafactory will start at 1GWh and will eventually increase to 30GWh. The project will be a part of the '**Made By India, For India**' initiative, which will accelerate domestic manufacturing of the important components for the electric vehicles.

Working of a gigafactory

Gigafactory, a giant operation that first took shape in the Nevada desert, is a **massive battery factory**, a part of the plan to help transition of the world onto renewable sources. **Tesla CEO Elon Musk** is the founder of Giga factory who is believed to have first coined the term "Gigafactory" in November 2013, and the word comes from the prefix "giga" which is used to denote a measurement that's been multiplied by one billion.

The gigafactory is intended to gradually provide cradle-to-cradle handling of batteries, from raw material over components to finished products, and recycling old batteries

into new. Cells constitute most of the value creation, whereas packing and electronics are minor parts. More engineers are assigned to developing production equipment than to developing products.

The basis of the energy storage system of Tesla products are **lithium-ion cells** in the 18650 form factor. These cylindrical cells have a diameter of 18 mm and are 65 mm in length, a size used for the batteries of laptops and are generally less expensive. The battery cells produced at the Gigafactory are of a new form factor, **larger than the 18650 cells**. Tesla uses Nickel Manganese Cobalt (NMC) lithium cells for stationary storage (Powerwall and Powerpack), and Nickel Cobalt Aluminium Oxide (NCA) for vehicles

Mobility transformation in India

India can save 64% of anticipated passenger road-based mobility-related energy demand and 37% of carbon emissions in 2030 by pursuing a shared, electric and connected mobility future. This would result in saving of approximately 60 billion USD by 2030. This reduction in energy consumption results from a synergistic impact of improvements in

- Systems integration Enabling wide-scale adoption of mobility solutions through ubiquitous availability and sharing of interoperable transport data (ITD).
- Scaled manufacturing Facilitating market creation through policies and mechanisms that enable manufacturing of electric vehicles (EVs) and necessary components in successive segments based on their market readiness
- Shared infrastructure development Better urban design, where a larger fraction of mobility demand is met by non motorised transit and public transit, and access to vehicle-charging infrastructure enables higher penetration of EVs



In addition to reducing energy demand, this transformation yields other benefits, including lower congestion of traffic, lower local emissions and improved public health. This has significant implications for India's electricity sector and economy, supporting India's ambitious renewable energy goals while saving money, providing jobs, and strengthening Indian industry

India is on the cusp of revolutionising its mobility system. The government has devised a twofold approach through the **Faster Adoption and Manufacturing of Electric Vehicles (FAME) Scheme**, which aims to benefit Indian industry and citizens. This Scheme's second phase offers \$1.4 billion in incentives to spur electric vehicle (EV) growth in the country

The NITI Aayog and the Rocky Mountain Institute (RMI) (a non-profit organisation) released a report on opportunities for the automobile sector and government under the FAME II scheme. The technical report titled 'India's Electric Mobility Transformation Progress to Date and Future Opportunities', quantifies the direct oil and carbon savings that the vehicles incentivised under FAME II will deliver. The FAME II scheme was notified by the Union Cabinet in February 2019, which aims to further accelerate the government of India's commitment to a clean mobility future, sees the electrification of transportation as a primary focus area

The report has **three primary objectives**

- Provide a summary of key policy and industry initiatives to support rapid adoption of electric mobility
- Analyse the impacts of FAME II with respect to emissions, oil consumption, and overall EV adoption trends
- Propose possible actions that industry and government can take in continued support of the faster deployment

of electric vehicles

FAME intends to catalyze the market for faster adoption of EVs to ensure durable economic growth and global competitiveness for India's automotive industry. If FAME II and other measures are successful, India could realize EV sales penetration of 30% for private cars, 70% for commercial cars, 40% for buses, and 80% for two- and three-wheelers by 2030.

Achieving these levels of market share by 2030 could generate cumulative savings of 846 million tonnes of CO₂ over the total deployed vehicles' lifetime.

The automotive industry's willingness to provide new mobility solutions will create enormous economic, social and environmental benefits for the citizens of India.

Giga factories in the world

There are at present three Gigafactories in the world

Gigafactory 1 This is operational since 2013 and is located in Nevada, USA.

Gigafactory 2 It's located in Buffalo, New York.

Gigafactory 3 This is the Tesla's latest factory where construction started in January 2019. It's located in the Lingang industrial zone of Shanghai, the first Gigafactory located outside of the United States.

More Gigafactories are yet to come up including one in Europe, possibly Germany.

- Giga factory 1 primarily develops lithium-ion batteries from start to finish. Tesla's partner Panasonic produces the cells in a secretive area of the factory, which carries out checks along the way to ensure high quality. Alongside the batteries, the factory produces electric motors for the Tesla Model 3, the company's cheapest-

ever car, plus the Powerwall and Powerpack energy storage systems designed to work with renewable sources.

- Giga factory 2 produces photovoltaic solar panels, like the ones used in the Tesla Solar Roof.

Giga factory 3 is planned to produce affordable versions of the Tesla Model 3 and Tesla Model Y for the Greater China market