Nishith Desai Associates
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E-Mobility: A Sustainable Automotive Future

Legal and Tax Analysis

November 2019

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1. Glossary

CCS	Combined Charging System
Discoms	Distribution Companies
DEP	Draft Energy Policy
EESL	Energy Efficiency Services Limited
EM	Electric Mobility
EV	Electric Vehicle
FAME	Faster Adoption and Manufacturing of (Hybrid &) EVs, 2015
GHG	Greenhouse Gas
GOI	Government of India
HOV	High occupancy vehicle
ICE	Internal Combustion Engine
IEP	Integrated Energy Policy
kWh	Kilowatt Hour
MAT	Minimum alternate Tax
MRTH	Ministry of Transport and Highways
NDRC	National Development and Reform Commission
NEA	National Energy Administration
NEMMP	National Electric Mobility Mission Plan
OEM	Original Equipment Manufacturers
STUs	State Transport Undertakings
ZEV	Zero- emissions vehicles

2. Executive Summary

The automobile industry of the 20th century was dominated by western automobile manufacturers from the United States and other European nations. The Iconic American automobile manufacturer Ford Motors, led the revolutionary wave of vehicles powered by an internal combustion engine ("**ICE**"). However, with growing concerns over rising vehicular emissions which make up a majority of green-house emissions, governments and automobile manufacturers across the world are seeking to transition from using fossil fuel combustion vehicles to electric-powered vehicles. Within the next decade, automobile makers plan to invest up to $300 billion on electric vehicle ("**EV**") technology.[1] China which for decades played catch-up to German, Japanese and American automobile manufacturers is now positioned to lead the EV revolution and has transformed itself into the world's largest EV market.[2]

As nations around the globe are joining forces to reduce the impact of climate change, EV's provide an effective solution for curbing global warming. At the Paris Climate Conference in December 2015, 195 countries adopted the first-ever universal, legally binding global climate deal. The Paris Agreement builds upon United Nations Framework Convention on Climate Change and seeks to bring all states together in a common cause to undertake ambitious measures to counter climate change and adapt to its effects. The agreement requires all parties to put forward their best efforts through nationally determined contributions and to strengthen these efforts in the years ahead. It also requires all parties to regularly report on their emissions and on their implementation efforts to ensure adequate checks.[3] To achieve their emission targets many countries have resorted to placing restrictions on conventional gasoline and diesel engines, which has led automobile companies to accelerate the shift towards electrification.[4]

In line with India's Paris Agreement targets of taking a lower carbon emission pathway, the government of India ('**GOI**') has pledged to reduce greenhouse emissions by 33-35 per cent from 2005 levels, by 2030.[5] The Indian automobile market is the fourth largest in the world and is set to occupy the number three position within three years.[6] However, this growth has led to an air pollution crisis, with Indian urban centres ranking amongst the post polluted in the world, and an increased dependency on expensive crude oil imports. This puts India's energy security position at risk, in case of any volatile changes in the prices of crude oil.[7]India is currently the world's third-largest importer of crude oil and aims to cut-back on the crude import bills by pushing towards the adoption of EVs.[8] In India, the transport sector contributes close to 10% of the total national greenhouse gas (**GHG**) emissions, with road-based transport i.e. automobiles

1. Paul Lienert, Norihiko Shirouzu, Edward Taylor, *Exclusive: Volkswagen, China spearhead $300 billion global drive to electrify cars*, REUTERS (August 19, 2019), https://in.reuters.com/article/autoshow-detroit-electric/exclusive-volkswagen-china-spearhead-300-billion-global-drive-to-electrify-cars-idINKCN1P40Ho.
2. *China's Car Revolution Is Going Global*, BLOOMBERG BUSINESSWEEK (July 20, 2019), https://www.bloomberg.com/news/features/2018-04-23/china-s-carmakers-want-to-dominate-world-s-next-era-of-driving.
3. *What is the Paris Agreement?*, UNFCCC **(August 10, 2019),** https://unfccc.int/process-and-meetings/the-paris-agreement/what-is-the-paris-agreement.
4. Charles Riley, The great electric car race is just beginning, CNN BUSINESS (August 19, 2019), https://edition.cnn.com/interactive/2019/08/business/electric-cars-audi-volkswagen-tesla/.
5. *India's Intended Nationally Determined Contribution is Balanced and Comprehensive: Environment Minister*, PRESS INFORMATION BUREAU (July 20, 2019), http://pib.nic.in/newsite/PrintRelease.aspx?relid=128403.
6. Patrick Mcgee and Simon Mundy, *India displaces Germany to become fourth-largest auto market*, FINANCIAL TIMES (July 18, 2017), https://www.ft.com/content/73b7ccf6-1714-11e9-9e64-d150b3105d21.
7. Zhijie Zhang and Wanli Xing 2018 IOP Conf. Ser.: Earth Environ. Sci. 153 032046 https://iopscience.iop.org/article/10.1088/1755-1315/153/3/032046/pdf.
8. *Nitin Gadkari bats for biofuel, electric cars to reduce air pollution, cut crude oil import*, TIMES OF INDIA (July 21, 2019), https://timesofindia.indiatimes.com/india/nitin-gadkari-bats-for-biofuel-electric-cars-to-reduce-air-pollution-cut-crude-oil-import/articleshow/70196144.cmsslowdown.

contributing about 87%.[9] Battery operated EVs, which have a zero rate of emission, have been recognised as a viable alternative to ICE based vehicles.

Mr Nitin Gadkari, Minister of Road Transportation in 2017 made an announcement for the automobile industry declaring his vision for Indian roads to have 100% EV by 2030.[10] This ambitious target came as a surprise to many, considering that the United Kingdom[11] and France[12] which are smaller markets than India are hoping to phase out ICE vehicles by 2040. However, keeping in mind the existing state of the automobile industry and employment concerns the GOI eventually diluted their plans for electric passenger cars from 100% to 30%.[13]

Pursuant to the above the GOI has launched various policy initiatives and schemes for the Indian automotive industry to incentivise the transition from ICE based vehicle to battery-powered EV. This paper analyses the challenges in the adoption of electric vehicles, with a regulatory, commercial and socio-economic perspective. Policy reports, regulations, state initiative's as well as a comparative analyses of EV policies from leading jurisdictions have been considered in this paper.

9. CSTEP (2018), Roadmap for achieving India's NDC pledge, (CSTEP-Report- 2018-08), http://www.cstep.in/drupal/sites/default/files/2019-01/CSTEP_RR_Roadmap_for_Achieving_Indias_NDC_Pledge_Nov2018.pdf.

10. *Switch to clean vehicles or get bulldozed: Nitin Gadkari tells automakers*, HINDUSTAN TIMES ((July 21, 2019), https://www.hindustantimes.com/india-news/nitin-gadkari-to-automakers-switch-to-alternative-fuel-or-be-bulldozed/story-Uyt44yGMiFzQwwosp5QNEL.html.

11. Stephen Castle, *Britain to Ban New Diesel and Gas Cars by 2040*, THE NEW YORK TIMES (July 14, 2019), https://www.nytimes.com/2017/07/26/world/europe/uk-diesel-petrol-emissions.html.

12. Angelique Chrisafis and Adam Vaughan, *France to ban sales of petrol and diesel cars by 2040*, THE GUARDIAN (July 14, 2019), https://www.theguardian.com/business/2017/jul/06/france-ban-petrol-diesel-cars-2040-emmanuel-macron-volvo.

13. India turns to electric vehicles to beat pollution, BBC (July 25, 2019), https://www.bbc.com/news/world-asia-india-48961525.

3. Embracing The Idea

EV is an automobile propelled by one or more electric motors, drawing power from an on-board source of electricity, typically batteries. EV's are mechanically simpler, less polluting and more durable than gasoline-powered cars.[14] To promote the widespread adoption of EVs, various governments across the world are utilizing a 'carrot and stick' approach to increase sales of EVs. However, the lack of adequate charging infrastructure is contributing to range anxiety concerns in the mind of consumers.[15] These concerns include the fear of being left stranded due to battery drainage or exhaustion and is a key reason that desists buyers from purchasing an EV.[16]

Additionally, the high upfront cost of EVs continues to pose a challenge for improving the rate of EV penetration into mainstream transportation. A typical EV costs significantly more than an ICE equivalent. As per a study conducted in the United States of America, in the compact passenger vehicle segment, electric vehicle costs 44% more than an equivalent ICE vehicle. For a mid-size passenger vehicle, the electric vehicle was found to be 60% more expensive.[17] It is for this reason that automobile manufacturers fear that the price of electrifying a small car may put it beyond the reach of buyers[18], as they feel that an ideal small EV should be able to meet consumer expectations pertaining to the range, charging time and affordability.[19] Despite the fact that the purchase price of EVs is more than their ICE based counterparts, the associated energy cost of operating an EV is much lower than that of an ICE based vehicle. For an average consumer, the recovery of the extra premium paid for buying an EV can be realised within 5 years. When an EV is used as a taxi, the timeline of recovery further gets reduced to just two years. Further, as battery costs drop across the world, EVs will become even more cost- competitive.[20]

14. Electric Vehicles Definition, EV NEWS (August 19, 2019), https://electricvehiclesnews.com/Definition/description.htm.

15. *Hyundai Kona electric SUV explodes inside a home garage*, BUSINESS TODAY (July 16, 2019), https://www.businesstoday.in/sectors/auto/hyundai-kona-electric-suv-explodes-inside-a-home-garage-in-canada-ev/story/368734.html

16. Anil Sasi and Sandeep Singh, *E-drive: High voltage, low charge* (July 18, 2019), https://indianexpress.com/article/auto-travel/e-drive-high-voltage-low-charge-electric-vehicles-budget-2019/

17. John W. Brennan and Timothy E. Barder, *Battery Electric Vehicles* vs. Internal Combustion Engine Vehicles, ADLITTLE (August 16, 2019), https://www.adlittle.de/sites/default/files/viewpoints/ADL_BEVs_vs_ICEVs_FINAL_November_292016.pdf.

18. ibid

19. Surajeet Das Gupta, *Current tech doesn't enable production of small e-cars: Maruti chairman*, BUSINESS STANDARD, August 2, 2019, at 1.

20. Alnoor Peermohamed, *Ola kicks off pilot of its electric mass mobility project in Nagpur*, BUSINESS STANDARD (August 6, 2019), https://www.business-standard.com/article/companies/ola-kicks-off-pilot-of-its-electric-mass-mobility-project-in-nagpur-117052601413_1.html.

4. Policies & Regulations In India

The auto sector contributes 7.5 per cent of India's gross domestic product and is responsible for a whopping 49 per cent of manufacturing GDP with a massive economic multiplier impact. The auto manufacturing space provides direct employment to eight million people in the manufacturing and service sector, which includes dealerships. The number swells up to 40 million people when one considers the extensive backward and forward linkages that include among other financiers, drivers and gasoline pump attendants.[21] The automobile sector is a key contributor to India's GDP, which attracts significant attention from the GOI in the form of responsive policy making and lucrative incentive schemes to direct the growth of this sector.

In the financial year 2018-19, the total number of EVs sold in India reached 7,59,600 units, which was primarily dominated by 6,30,000 units of three-wheeler and 1,26,000 units of two-wheeler vehicles.[22] However, this is a minuscule figure when compared to the total automobiles sold during that period. To improve the perception towards EVs amongst Indian consumers, both central and state government will have to provide a significant boost to the EV ecosystem by making charging infrastructure robust. The need to promote domestic manufacturers by enhancing their capacity to locally produce critical components such as motors, controllers and batteries instead of depending on imports from China has also been recognised.[23]

To provide a significant impetus to EVs in India, the GOI has come out with certain key policies to push for its adoption, which are discussed as follows.

I. Energy Policy, 2017

In 2006, the GOI had released an Integrated Energy Policy 2006 ("**IEP**"). The IEP recommended the promotion of hybrid vehicles and EVs by way of undertaking significant efforts to promote the development of low weight and high-density batteries. The IEP also emphasized on making available commercially viable hybrid and flex-fuel vehicles in India, which run on varying proportions of ethanol-blended fuels. The policy proposed various fiscal incentives such as subsidies, tax incentives for the automotive industries to support commercialization of hybrid and battery-operated vehicles in India.[24]

This was further substituted by the National Electric Mobility Mission Plan 2020, as discussed below.

II. National Electric Mobility Mission Plan 2020

The National Electric Mobility Mission Plan 2020 ("**NEMMP**") was launched in 2013 by the Ministry of Heavy Industries and Public Enterprises in the form of a vision statement towards unveiling the demand for EVs. The key principles that guide the future roadmap for EV penetration in NEMMP include creating consumer acceptability for EVs by developing infrastructure to support ownership and use of EVs, development/acquisition of EV / battery technology and creation of local manufacturing capability. The NEMMP aims to utilize electric mobility as an opportunity to achieve global

21. Ajay Bodke, *Trouble in Motown! Auto sector which is 49% of manufacturing GDP looks for rescue*, MONEY CONTROL, (August 16, 2019), https://www.moneycontrol.com/news/business/markets/trouble-in-motown-auto-sector-which-is-49-of-manufacturing-gdp-looks-for-rescue-4264251.html.

22. Nilesh Wadhwa, EV *sales in India cross 7.5 lakh mark in FY2019*, AUTOCAR INDIA (July 21, 2019), https://www.autocarindia.com/car-news/ev-sales-in-india-cross-75-lakh-mark-in-fy2019-412542.

23. Lijee Philip, India Short on *EV Parts Makers, to Rely on Chinese Imports*, ET AUTO (July 20, 2019), https://auto.economictimes.indiatimes.com/news/auto-components/india-short-on-ev-parts-makers-to-rely-on-chinese-imports/68457597

24. Integrated energy policy, Planning Commission, Govt. of India, http://planningcommission.gov.in/reports/genrep/rep_intengy.pdf

leadership in manufacturing of EVs and for the expansion of domestic markets by providing an initial boost that can create demand for EVs, which would stimulate growth in the manufacturing of EVs, at scale. The NEMMP through the development of indigenous manufacturing capabilities, requisite infrastructure, consumer awareness and technology, aims to achieve sale of 6-7 million units for a full range of EV (mild hybrids to full electric) by 2020. The bulk of this demand is expected to come from (**pure**) electric two-wheelers, followed by hybrid EVs (**HEVs**) and other (**pure**) battery EVs (**BEVs**).[25]

The aim and vision for boosting e-mobility in India vis-à-vis NEMMP eventually culminated in the introduction of Faster Adoption and Manufacturing of Hybrid & EVs, 2015 scheme, as discussed below.

III. Faster Adoption and Manufacturing of Hybrid & EVs, 2015

The Department of Heavy Industry had launched an incentive scheme, known as the Faster Adoption and Manufacturing of (Hybrid &) EVs, 2015 ("**FAME**") in India, to give impetus to EV adoption, especially by promoting the use of electric buses for public transportation. FAME has a fourfold objective, which can be categorised into technology development, demand creation, pilot projects and charging infrastructure.[26]

FAME encourages faster adoption of electric and hybrid vehicles by offering upfront incentives on the purchase of such vehicles as well as by establishing necessary charging Infrastructure. The first phase of the scheme was notified on April 1, 2015, with a total outlay of INR 7.95 billion.[27] Initially launched for two years, GOI kept extending the scheme every six months till March 2019 and enhanced the total outlay to INR 8.95 Billion ("**FAME 1**").

Under FAME 1, the demand incentive is provided to consumers which can be availed upfront at the point of purchase and the same is reimbursed to the manufacturers from Department of Heavy Industries (**DHI**) on a monthly basis.[28] The idea behind this is to induce demand for EVs in the market by making them more affordable to businesses and individuals. Since the inception of the scheme, the GOI had given financial support (demand incentive) to about 2,61,507 electric/ hybrid vehicles till 6th December 2018.[29]

Recently, the GOI revised its incentive scheme with FAME 2, which came into effect on 1st April 2019. FAME 2 is an expanded version of FAME 1 and entails a total subsidy of INR 96.34 billion by the GOI towards Original Equipment Manufacturers ("**OEM**") of EVs for three years till 2022. The GOI has sanctioned INR 85.96 billion for demand incentives and INR 10 billion have been earmarked for creating charging infrastructure. FAME 2 also offers incentives for electric buses, three-wheelers and four-wheelers which are to be used for commercial purposes. Plug-in hybrid vehicles and those with a sizeable lithium-ion battery and electric motor shall also be eligible for financial incentives depending on the size of the battery.[30]

25. National Electric Mobility Mission Plan 2020, Dept. of Heavy Industries & Public Enterprises, Govt. of India, ://dhi.nic.in/writereaddata/Content/NEMMP2020.pdf

26. Ministry of Heavy Industries & Public Enterprises, *Publication of notification in Gazette of India (Extraordinary) regarding Phase-II of FAME India scheme*, F.No. 1(1)/2019-AEI (Notified on March 8, 2019). https://dhi.nic.in/writereaddata/UploadFile/publicationNotificationFAME%20II%208March2019.pdf.

27. Ibid

28. *Anant Geete Launch's the Scheme for Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles in India – Fame India*, PRESS INFORMATION BUREAU (July 19, 2019), http://pib.nic.in/newsite/PrintRelease.aspx?relid=118088.

29. *FAME-India Scheme*, PRESS INFORMATION BUREAU (July 19, 2019), http://pib.nic.in/newsite/PrintRelease.aspx?relid=186277

30. Ministry of Heavy Industries & Public Enterprises, *Publication of notification in Gazette of India (Extraordinary) regarding Phase-II of FAME India scheme*, F.No. 1(1)/2019-AEI (Notified on March 8, 2019). https://dhi.nic.in/writereaddata/UploadFile/publicationNotificationFAME%20II%208March2019.pdf.

Under FAME 2 GOI envisages support for setting up of public charging infrastructure through active participation of various stakeholders, which includes government agencies, private industries and public-sector enterprises. FAME 2 also proposes provision of one slow-charging station for every electric bus and one fast-charging station for 10 electric buses.[31]

To have a net positive impact on the environment, FAME 2 encourages interlinking of renewable energy sources with charging infrastructure. As per FAME 2, the intent of GOI is to incentivize the purchase of 7,090 electric buses with an outlay of INR 35.45 billion, 20,000 hybrids with INR 260 million, 35,000 four-wheelers with INR 5.25 billion and 500,000 three-wheelers with INR 25 billion. However, the same is subject to review on a periodic basis and would be notified accordingly by the GOI from time to time.[32]

In addition to the above, the key incentives under FAME 2 are detailed below:

A. Demand Incentives

To provide upfront subsidies to buyers in the form of reduced price for acquiring an EV, FAME 2 states that subsidies will be linked to battery capacity of the vehicles. It proposes to extend an incentive of INR 10,000 per kilowatt hour (**kWh**) for two, three and four-wheeler EVs, based on the size of their batteries. To illustrate, if a car has 25 kWh battery pack it shall get INR 250,000 subsidy. Incentives based on battery pack size will encourage manufacturers to add bigger batteries subsequently leading to extended range of EV's.

To encourage state transport undertakings ("**STU**") to purchase more electric buses for intra-city, inter-city or inter-state travel, INR 20,000 per kWh will be offered as an incentive. However, the amount for buses may further be subject to competitive bidding amongst OEMs conducted by STUs. STUs come out with their own technical requirements. The technically qualified proposal with the lowest rate is awarded the contract. Electric buses will be offered incentives based on the operational expenditure model adopted by State/City transport undertakings and other public entities operating in the transport sector to supplement the fleet of EVs. To prevent misallocation of subsidies, the GOI has sought to restrict high end EVs from availing government-funded demand incentives. Only buses priced up to INR 20 million and plug-in hybrids, four-wheeler EV under INR 1.5 million, three-wheelers under INR 500,000 and two-wheelers under INR 150,000 will be eligible for incentives.[33]

B. Disbursement of Demand Incentives

All OEMs, except for the ones manufacturing buses, shall be able to claim demand incentives discussed above through an e-enabled framework and mechanism set-up under Dept. of heavy industries. The OEMs shall submit their claims for reimbursement of demand incentive on a monthly basis to the Dept. of heavy industry for settlement. Though the above-stated measures will have an immediate impact on the upfront pricing of EVs and bring in more models, it will take sustained efforts by the Centre, in partnership with State governments, along with adequate private sector investment, to enable setting up of a vibrant EV ecosystem.[34]

31. Ibid
32. Ibid
33. Ibid
34. Ibid

5. Charging Infrastructure Policy

GOI through FAME 2 which was implemented with effect from 1st April 2019, seeks to boost the availability of charging stations in India through active participation of both private and public-sector. Of the total allocation under FAME 2, INR 10 billion has been allocated for setting up charging stations for EVs. Keeping in mind that charging infrastructure availability is one of the key requirement for accelerated adoption of EVs, the Ministry of Power vide its notification[35] sought to promote affordable tariffs for EV owners and charging station operators. Basis the same, setting up of public charging stations is to be a delicensed activity and any individual/entity can set up public charging stations as long as they adhere to the prescribed technical, performance standards and protocols. Further, it was also clarified that setting up of charging station for EVs won't require a license under the provision of the Electricity Act, 2003.[36]

In order to ease up the process of setting up charging stations, the notification also provides that any person seeking to set up a public charging station will be given electricity connections on priority by the power distribution company supplying in that area.

Lastly, realizing the importance that robust charging infrastructure has on the minds of the consumers, it was recommended that there should be at least one charging station in a grid of 3 km x 3 km and one charging station every 25 kms on both sides of the highways/roads. Further, the state nodal agency shall fix the ceiling of the service charges to be charged by the public charging stations to ensure reasonable pricing.[37]

I. Setting up of Charging Infrastructure

In furtherance of the objectives of FAME 2, the GOI through an expression of interest issued by the Ministry of Heavy Industries invited proposals for the deployment of EV charging infrastructure in big and smart cities on July, 12 2019. The expression of interest has also invited proposals from satellite towns connected to seven metros (Delhi, Mumbai, Kolkata, Chennai, Hyderabad, Bengaluru and Ahmedabad); major cities of special categories State/UTs; and the capital city of all states/UTs not covered in the above categories.[38]

In a move to make it convenient for a personal vehicle owner to make a shift towards EVs, the Union Housing and Urban Affairs Ministry have made amendments to the Model Building Byelaws 2016, and Urban Regional Development Plans Formulation and Implementation Guidelines 2014. Provisions have also been made for setting up EV charging stations in residential and commercial buildings, bus terminals and service stations and multi-level parking lots.[39] These guidelines on EV Charging Infrastructure have also been circulated to all the State Governments and UT administrations with the request to amend their building byelaws and master plan regulations.[40]

35. Notification vide No. 12/2/2018-EV dated December 14 2018

36. *Govt to allow individuals to set up electric vehicle charging stations without licence*, BUSINESS TODAY (July 24, 2019),https://www.businesstoday.in/sectors/auto/govt-to-allow-individuals-to-set-up-public-ev-charging-stations-without-licence/story/289304.html

37. *Charging Infrastructure for Electric Vehicles – Guidelines and standard*, MINISTRY OF POWER, GOVT. OF INDIA (July 24, 2019), https://powermin.nic.in/sites/default/files/webform/notices/scan0016%20%281%29.pdf.

38. E*OI inviting proposals for availing incentives under Fame India scheme phase 2 for deployment of EV charging infrastructure within cities*, MIN. OF HEAVY INDUSTRIES, GOVT. OF INDIA (July 24, 2019), https://dhi.nic.in/writereaddata/UploadFile/EOI%20for%20EV%20charging%20in%20cities%2012%20july.pdf

39. *Amendments in Model Building Bye-Laws (MBBL - 2016) for Electric Vehicle Charging Infrastructure*, MOHUA, GOVT. OF INDIA (July 24, 2019), http://mohua.gov.in/upload/whatsnew/5c6e472b20d0aGuidelines%20(EVCI).pdf

40. Model Building Byelaws 2016 & Urban Regional Development Plans Formulation and Implementation Guidelines 2014 Amended for Establishing EV Charging Infrastructure, PRESS INFORMATION BUREAU (July 24, 2019), http://pib.nic.in/PressReleaseIframePage.aspx?PRID=1564744

II. Charging Standard

As per GOI's notification[41], public charging stations shall install both European Combined Charging System ("**CCS**") and Japanese CHAdeMO[42] charging platforms in addition to the Indian Bharat Standard. Of the three standards, Bharat Standard utilises low voltage charging technology (72 volts – 100 volts). Whereas CCS and CHAdeMO Standards utilise high voltage technology (200 volts and above).

There are also media reports which suggest that India plans to come up with new indigenous charging standards. As per a report, the main incentive of having indigenous charging standards is to significantly reduce the cost of setting up charging stations in India. Presently, companies setting up charging stations which utilise global charging standards such as European CCS or Japanese CHAdeMO, have to pay license fee which makes the entire process of setting up significantly expensive.[43]

Globally, the world of electric vehicle charging standards has been fragmented, but over time some leading standards are emerging. CCS is primarily being driven by European and North American auto manufacturers.[44] China, which has developed its own standard known as GB/T, is now collaborating with Japanese CHAdeMO to develop a next-gen ultra-fast EV charging standard.[45]

41. Notification vide No. 12/2/2018-EV dated December 14 2018.

42. CHAdeMO is the trade name of a fast charging method for battery electric vehicles delivering up to 62.5 kW by 500 V, 125 A direct current via a special electrical connector.

43. Malyaban Ghosh and Utpal Bhaskar, *India to frame indigenous EV charging station norms*, LIVEMINT (August 10,2019), https://www.livemint.com/news/india/india-to-frame-indigenous-ev-charging-station-norms-1558028487540.html.

44. *A harmonized connector approach per geographical region facilitates EV market uptake*, CHARGING INTERFACE INITIATIVE (August 11, 2019), https://www.charinev.org/fileadmin/Downloads/Papers_and_Regulations/CharIN_One_Pager_Connectors_used_worldwide.pdf.

45. Fred Lambert, *CHAdeMO and China are working together on a 'next-gen ultra-fast' EV charging standard*, ELECTREK (August 11, 2019), https://electrek.co/2018/08/27/chademo-china-next-gen-ultra-fast-ev-charging-standard/.

6. Tax Incentives

In a bid to boost EV adoption in India, the GOI has introduced numerous incentives in this year's finance budget to generate consumer interest in EV and also attract fresh investments in EV manufacturing. The Finance Minister recently announced income tax rebates of up to INR 150,000 to customers on interest paid on loans to buy EVs, with a total exemption benefit of INR 250,000 over the entire loan period. The Finance Minister also announced the customs duty exemption on lithium–ion cells, which will contribute to the reduction in the cost of lithium-ion batteries in India. Since key components such as lithium-ion cells are not manufactured locally, makers of components such as solar electric charging infrastructure, lithium storage batteries and other components will be offered income tax exemptions, which will be linked to the investment made as per Section 35AD of the Income Tax Act, to incentivize EV uptake and increase local value addition.[46]

Post budget, the goods and services tax council proposed to reduce taxes on EVs to the lowest slab of 5% from 12%. The tax on EV chargers has also been reduced to 5% from 18%.[47] Manufacturers of EV have been pushing for a reduction in the GST rates for a long time, considering that the EV industry is still at a nascent stage.[48]

With respect to the import of completely built-up EV, the custom duty of 60% / 100% is charged depending upon the price and size of the engine. However, for a pre-assembly version of an EV, the GOI has lowered custom duties on parts and components imported for assembly to 10 to 15 per cent[49] from 15 to 30 per cent. Indian policymakers have consistently expressed their intention to make India a global hub of manufacturing of EV by encouraging local manufacturing of components under the Make in India initiative.[50]

46. Dilasha Seth, *Budget likely to charge up electric vehicle push with tax incentives*, BUSINESS STANDARD (July 18, 2019), https://www.business-standard.com/article/economy-policy/budget-likely-to-charge-up-electric-vehicle-push-with-tax-incentives-119062601459_1.html

47. Gireesh Chandra Prasad, *GST Council slashes tax rates on electric vehicles, chargers*, LIVEMINT (July 16, 2019), https://www.livemint.com/news/india/gst-council-slashes-tax-rates-on-electric-vehicles-chargers-15642121950 59.html.

48. *Auto industry pitches for lower GST on EVs*, THE NEW INDIAN EXPRESS (July 16, 2019), http://www.newindianexpress.com/business/2019/jun/21/auto-industry-pitches-for-lower-gst-on-evs-1993195.htmlindia

49. Abhilasha Singh, *Budget 2019: SIAM welcomes reduction in import duty on CKD electric vehicle components*, FINANCIAL EXPRESS (August 12, 2019), https://www.financialexpress.com/auto/car-news/budget-2019-siam-welcomes-reduction-in-import-duty-on-ckd-electric-vehicle-components/1461562/.

50. Malyaban Ghosh, *Govt steps on the gas to put India's EV mission in fast lane*, LIVEMINT (July 16, 2019), https://www.livemint.com/budget/news/govt-steps-on-the-gas-to-put-india-s-ev-mission-in-fast-lane-1562350841874.html.

7. State Level Policies

To incentivise the use of EV/hybrid vehicles and with the intention to expand their manufacturing base, multiple state governments have taken various initiatives to attract global EV manufacturers to set up manufacturing plants within the states. They have also come out with both monetary and non-monetary incentives such as affordable power tariffs to fast track adoption of EVs, affordable charging etc. The EV policies of some states are discussed below.

I. Karnataka

Karnataka's EV policy aims to attract investments worth INR 310 billion and create 55,000 jobs, both from the supply and the demand side. It seeks to create a conducive environment for transition to EVs from the ICE vehicle's. The policy also focuses on research and development and has provisions for special initiatives for EV manufacturing such as making industrial land available to create EV manufacturing zones. To attract manufacturing enterprises, it proposes to provide quality infrastructure in the form of readymade flatted factories, with sewage, power, water and testing facilities on a ready built basis to enable setting up of ancillary units through public private partnership. The policy seeks to establish a vibrant EV ecosystem by providing support for manufacturing plants, charging infrastructure, skill development incentives and includes concessions such as stamp duty exemption, capital subsidies, concessional registration charges, reimbursement of land conversion fee, interest free loan among others. It seeks to establish a start-up incubation centre to facilitate developments in E-mobility wherein start-ups will be encouraged to develop business models centred on EVs. As per the policy a venture capital fund will also be set up for research on EV mobility. The policy aims to shift auto-rickshaws, cab aggregators, corporate fleets and public transport systems into EVs. This shall be achieved by encouraging auto rickshaws to go for retrofitting and move towards E-mobility. STUs will introduce 1,000 electric buses during the policy period. Cab aggregators, corporate fleet, school buses/vans in Bengaluru will be encouraged to achieve 100% electric mobility by 2030 through a combination of tax incentives and subsidies. [51]

II. New Delhi

New Delhi has attracted global attention for being one of the most polluted cities in the world[52]. The New Delhi EV policy seeks to promote the rapid adoption of battery EVs so that they contribute to 25 per cent of all new vehicle registrations by 2023. New Delhi's EV policy seeks to incentivise the purchase of EVs and support electrification of public and shared transport. It seeks to waive off road tax, registration charges, one-time parking fee, and auto-rickshaw permit fees for e-autos. It seeks to encourage App-based aggregators and ride-hailing service providers to create a fleet of EVs by offering cash back rebates for short first and last mile connectivity trips. Additionally, a congestion fee of up to 2.5 per cent on fare will be levied on all cab aggregator and taxi trips. However, this tax will be waived for rides taken in an EV. Fee collected will be deposited with the government every month and will be allocated to the State EV Fund. For public transport, the Delhi government is looking to have 50 per cent of the new vehicles registered to be electric in five years. The policy includes provisions such as changes in building bye-laws, availability of concessional locations for charging stations to create an enabling framework for the creation of private as well as public charging infrastructure[53]

51. *Karnataka Electric Vehicle & Energy storage Policy 2017*, GOVT. OF KARNATAKA (July 21, 2019) https://www.vtpckarnataka.gov.in/pdf/policies/Karnataka-State-Electric-Vehicle-Energy-Storage-Policy-2017-ilove-pdf-compressed.pdf.

52. Mayank Bhardwaj, *New Delhi is world's most polluted capital, Beijing eighth*, REUTERS (JULY 24, 2019), https://in.reuters.com/article/us-india-pollution/new-delhi-is-worlds-most-polluted-capital-beijing-eighth-idINKCN1QM1FH.

53. *Delhi Electric Vehicle Policy*, GOVT. OF NCT OF DELHI (July 21, 2019), http://transport.delhi.gov.in/sites/default/files/All-PDF/Electric%20Policy%202018.pdf

III. Maharashtra

Through its EV policy, Maharashtra aims to Increase the number of registered EVs to 500,000. In the process, it seeks to generate an investment of INR 250 billion for EVs and EV infrastructure, and create jobs for 1,00,000 people. It seeks to achieve this through fiscal and non-fiscal incentives such as exemption from road tax and registration fees to increase the viability of EVs. In order to boost charging infrastructure, it provides for the creation of dedicated EV charging infrastructure through subsidised investment. It seeks to promote R&D and innovation in this sector. Petrol pumps will be allowed to set up charging stations freely, subject to regulations. To increase the share of EV in public transportation, it has a provision to promote EVs in public transport in six cities, i.e. Mumbai, Pune, Aurangabad, Thane, Nagpur, and Nashik. The first 1,000 private/public passenger electric bus buyers will be eligible for user subsidy for five years, and the first 100,000 EVs across categories will get end-user subsidy for five years.[54]

IV. Uttar Pradesh

Uttar Pradesh EV policy aims to establish UP as a preferred destination for attracting investments in EV manufacturing and create new employment opportunities in that process. To prevent transitional disruption, it plans to create a conducive environment to shift from ICE vehicles to EVs, by encouraging the use of Hybrid EVs during the transition phase. Hybrid EV's shall be supported through the promotion of methanol fuel cells which will smoothen transition and reduce pollution. To meet the needs of the industry it includes provisions to develop human capital and augment the power capacity. It plans to promote EVs in public transport by introducing 1,000 EV buses in phases by 2030. This will also introduce green routes in select destinations. To boost local manufacturing, it seeks to promote EV battery and charging equipment manufacturing, and incentivises manufacturing of Hydrogen-powered fuel cells and solar-powered cells through stamp duty reimbursement, SGST reimbursement along with capital and infrastructure interest subsidy. It also provides for setting up of EV incubation centres at IIT-Kanpur and other leading engineering institutions to encourage business models on EVs. The state provides 100 per cent road tax exemption on EVs purchased within the state.[55]

V. Andhra Pradesh

Andhra Pradesh seeks to attract investments worth INR 300 billion by 2030 to become a global hub for electric mobility development and manufacturing and is in the process of creating employment for 60,000 people. The cities of Vijayawada, Vishakhapatnam, Amaravati and Tirupati will be declared as model Electric Mobility (**EM**) cities with phase-wise goals to adopt EVs, charging & hydrogen refuelling infrastructure and new EV enabling building codes. It targets to bring in manufacturing units of high-density energy storage of at least 10GWh capacity in the next 5 years to cater to both domestic as well as the export market. It also aims to convert 100% of Andhra Pradesh state road transport corporation bus fleet of over 11,000 buses into electric buses by 2029, with the first phase of 100% conversion of the bus fleet in top 4 cities by 2024. With respect to tax incentives, 100% net SGST accrued to the State will be reimbursed for a period of five years for micro and small industries, seven years for medium industries, ten years for large industries. This reimbursement will be limited to 100% of Capex or for the period stated, whichever is earlier. Furthermore, 100% of stamp duty and transfer duty paid by the industry on purchase or lease of land meant for industrial use will be reimbursed[56]

54. *Maharashtra electric Vehicle Policy 2018*, GOVT. OF MAHARASHTRA (July 21, 2019), https://www.maharashtra.gov.in/Site/Upload/Government%20Resolutions/English/20180214180718981O.pdf.

55. *Uttar Pradesh Electric Vehicle Policy 2018*, GOVT. OF UTTAR PRADESH (July 21, 2019), https://niveshmitra.up.nic.in/Documents/DraftPolicies/Uttar_Pradesh_Electric_Vehicles.pdf.

56. *Electric Mobility Policy 2018-23*, GOVT OF ANDHRA PRADESH (July 20, 2019), https://www.acma.in/uploads/doc/AP%20Policy_final.pdf.

8. Industry Impetus

I. Battery Swapping

In FY 2018-2019, total EV sales in India crossed the 7,50,000-units mark and reached a total of 7,59,600 units and more than 99% of it was from two-wheelers and three-wheelers, and less than 1% from the four-wheelers.[57] Considering India is a small vehicle dominated market, battery swapping in these segments presents a leapfrogging opportunity for India's EV dreams. The key here is to make the transition easier for the users by finding a replacement for the existing petrol pump. Thus, it is important to ensure that battery swapping is actively treated as a promising solution to accelerate the adoption of EVs in India, especially for the smaller vehicle segment. Sensing the enormous opportunity that the Indian market offers, new entrants, both domestic and foreign, are working on creating an ecosystem of swappable batteries aimed at drastically cutting the time required for charging EVs, thus enabling faster adoption of electric mobility in the country. Leading the charge are companies like Sun Mobility,[58] Gurgaon-based Exicom Power Solutions and 22 Kymco, an alliance between startup Twenty Two Motors Pvt. Ltd and Taiwan's Kymco Global. They are working with their respective networks.

Additionally, Panasonic India Pvt. Ltd, which has committed to set up 100,000 EV charging stations to power an estimated fleet of 500,000 electric two- and three-wheelers in five years[59], is conducting pilot programs on battery swaps in the National Capital Region.[60]

II. Adoption of EV's by Government Department's

Several state transport corporations have introduced or planned to introduce electric buses, partly fuelled by the central subsidies launched in this regard.[61] Bharat Heavy Electricals[62] and Energy Efficiency Services Limited (**EESL**)[63] both are Government-owned power companies that have released plans to set up electric charging stations for EVs. GOI is considering a bulk purchase of an EV fleet from Energy Efficiency Services Ltd (**EESL**)[64]. EESL is a joint venture of four power public sector undertakings, namely NTPC Limited, REC Limited, Power Finance Corporation Limited and Power Grid Corporation of India Limited. It has in the past been credited to bring about an LED bulb revolution in the country by floating bulk tenders that led to an eight-fold reduction in the price of a 9 watt LED bulb in three years. In August 2017, it came out with its first tender of 10,000 vehicles.[65]

57. Nilesh Wadhwa, *EV sales in India cross 7.5 lakh mark in FY2019*, AUTOCAR INDIA (July 25, 2019), https://www.autocarindia.com/car-news/ev-sales-in-india-cross-75-lakh-mark-in-fy2019-412542.

58. *SUN Mobility ties up with electric vehicle fleet operator SmartE*, ECONOMIC TIMES (July 25, 2019), https://economictimes.indiatimes.com/small-biz/startups/newsbuzz/sun-mobility-ties-up-with-electric-vehicle-fleet-operator-smarte/articleshow/66848537.cms?from=mdr

59. *Amit Pandey, To put electric mobility in fast lane, firms push for swappable batteries*, LIVEMINT (July 25, 2019), https://www.livemint.com/auto-news/to-put-electric-mobility-in-fast-lane-firms-push-for-swappable-batteries-1561655633564.html.

60. *Panasonic Launches First of Its Kind EV Charging Service for India*, PANASONIC (July 25, 2019), https://news.panasonic.com/global/topics/2019/68524.html

61. Paran Balakrishnan, *E-buses gaining traction on Indian roads*, BUSINESSLINE (JULY 27, 2019), https://www.thehindubusinessline.com/opinion/columns/e-buses-gaining-traction-on-indian-roads/article26713920.ece.

62. *BHEL installs first solar EV charging station on Delhi-Chandigarh highway*, ET ENERGY WORLD (July 16, 2019), https://energy.economictimes.indiatimes.com/news/power/bhel-installs-first-solar-ev-charging-station-on-delhi-chandigarh-highway/68251129.

63. Shreya Nandi, *EESL to set up 200 more charging stations in Delhi, NCR by October*, LIVEMINT (July 17, 2019), https://www.livemint.com/industry/energy/eesl-to-set-up-200-more-charging-stations-in-delhi-ncr-by-october-1563013058845.html.

64. *EESL to float tender for another 10,000 electric cars on Thursday*, LIVEMINT (July 16, 2019), https://www.livemint.com/Industry/oS5G8sAvFK4DrMDE4pxWhI/EESL-to-float-tender-for-another-10000-electric-cars-on-Thu.html.

65. *Sumant Banerji, EESL to float fresh tender for 10,000 electric cars by March*, BUSINESS TODAY (August 5, 2019), https://www.businesstoday.in/current/policy/eesl-to-float-fresh-tender-10000-electric-cars-by-march/story/264224.html.

Tata Motors won the contract, outbidding Mahindra and Mahindra. However, Mahindra and Mahindra Ltd later matched the bid made by Tata Motors Ltd, thus receiving 30% of the procurement order[66]

III. Lithium-Ion Giga factory

State-owned Bharat Heavy Electricals Limited (BHEL), one of India's largest power generation equipment manufacturers, is in talks with Australia's LIBCOIN consortium[67] to build 1GWh lithium-ion battery plant in India. Development of the Giga factory would initially start with the construction of a 1 gigawatt-hour lithium-ion battery plant, which would be scaled up to 30 GWh in due course. LIBCOIN is a consortium comprising Magnis Energy, Duggal Family Trust and Charge CCCV (**C4V**) and plan to build large lithium-ion battery Giga factories globally.[68] This project will bring energy independence by replacing oil imports with abundant renewable energy. This project also includes Make in India element with focus on core-cost components manufactured domestically. It will also create integrated manufacturing ecosystem resulting in self-reliance and lower cost.[69]

IV. Suzuki Lithium-Ion Batteries Plant in Gujarat

Japan's Suzuki Motor in a joint venture (**JV**) with Toshiba and Denso plans to invest INR 11.51 billion to set up lithium-ion battery manufacturing facilities. The JV's new plant will rollout locally made batteries for use in hybrid and all-electric cars by 2020 and will be housed at the Suzuki Motor Gujarat (**SMG**) campus in Hansalpur. Batteries from the plant will also be used for electric two-wheelers to be introduced by Suzuki in India in the coming years. The company plans to launch an electric two-wheeler in India by 2020.[70] The lithium-ion batteries produced will primarily be used by Suzuki for its own car models, however the JV would be open to supplying batteries to other automakers as well.[71]

V. Scale Battery Storage Plants.

To secure India's energy needs, GOI is planning to set up Tesla-style Giga factories[72] to manufacture batteries with an investment of around $4 billion. This is being planned as the country prepares to transition from ICE vehicles to EV. As per the plan, at least four Tesla-style Giga factories shall be set up with a capacity of 10 gigawatt hours (**GWh**) each. The project is being helmed by the federal think tank NITI Aayog and aims to replicate what Tesla has achieved at its Giga factory in Nevada, US. To attract manufacturers, GOI as per media reports, may offer slew of incentives to manufacturers such as concessional financing options, fixed interest subvention on loans availed in Indian rupees, a reduction in minimum alternative tax (**MAT**) etc. The battery storage plant shall not only be for exclusive use of electric vehicles, it will also cater to the consumer electronics industry and electricity grids, given the intermittent nature of electricity from renewable energy sources such as

66. Arushi Kotecha, *Mahindra matches Tata Motors's EV tender bid*, LIVEMINT (August 5, 2019), https://www.livemint.com/Industry/ce5DCpEBc03rOhzR6CUDAN/Mahindra-matches-Tata-Motorss-EV-tender-bid-to-supply-150.html.

67. LIBCOIN is a consortium comprising Magnis Energy, Duggal Family Trust and Charge CCCV(C4V)

68. *BHEL, Libcoin consortium to build Lithium-Ion gigafactory*, THE HINDU (July 29, 2019), https://www.thehindu.com/business/bhel-libcoin-consortium-to-build-lithium-ion gigafactory/article26054278.ece.

69. *BHEL and LIBCOIN to Build India's First Lithium Ion Giga Factory*, PRESS INFORMATION BUREAU (August 1, 2019), http://pib.nic.in/newsite/PrintRelease.aspx?relid=187590

70. Malyaban Ghosh, *Maruti will soon go for lithium-ion batteries over lead*, LIVEMINT (July 28,2019), https://www.livemint.com/Auto/FVefAaqbe6cW1wnMzw-5TUK/Maruti-will-soon-go-for-lithiumion-batteries-over-lead.html

71. Siddharth Vinayak Patankar, *Suzuki JV With Toshiba, Denso To Set Up Electric Car Battery Plant In Gujarat*, NDTV AUTO (July 28,2019), https://auto.ndtv.com/news/suzuki-jv-with-toshiba-denso-to-begin-rolling-out-lithium-ion-batteries-by-2020-1750344.

72. The Tesla Gigafactory 1 is a lithium-ion battery and electric vehicle subassembly factory near Reno, Nevada. It is expected to be the largest building in the world and powered by renewable energy, with the goal of achieving net zero energy.

solar and wind.[73] Battery storage plants will have an important role to play in the Indian energy ecosystem as the GOI is placing heavy reliance on renewable sources of energy. In furtherance of which, the GOI is planning to subsidise creation of up to 50-gigawatthour of battery manufacturing capacity a year. According to the timeline drawn by the Niti Aayog, the GOI will invite bids by December 2019 and award contracts subsequently. Post the contracts are awarded, companies would be expected to commence operations by 2022 and gradually scale it up to the full committed capacity by 2025.[74]

VI. Securing Lithium Supplies

Lithium is a key component of lithium-ion batteries that are commonly used in gadgets such as smartphones, laptops and now EVs. These batteries hold the key to clean energy-powered future. By enabling electric mobility, this versatile energy-storage medium has the potential to cut pollutants and greenhouse emissions. It is for this reason that it has also been described as white petroleum.[75] While the globe and especially China continue their expansions on this front (China investing $4.2 billion in deals to secure lithium mines in South America[76]), three Indian public sector companies (National Aluminium Co Ltd, Hindustan Copper Ltd and Mineral Exploration Corp Ltd) have formed a joint venture called Khanij Bidesh India. This JV shall acquire mining assets overseas that have minerals such as lithium and cobalt, which are key raw materials in the manufacturing of batteries for EVs..[77] Additionally, India is seeking to develop newer battery technologies such as polymer-based solid-state batteries to prevent reliance on lithium or cobalt imports.

73. *Utpal Bhaskar, India readies plan for $4 billion Tesla-scale battery storage plants*, LIVEMINT (July 29, 2019), https://www.livemint.com/news/india/india-readies-plan-for-4-billion-tesla-scale-battery-storage-plants-1564077561033.html.

74. Yogima Sharma, *Subsidies soon to make batteries in India*, ECONOMIC TIMES (October 9, 2019), https://economictimes.indiatimes.com/news/economy/policy/subsides-soon-to-make-batteries-in-india/articleshow/70526760.cms?from=m-dr.

75. Biman Mukherji, *Things to Know About Lithium–the 'White Petroleum'*, WSJ (August 8, 2019), https://blogs.wsj.com/briefly/2016/05/05/lithium5things/.

76. Mitra Taj and Michael Nienaber, *In the new lithium 'Great Game,' Germany edges out China in Bolivia*, REUTERS (August 8, 2019), https://uk.reuters.com/article/us-bolivia-lithium-germany/in-the-new-lithium-great-game-germany-edges-out-china-in-bolivia-idUKKCN1PM1LS.

77. *KABIL Set up to Ensure Supply of Critical Minerals*, PIB (August 8, 2019), http://pib.nic.in/newsite/PrintRelease.aspx?relid=192437.

9. Global Policy Initiatives

I. China

In 2018, more electric cars were sold in China than in the rest of the world combined.[78] This significant growth can be credited to the big-ticket investments made in the EV ecosystem in China to meet its targets under the Paris Agreement. The Chinese government is pushing for adoption of EVs through a variety of incentives which includes heavy subsidies, rebates, quotas for vehicle manufacturers and tax exemptions.

A major reason behind the growth of the EV industry in China has been the support granted to it in the form of national subsidies by the Chinese government. The Chinese government began subsidizing EV purchases for government and public fleets in 2009, and individual car buyers in 2013. Subsidies in 2013 ranged from RMB 35,000 to RMB 60,000, depending on the vehicle's electric range, and have been reduced regularly since.[79]

To ensure affordable pricing of EVs, the government transfers substantial fiscal subsidies directly to the manufacturers, based on the number of vehicle registered and sold. However, this policy wasn't without its own set of flaws. A nationwide investigation was conducted by the Chinese government in early 2016 which found that some manufacturers used unscrupulous means to receive subsidies. Previously, manufacturers often registered their vehicle illegally, used a small battery and received subsidies equivalent to larger batteries. Manufacturers also engaged in falsifying clients, since in China subsidies are paid to manufacturers only for EVs that are actually sold, not just produced. The investigation discovered that certain manufacturers sold their vehicles to themselves rather than to end-users to receive the subsidies. The result is that some subsidized vehicles were manufactured and sold on paper, but never reached to consumers. This prompted for a policy redesign.[80]

In the updated policy as effective from 2019, a combination of credits and disincentives have been employed to improve the fuel efficiency of traditional-fuel vehicles, as well as to promote the deployment of EVs. It requires automobile manufacturers that sell 30,000 cars or more annually in China to produce fleets with a corporate average fuel economy of 42 miles per gallon by 2020, and 54.5 miles per gallon by 2025. OEMs that fail to meet the quota will acquire negative credits, which, if allowed to accumulate, must be offset by either by purchasing positive credits from other companies or by reducing the production of fuel-burning cars.[81] EV's are also promoted through non-fiscal incentives, such as exemption from city license plate lotteries or restrictions. Getting a license plate for an ICE car can take years through a lottery which are held every other month in Beijing or cost more than $12,000 in a monthly auction in Shanghai. An EV license plate is free and often can be obtained a lot faster.[82] Furthermore, EV's are not subject to registration restrictions or driving bans on certain days, that apply to vehicles with ICE in Chinese megacities.[83]

78. Akshat Rathi, *Five things to know about China's* ***electric-car*** *boom*, QUARTZ (August 5, 2019), https://qz.com/1517557/five-things-to-know-about-chinas-electric-car-boom/.

79. ShiqiOu, *A Study of China's Explosive Growth in the Plug-in Electric Vehicle Market*, Oak Ridge National Laboratory, 37 (2017).

80. Hongyang Cui, *Subsidy fraud leads to reforms for China's* EV market, THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION (JULY 20, 2019),.

81. Jack perkowski, *What China's Shifting Subsidies Could Mean For Its Electric Vehicle Industry*, FORBES (JULY 22, 2019), https://www.forbes.com/sites/jackperkowski/2018/07/13/china-shifts-subsidies-for-electric-vehicles/#7e885f2f5703.

82. Tycho De Feijter, *The Boom Goes On: China's Electric Car Sales Up 162% So Far This Year*, FORBES (July 22, 2019), https://www.forbes.com/sites/tychodefeijter/2016/07/22/and-the-boom-goes-on-chinas-electric-car-sales-up-162-in-h1/.

83. Pearl Chen, *Beijing's car plate policies*, GLOBAL TIMES (September 19, 2019), http://www.globaltimes.cn/content/1098345.shtml.

II. United States Of America

In the United States, the federal government and many states offer financial incentives, including tax credits, for lowering the up-front costs of EVs. The federal government offers EV owners a tax credit of $2,500 to $7,500 per vehicle, depending on battery size. The tax credit is available only for the first 200,000 vehicles sold by each manufacturer, after which it begins to phase out for that manufacturer.[84] Federal fuel efficiency standards also provide incentives for manufacturers to sell EVs.[85] Many US states have come forward and offered tax credits rebates for the purchase of EVs. Monetary and non-monetary incentives may include additional tax credits, vehicle or infrastructure rebates or vouchers, vehicle registration fee reductions, loans, special low-cost charging rates, and high-occupancy vehicle lane exemptions.

Further, the multistate zero-emissions vehicle (**ZEV**) program has been put forward by the Multi-State ZEV Task Force which includes the states of California, Connecticut, Maryland, Massachusetts, New York, Oregon, Rhode Island, New Jersey and Vermont. These nine states represent nearly 30 per cent of the new car sales market in the United States.[86] Under the ZEV regulation auto manufacturers are required to produce a number of ZEVs and plug-in hybrids each year, based on the total number of vehicles sold by the manufacturer. Manufacturers with higher overall sales of all vehicles are required to make more ZEVs. Requirements are in terms of percent credits, ranging from 4.5 per cent in 2018 to 22 per cent by 2025.[87] Vehicle produced shall receive credits based on its electric driving range. The more range a vehicle has, the more credit it receives. Credits not needed for compliance in any given year can be banked for future use, traded, or sold to other manufacturers.[88]

In addition, to accelerate the installation of EV charging infrastructure nationwide the federal government had extended tax credits for the cost of installing V charging stations. Also, in November 2016, the US Federal Highway Administration designated 48 EV charging corridors along 25,000 miles of US highways, based on the suggestions submitted by states. While the corridors mostly provide signage for existing chargers, the federal government is also authorized to provide up to $4.5 billion in loan guarantees for EV charging infrastructure along the corridors. However, basis information in public domain, no loan guarantees have been issued to date under this program.[89]

Despite the lack of major federal policy or incentives, many US states, city governments have come forward and offered incentives for the installation of EV charging equipment. These include rebates, tax credits, tax exemptions, grants and loans. In addition to financial incentives, some states are also promoting EV charging infrastructure through standards, mandates and codes

III. Norway

Norway is a pioneer with respect to the EV industry. In its efforts to cut down greenhouse emissions, the Norwegian Parliament has decided on a goal that all new cars sold by 2025 should be zero-emission vehicles.[90] Norway generates most of its electricity through its

84. Jieyi Lu, *Comparing U.S. and Chinese Electric Vehicle Policies*, ENVIRONMENTAL AND ENERGY STUDY INSTITUTE (July 25, 2019), http://www.eesi. org/articles/view/comparing-u.s.-and-chinese-electric-vehicle-policies.

85. Justin Worland, *These Fuel Economy Regulations Mean You May Soon Be Buying an Electric Car*, TIME (July 18, 2019), http://time.com/4402090/epa-cafe-standards-climate-change/.

86. *Multi-state ZEV action plan*, NESCAUM (July 18, 2019), https://www.nescaum.org/documents/2018-zev-action-plan.pdf.

87. *What is ZEV?*, UCSUSA (August 10, 2019), https://www.ucsusa.org/clean-vehicles/california-and-western-states/what-is-zev.

88. *The Zero Emission Vehicle (ZEV) Regulation*, CALIFORNIA AIR RESOURCES BOARD, (July 18, 2019), https://ww2.arb.ca.gov/node/2558/about

89. Bobby Magill, *U.S. Designates Electric Vehicle Charging Corridors*, CLIMATE CENTRAL (JULY 22, 2019), https://www.climatecentral.org/news/us-designates-electric-vehicle-charging-corridors-20842

90. Camilla Knudsen and Alister Doyle, *Norway powers ahead (electrically): over half new car sales now electric or hybrid*, REUTERS (July 20, 2019), https://www.reuters.com/article/us-environment-norway-autos/norway-powers-ahead-over-half-new-car-sales-now-electric-or-hybrid-idUSKBN1ESoWC.

hydropower plants.[91] Norway has planned to harness this electricity to drive EV deployment and charging requirements. To achieve its decarbonisation goals, Norway has set a 2020 target of reaching a CO_2 emission rate below 85 gm/km, it sets to achieve this target through a strong reliance on renewable sources of energy.[92]

To boost EV demand among consumers, the Norwegian government has waived off the erstwhile hefty vehicle import duties, registration and sales taxes that were levied on buyers of electric cars. Conventional engine-powered cars, however, continue to be taxed heavily in Norway, due to which for example the premium gas-powered Volvo XC90 SUV, starts at $107,100 in Norway compared with $47,700 in the US.[93] Purchase of emission emitting vehicles is discouraged through an innovative calculation of registration tax. The registration tax for all new cars is calculated by a combination of weight, carbon dioxide and nitrogen oxides emissions. The tax is progressive, making big cars with high emissions are more expensive. Over time, registration tax has been adjusted gradually to have more emphasis on emissions and less on weight.[94] Apart from tax incentives, EV owners don't have to pay road tolls and get free use of ferries and bus lanes in congested city centres.[95] However, these incentives, which are costing the government almost $1 billion are not permanent and are being phased out in 2021, though any road tolls and fees for EVs would be limited to half of what gasoline car owners must pay. Gradually over time as the ecosystem matures subsidies for electric cars will be replaced by higher taxes on traditional cars.[96]

IV. Japan

Japan aims to ensure that all new vehicles sold in Japan should be electric or hybrid vehicles by 2050.[97] This ambitious goal has been set to ensure that domestic manufacturers are competitive in an industry that is fast shifting to electric mobility. Japan seeks to maintain its position in the global auto market as a major manufacturer and exporter of automobiles. Japan has its own fast-charging standard known as CHAdeMO.[98] "CHAdeMO" is an abbreviation of "CHArge de MOve".[99] CHAdemMO charging standard was developed by the CHAdeMO Association, which commenced as a partnership between Nissan, Mitsubishi, Fuji Heavy Industries and the Tokyo Electric Power Company. It was established in March 2010.[100] Since the introduction of EVs in Japan, the government and automakers have identified adequate charging infrastructure as a key requirement of EV sales. To ensure adequate charging stations, Japan in 2013 launched "Next Generation Vehicle Charging Infrastructure Deployment Promotion Project" to fund setting up of charging stations around various cities and highway rest stations[101]. To facilitate the rapid expansion of EVs, the development bank of Japan collaborated with Toyota, Honda, Nissan and Mitsubishi to develop the Nippon Charge

91. Andrew McKay, *Hydropower in Norway*, LIFE IN NORWAY (July 20, 2019), https://www.lifeinnorway.net/hydropower-in-norway/. https://www.lifeinnorway.net/hydropower-in-norway/.

92. Erik Figenbaum, *Perspectives on Norway's supercharged electric vehicle policy, 25*, ENVIRONMENTAL INNOVATION AND SOCIETAL TRANSITIONS, 14-34 (2017).

93. *Norway Sees A Boom In Electric Cars, Fueled By The Government*, NDTV (July 20, 2019), https://auto.ndtv.com/news/norway-sees-a-boom-in-electric-cars-fueled-by-the-government-1965213.

94. *Nordic EV Outlook 2018*, IEA (July 20, 2019), http://www.indiaenvironmentportal.org.in/files/file/Nordic%20EV%20Outlook%202018.pdf.

95. Mark Lewis, *Norway sees boom in electric cars, fueled by the government*, AP NEWS (July 20, 2019), https://www.apnews.com/7fdc039fee6c4c62bdc7605497 2a2e03.

96. Ibid.

97. Kyodo, *Japan aims to have all new passenger cars be electric by 2050: panel report*, TJT (August 6, 2019), https://www.japan-times.co.jp/news/2018/07/24/business/japan-aims-make-new-passenger-cars-electric-2050-panel-report/#.XUnSdy-B3BI.

98. *CHAdeMO in a Nutshell*, CHADEMO (August 11, 2019), https://www.chademo.com/about-us/what-is-chademo/.

99. *General Outline of "CHAdeMO Association"*, TEPCO (August 11, 2019), http://www.tepco.co.jp/en/press/corp-com/release/betu10_e/images/100315e1.pdf.

100. Brad Berman, *Quick charging of electric cars*, PLUGINCARS (August 7, 2019), https://www.plugincars.com/electric-car-quick-charging-guide.html.

101. Mark Kane, *$1 Billion Charging Infrastructure Project Will Enlarge Fast Charger Network In Japan*, INSIDEEVS (August 7, 2019), https://insideevs.com/news/321816/1-billion-charging-infrastructure-project-will-enlarge-fast-charger-network-in-japan/.

Service , a charging stations network spanning the country that presently operates as a private joint venture.[102] Due to substantial investments in charging infrastructure, there are more electric car charging stations than gas stations in Japan. As of 2016, there were approximately 40,000 EV charging stations in Japan and less than 35,000 gas stations.[103] Japan also provides generous tax incentives to adopters of EVs. It exempts EV owners from acquisition tax and tonnage tax. To reduce the upfront cost of EVs, consumers have to pay reduced tax rates[104] on the acquisition of EVin addition to purchase subsidies.[105]

V. Netherlands

Netherlands has been one of the leaders in EV adoption and promotion, with more than 49,000 EVs on its road. Netherland recorded sale of 24,024 EVs in 2018.[106] The Netherland's government has taken a comprehensive set of actions to achieve their ambitious target of 75,000 privately owned EVs on its roads by 2020, and 50 % of all new car sales in plug-in electric of which a minimum of 30% of the vehicles should be fully electric by 2025. Series of the action plan has been published to achieve this objective.

These action plans have led to the establishment of the Formula E-Team, which is a national public-private platform that brings together different stakeholders such as businesses, academia, non-profit organizations, and the government to brainstorm and stimulate the development of EV charging infrastructure and new electric mobility policies. With respect to tax incentives, EVs have been exempted from registration and road taxes, and they also have the advantage of reduced taxes for the private use of company cars. Netherlands has a very dense network of public charging stations with 19.3 charging stations per 100 kilometers far ahead of countries like Japan, Germany and the UK.[107]

To increase publicly accessible EV charging infrastructure, the government has come out with green deal under which the Dutch central government has made available €5.7 million in public funding to co-fund the installation of up to 8,000 additional public charging stations.[108] In addition to the national government, local governments have also come forward with a variety of incentives to accelerate the adoption of EVs. Such incentives include purchase subsidy, demarcation of low emission zone, free-floating parking permits and bus lane access.[109]

102. Eric Loveday, *Nissan, Honda, Toyota and Mitsubishi Form Nippon Charge Service*, INSIDEEVS (August 7, 2019), https://insideevs.com/news/321994/nissan-honda-toyota-and-mitsubishi-form-nippon-charge-service/.

103. Justin McCurry, *Japan now has more electric car charge points than petrol stations*, THE GUARDIAN (August 7, 2019), https://www.theguardian.com/world/2016/may/10/japan-electric-car-charge-points-petrol-stations.

104. *The motor industry of Japan 2010*, JAPAN AUTOMOBILE MANUFACTURERS ASSOCIATION (August 7, 2019), http://www.jama-english.jp/publications/MIJ2010.pdf.

105. *Japan's measures to withstand impact of global crisis on its automotive industry*, JAMA ASIA (August 7, 2019), http://www.jama-english.jp/asia/news/2009/vol36/index.html.

106. Karel Beckman, *Dutch EV Sales: Tripled In 2018, 30% Market Share In December, Tesla Model S Took #1 Spot — #QuickNews*, CLEAN TECHNICA (August 7, 2019), https://cleantechnica.com/2019/01/05/dutch-ev-sales-tripled-in-2018-30-market-share-in-december-tesla-model-s-took-1-spot-quicknews/.

107. Niall Mccarrthy, *Netherlands Top For Electric Vehicle Charger Density*, FORBES (August 7, 2019), https://www.forbes.com/sites/niallmccarthy/2018/10/08/netherlands-top-for-electric-vehicle-charger-density-infographic/#76b823a7238b.

108. *Electric transport in the Netherlands*, NETHERLANDS ENTERPRISE AGENCY (August 7, 2019), https://www.rvo.nl/sites/default/files/2017/04/Highlights-2016-Electric-transport-in-the-Netherlands-RVO.nl_.pdf.

109. Dale Hall, *Marissa Moultak and Nic Lutsey, Electric vehicle capitals of the world*, ICCT (August 7, 2019), https://theicct.org/sites/default/files/publications/Global-EV-Capitals_White-Paper_06032017_vF.pdf.

Way Forward

According to the Global EV Outlook 2019 report released by the International Energy Agency, the global EV fleet exceeded 5.1 million in number by 2018, up by approx. 2 million EV's compared to the previous year and almost doubling the number of new EV sales. China continues to remain the world's largest electric car market, followed by Europe and the United States. Norway is the global leader if EV market share is considered.

In relation to India, various policies, regulations and incentives introduced by the GOI along with different State governments clearly establish India's intention to promote EVs and develop India into a manufacturing hub for EVs. This would organically also open up ample opportunities for private players to get into the EV space, both for manufacturing and charging of EVs (including strategic technology collaborations). This being said, support from state government and local transport authorities would be critical for creating and implementing a robust EV ecosystem within India.

However, GOI will also have to keep in mind the current slowdown in the overall automobile industry and accordingly rationalize its policy implementation. Therefore, it must not take any decision which pushes the manufacturers into red and damage an efficient component supply chain given the potential impact it may have on employment generation. At the same time, it cannot afford to delay the steps required to upkeep the environment and tackle air pollution.

Thus, a balance would need to be struck, which will not only catalyse a home-grown EV ecosystem but also lead the way for sustained growth and development.

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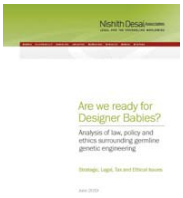

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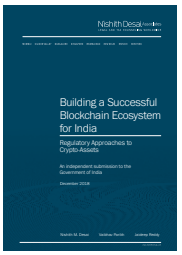

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