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The dilemma of choosing Electric Vehicles vs Hybrids vs Internal Combustion (IC) Engine based Auto development for India

In the journey of EVs, compared to China, we are in the same stage as we were in the Solar Industry 5 years ago. Over the last 5 years, we have seen how the Chinese solar imports have dealt a death blow for our panels manufacturing industry and the Make in India story is a non-starter here. We need to make sure that we do not get trapped in a similar situation in the EVs story as there is every possibility that China will be presenting a huge competition to the Indian Industry in this business as well.

Overview

Like the Solar boom 5 years back, today, the Electric Vehicles is causing a similar disruption in the Auto Industry globally. India, today is at the cusp of deciding its future and it is important for everyone to get a 3600 perspective of what it means and what would work for our nation. This note is an attempt to put all these perspectives in place and make a call on what would work for India. I will be discussing the following aspects in this note:

1. Global development of EV's and where it stands today
2. What are the strategic imperatives for India today? Not just from an Auto industry perspective but looking at the overall macro imperatives for India
3. The importance of Auto industry in India's economic interest
4. What is being planned for the future of India's mobility? It's impact on the various elements of Indian economy.
5. What should be the ideal roadmap for India?

Global development of EV's and where it stands today

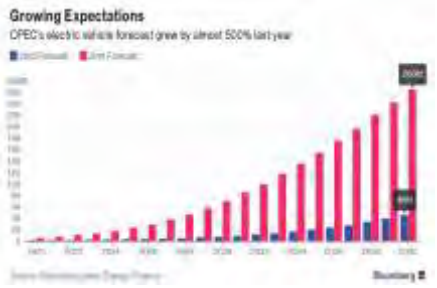
Most global observers and researchers are revising their electric-vehicle forecasts upward as improving battery costs challenge previous assumptions about growth. A new study from Bloomberg New Energy Finance1, has shown that OPEC has drastically increased their EV forecast this year compared to the last year as shown in the chart below:

This is largely due to developments in the Lithium Ion Batteries and driven primarily by China in the world. China has bet heavily on the EV industry for many strategic reasons, namely:

- Its urgent need to reduce Oil Imports
- The Pollution problems in China reaching significant proportions
- Its long held belief to dominate in most spheres of business and the Auto industry based on IC Engines was one industry where it couldn't dominate and it was largely dominated by European / Japanese and American technology

They worked on this from a long term perspective and started working towards EV over the last 10 years or so.

- Today, they are leading the world in terms of having the most capacity for Lithium Batteries (said to be building capacity for one million batteries a year) and have secured resources round the globe for Lithium supply.



- On the demand side, they have been investing heavily on Government subsidies to drive up demand and have plans to set goals for electric and hybrid cars to make up at least a fifth of Chinese auto sales by 2025, with a staggered system of quotas beginning in 2018.
- It is going to create a national champion in batteries and is determined to close the gap with Korean and Japanese battery makers by 2020.
- To reach this ambitious target, the Chinese government offers substantial fiscal subsidies, at both the national and local levels. By the end of 2015, the Chinese national government had poured 33.4 billion yuan (~$4.87 billion) into its EV market, and EV sales skyrocketed from 2,300 in 2009 to 507,000 in 2016. As many as a third of these sales were electric commercial vehicles (including buses, coaches, trucks, and vocational vehicles), while electric passenger car sales hit a record of 336,000 in 20162.

What are the strategic imperatives for India today? Not just from an Auto industry perspective but looking at the overall macro imperatives for India

For India today, there are many strategic imperatives for us now. I have listed down below some of them which has an impact on our choice of going full EV or going the Hybrid to EV route or sticking on to the IC Engine based Auto route.

- Fuel Security: The most important aspect for a developing nation like us is the issue of fuel security. India currently depends on a large scale imports of crude to meet most of our mobility fuel needs. India's gross petroleum import bill, including shipments of both crude oil and petroleum products, rose 9 per cent last financial year to $ 80.3 billion3 on the back of seven percent rise in volumes and a three percent increase in the average crude price. If the current status quo is maintained, our Energy consumption for Motorised Vehicles will increase from ~50 MTOE to over 200 MTOE by 20304. So, the question of maintaining a status quo on our Motor Vehicles policy for the long term is invalid and we need to look at every possible route to reduce our fuel consumption.
- Reduction in Carbon Emissions: Along with the fuel security, one other important aspect facing India and its development goals is the urgent need to reduce our Carbon emissions and meet our climate obligations. If the current status quo is maintained, our Carbon emissions from Motorised Vehicles will increase from ~150 Million Tons to over 550 Million Tons by 20305. So, the question of maintaining a status quo on our Motor Vehicles policy for the long term is invalid and we need to look at every possible route to reduce our Carbon emissions as well.
- Lower Power Demand: One curious problem, which we have seen in the last 3-4 years, ever since most of the supply side issues in Power generation (coal) were taken care of, is the issue of lack of growth of Power Demand in the country. Most power plants are operating at a PLF of 55% in the country. This, coupled with an ambitious Renewable Energy targets and growth (over 175 GW by 2022), will lead to a serious case of oversupply and the viability of a crucial engine of the Indian Economy (Power sector) will be in serious question. Planners in the 11th and 12th 5 year plans had factored for a growth of 7% Power demand in India while it has been stagnant for most years in the last 5-6 years and now (2016-17 vs 2015-16) it has reached a 4.08% growth6. A new source of Power demand in terms of Electric Vehicles will be highly appreciated by the power sector. It may lead to a more stable power demand and that too from a 'paying customer segment' over the years and increase the viability of the sector.

The importance of Auto industry in India's economic interest

There is no doubt that automobile industry in India is one of the best examples of "Make in India" and has helped grow a strong manufacturing base in India. The diverse set of sub-assemblies and ancillary units that cater to the Auto Industry is a well-developed eco system in itself. To measure it with some statistics to make it more meaningful7 -

- The country will export nearly 800,000 cars in 2017, a value of at least $4 billion, with nearly 90 per cent localisation.
- In small cars, we are now a global manufacturing hub. To this, we must add our success in auto components, another $4-5 billion of exports.
- This is one of the few sectors where we have global scale and competitiveness. Make in India works for small cars.
- India is projected to be the third largest car market in the world by 2020, with domestic volumes over 4.5 million.
- Currently, we have component localisation of above 85 per cent, with the majority of the value addition in India.

What is being planned for the future of India's mobility? It's impact on the various elements of Indian economy.

India, began to take the emergence of EV's seriously only in the period 2009-10 and then started a series of discussion amongst various bodies and in 2012 a policy in the name of NEMMP 2020 (National Electric Mobility Mission Plan 2020 was launched. Under this mission, the government would use the following mechanisms/ policies to increase the usage of electric vehicles in India:

- National Electric Mobility Mission Plan (NEMMP) 2020 targets to deploy 5 to 7 million electric vehicles in the country by 2020
- NEMMP also targets 400,000 passenger battery electric cars (BEVs) by 2020 avoiding 120 million barrels of oil and 4 million tons of CO2. Total investment required for this will be Rs. 20,000 - 23,000 Crores (approx. 3 billion USD)
- Permissive legislations: Legislations to allow usage of electric vehicles in various areas, if not already allowed
- Operational regulations: Use of legislation framework and regulations aimed at setting safety regulations, emission regulations, vehicle performance standards, charging infrastructure standards, etc.
- Fiscal policy measures: Trade related policies for shaping the market, imports and exports
- Manufacturing policies aimed at encouraging investments
- Specific policies aimed at incentivizing manufacturing and early adoption of electric vehicles through demand creation initiatives
- Schemes and pilot projects for facilitating infrastructure creation
- Policy for facilitating research & development

Unfortunately, apart from launching this Plan and a few pilot projects, nothing much was done on the ground in terms of implementation of this policy till 2015 when the new government came and launched FAME in April 2015. In order to promote the sale of electric vehicles in the Indian market, the government launched FAME scheme (Faster Adoption and Manufacturing of Hybrid and Electric vehicles) in India, as a part of the National Electric Mobility Mission Plan 2020, under which, the government would provide certain incentives to lower the purchasing cost of electric vehicles

- The scheme has 4 focus areas i.e. Technology Development, Demand Creation, Pilot Projects and Charging Infrastructure.
- Overall, the government is expected to spend around Rs. 14,000 Crores for this scheme, which includes incentives to the customers for purchasing the electric vehicles, incentives to the manufacturers for research and development besides developing the charging infrastructure
- During the financial Year 2015-16, an amount of Rs. 75 Crores was allocated for this scheme, which was almost fully utilised. In the financial year 2016-17, Rs. 128 Crore (approx) has already been utilised
- Under this scheme, about 111,897 hybrid/electric vehicles (xEVs) have been given direct support by way of demand incentives since the launch

on 1st April 2015.

- Department has also approved pilot projects, charging infrastructure projects and technological development projects aggregating to nearly Rs. 155 Crores.
- In the Union Budget for 2017-18, as allocated Rs 175 crore for promotion of green cars. The fund would be utilised for establishing 200 charging stations, granting incentives for 1.5 lakh vehicles, 200 electric buses and 1,000 electric government vehicles, besides creating infrastructure for making electric vehicles and research in battery technology. Incentives of about Rs. 33 to 66 Lakhs are planned for each electric bus which typically costs around Rs. 1-2 Crores (imported buses) and around Rs. 50-80 Lakhs (domestically manufactured)
- Under the JNNURM (Jawaharlal Nehru National Urban Renewal Mission), NEMMP (National Electric Mobility Mission Plan) and Smart city plans launched by the government, various state and local transport bodies are expected to purchase electric buses over the next 5 years

The investment plans for FAME is outlined below:

Component of the Scheme	2015-16	2016-17
Technology Platform (including testing infrastructure)	Rs. 70 Crore	Rs. 120 Crore
Demand Incentives	Rs. 155 Crore	Rs. 340 Crore
Charging Infrastructure	Rs. 10 Crore	Rs. 20 Crore
Pilot Projects	Rs. 20 Crore	Rs. 50 Crore
IEC / Operations	Rs. 05 Crore	Rs. 05 Crore
Total	Rs. 260 Crore	Rs. 535 Crore
Grand Total		Rs. 795 Crore

In 2017, the Government of India through extensive ministerial discussions has come out with a major policy document in terms of "Transformative Mobility For All".

The NEMMP 2020 was extensively handled by Department of Heavy Industries till 2016. In 2017, a major Inter ministerial discussion on this took place which included the Prime Ministers Office, Niti Ayog (Planning Body), Department of Heavy Industries, Power Ministry, Ministry of Surface Transport & Roads, Urban Development Ministry, Petroleum and the Finance Ministry. From this emerged, a need to look at transforming the Mobility in the Country and reduce the dependence on Fossil fuels and imports obligation on the Country.

One of the key pillars of this Transformative mobility is the emergence of EV's and the EV infrastructure that is likely to be needed. Post this discussion, the Niti Ayog has come out with a report on the plans for the Government for the Transformative Mobility Solutions For All

This reports sets out the future direction from not just an Auto Industry perspective but looks at the future of Mobility and the key essence of this plan is to move towards a Mobility solution for India by 2030 which is 'Shared' (less personal ownership),'Connected' (move towards a common shared platformed and various solutions are connected) and which is based on 'Electric ' technology (preference towards EV over other forms in all modes of transportation)

This is brilliant report which has looked at various modes of transportation in terms of Private and Fleet ownership and has provided for a road map of each element to move towards EV. For e.g.
2W - Private / Fleet
3W - Fleet

ELECTRIC VEHICLE MARKET SEGMENT	PRIVATE VS. FLEET*
2-wheelers	Private
	Fleet**
3-wheelers	Fleet
4-wheelers	Private
	Fleet
Buses	Fleet

■ PRIVATE
■ FLEET

Figure 4: Representative Diagram plotting EV market segments based on their current market readiness (Y-Axis) and impact on CO_2 Emissions and particulate matter reduction (X-Axis)

Several strategies can improve each segment's market readiness and impact:
1. Service strategy : High-mileage electric service vehicles' lower operating costs can offset capital cost premiums
2. Technology strategy : Smart, standardized and swappable batteries could reduce capital cost for electric 2 - and 3-wheelers
3. Manufacturing strategy: Private 4-wheelers and commercial buses can become economic as battery prices decline further

2017 PHASE 1 2019

Harvest low-hanging fruit + Enhance small bites + Support rising stars

Source: Niti Ayog and the RMI report on Transformative Mobility Solutions for all

4W (PV) - Private / Fleet
Buses - Fleet

The report calls for an early movement of Fleet operated vehicles to move towards EV faster as it makes more economic sense to them rather than Private owners as shown below[8]:

Post this, in the launch of GST, EV were kept at the 12% levels, while Hybrids fall at the 43% levels (luxury products) - this has let to a lot of heartburn in the Auto industry with major players and Auto Component industry focusing on Hybrids seriously and there are now representations to give more weightage to Hybrids as well and reduce GST on Hybrids.

The impact of the Government of India's policy on the Auto Sector

While, from a long term national perspective, the policy may make sense, the immediate impact of the policy on the Indian Auto sector may be unsettling for many reasons:

- Most of the Indian Auto and Auto Ancillaries are more based in IC (Internal Combustion) based technology and are doing well in this segment
- Most of these players were planning to shift to Hybrids first and then plan for the EV in the distant future.
- The FAME policy in 2015 further ignited / pushed the Indian auto industry towards Hybrids and most MNC firms had made serious investments and plans to launch many Hybrids in India
- The sudden push for EV without overtly mentioning Hybrids and launch of GST with 43% on Hybrids has sent a clear signal to the Industry that India will move towards EV and may look at the Hybrids in between.

One positive aspect that remains is that the Private 4W segment will still require a longer time to move towards EV and this could be pushed towards Hybrids with some policy interventions. This will also help the Indian Auto sector to utilize the existing investments on this technology.

The EV Charging infrastructure would need a serious investment and this investment should be directed towards 'Made in India' Chargers again and this would also help in our Electronics manufacturing in a big way.

This will necessitate the Indian Auto sector to relook at our skills and ecosystem we have built over the years and will need to move with the changing times and get into the various other components of EV and be ready for the growth in EV's.

This will also need a considerable investment (INR 1.8 Lakh crores9) in setting up the EV infrastructure in terms of charging stations in the country. There will be a considerable play for Electronics Design and Manufacturing in this sector going forward.

What should be the ideal roadmap for India?

The future of Indian mobility towards EV is an ideal one and care should be taken to take the Indian Auto industry to the next level.

In the journey of EVs, compared to China, we are in the same stage as we were in the Solar Industry 5 years ago. Over the last 5 years, we have seen how the Chinese solar imports have dealt a death blow for our panels manufacturing industry and the Make in India story is a non-starter here. We need to make sure that we do not get trapped in a similar situation in the EVs story as there is every possibility that China will be presenting a huge competition to the Indian Industry in this business as well.

There will be an urgent need for a strong policy framework to promote Indian manufacturing and support from the Government to make our Indian stakeholders move towards EV gradually.

There is an urgent need also to help our Indian Auto Ancillaries to move towards making EV Components in India and there will a series of support initiatives required to develop products, testing infrastructure and also to reskill our huge workforce in this area.

The Government has already taken up a lead and is promoting the Power PSU's to take a lead in setting up the EV Charging infrastructure in the country.

We would need more action on getting Lithium manufacturing in India move towards local manufacturing in a big way and not be a nation of assemblers with core imports from China. This would need serious work in securing the raw materials for battery manufacturing.

The EV Charging infrastructure would need a serious investment and this investment should be directed towards 'Made in India' Chargers again and this would also help in our Electronics manufacturing in a big way.

There will be a need to set up a Global Technology Center in motors design and manufacturing space going forward and we should encourage global firms to invest in India in this.

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energetica

SPEAKING TO...

to get some more details for the readers.

Energetica India speaks to Mr. A M Devendranath; Vice President, BU Head -AC&R and Energy, Feedback Consulting to get more insights into the Industry Trends.

ENERGETICA INDIA: **What kind of challenges does India face in on-the-ground acceptance of electric vehicles (EV) in our daily lives?**

DEVENDRANATH: The vehicle usage for personal use and for Commercial use will behave differently when it comes to acceptance of EV in India in the future. On the ground acceptance of EV (Passenger cars for personal use) will largely depend on the 2-3 key aspects as given below:

- It will depend on the Value perception of these vehicles which will include elements of Cost of EV's, Type and models of EV's that will be introduced in India. The Indian Consumers who have been used to seeing various IC Engine based vehicles and its luxuries will need to see similar vehicles (or better) from the EV Stable, else adaptation to EV's will be highly effected. It may lead to the "Nano" syndrome where Nano lost entire plot of a Low cost vehicle as it was perceived as a poor mans' car with low features by middle and higher middle class population and it was not seen as "Aspirational enough" by the 2 Wheeler owners..
- It will also face the challenge of convenience of using the EV's - by that it means the range of these Vehicles per charge and the Charging Infrastructure. Most Indians are still aware of the long serpentine in CNG Stations. So will an Indian consumer's life be easy using an EV will depend on the convenience and availability of EV Charging stations.

However, there may be certain segments where EV's will penetrate highly owing to the sheer cost economics of running EV's vs IC Engine based vehicles - such as 3-Wheeler Fleets, Car Fleet companies and Bus Fleet Operators. The sheer costing saving of running EV's will drive these segments to shift to EV's given the availability of these vehicles and they will worry about the EV Charging facilities themselves and will create newer models of business here.

The usage of 2 W EV's will also not face much problem as there are no problems related to Charging as such and will depend on how the 2W firms adapt and bring in more EV models in 2W and it will also depend on Incentives.

ENERGETICA INDIA: **At what stage of development are Indian auto-makers at in EV?**

DEVENDRANATH: The segments of 2 & 3W has seen active interest and also most Bus manufacturers are actively pursuing the EV models and mostly commercial development of these vehicles are going on.

The passenger car market is is slightly behind with one player (Mahindra & Mahindra) actively manufacturing it here and others are yet evaluating it. Most Indian Car manufacturers were banking on getting in Hybrid vehicles first and then the Pure Battery EV's but the recent policy changes have forced them to scale back their Hybrid plans.

ENERGETICA INDIA: **Can we progress in EV with the "Make in India" program?**

DEVENDRANATH: If India is serious about EV's it will have to be on a "Make in India" platform else it will be a huge loss to the nation. It should be noted that EV's are a threat to a very successful Auto Manufacturing Ecosystem in India - both at the OEM level and the Auto components levels. Auto manufacturing is one of our few key success stories. If we do not have policy protection and incentives for Make in India for EV's then it will be like killing a well-functioning Industry for some other countries gain. The Government is aware of this aspect and all the right noises are being made. The Indian Auto and Auto components industry is also mature enough and aware of these dangers and hence most stakeholders are making relevant plans for Make in India.

Also the higher penetration of EV's in India will also lead to many other sectors such as Power Electronics, Motor manufacturing and PCB manufacturing etc getting a play in Making in India at a large scale. It is high time our Electronics sector got a really demand pull for Made in India products and EV's could provide just that.

ENERGETICA INDIA: **What kind of impact will the growth of EV have on the power sector in India?**

DEVENDRANATH: It will be too early to comment on any numbers here on the impact on Power sector as it has many variables now which are not confirmed yet - such as the type of vehicles that will shift to EV, the % of EV penetration and also the Type of Charging these vehicles will adapt. The types of chargers that Indian Manufacturers will come up with - fast chargers / slow chargers etc. All these factors will lead to determining the amount of power that will be needed to meet the Power Demand of EV's.

However, it is to be noted that there will be positive impact on the power sector as it will be providing a new demand segment for the Power Sector and the sagging demand will get a boost with a Paying customer. Also our large scale RE power coming in to the grid will also get a demand and the EV Chargers integrated with EV's could also lead to grid balancing issues with large scale RE integration.