



Battery-Operated Vehicles

Alternate Fuels for Surface Transportation Programme

The transportation sector is a major source of global carbon emissions and also contributes to air quality concerns, particularly in urban areas. Increasing motorization trend across the world has led to a steady increase of CO₂ emissions. Concerns on emissions and their effects on climate change are currently the drivers behind automotive technology. **Sohail Akhtar** feels that it is therefore imperative to address the concerns through penetration of suitable green transport technologies to the masses.

The Ministry of New and Renewable Energy (MNRE) has been implementing broad based research, design, development and demonstration programme on Alternate Fuels for Surface Transportation (AFST) for more than two decades. MNRE had issued guidelines/scheme on November 12, 2010. A provision was made to provide Central Financial Assistance (CFA) as a subsidy to the end-users for purchasing of new indigenous battery operated vehicles (2, 3, and 4 wheelers). About 16 industries have come forward and shown their interest for the development of electric vehicles. These vehicles are environmentally benign. Battery operated vehicles (BOVs) are a must and should have test report certifications from Automotive Research Association of India (ARAI), Pune, Maharashtra or Vehicles Research Development Establishment (VRDE), Ahmednagar, Maharashtra, or International Centre for Automotive Technology (ICAT) Manesar, Haryana. These vehicles make use of 30 per cent indigenous components for claiming the incentives/subsidy from the Government of India. The Ministry has supported 47,000 BOVs of different models of different carrying capacity.

Apart from the above, the Ministry has also been supporting broad based research, design, development, and demonstration programme for the development of motor, controller, charger, chassis, battery, and battery management system, etc., as per the research and development guidelines of the Ministry.

Now, the Ministry of Heavy Industries and Public Enterprises, Government of India, has taken up an initiative and formulated the guidelines for implementation of BOVs on a large scale. Therefore, MNRE has discontinued the scheme. The Ministry of Heavy Industries and Public Enterprises, Department of Heavy Industry has set up a National Council for Electric Mobility (NCEM) and a National Board for Electric Mobility (NBEM) for mission mode approach to expand electric mobility and manufacture of electric vehicles (including hybrid) and their components. MNRE is a permanent member in the NCEM as well as in the NBEM.

Improving BOVs/Hybrid Electric Vehicles/Plug-in Hybrid Electric Vehicle

Critical Challenges for Large-scale Deployment of Electric Vehicles (EVs) in Power Systems: The most critical challenge is with respect to the battery, which has low energy density, high gross weight, low life cycle and also takes too much time for charging, i.e., 6 to 8 hours continuously. A suitable battery is not available in the Indian market. Lithium-ion battery is most suitable for electric vehicles; however, the cost is three to four times higher than the lead-acid traction batteries. Lithium is not available in India and is therefore dependent on China, Bolivia, Columbia, and Brazil respectively, instead of importing fossil fuel from the Gulf countries, technologies, practices, and policies hold the greatest promise for managing EV charging along with proper assignment of charging costs, while protecting consumer privacy. A proper charging facility should be developed point-to-point. A mechanism should be in place which allows consumers to recharge the batteries without having to wait.

- **Facilitation for International Harmonization regarding international standards for integration of EVs with electricity networks:** The Government of India is closely working with the Bureau of Indian Standards and with other organizations to develop a mechanism for standardization of components, i.e., motor, controller, charger, chassis, battery and battery management system, etc., keeping in view International harmonization.
- **Constructive roles in organized EV charging:** International seminars/symposia/conferences should be organized for electricians/mechanics/fitters who will be directly involved in day-to-day operation and maintenance. These vehicles should also be charged from renewable energy, where conventional power is not available.
- **Experience of Clean Energy Ministerial (CEM) countries where direct load control has been deployed:** However, as far as the CEM experience is concerned, it has been seen that due to fluctuation in voltage, the life of battery reduces and users are losing confidence day by day in purchasing BOVs. Due to fluctuating voltage, in some cases chargers have also been burnt. It has also been seen in Bharat Heavy Electrical Vehicles and Chatelec Company, Pimpri-Chinchwad, Pune that a number of chargers were burnt during the charging of the buses (16-seater capacity) at night. This issue has been discussed a number of times with the manufacturers, wherein they have informed that fluctuation in voltage may result in such mishaps.
- **Emerging business models at the EV power system interface, their benefits, cost and risks allocated, and how policy can be formulated for better incentives:** The cost of the electric vehicle

THE MINISTRY OF HEAVY INDUSTRIES AND PUBLIC ENTERPRISES, DEPARTMENT OF HEAVY INDUSTRY HAS SET UP A NATIONAL COUNCIL FOR ELECTRIC MOBILITY (NCEM) AND A NATIONAL BOARD FOR ELECTRIC MOBILITY FOR MISSION MODE APPROACH TO EXPAND ELECTRIC MOBILITY.



Battery-operated two-wheeler

Table 1: List of BOV manufacturers

Sl. No.	Company	Nature of Business	Location
1	M/s Mahindra Reve Electric Vehicles Pvt. Ltd	4-Wheeler Manufacturer	Bengaluru
	2-Wheeler EV Manufacturers		
2	M/s Hero Electric Vehicles Pvt. Ltd	2-Wheeler (Low & High speed) Manufacturer	Delhi
3	M/s Electrotherm (I) Ltd	2-Wheeler (Low & High speed) Manufacturer	Gujarat
4	M/s Avon Cycles Ltd	2-Wheeler (Low speed) Manufacturer	Ludhiana
5	M/s Lectrix Motors Ltd	2-Wheeler (Low speed) Manufacturer	Delhi
6	M/s BSA Motors Pvt. Ltd	2-Wheeler (Low speed) Manufacturer	Chennai
7	M/s Lohia Auto Industries	2-Wheeler (Low speed) Manufacturer	Noida (UP)
8	M/s Green Electric Vehicles	2-Wheeler (Low speed) Manufacturer	Chennai
9	M/s Ultra Motors	2-Wheeler (Low speed) Manufacturer	Delhi
10	M/s Ajanta(Oreva)	2-Wheeler (Low speed) Manufacturer	Gujarat
11	M/s Ampere Vehicles Pvt. Ltd	2-Wheeler (Low speed) Manufacturer	Coimbatore
12	M/s Nortech Ferrow Alloys	2-Wheeler (Low speed) Manufacturer	Delhi
13	M/s Ashish Wheels Ltd	2-Wheeler (Low speed) Manufacturer	West Bengal
14	M/s Xs Bikes	2-Wheeler (Low speed) Manufacturer	Himachal Pradesh
15	M/s Doon	2-Wheeler (Low speed) Manufacturer	Uttaranchal
16	M/s Argentum	2-Wheeler (Low speed) Manufacturer	Noida (UP)



Charging with solar panel

is comparatively higher to the conventional vehicles because of low production. MNRE has been providing Central Financial Assistance as an incentive to the beneficiary to meet out the high cost of the vehicles. The Government of India is also considering to waiver road tax, VAT, Octroi, etc.

- **Unique challenges and opportunities arise in emerging economies for EV integration:** There is a need to develop high energy density battery, i.e., lithium-ion battery for integration of electric vehicles on mass level.
- **Energy criteria and mobility schemes may be developed for urban planning and sustainable cities:** Electric mobility is fully dependent on sustainable power production, which will build up confidence between industries and users of electric vehicles at mass level. A public transport system should be developed with the help of a city planner taking help from the Ministry of Urban Development, Ministry of Highways and Road Transportation, and the Ministry of Heavy Industries and Public Enterprises, Government of India.

Table 1 gives a list of the manufacturers that have been listed in the Ministry after recommendation of ARAI, Pune; ICAT, Manesar and VRDA, Ahmednagar. **AU**

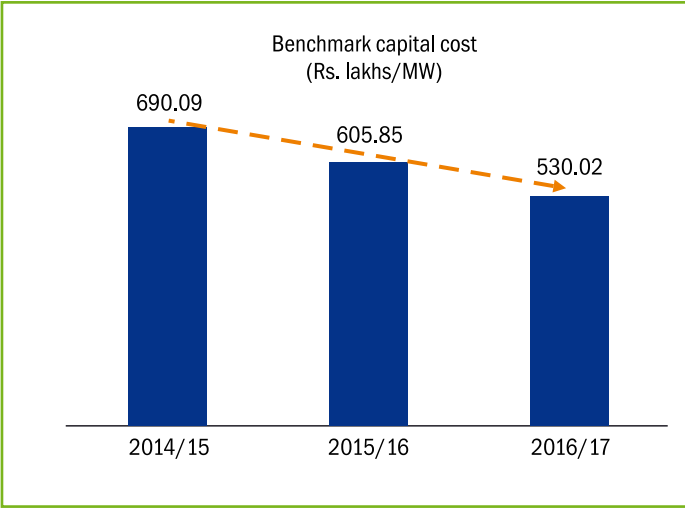
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CERC ENDORSES CAPITAL COST FOR SOLAR TO A NEW LOW

The Central Electricity Regulatory Commission (CERC) annually reviews the benchmark capital cost norm for solar PV power projects as per the proviso of Regulation 5 of “RE Tariff Regulations, 2012”.

On March 23, 2016, the CERC determined the Benchmark Capital Cost for ground-mounted solar PV power for the financial year 2016–17 at ₹530.02 lakh/MW. The component-wise breakup for the benchmark cost is given in Table 1 for the year 2016–17. In comparison to last year’s cost breakup, all component costs have been brought down. This year’s cost is ~13 per cent lower than last year’s benchmark of ₹605.85 lakh/MW, which itself was a step down by ~12 per cent from the 2014–15 benchmark cost of ₹690,109 lakh/MW.

The tariff for solar PV is devised as per the “Tariff Structure” defined in the proviso 9 of the regulation.



Cost Components	Cost for 2016–17 (lakh/MW)	Percentage of Total Cost
PV modules	328.39	61.96%
Land cost	25.00	4.7%
Civil and general works	35.00	6.6%
Mounting structure	35.00	6.6%
Inverters	35.00	6.6%
Evacuation cost*	44.00	8.3%
Preliminary and operative expenses, etc. **	27.63	5.21%
Total capital cost	530.02	100%
*Cables earthing arrangements, step up outdoor type transformer, breaker, current transformers, potential transformers, auxiliary transformers control cables, isolators, lightning arrestors, protection relays, and Time of Day (ToD) metres/tariff metres, peripheral lighting, telemetry system for real time monitoring)		
** (i) Insurance Cost: 0.5 per cent; (ii) Contingency: 0.5 per cent; (iii) Interest during Construction (IDC): 5 per cent; (iv) Financing cost: 1 per cent; (v) Project management cost: 0.5 per cent; and (vi) Pre-operative Cost: 0.5 per cent		

The tariff for renewable energy technologies shall be single part tariff consisting of the following fixed cost components:

- (a) Return on equity; (b) Interest on loan capital; (c) Depreciation; (d) Interest on working capital; (e) Operation and maintenance expenses

The tariff for the year 2016–17 as mentioned in the tariff order was determined as ₹5.68 /kWh, which is an almost 20 per cent drop from ₹7.04/kWh in 2015–16.

These cost reductions indicate increased viability of solar PV power in near future and bring a positive note to the growth of the solar PV sector in the country. **AU**

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Table 1: The component-wise breakup for the benchmark for the year 2016–17

2016–17 LCOE	5.68/kWh
Levelized benefit from AD	0.59/kWh
Net levelized Tariff after adjusting AD	5.09/kWh