Electricity Grid Management Through Vehicle to Grid (V2G) Integration Technology in India and Using Blockchain Technology for Charging of EVs with Green Electricity

Presented at Asia Clean Energy Forum (ACEF 2024)
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6th June 2024
EV Scenario in India

- Government of India (GoI) has set a target to achieve of 30% electrification of the country’s vehicle fleet by 2030 as part of the pathways towards net zero target by 2070

- India had started its journey towards electrification of transportation in 2013 with the launch of National Electric Mobility Mission Plan (NEMMP) and Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) scheme was introduced in 2015, and further extended in 2019 as FAME II

- In 2022, Convergence Energy Services Limited (CESL) floated bids for 5,450 electric buses in 5 cities under Gross Cost Contracting (GCC) model

- Currently 8102 electric buses and 12,146 public EV charging stations are operational across the country

- Ministry of Road Transport and Highways (MORTH) has planned for developing E-Highways to provide clean and green surface transport with world class facilities for E-Highway users

- “Vision 2030: PM Public Transport Sewa” is envisaging 600km of electric highways, replacement of 800,000 diesel buses with electric buses including 50,000 school buses

- Concessional Taxes for EVs: 12% (with no CESS) as against the 28% GST rate with CESS up to 22% for conventional vehicles
<table>
<thead>
<tr>
<th>Policy and Standards</th>
<th>Research Reports and White Papers</th>
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<tr>
<td>❖ Advised several states on formulation of EV Policies</td>
<td>❖ Electric Vehicles: A Sustainable Solution to Air Pollution in Delhi</td>
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<td>❖ Worked with Forum of Regulators and State Electricity Regulatory Commissions (SERCs) for <strong>creation of separate tariff slab for EV charging</strong></td>
<td>❖ Electric Vehicle Charging Stations Business Models for India</td>
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<tr>
<td>❖ Worked with Bureau of Indian Standards (BIS) to form ETD-51 for formulation of standards for EVSE</td>
<td>❖ Electric Vehicle Policies and Electricity Tariff for EV Charging in India</td>
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<td>❖ Electrification of School Buses</td>
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ISGF Credentials – Electric Mobility

Roll Out Strategies and Implementation

- Implementation Plan for Electrification of Public Transportation in Kolkata – 2017
- System Studies for Public Charging Stations in Bangalore
- Study on Infrastructure and Enabling Environment for Road Electric Transport in SAARC Member States - 2019
- Establishment of Charging Infrastructure to Support Deployment of 80 Electric Buses in Kolkata - 2018
- Feasibility Study on Introducing Electric Vehicles in the Sundarbans Landscape - 2019
- Electrical Safety Hazard Mitigation for Bus Depots for Electric Vehicle Supply Equipment (EVSE) – 2021-22
- Feasibility Analysis and Pilot Demonstration of Electrification of Goods Transport in Industrial Corridors in North India - 2023
- System Studies for Electric Grid Augmentation for Charging Infrastructure for 1180 Electric Buses in Kolkata - 2023
- Demonstration of Vehicle to Grid (V2G) Technology in India and Charging of EVs with Green Electricity (Ongoing)
Vehicle Grid Integration – Evolving Era in Electric Mobility

How it Works
V2G enables bi-directional charging, allowing EV batteries to both draw power from and feed power back into the electrical grid. This provides flexibility and energy storage capabilities to support the grid.

Key Benefits
V2G can improve grid stability, increase renewable energy integration, reduce power outages, and provide cost savings to both EV owners and grid operators.

Technological Advances
Ongoing improvements in battery technology, charging infrastructure, and grid integration systems are making V2G more practical and cost-effective.
Demonstration of Vehicle to Grid (V2G) Technology in India

- **Project Scope:**
  - **Demonstration of Adoption of V2G technology in India:** Four Tata Nexon EVs will be fitted with bi-direction on-board AC-DC converters; and bi-directional AC EVSEs will be deployed to demonstrate V2G functionalities.
  - **Solution for EV Charging with Green Electricity:** Tracking and certifying green energy usage in EV charging using Blockchain technology (Power Ledger).

- **Demo sites:** Delhi and Kerala, India

- **Technical Collaboration:** University of Delaware, USA

- **Project Partners:**
  - **V2G Technology:** University of Delaware, USA
  - **Partner Electricity Utilities:** BSES Rajadhani Pov BSES Yamuna Power Ltd (BYPL) in Delhi; and KSEB
  - **Software Support:** SEW, Inc
  - **OEMs:** Watt&Wells, USA and Nuvve, USA
  - **Observers:** Central Electricity Authority (CEA), GoI; Delhi Electricity Regulatory Commission (DERC); Tata Motors Ltd

- **Project Timelines:** February – October 2024
Another component of this V2G Demo is to integrate **Blockchain technology for tracking and certifying green energy** in EV charging, contributing to Green Mobility.
Coordinated efforts by policymakers, utilities, EV manufacturers, and technology providers will be needed to unlock the full potential of V2G

- Adoption of Standards for V2G by Bureau of Indian Standards (BIS)
- The charging and discharging operations integrated with automation systems of the distribution grid
- Advance integrated planning of power and transport sectors to avoid network congestion
- Install bidirectional EVSEs in large buildings, official complexes and residential colonies where EVs will be parked for longer hours
- EV OEMs may explore the capabilities of V2G enabled EVs to manufacture V2G variant EVs
- Policies and Regulations for incentivizing EV owners to participate in V2G programs offered by utilities
- Distribution utilities to build DERMS platforms that can integrate V2G systems
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V2G Demographic and P2P Trading with EV Charging