DISTRIBUTION UTILITY MEET 2025

Power Foundation of India

Session Partner

SESSION 6:

ELECTRIC VEHICLES – A $200 BILLION OPPORTUNITY IN INDIA AND DISCOMs ROLE IN MAKING THIS A REALITY

Nov, 2025

BACKGROUND

Power Foundation of India is a registered Society under the aegis of MoP

Evidence-based research to facilitate informed decision making by Regulators, the Ministry & concerned stakeholders

Committed to address challenges in Power Sector for benefit of consumers & investors and ensure sustainable development of the Sector

The Society is funded through subscriptions from power sector CPSEs

GOVERNANCE STRUCTURE OF PFI

Steering Council

To guide the Foundation in carrying out its activities, setting of agendas and to give suggestions on behalf of Government

Chairman - Hon'ble Minister of Power
Members – Secretaries of Various Ministries
CEO – Niti Aayog
Chairperson – CEA
CMDs of Power CPSEs

Governing Council

To manage and administer all affairs of the society

Representatives of Power sector CPSEs

PFI: Engagement with Institutes / Organisations

MoUs Signed

केविप्रा cea

प्रयास Prayas (Energy Group)

AIDA Collaboration | Innovation | Excellence

Administrative Staff College of India

BERKELEY LAB

Bloomberg

FSR GLOBAL

CLIMATE POLICY INITIATIVE

BSES

TATA POWER-DDL

MoUs Signing in Process

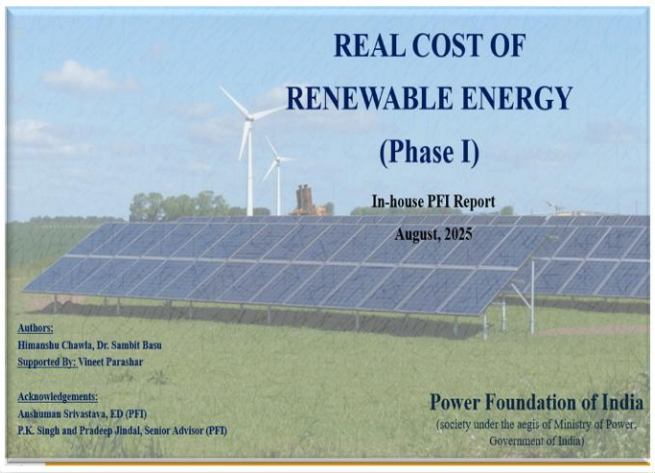
IIMA

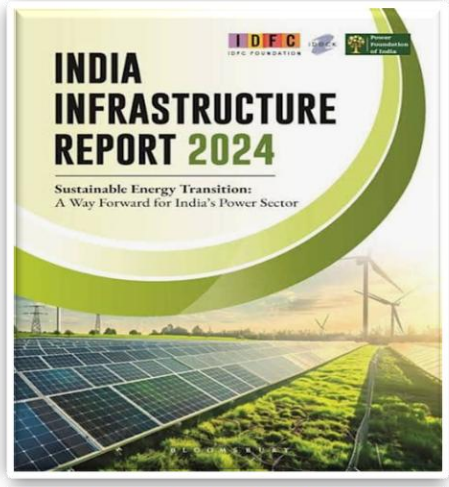
CSEP

PFI: Studies Completed

(*in line with earlier MoMs of Steering Council/MoP*)

Evidence-based Research





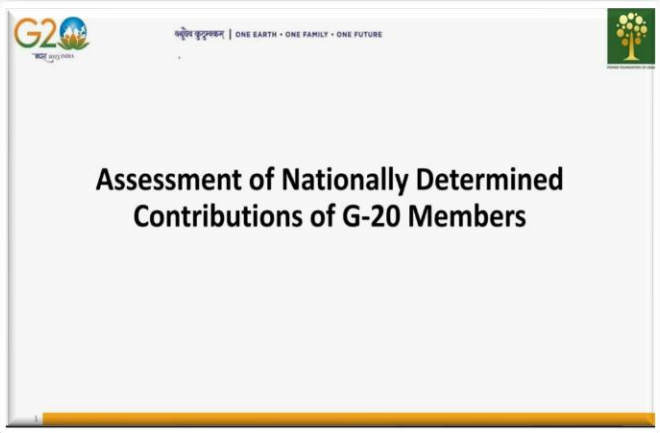
Tapping the Potential of Agriphotovoltaics in India

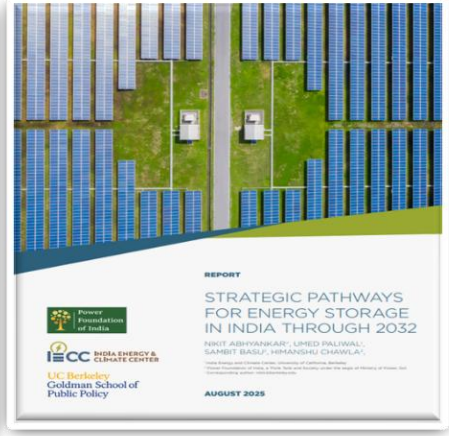
A Report by Power Foundation of India & Climate Policy Initiative

October, 2025

CLIMATE POLICY INITIATIVE

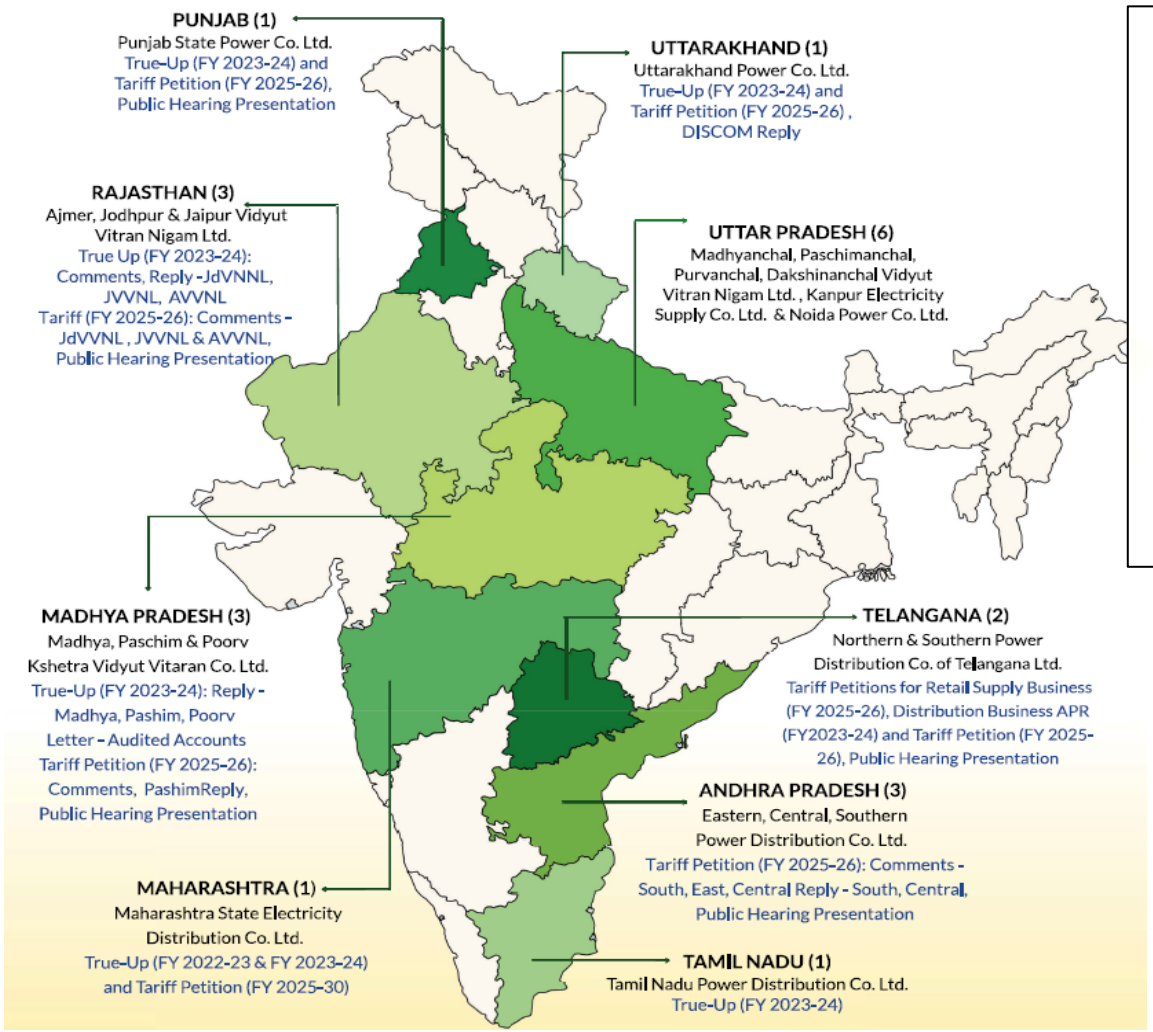
Power Foundation of India

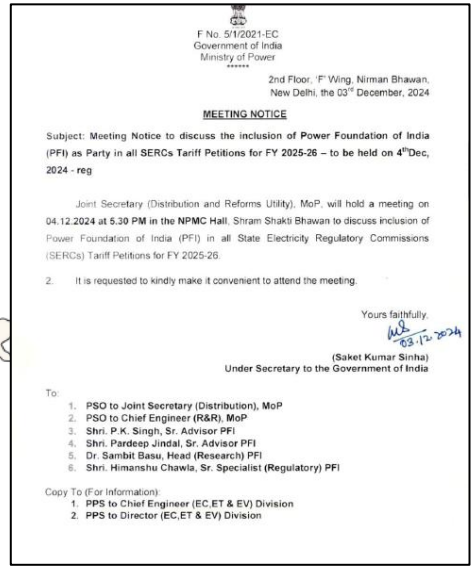




REGULATORY SUPPORT – DISCOMs Tariff Petitions

PFI PARTY in SERCs - 21 critical DISCOMs across 9 States,
18 True-Up Petitions for FY 2023-24, 22 ARR & Tariff Petitions for FY 2025-26





F No. 5/1/2021-EC
Government of India
Ministry of Power

2nd Floor, 'F' Wing, Nirman Bhawan,
New Delhi, the 03rd December, 2024

MEETING NOTICE

Subject: Meeting Notice to discuss the inclusion of Power Foundation of India (PFI) as Party in all SERCs Tariff Petitions for FY 2025-26 – to be held on 4thDec, 2024 - reg

Joint Secretary (Distribution and Reforms Utility), MoP, will hold a meeting on 04.12.2024 at 5.30 PM in the NPMC Hall, Shram Shakti Bhawan to discuss inclusion of Power Foundation of India (PFI) in all State Electricity Regulatory Commissions (SERCs) Tariff Petitions for FY 2025-26.

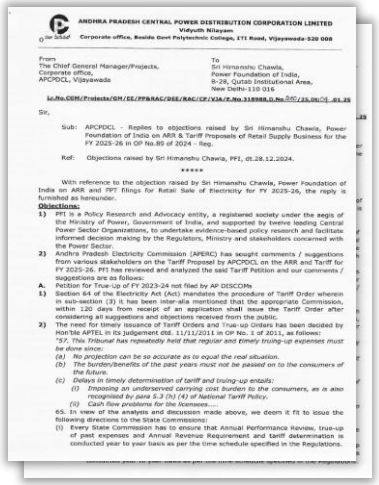
2. It is requested to kindly make it convenient to attend the meeting.

Yours faithfully,
03.12.2024
(Saket Kumar Sinha)
Under Secretary to the Government of India

To:
1. PSO to Joint Secretary (Distribution), MoP
2. PSO to Chief Engineer (R&R), MoP
3. Shri. P.K. Singh, Sr. Advisor PFI
4. Shri. Pardeep Jindal, Sr. Advisor PFI
5. Dr. Sambit Basu, Head (Research) PFI
6. Shri. Himanshu Chawla, Sr. Specialist (Regulatory) PFI

Copy To (For Information):
1. PPS to Chief Engineer (EC,ET & EV) Division
2. PPS to Director (EC,ET & EV) Division

Reply from DISCOMs



ANDHRA PRADESH CENTRAL POWER DISTRIBUTION CORPORATION LIMITED
Vidyuth Nilayam
Corporate office, Beside Govt Polytechnic College, ITI Road, Vijayawada-520 008

From
The Chief General Manager/Projects,
Corporate office,
APCPDCL, Vijayawada

To
Sri Himanshu Chawla,
Power Foundation of India,
9-26, Qutab Institutional Area,
New Delhi-110 016

Lr.No.CGM/Projects/GM/EE/PPRAC/DEE/RAC/CP/VJA/F.No.318988,D.No.880/25.09.01.01.25

Sir,

Sub: APCPDCL - Replies to objections raised by Sri Himanshu Chawla, Power Foundation of India on ARR and Tariff Proposals of Retail Supply Business for the FY 2025-26 in OP No.89 of 2024 - Reg.

Ref: Objections raised by Sri Himanshu Chawla, PFI, dt.28.12.2024.

With reference to the objection raised by Sri Himanshu Chawla, Power Foundation of India on ARR and PPT filings for Retail Sale of Electricity for FY 2025-26, the reply is furnished as hereunder.

Objections:

1) PFI is a Policy Research and Advocacy entity, a registered society under the aegis of the Ministry of Power, Government of India, and supported by twelve leading Central Power Sector Organizations, to undertake evidence-based policy research and facilitate informed decision making by the Regulators, Ministry and stakeholders concerned with the Power Sector.

2) Andhra Pradesh Electricity Commission (APERC) has sought comments / suggestions from various stakeholders on the Tariff Proposal by APCPDCL on the ARR and Tariff for FY 2025-26. PFI has reviewed and analyzed the said Tariff Petition and our comments / suggestions are as follows:

A. Petition for True-Up of FY 2023-24 not filed by AP DISCOMs

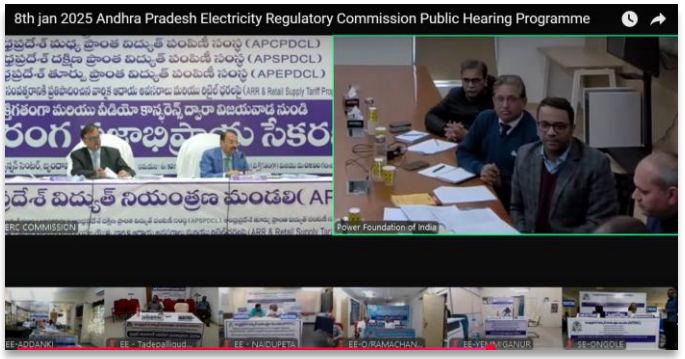
1) Section 64 of the Electricity Act (Act) mandates the procedure of Tariff Order wherein in sub-section (3) it has been inter-alia mentioned that the appropriate Commission, within 120 days from receipt of an application shall issue the Tariff Order after considering all suggestions and objections received from the public.

2) The need for timely issuance of Tariff Orders and True-up Orders has been decided by Hon'ble APTEL in its judgement dtd. 11/11/2011 in OP No. 1 of 2011, as follows:
"57. This Tribunal has repeatedly held that regular and timely truing-up expenses must be done since:
(a) No projection can be so accurate as to equal the real situation.
(b) The burden/benefits of the past years must not be passed on to the consumers of the future.
(c) Delays in timely determination of tariff and truing-up entails:
(i) Imposing an unobserved carrying cost burden to the consumers, as is also recognised by para 5.3 (h) (4) of National Tariff Policy.
(ii) Cash flow problems for the licensees....."

65. In view of the analysis and discussion made above, we deem it fit to issue the following directions to the State Commissions:
(i) Every State Commission has to ensure that Annual Performance Review, true-up of past expenses and Annual Revenue Requirement and tariff determination is conducted year to year basis as per the time schedule specified in the Regulations.

CLICK

Public Hearings



APERC Public Hearing

TGERC Public Hearing

PFI: Other Engagements

Regional Regulatory Workshops

Funded by PFI

- Senior Officers of SERCs, DISCOMs, State GENCOs & TRANSCOs
- Workshops – Broad overview on national/ international best practices in electricity regulatory aspects, power project financing, energy transition and related areas

PFI Chair Professor at IISc Bangalore

Indian Institute of Science
भारतीय विज्ञान संस्थान

MoU Signed on 25th September 2025

Name of the Chair – 'PFI Chair Professor on Energy Independence, IISc '

Research area– Emerging Technologies to achieve Energy Independence by 2047

Rating Regulatory Performance of all 36 States & UTs


REPORT

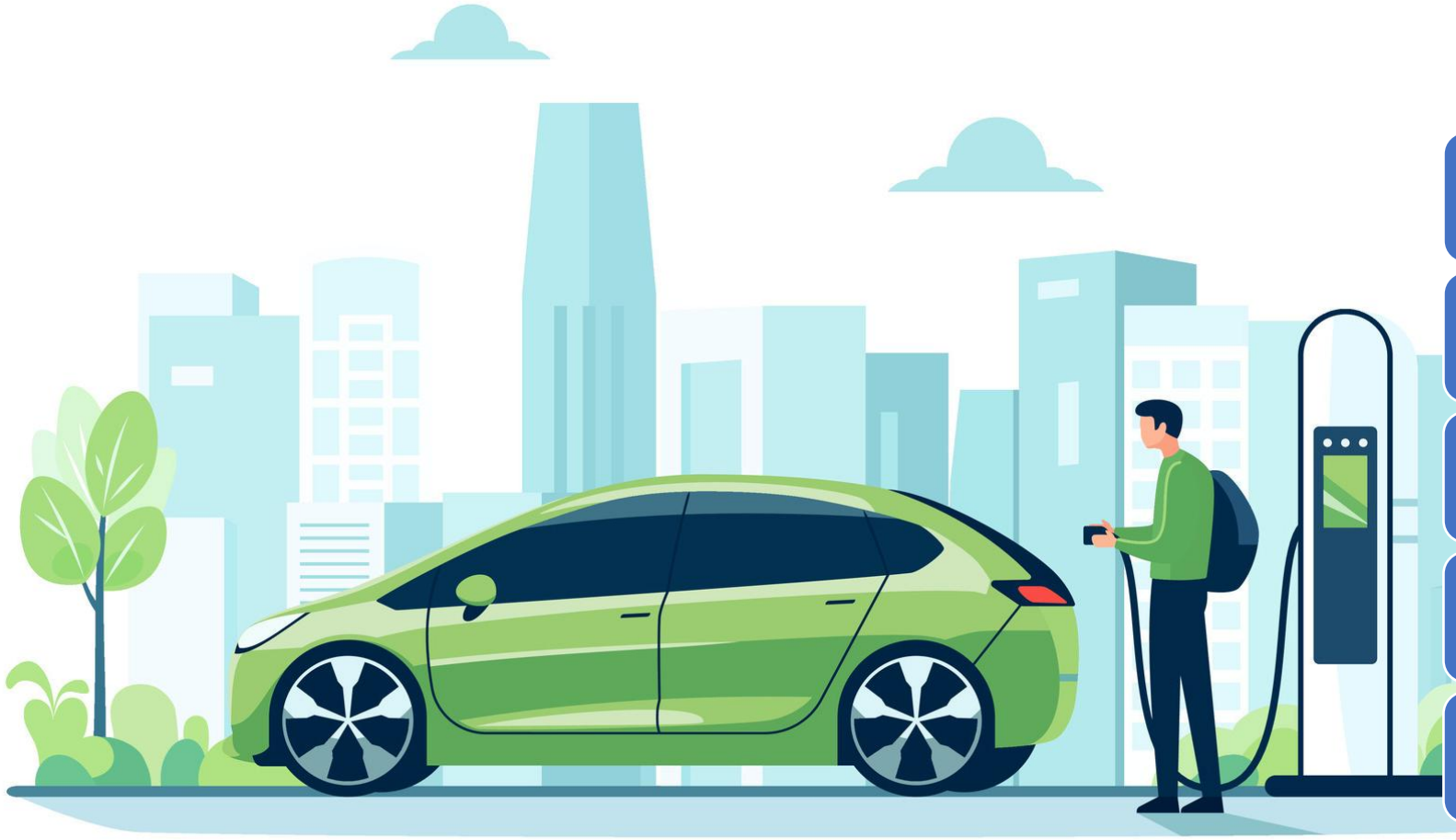
RATING REGULATORY PERFORMANCE
OF
STATES AND UNION TERRITORIES

POWER FOUNDATION OF INDIA Oct, 2025 REC Ltd.

- Rating based on 5 heads – Resource Adequacy, DISCOM Financial Viability, Ease of Living / Doing Business, Energy Transition & Regulatory Governance
- Draft scores presented to all SERCs in regional meetings held between 9th-11th September 2025

Power Foundation of India

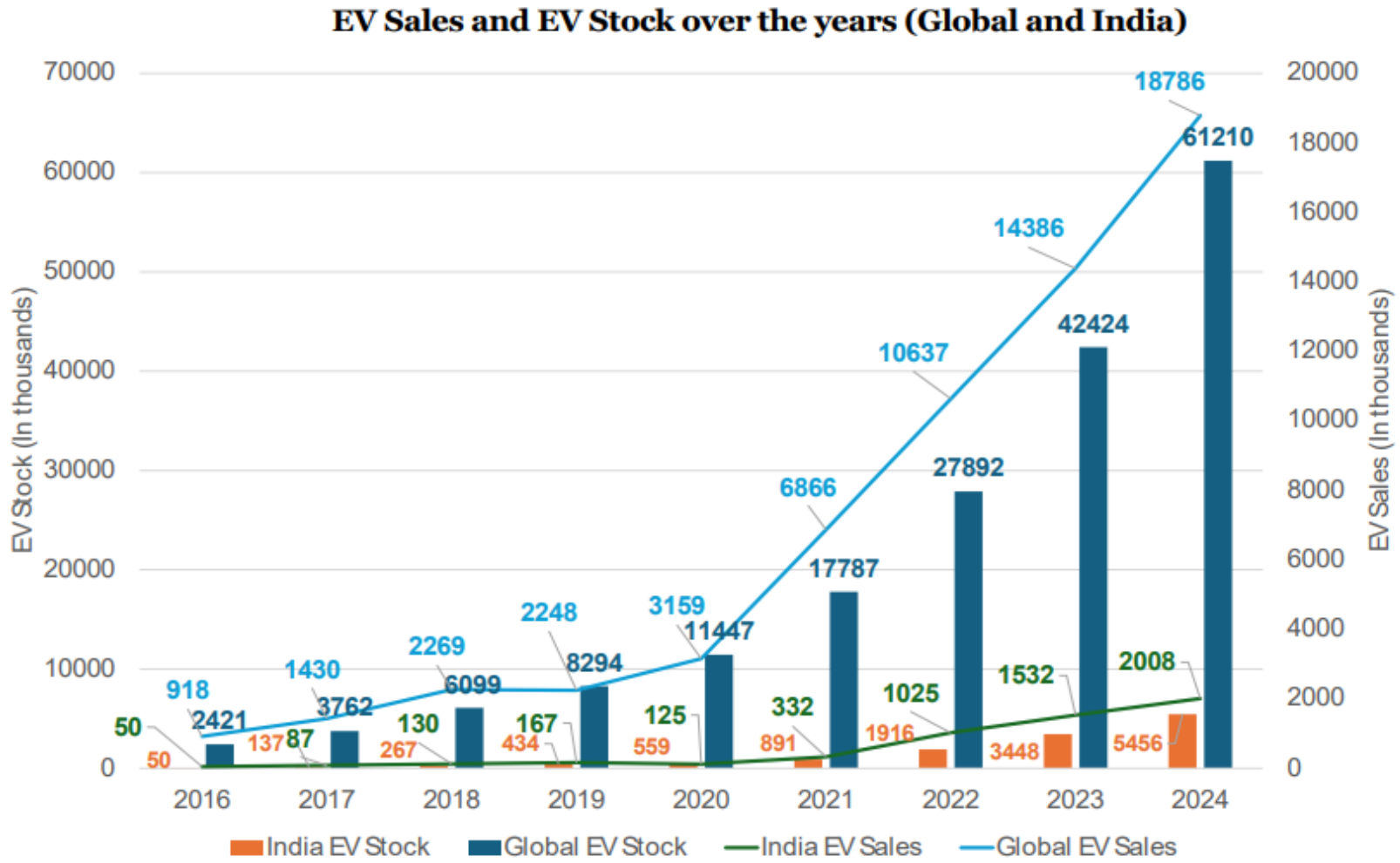
Why EV Transition?



- Reduce dependence on imported fuel
- Reduce Greenhouse Gases (GHG) emissions
- Improve air quality
- Becoming a leader in a rapidly growing global market
- Increase share of renewable energy by leveraging the storage capacity of EV batteries

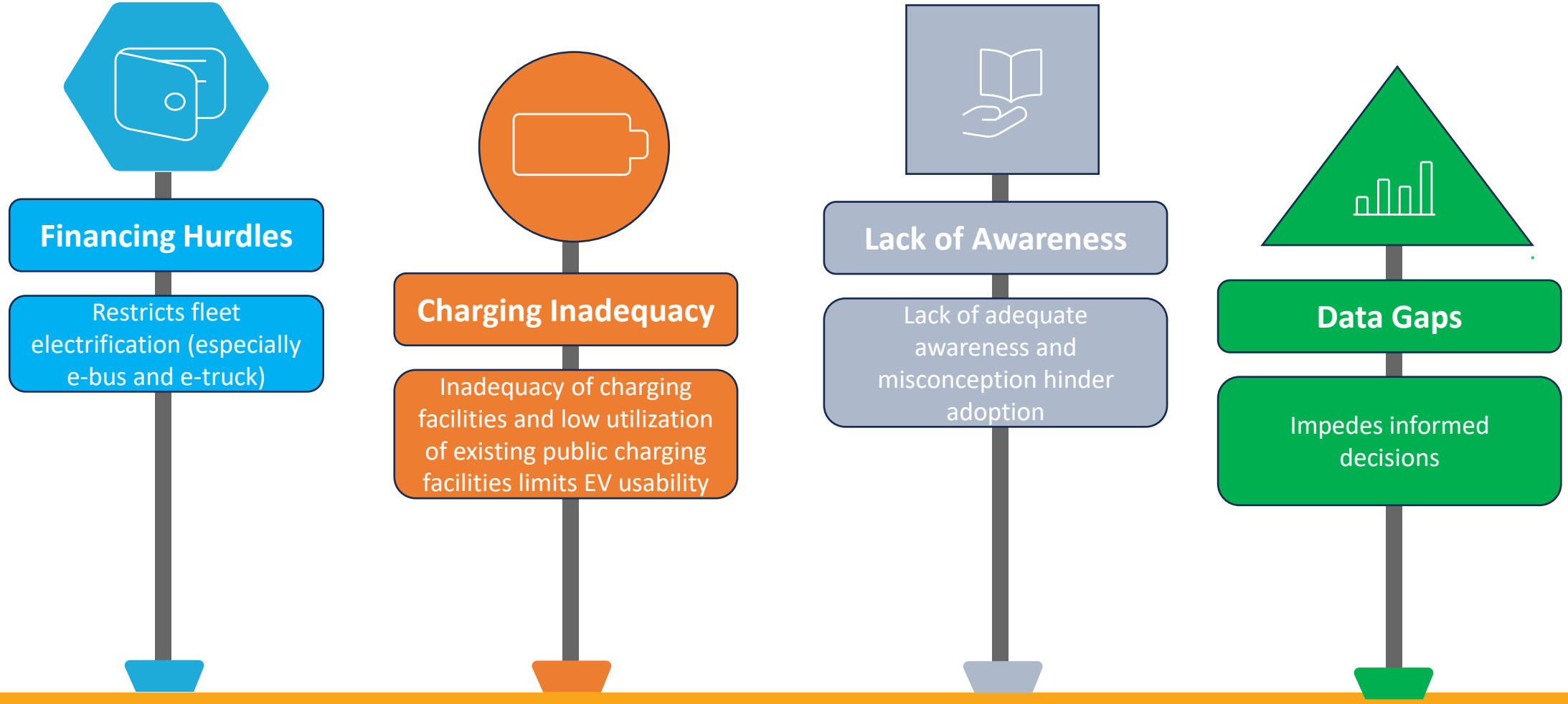
INTRODUCTION | NITI Aayog Report

India's EV transition has been slow to start, but is picking up



Source: 1) IEA Global EV Data Explorer for global data, 2) VAHAN Portal for India data

KEY CHALLENGES | NITI Aayog Report



CHALLENGES FOR THE POWER SECTOR

India's EV market is **projected to grow to a $200 billion opportunity** by 2030, with significant penetration in public transport and private mobility.

Uncoordinated EV charging, particularly during evening hours, can amplify system **peak demand**, stressing grid infrastructure.

Increased short-term power procurement during peak periods may raise DISCOMs' **Average Power Purchase Cost (APPC)** and overall cost of supply.

Smart tariffs, including **Time-of-Day (ToD)** and **real-time pricing**, can promote off-peak charging, reduce grid stress, and improve cost efficiency.

It is important that India achieves its EV transition goals while ensuring that the **power sector remains cost-effective and resilient**

Study the incidence of Electric Bus Charging on DISCOMs' Network and Scope for Optimal Power Purchase

(PFI Report)

August 2025

Supported By

BSES Rajdhani Power Limited

TATA POWER-DDL

BSES Yamuna Power Limited

PFI Authors: Himanshu Chawla Sr. Specialist (Regulatory) supported by Vineet Parashar

Acknowledgements:

Anshuman Srivastava, ED (PFI), P.K. Singh, Senior Advisor (PFI) & Dr. Sambit Basu, Head Research (PFI)

Power Foundation of India

(Autonomous Society under the aegis of Ministry of Power, Government of India)

Acknowledgements & Key Contributors

Acknowledgements

BSES is committed to powering a greener, smarter, and more resilient energy future for Delhi, ultimately benefiting consumers with reliable, cost-effective, and environmentally responsible energy solutions. In this direction, this Report of PFI will certainly support DISCOMs in achieving its target.

Amal Sinha, Group CEO, BSES Delhi DISCOMs

PFI has done commendable work of addressing the core issue of optimisation of Peak Demand of DISCOMs through collaboration with BRPL, which will be fruitful for the consumers of Delhi at large.

Abhishek Ranjan, CEO, BSES Rajdhani Power Ltd.

TPDDL, in its continuous efforts of give impetus to clean and green technology initiatives, is leading as a front-runner utility in the country by scaling up its electric vehicle fleet. PFI Report will definitely help in optimising the Charging of the Electric Fleet.

Dwijadas Basak, CEO, TATA Power Delhi Distribution Ltd.

PFI has actively engaged with Delhi DISCOMs and has come out with very pertinent recommendations for managing peak demand in Delhi. The study findings will help DISCOMs and policymakers in creating a sustainable and resilient power infrastructure ecosystem for the benefit of our esteemed customers.

Brajesh Kumar, COO, BSES Yamuna Power Ltd.

I commend the efforts of the PFI for producing this comprehensive and forward-looking analysis. The insights from this report will be valuable for all stakeholders as we work together to deliver on India's energy aspirations.

Anshuman Srivastava Executive Director, Power Foundation of India

E-mobility is the need of the hour, but it is struggling with core issues, such as charging at Peak hours at a costlier rate and non-rationalised tariffs for charging EVs, etc. This report makes a timely and valuable contribution by addressing these very questions in a structured and data-driven manner.

Praveen Kumar Singh Senior Advisor, PFI

Dr. Sambit Basu Head - Research, PFI

Key Contributors

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Commercial Operations, Renewables and Regulatory Affairs

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GM (Renewable- EV & Open Access), BRPL
Associated with Reliance ADAG Group for ~ 20 years

TATA POWER-DDL

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Head- Regulatory, TPDDL
Former CFO, Tata Power Trading

Manish Jain
Head (Revenue Protection), TPWODL
Former Regulatory Head, TPDDL

Jyoti Jagtani
AGM- Regulatory

Ankit Malik
HoG (RTPM , Storage solutions & Reliability)

Sandeep Kumar
Head (Power Management), TPDDL

BSES Yamuna Power Limited

Mukesh Dadhich
Head-Business Development, Sustainability & Clean Technology, BYPL

Sunil Sharma
GM (DER and NTI), BYPL
Key member of Sustainability leading various initiatives under Renewables, Demand Side Management, E-Mobility, Energy Storage.

Contents

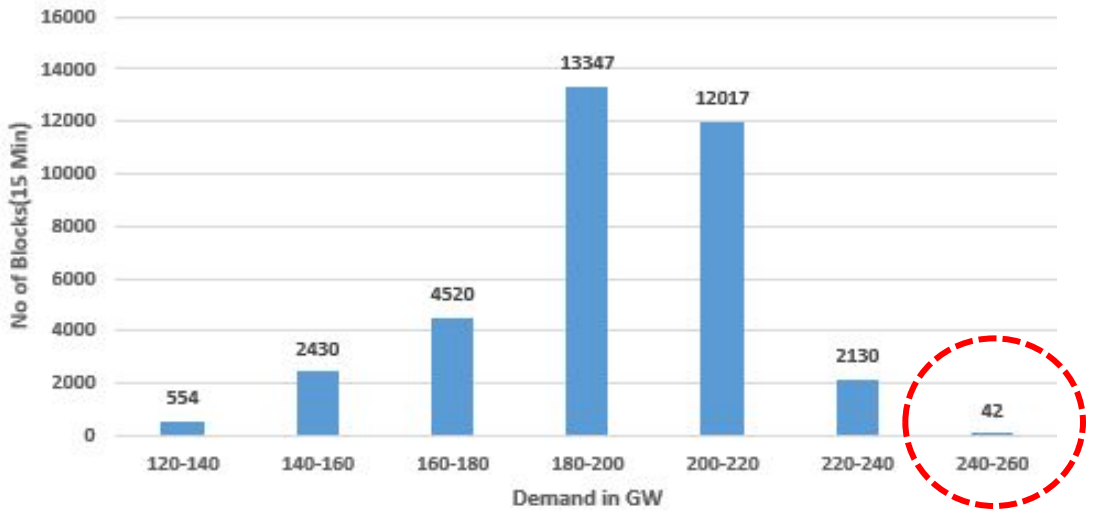
- Problem Statement
- Objective of the Study
- Approach and Methodology
- Analysis
- Findings
- Optimization Measures- Shifting of Load, BESS & deferral of Network (avoided Peak)
- Recommendations to Stakeholders
- Conclusion

Problem Statement | Peak Demand all India

PEAK DEMAND, THE MENACE

- Peak demand, the highest average load measured in kVA or kW at the point of supply of a consumer during a consecutive period of 15/30 mins during a billing cycle
- All India Peak Demand increased from **157 GW in FY 2015-16 to 250 GW** in FY 2024-25 (*CEA*), however, it occurs for only ~0.1% of the total time in a Year (in 42-time blocks), Fig 1.
- DISCOMs, as mandated u/s Sec. **43 of the Electricity Act, 2003, for "Duty to Supply on request"** required to maintain the network to meet Peak Demand and incur commensurate Power Purchase Cost & Network Cost to meet such Peak Demand.
- **Supreme Court in Judgement dtd. 19/05/2023** in KC Ninan v. Kerala State Electricity Board has ruled that "*the owner or occupier has the statutory right to "demand" electricity for the premises under their use or occupation*."

Fig 1: Frequency Distribution of Demand in FY 2024-25
(Grid Controller of India)



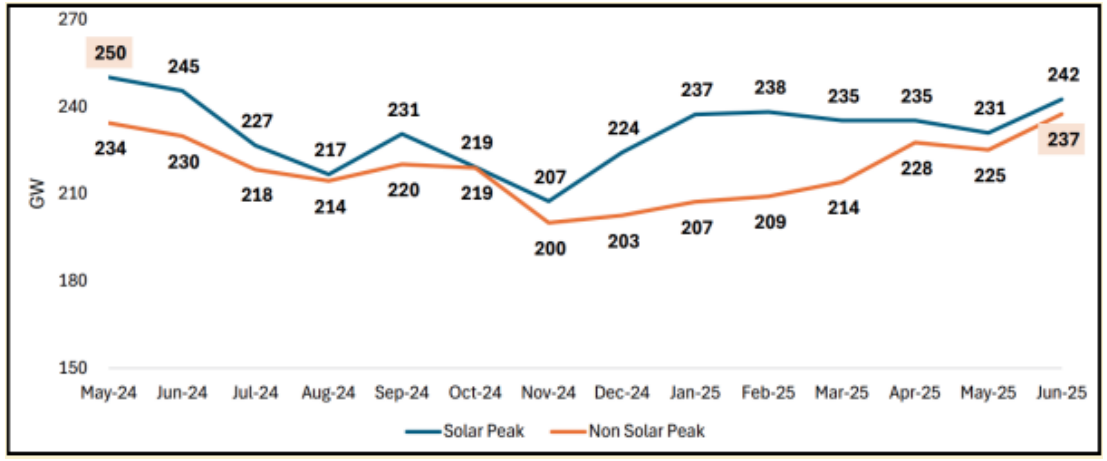


Fig 2: Peak Demand Monthly Trend in FY 2024-25, *Source: GRID India*

Huge Solar Power meets the Peak Demand during daytime, but vanishes during night peak

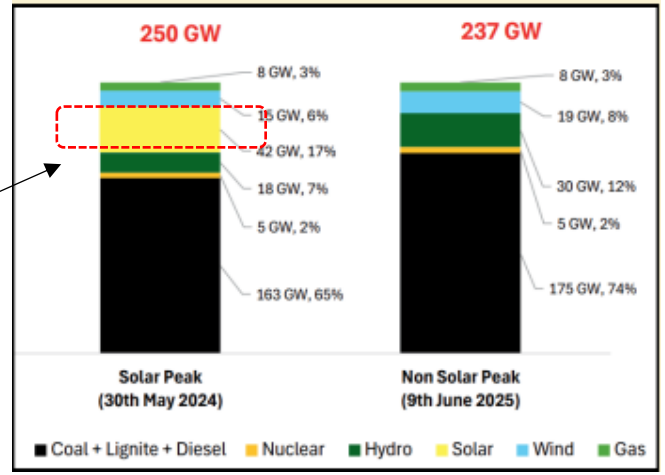


Fig 3: Source-wise contribution in Peak Demand FY 2024-25, *Source: GRID India*

Problem Statement | Peak Demand Delhi DISCOMs

Peak load FY 2023-24

Delhi: 7438 MW
(~1% of the time)

- **BRPL: 3758 MW**
- **TPDDL: 2218 MW**
- **BYPL: 1800 MW**

Highly dense and populated DISCOMs, with consumer density of ~4,000/ sq km for BRPL & TPDDL and 9,000/ sq km for BYPL

Fig 4. Delhi Load Duration Curve FY 2023-24 *(Delhi SLDC)*

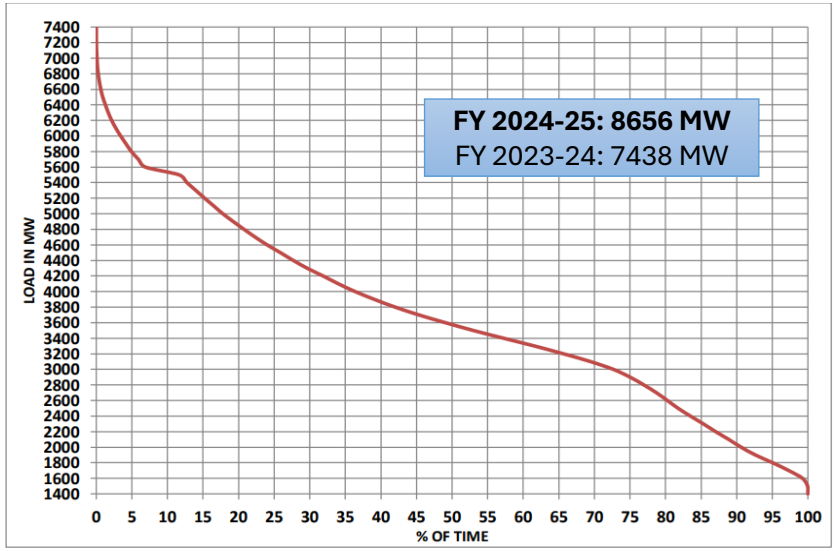


Fig 5. Frequency Distribution of Demand in FY 2023-24, Delhi

~1,000 MW of differential load (Δ) occurred for just 1% of the time in a year, **for 113 hours only**

LOAD REMAINED ABOVE IN MW	DURATION IN HOURS	(%) OF TIME
7400	0.00	0.00
7300	0.50	0.00
7200	1.50	0.01
7100	5.50	0.04
7000	11.50	0.09
6900	19.25	0.15
6800	33.25	0.27
6700	53.50	0.43
6600	79.25	0.64
6500	112.75	0.91
6400	159.75	1.28
6300	209.50	1.69
6200	269.00	2.16
6100	341.50	2.75
6000	426.00	3.43
5900	518.25	4.17
5800	613.50	4.93
5700	736.00	5.92

Fig 6. BRPL Load Duration Curve FY 2023-24

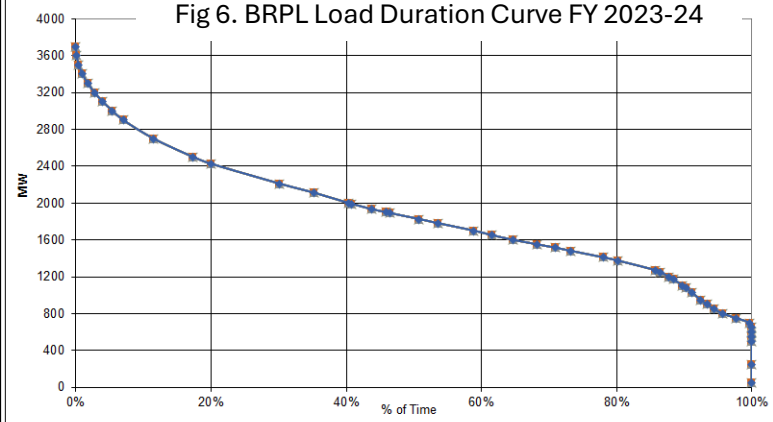


Fig 7. TPDDL Load Duration Curve FY 2023-24

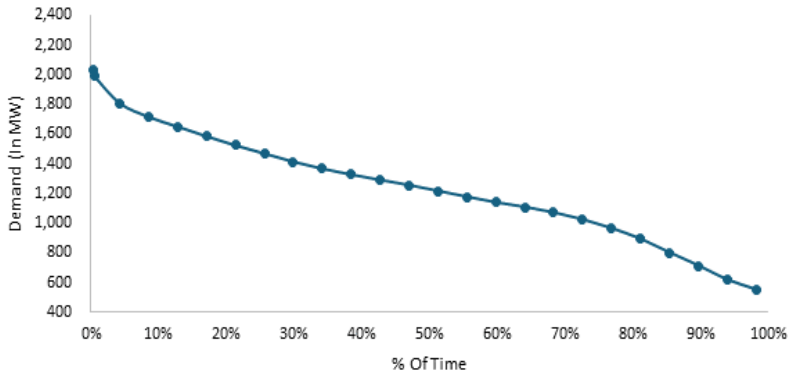
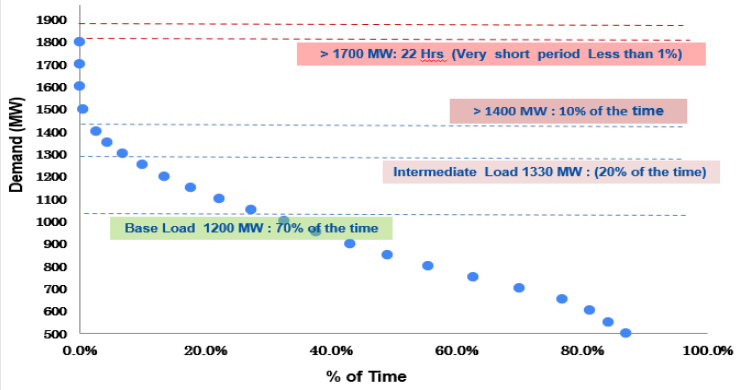


Fig 8. BYPL Load Duration Curve FY 2023-24



Problem Statement | Peak Demand Delhi DISCOMs

Fig 9. Delhi Peak Demand FY 2024-25 & 2023-24 *(Delhi SLDC)*

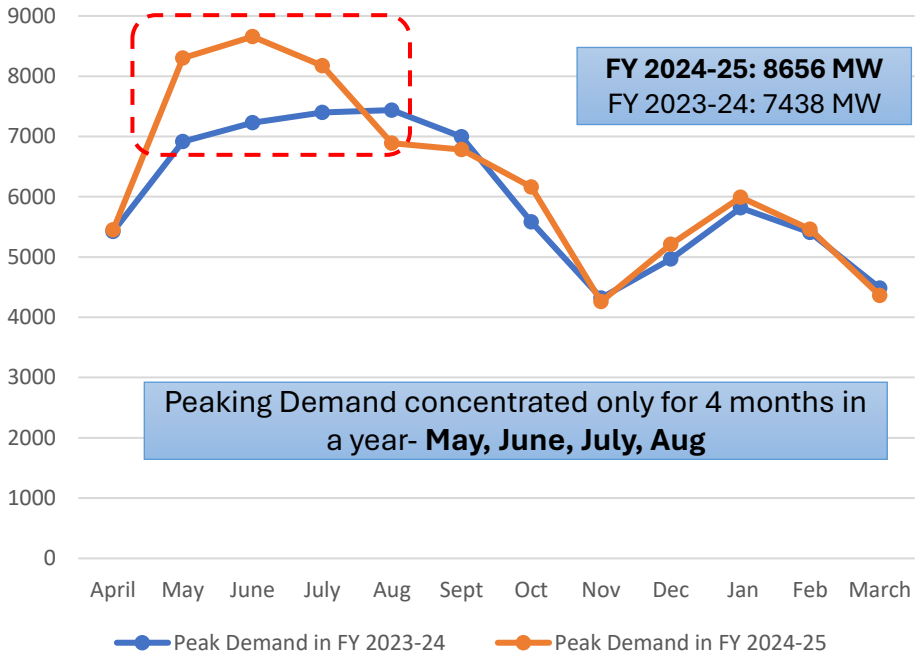
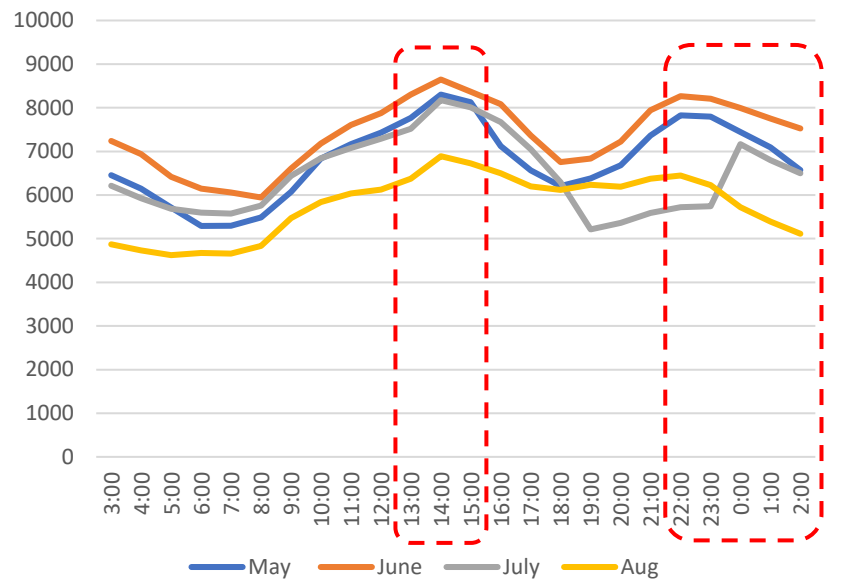


Fig 10. Delhi Block wise Peak Demand in FY 2024-25



For 4 months, i.e., May, June, July, Aug Demand peaking concentrated only in 5-6 hrs

Fig 11. Short Term rate in Peak hours (Rs./kWh)

Time Block	BRPL	TPDDL	BYPL
June 2024			
2100-2130	9.67	10	10
2130-2200	9.62	10	10
2200-2230	9.65	10	10
2230-2300	9.76	10	10
2300-2330	9.77	10	10
2330-2400	9.76	10	10
0000-0030	9.88	9.84	10
0030-0100	9.83	9.5	10
July 2024			
2100-2130	9.67	10	10
2130-2200	9.62	10	10
2200-2230	9.65	10	10
2230-2300	9.76	10	10
2300-2330	9.77	10	10
2330-2400	9.76	10	10
0000-0030	9.88	10	9.58
0030-0100	9.83	9.52	8.51

- DISCOMs coincident Peak Demand translates to States' Coincident and majority of States' coincident translates to All India coincident.
- **Differential (Δ) Peak load is ~1000 MW occurred for ~1% of the time, i.e., around 113 hours in FY 2023-24**
- To meet Peak load, Delhi DISCOMs **procures Short term power @ avg rate of Rs. 8.5/kWh**, ~ **Rs. 3000 Cr in FY 2024-25** (~ 10% of Total Power Purchase Quantum). Power Purchase for 4 months- May, June, July, Aug is ~ **Rs. 1400 Cr** out of which Power Purchase in peaking 5-6 hrs, is ~**Rs. 750 Cr.**
- To meet Δ Peak load of ~1000 MW, Delhi DISCOMs **procures Short term power @ Rs. 10/kWh (Fig. 11).** At National level, the power purchase cost required to meet the Peak Load would be staggering

Problem Statement | Peak Demand Delhi + E-Bus

Jun-24	Peak Demand		
Time Block	BRPL	TPDDL	BYPL
0000-0030	2.44%	2.38%	2.42%
0030-0100	2.39%	2.34%	2.38%
0100-0130	2.34%	2.28%	2.33%
0130-0200	2.29%	2.23%	2.28%
0200-0230	2.23%	2.18%	2.23%
0230-0300	2.18%	2.13%	2.17%
0300-0330	2.12%	2.07%	2.11%
0330-0400	2.07%	2.02%	2.06%
0400-0430	2.01%	1.96%	1.99%
0430-0500	1.96%	1.91%	1.94%
0500-0530	1.90%	1.84%	1.88%
0530-0600	1.82%	1.78%	1.83%
0600-0630	1.75%	1.72%	1.79%
0630-0700	1.71%	1.68%	1.77%
0700-0730	1.67%	1.65%	1.74%
0730-0800	1.65%	1.64%	1.71%
0800-0830	1.64%	1.63%	1.67%
0830-0900	1.65%	1.63%	1.66%
0900-0930	1.70%	1.71%	1.70%
0930-1000	1.78%	1.85%	1.78%
1000-1030	1.85%	1.94%	1.84%
1030-1100	1.91%	2.02%	1.92%
1100-1130	1.97%	2.08%	1.98%
1130-1200	2.01%	2.13%	2.04%
1200-1230	2.06%	2.19%	2.10%
1230-1300	2.11%	2.23%	2.14%
1300-1330	2.14%	2.16%	2.16%
1330-1400	2.20%	2.25%	2.20%
1400-1430	2.27%	2.34%	2.25%
1430-1500	2.33%	2.40%	2.29%
1500-1530	2.35%	2.43%	2.32%
1530-1600	2.34%	2.42%	2.35%
1600-1630	2.32%	2.38%	2.34%
1630-1700	2.26%	2.33%	2.29%
1700-1730	2.20%	2.25%	2.23%
1730-1800	2.11%	2.15%	2.17%
1800-1830	2.02%	2.07%	2.10%
1830-1900	1.96%	2.01%	2.04%
1900-1930	1.94%	1.98%	1.99%
1930-2000	1.98%	1.99%	1.99%
2000-2030	2.04%	2.01%	2.01%
2030-2100	2.11%	2.03%	2.05%
2100-2130	2.20%	2.05%	2.09%
2130-2200	2.29%	2.16%	2.18%
2200-2230	2.38%	2.26%	2.28%
2230-2300	2.45%	2.34%	2.36%
2300-2330	2.47%	2.38%	2.42%
2330-2400	2.47%	2.39%	2.44%

Fig 12. E-Bus Charging during Peak hours in Delhi

June-24	Peak Demand			E-Bus Charging		
Time Block	BRPL	TPDDL	BYPL	BRPL	TPDDL	BYPL
1300-1330	2.14%	2.16%	2.16%	3.20%	3.69%	3.65%
1330-1400	2.20%	2.25%	2.20%	3.40%	3.88%	3.73%
1400-1430	2.27%	2.34%	2.25%	3.37%	3.95%	3.73%
1430-1500	2.33%	2.40%	2.29%	3.52%	4.00%	3.75%
1500-1530	2.35%	2.43%	2.32%	3.49%	4.03%	3.98%
1530-1600	2.34%	2.42%	2.35%	3.51%	3.90%	3.61%
1600-1630	2.32%	2.38%	2.34%	2.93%	3.71%	2.85%
2100-2130	2.20%	2.05%	2.09%	1.99%	2.66%	3.33%
2130-2200	2.29%	2.16%	2.18%	3.07%	3.91%	4.06%
2200-2230	2.38%	2.26%	2.28%	3.85%	3.76%	3.62%
2230-2300	2.45%	2.34%	2.36%	3.42%	3.20%	3.51%
2300-2330	2.47%	2.38%	2.42%	2.76%	3.77%	4.10%
2330-2400	2.47%	2.39%	2.44%	3.11%	4.17%	4.17%
0000-0030	2.44%	2.38%	2.42%	3.53%	3.91%	3.43%
0030-0100	2.39%	2.34%	2.38%	3.71%	3.81%	2.90%
0100-0130	2.34%	2.28%	2.33%	3.27%	3.98%	3.30%
0130-0200	2.29%	2.23%	2.28%	3.00%	3.71%	3.52%

Load pertaining to Domestic, Commercial, Industrial & other consumers is not particular to peak timings unlike EV Charging which comes during Peak hours in Summers. **Impact !!**

E-BUS CATALYSING PEAK DEMAND PROBLEM

While operation of Electric buses compared to Oil and gas-based buses will reduce pollution but unless properly planned, growing penetration of EVs may have a destabilising effect on the grid, may hamper cost economics of the Distribution Companies and increase the Average Cost of Electricity Supply to Retail consumers.

EVs demand electricity for charging according to convenience, which may coincide with the Peak Demand, pushing it up resulting in purchase of Costlier Short-Term Power to meet the demand.

Problem Statement | Role of Surging Electric Fleet

SURGENCE OF ELECTRIC FLEET

Fig 13. Surgence of EV (% of the total)

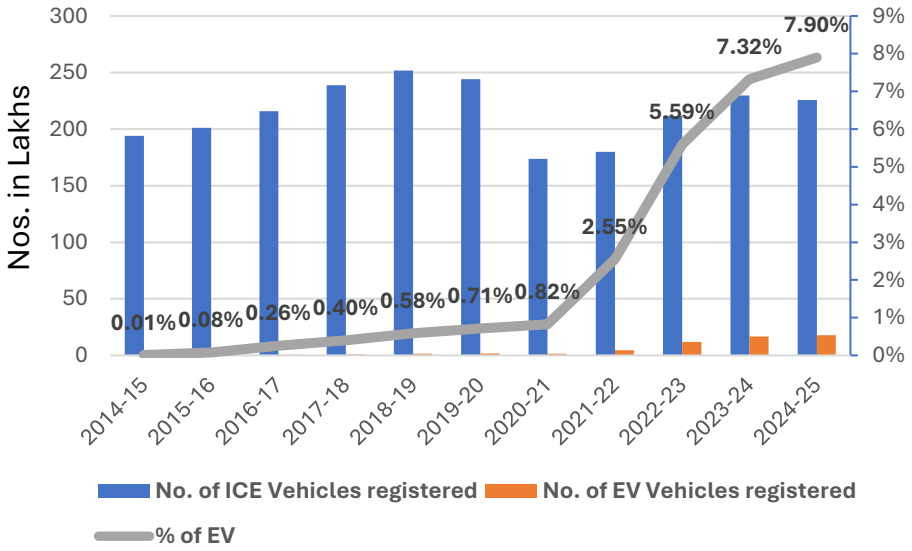
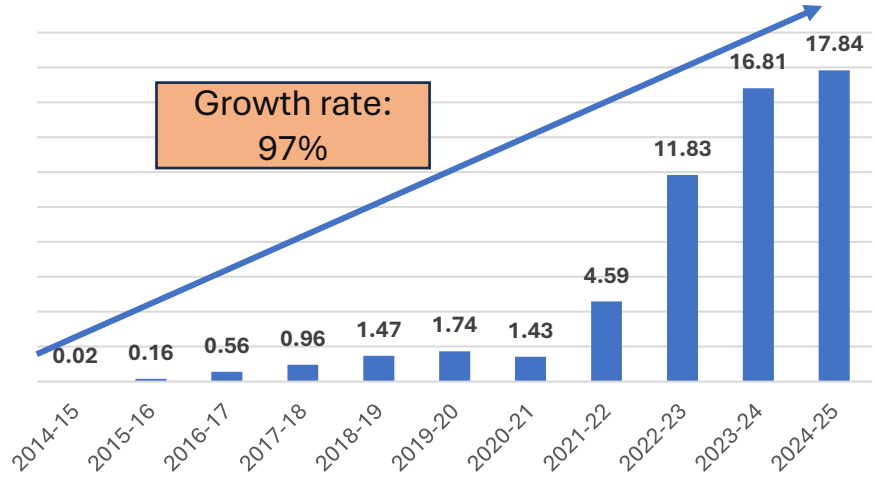


Fig 14. No. of EV Vehicles registered (in lacs)



During last 10 yrs, **EV registered CAGR of 97%.**

During FY 2024-25, EV sold is 8% of the total vehicles.

Given the thrust on Green mobility, EV are expected to rise significantly in the coming time.

As a result, the Energy requirement will also rise considerably.

Source: PIB, GoI

As per CEA (EPS), estimated EV on the road by FY 2031-32 would be **491 lakhs (14% of the total),** power consumption of **27,000 MU out of total consumption of 24,73,736 MU at All-India level.**

Power Sector Report by OmniScience Capital, estimated EV on the road by FY 2034-35 would be 1,620 lakhs, power consumption 159,000 MU.

India's Target of 30% EV market share by 2030, **EV30@30**

EV30@30 INCREASING UPTAKE OF ELECTRIC VEHICLES
A CAMPAIGN OF THE CLEAN ENERGY MINISTERIAL

ELECTRIC BUS CHARGING- CATALYSING PEAK DEMAND MENACE

ABOUT E- BUSES

ENERGY GUZZLER

E_BUS PARAMETERS 12 METRE *

- **Capacity of Battery: 268 kW**
- DC Fast Chargers of 240 kW each
- **Charging time: ~2 hrs (80% charge in 1 hr)**
- Range of E-Bus ~ 230 km
- Operational hours of E- Bus : 8 hr, Single trip
- Li-ion Battery with useful life of 8 years depending on SOC
- No. of charges available per E-Bus at the Depot : 1:5
- Charger Cost: 14~15 lakh

*For 12-m E-Buses

Source: Report on "THE ROAD AHEAD FOR PRIVATE ELECTRIC BUSES IN INDIA", Shakti Foundation & USAID

No. of E-bus	10,000	Nos
No. of plies in a day	2	Nos
Battery	268 (12-m) 200 (9-m)	kW
Charging Time	3	hrs
Consumption (annual)	**3592**	**MU**

- 12-m E-Buses with 268 kW and 9-m Buses with 200 kW battery pack
- 80:20 ratio for 12-m and 9-m E-Buses

As on July 2024, 9143 nos of e-Bus, all India level
Source: *PIB, Govt. of India*

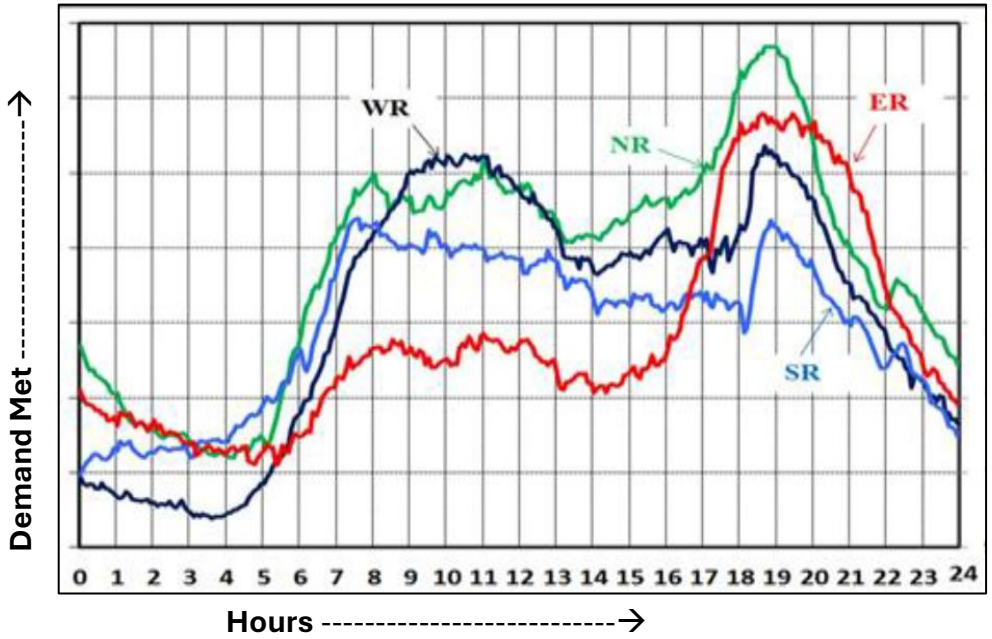
No of E-buses estimated to reach to 1,50,000 by 2030 (market Research)

Problem Statement | Role of Surging Electric Fleet

SURGENCE OF ELECTRIC FLEET | BURDEN ON PEAK DEMAND

- Road transportation accounts for 12% of CO2 emissions *(NITI Aayog)*. The GoI, with objective of reducing emissions from Transportation and improving the air quality, promoting adoption of Electric Vehicles (EVs). Government provides subsidies on purchasing EVs through FAME (Faster Adoption and Manufacturing of Electric Vehicles) India scheme.
- Other policy support programs like Production Linked Incentive (PLI) schemes for domestic vehicle manufacturing and battery cell production, Tax reduction on EV chargers and charging stations, and Capital subsidies to Oil marketing Companies (OMCs) for setting up public EV charging infrastructure.
- As on March'25, 2152 E-Buses in Delhi. 1752 E-buses under DTC and 400 E-buses under the DIMTS cluster scheme. This includes 12-meter Buses, 9-meter smaller Buses.
- E-Buses by virtue of their operations, Charge during night hours and ply during daytime but DISCOMs experience peak during nighttime, *(as shown in Graph)* which may coincide with the E-Bus Charging.

ELECTRIC BUS CHARGING- CATALYSING PEAK DEMAND MENACE



E- BUS DEPOTS

ENERGY GUZZLER

As per Power Sector Report by OmniScience Capital

- 35 lacs E-Buses estimated on road by FY 2034-35
- Power consumption for the same would be 33,000 MU.

	E-BUS DEPOT	DEPOT LOAD
BRPL	NEHRU PLACE	5 MW
	MAYAPURI	4 MW
	MUNDELA	5 MW
	SUKHDEV VIHAR	7 MW
BYPL	RAJGHAT	4 MW
	HASSANPUR- 1	8 MW
TPDDL	BARWALA	12 MW
	WAZIRPUR	7 MW
	SUBASH PALACE	8 MW
	ROHINI, SEC- 6	4 MW
	KINGSWAY CAMP	3 MW
	ROHINI, SEC- 16	4 MW
		69 MW*

* As on Nov, 2024

Capacity in FY 2025-26 : 268 MW
Capacity in FY 2029-30 : 500 MW

RULES ON EV TARIFF AND EV TARIFF SCHEDULE

Ministry of Power notification dtd. 17/09/2024 for Electric Vehicle Charging Infrastructure:

*"**9. Tariff for supply of electricity to EV charging stations***

(1) The tariff for supply of electricity to EV Charging Stations shall be single part and shall not exceed "ACoS" till 31.03.2028.

(2) The Distribution Licensee will charge 0.7 times the ACoS during solar hours (9:00 AM to 4:00 PM) and 1.3 times ACoS during non-solar hours (remaining hours).

(3) Each EV charging station must have separate metering arrangements to accurately record consumption and apply the appropriate tariff.

(4) Distribution Licensee may provide sub metering for EV charger, behind-the-meter of an existing HT connection."

- Costly ST Power Purchase
- No Fixed Charges
- Least Energy Charges Rs.4/kVAh
- ToD (Off-peak Rebate of 20%)

  4 AM to 10 AM

Clause 8.3 of Tariff Policy, 2016:

*"For achieving the objective that the **tariff progressively** **reflects the cost of supply of electricity**, the Appropriate Commission would notify a **roadmap such that tariffs are brought within** **±20% of the average cost of supply**. The road map would also have intermediate milestones, based on the approach of a gradual reduction in cross-subsidy"*

EV TARIFFS IN DIFFERENT STATES

TARIFF SCHEDULE IN DELHI

Sr. No.	Category	Fixed Charges	Energy Charges
10. Charging Stations for E-Rickshaw/E-vehicle on Single Point Delivery/ Swapping of Batteries			
10.1	Supply at LT	-	4.50 Rs./kWh
10.2	Supply at HT	-	4.00 Rs./kVAh

Comparison of ABR of EV-CS with ACoS of DISCOMs (Rs./kWh)

DISCOMs	Average Cost of Supply (ACoS)	Average Billing Rate (ABR) for EV-CS	ABR (EV-CS) as a percentage of ACoS (%)	Tariff for EV-CS as per MoP Guidelines (Sept'24)	
				Solar Hours	Non-Solar Hours
BRPL	9.9	4.11	41%	6.93	12.87
BYPL	8.67	4.19	48%	6.07	11.28
TPDDL	9.55	4.52	47%	6.69	12.42
Total	**9.5**	**4.25**	**45%**	**6.65**	**12.35**

TARIFF SCHEDULE IN OTHER STATES

State	EV Tariff (FY 2025-26)	
	Fixed Charge (Rs./kVA/month)	Energy Charge (Rs./kVAh)
Maharashtra	Nil	9.25
Karnataka	200	4.50
Rajasthan	150	6.00
Uttar Pradesh	Nil	7.30
Gujarat	25	4.00
Telangana	100	6.00

- Unlike other States, Delhi has very less tariff for EV - Rs. 4/kVAh
- Very high Cross subsidization levels
- No Fixed Charges

E-BUS WORKING MODEL contd..

Land
Owned by DTC
Given on lease

Charging Stations

EXICOM, ABB, BHEL, TELUS

Electric Bus Depots

Charging Infrastructure - Aggregators

TATA MOTORS · ASHOK LEYLAND · JBM Group

Tariff Rs. 4.00/kWh (HT)

ACS- Rs. 8.33/kWh

DISCOMs

TATA POWER-DDL · BSES

ABR- Rs. 8.90/kWh

E-Bus

Fixed Charge of Rs. 43/km to Aggregators

DTC

Delhi Transport Corporation

Charged fare for using E-Bus Service

Consumers of E-Bus Service

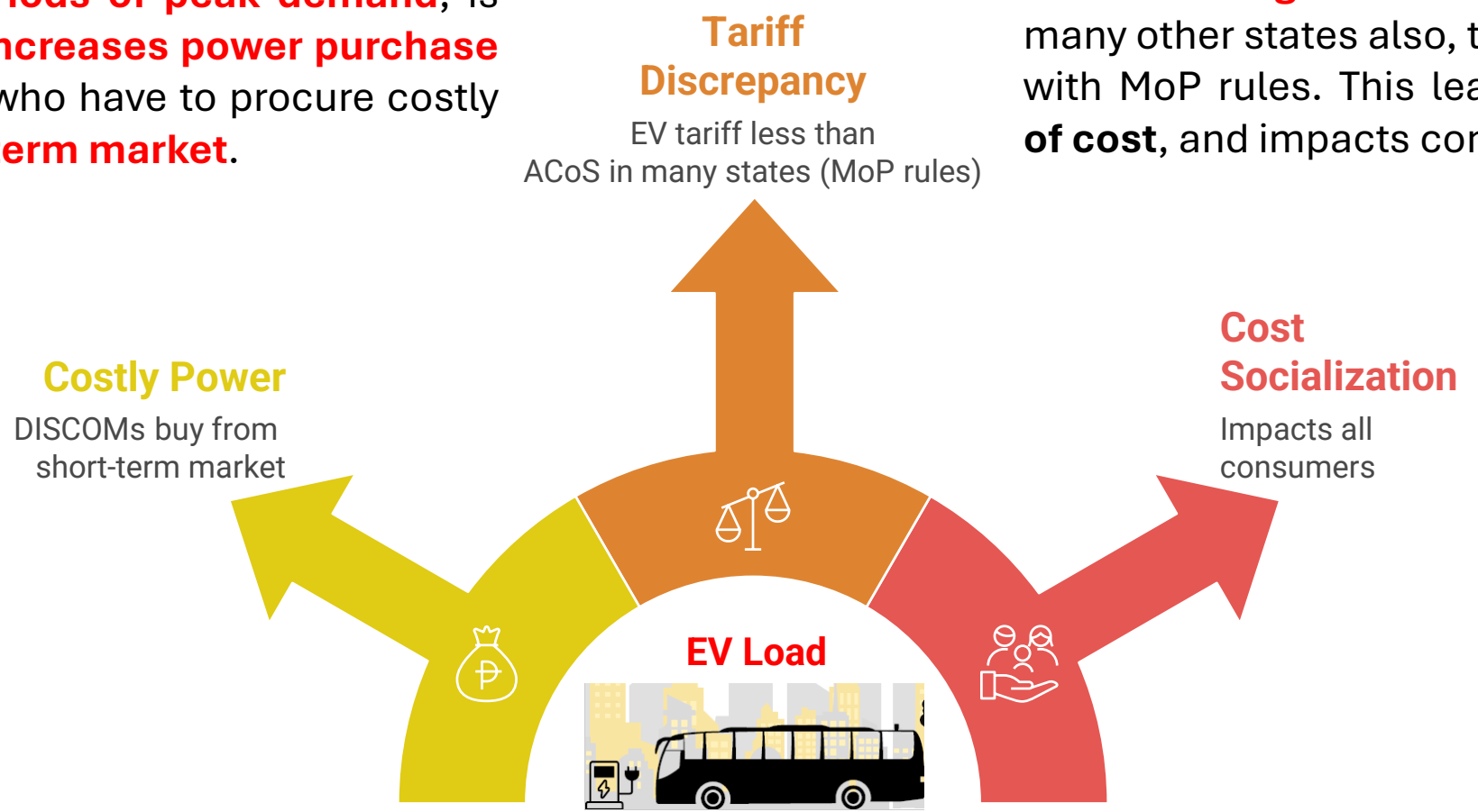
Tariff comparatively higher for other Consumers

Key Challenges with Surging Electric Fleet

KEY CHALLENGES

EV **increases power demand load**, which coincides with **periods of peak demand**, is **intermittent** and **increases power purchase cost** of DISCOMs who have to procure costly power from **short-term market**.

In **Delhi**, the **tariff for EVs is less than 50% of the Average Cost of Supply** (ACoS). In many other states also, the tariff is not in line with MoP rules. This leads to **socialization of cost**, and impacts consumers.



APPROACH & METHODOLOGY

NDA Signed

- NDAs signed with Delhi DISCOMs *(Annexure-2)*
- BSES dtd. 31st Jan'24
- TPDDL gave in Principle approval vide email dtd. 10/01/2024

Scope of Study

- Impact Assessment of EV Load Depot & Power Purchase
- Electric Bus actual 30 mins feeder data of consumption, Power Purchase Quantum & Cost, Revenue details etc.

Data Sharing

- Actual Feeder information on Half Hourly basis for June, July, Dec 2023 and June, July 2024
- Demand Met of DISCOM as a whole
- Average Loading (kW), Long-term & Short-Term (Power Exchange & Bilateral), Power Purchase Quantum and Cost data

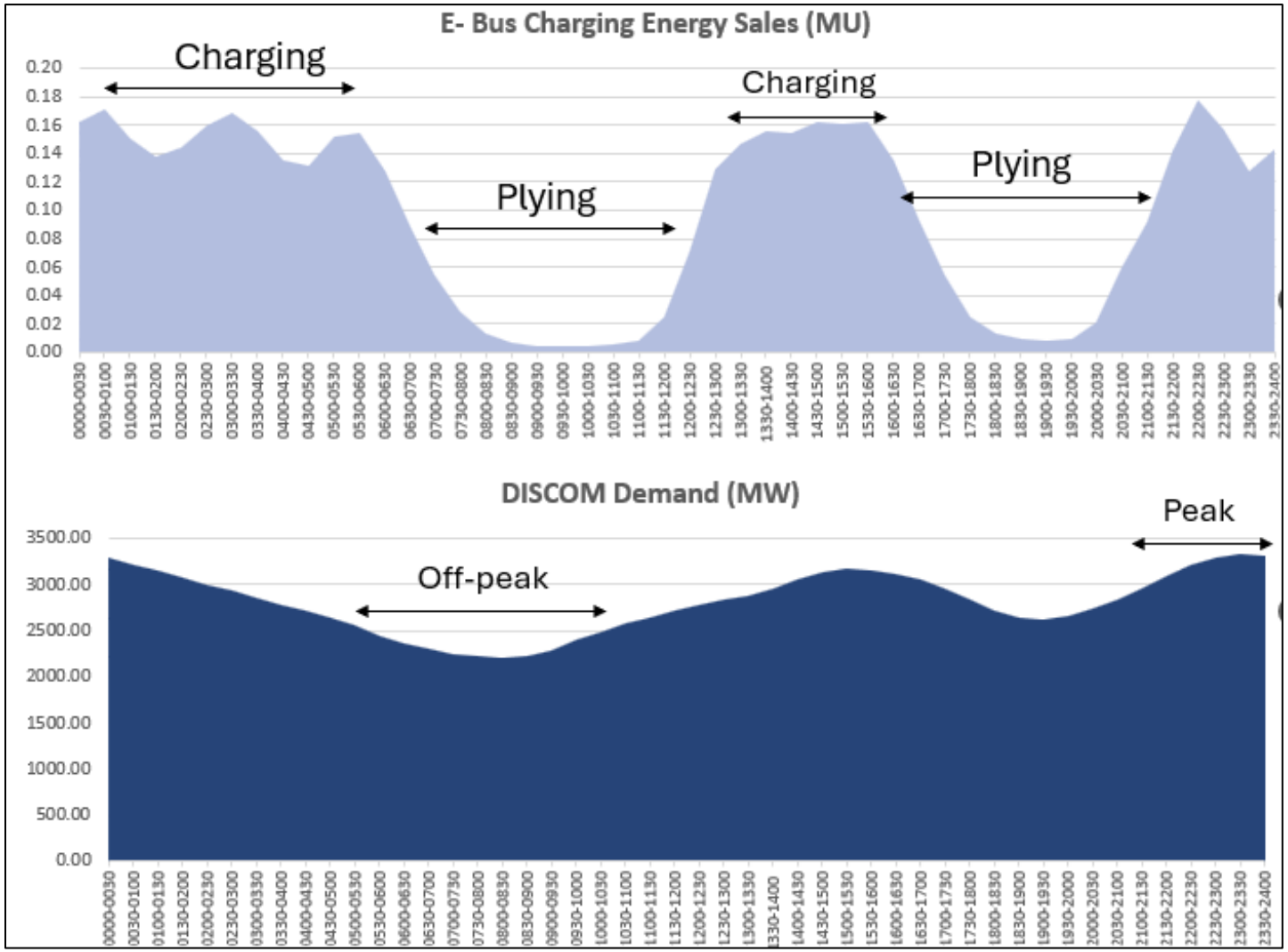
Impact Assessment Study majorly related to Power Purchase Cost, Cross subsidization levels due to Electric Buses Charging Pattern wherein Actual data related to Feeder, catering EV Depot Load, and Power Purchase for Delhi DISCOMs will be utilised.

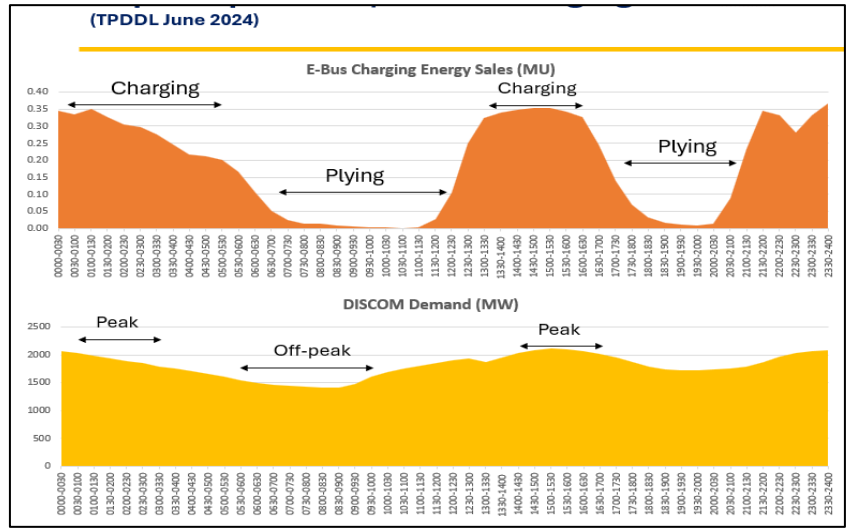
Power Foundation of India

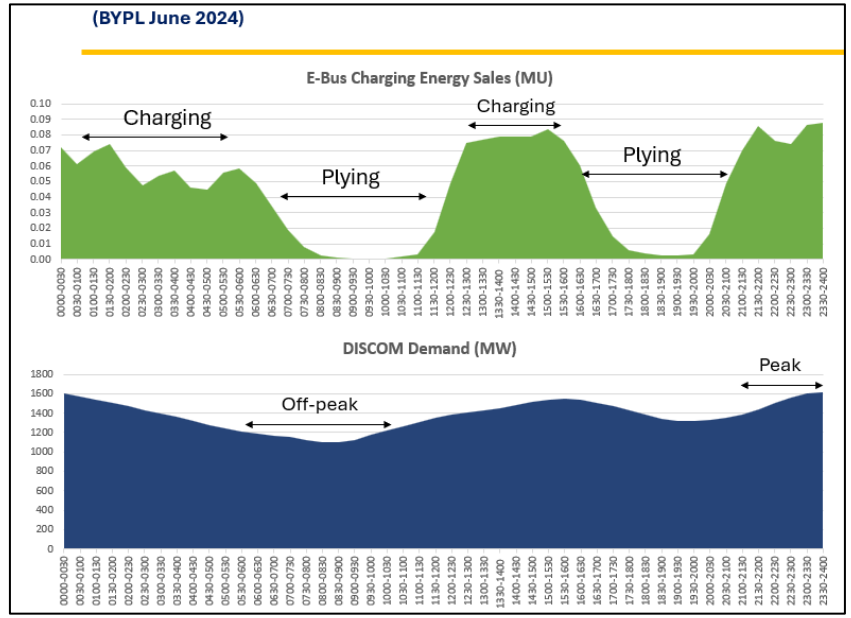
FINDINGS

Superimposition | E-Bus Charging load wrt Total Load

(BRPL June 2024)







Heat Map | E-Bus Charging & total Load in Summer

(BRPL June 2024)

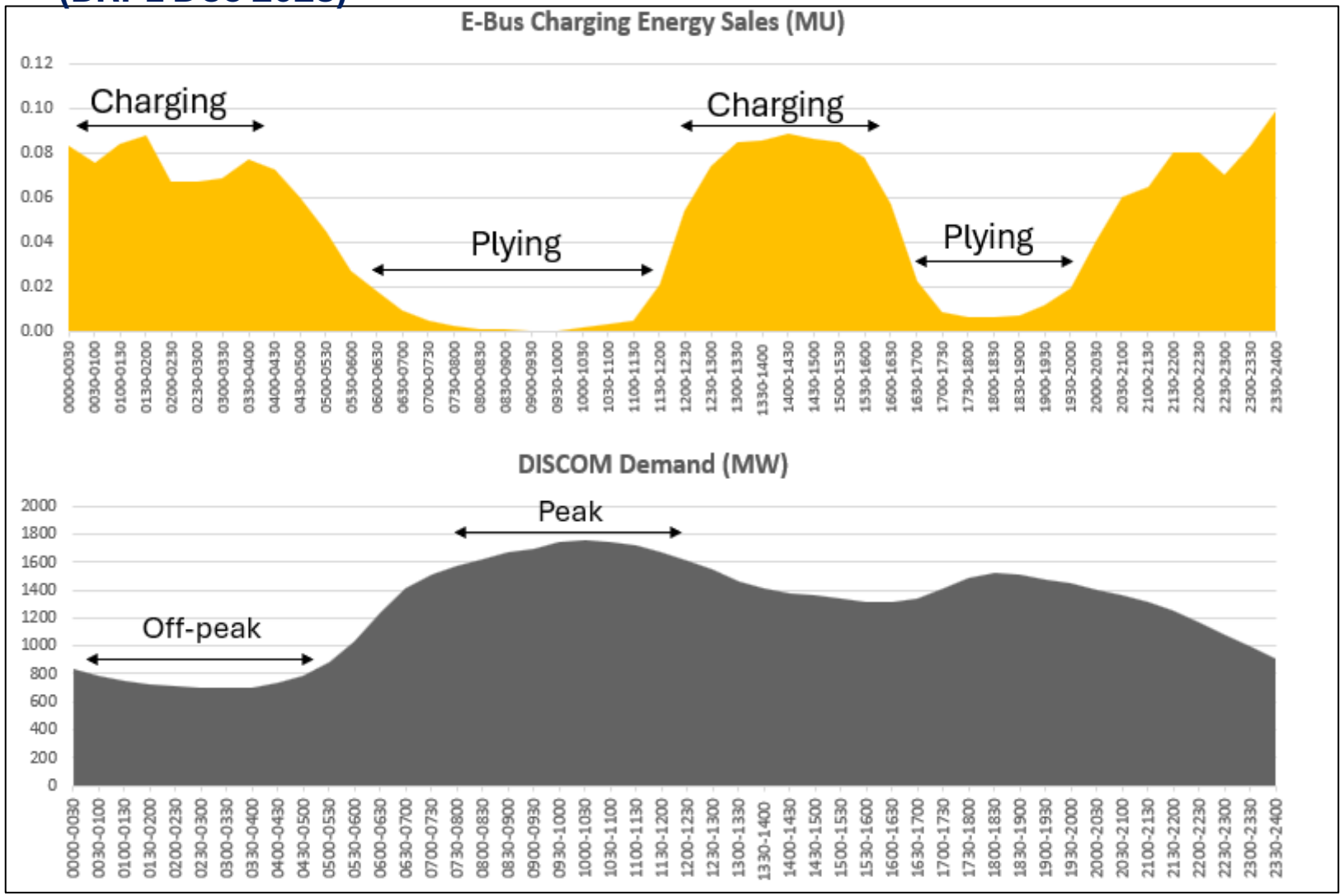
Time Block	Demand Met (MU)	E-Bus Consumption (MU)				Total E-Bus consumption (MU)	Demand met (%) wrt Total Demand Met	E-Bus consumption (%) wrt Total E-Bus
		Mundela (4.8 MW)	Mayapuri (4 MW)	Nehru Place (5 MW)	Sukhdev Vihar (7 MW)			
0000-0030	49.28	0.04725	0.03062	0.02598	0.05866	0.16251	2.44%	3.53%
0030-0100	48.33	0.05043	0.03228	0.03500	0.05290	0.17061	2.39%	3.71%
0100-0130	47.22	0.03639	0.03505	0.03193	0.04690	0.15027	2.34%	3.27%
0130-0200	46.17	0.02479	0.03314	0.02295	0.05713	0.13800	2.29%	3.00%
0200-0230	44.97	0.03078	0.02717	0.02894	0.05678	0.14367	2.23%	3.12%
0230-0300	43.95	0.04273	0.02982	0.03556	0.05135	0.15946	2.18%	3.47%
0300-0330	42.86	0.04675	0.03536	0.02525	0.06085	0.16822	2.12%	3.66%
0330-0400	41.81	0.03852	0.03586	0.02289	0.05800	0.15527	2.07%	3.37%
0400-0430	40.69	0.02979	0.03215	0.02806	0.04467	0.13467	2.01%	2.93%
0430-0500	39.64	0.03215	0.03108	0.02597	0.04260	0.13180	1.96%	2.86%
0500-0530	38.31	0.04136	0.03392	0.01940	0.05706	0.15173	1.90%	3.30%
0530-0600	36.71	0.04314	0.03415	0.01622	0.06068	0.15419	1.82%	3.35%
0600-0630	35.43	0.03938	0.02993	0.01141	0.04667	0.12739	1.75%	2.77%
0630-0700	34.44	0.02890	0.02354	0.00519	0.02978	0.08742	1.71%	1.90%
0700-0730	33.75	0.01712	0.01644	0.00193	0.01878	0.05426	1.67%	1.18%
0730-0800	33.30	0.00917	0.01036	0.00065	0.00864	0.02881	1.65%	0.63%
0800-0830	33.12	0.00485	0.00463	0.00031	0.00408	0.01387	1.64%	0.30%
0830-0900	33.38	0.00256	0.00165	0.00028	0.00292	0.00741	1.65%	0.16%
0900-0930	34.34	0.00136	0.00052	0.00015	0.00260	0.00464	1.70%	0.10%
0930-1000	35.90	0.00097	0.00033	0.00063	0.00245	0.00439	1.78%	0.10%
1000-1030	37.32	0.00075	0.00040	0.00164	0.00208	0.00487	1.85%	0.11%
1030-1100	38.60	0.00077	0.00037	0.00304	0.00174	0.00592	1.91%	0.13%
1100-1130	39.71	0.00079	0.00032	0.00549	0.00170	0.00830	1.97%	0.18%
1130-1200	40.65	0.00732	0.00103	0.01555	0.00161	0.02551	2.01%	0.55%
1200-1230	41.56	0.02909	0.01100	0.01802	0.01279	0.07090	2.06%	1.54%
1230-1300	42.59	0.04049	0.02620	0.01770	0.04390	0.12829	2.11%	2.79%
1300-1330	43.27	0.05084	0.02886	0.02436	0.04332	0.14738	2.14%	3.20%
1330-1400	44.36	0.05439	0.03068	0.02347	0.04782	0.15636	2.20%	3.40%
1400-1430	45.75	0.05143	0.02955	0.02532	0.04869	0.15500	2.27%	3.37%
1430-1500	46.96	0.05504	0.02898	0.02833	0.04940	0.16175	2.33%	3.52%
1500-1530	47.52	0.05252	0.02868	0.02870	0.05049	0.16038	2.35%	3.49%
1530-1600	47.22	0.05618	0.02865	0.02730	0.04948	0.16160	2.34%	3.51%
1600-1630	46.76	0.05268	0.02190	0.02134	0.03889	0.13469	2.32%	2.93%
1630-1700	45.74	0.04326	0.01568	0.01182	0.02226	0.09302	2.26%	2.02%
1700-1730	44.37	0.02614	0.00817	0.00918	0.01101	0.05450	2.20%	1.18%
1730-1800	42.66	0.01030	0.00403	0.00532	0.00594	0.02558	2.11%	0.56%
1800-1830	40.83	0.00431	0.00199	0.00279	0.00413	0.01321	2.02%	0.29%
1830-1900	39.57	0.00295	0.00087	0.00235	0.00340	0.00956	1.96%	0.21%
1900-1930	39.23	0.00201	0.00075	0.00280	0.00242	0.00798	1.94%	0.17%
1930-2000	39.93	0.00161	0.00146	0.00411	0.00233	0.00951	1.98%	0.21%
2000-2030	41.14	0.00157	0.00702	0.01049	0.00197	0.02105	2.04%	0.46%
2030-2100	42.71	0.01276	0.02273	0.02194	0.00183	0.05925	2.11%	1.29%
2100-2130	44.36	0.02896	0.03104	0.02604	0.00557	0.09161	2.20%	1.99%
2130-2200	46.27	0.04982	0.02810	0.02354	0.03991	0.14137	2.29%	3.07%
2200-2230	48.08	0.05250	0.02644	0.02609	0.07217	0.17720	2.38%	3.85%
2230-2300	49.41	0.03573	0.02779	0.03128	0.06251	0.15730	2.45%	3.42%
2300-2330	49.91	0.02229	0.03357	0.03084	0.04034	0.12704	2.47%	2.76%
2330-2400	49.79	0.03105	0.03535	0.02589	0.05090	0.14319	2.47%	3.11%
Total	**2019.87**	**1.35**	**0.96**	**0.81**	**1.48**	**4.60**	**100.00%**	**100.00%**

During Summers (June 2024) for BRPL:

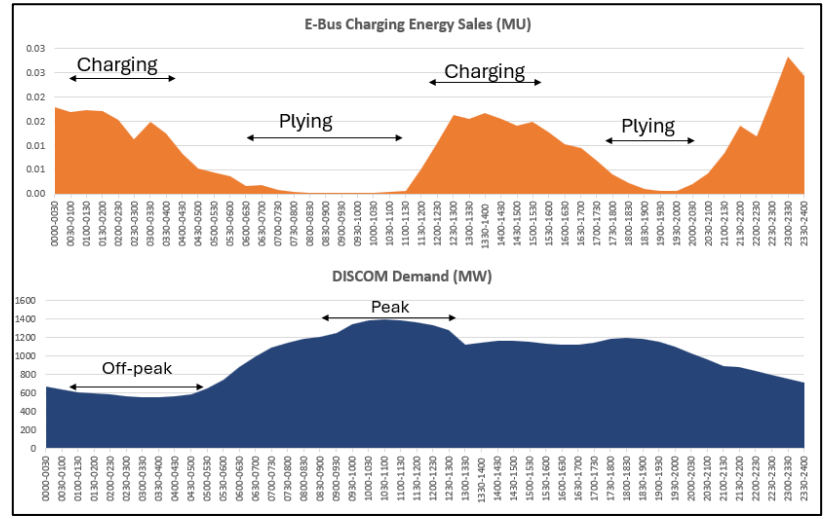
- Peak Load of DISCOM and E-Bus Charging load comes during Night **(10 pm to 2:30 am)** and during afternoon **(2:30 pm to 4 pm)**
- During morning hours (7am to 10am), DISCOM doesn't have Peak Load neither there is load of E-Bus Charging. Similar scenario observed during evening hours (6 pm to 8 pm)

E-Bus Charging load wrt total load in Winter

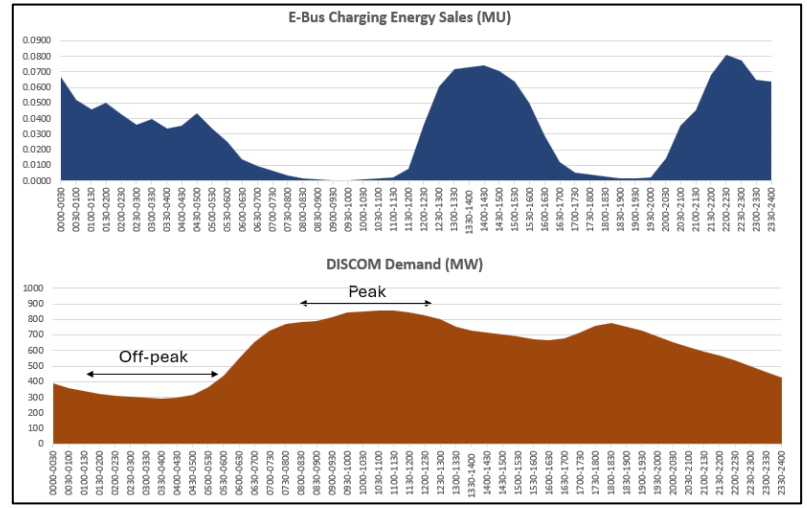
(BRPL Dec 2023)



(TPDDL Dec 2023)



(BYPL Dec 2023)



Heat Map E-Bus Charging & total Load in Winter (TPDDL Dec 2023)

Power Foundation of India

Time Block	Demand Met (MU)	E-Bus Consumption (MU)		Total E-Bus consumption (MU)	Demand Met (%) wrt Total Demand Met	E-Bus consumption (%) wrt Total E-Bus
		Depot 5 -Wazirpur	Depot-6-Subhash Place			
0000-0030	10.07	0.0024	0.0156	0.0179	1.41%	4.23%
0030-0100	9.62	0.0032	0.0139	0.0170	1.35%	4.01%
0100-0130	9.18	0.0037	0.0136	0.0173	1.29%	4.07%
0130-0200	8.94	0.0035	0.0137	0.0171	1.25%	4.04%
0200-0230	8.75	0.0032	0.0122	0.0154	1.22%	3.63%
0230-0300	8.57	0.0026	0.0087	0.0113	1.20%	2.67%
0300-0330	8.38	0.0025	0.0123	0.0149	1.17%	3.50%
0330-0400	8.34	0.0021	0.0105	0.0126	1.17%	2.96%
0400-0430	8.50	0.0012	0.0071	0.0084	1.19%	1.97%
0430-0500	8.86	0.0006	0.0046	0.0052	1.24%	1.23%
0500-0530	9.74	0.0008	0.0037	0.0044	1.36%	1.04%
0530-0600	11.16	0.0010	0.0027	0.0037	1.56%	0.88%
0600-0630	13.22	0.0005	0.0013	0.0018	1.85%	0.41%
0630-0700	15.03	0.0007	0.0012	0.0019	2.11%	0.46%
0700-0730	16.34	0.0005	0.0004	0.0009	2.29%	0.21%
0730-0800	17.15	0.0002	0.0003	0.0005	2.40%	0.12%
0800-0830	17.77	0.0000	0.0003	0.0003	2.49%	0.07%
0830-0900	18.12	0.0000	0.0003	0.0003	2.54%	0.07%
0900-0930	18.82	0.0000	0.0003	0.0003	2.64%	0.06%
0930-1000	20.25	0.0000	0.0003	0.0003	2.84%	0.06%
1000-1030	20.85	0.0001	0.0002	0.0002	2.92%	0.06%
1030-1100	20.99	0.0004	0.0002	0.0006	2.94%	0.13%
1100-1130	20.78	0.0003	0.0005	0.0008	2.91%	0.19%
1130-1200	20.44	0.0003	0.0051	0.0054	2.86%	1.28%
1200-1230	19.95	0.0012	0.0094	0.0106	2.79%	2.50%
1230-1300	19.21	0.0024	0.0139	0.0163	2.69%	3.85%
1300-1330	16.88	0.0029	0.0127	0.0156	2.36%	3.67%
1330-1400	17.13	0.0024	0.0143	0.0167	2.40%	3.94%
1400-1430	17.46	0.0021	0.0133	0.0155	2.45%	3.64%
1430-1500	17.47	0.0018	0.0124	0.0142	2.45%	3.34%
1500-1530	17.26	0.0022	0.0128	0.0150	2.42%	3.54%
1530-1600	17.01	0.0013	0.0113	0.0126	2.38%	2.98%
1600-1630	16.81	0.0012	0.0091	0.0102	2.35%	2.41%
1630-1700	16.88	0.0007	0.0089	0.0096	2.36%	2.26%
1700-1730	17.21	0.0003	0.0066	0.0069	2.41%	1.63%
1730-1800	17.77	0.0001	0.0040	0.0041	2.49%	0.96%
1800-1830	18.00	0.0007	0.0017	0.0024	2.52%	0.56%
1830-1900	17.82	0.0004	0.0007	0.0012	2.50%	0.27%
1900-1930	17.36	0.0001	0.0007	0.0008	2.43%	0.19%
1930-2000	16.58	0.0002	0.0006	0.0008	2.32%	0.18%
2000-2030	15.49	0.0007	0.0014	0.0020	2.17%	0.48%
2030-2100	14.46	0.0003	0.0041	0.0044	2.03%	1.02%
2100-2130	13.46	0.0003	0.0083	0.0086	1.89%	2.03%
2130-2200	13.21	0.0018	0.0124	0.0142	1.85%	3.35%
2200-2230	12.64	0.0019	0.0099	0.0118	1.77%	2.79%
2230-2300	12.04	0.0019	0.0180	0.0199	1.69%	4.69%
2300-2330	11.34	0.0046	0.0237	0.0284	1.59%	6.68%
2330-2400	10.69	0.0043	0.0200	0.0243	1.50%	5.71%
Total	**714.01**	**0.0653**	**0.3592**	**0.4245**		

FINDINGS | SUMMARIZED

Coinciding E-Bus Charging	Electric Buses Charging **coincides with the Peak Demand of DISCOMs in Summer months (April- Sept)**
Power for E-Bus Charging	E-buses Charging load is majorly met through **procurement of Short-term power** at **very high rate** ~ 8.5 Rs./kWh
Shifting of E-Bus Charging	E-buses Charging load during Peak hours which can **be shifted and met through Long term Power Purchase** subject to availability of Power during that period
BESS for Optimization	Deployment of Battery Storage **(BESS) at Strategic locations** for Power Purchase Cost Optimization of E-Bus Charging
Network Cost	By shifting the Peak Demand occurring through E-Bus Charging Stations, **savings in corresponding Network Cost of the DISCOMs**

1. OPTIMIZATION THROUGH SHIFTING OF E-BUS CHARGING LOAD

OPTIMIZATION OF POWER PURCHASE COST | AVOIDING PEAK | BYPL

Power Foundation of India

June-24 BYPL													
Time Block	Demand Met (MU)	Total E-Bus consumption (MU)	Demand met (%) wrt Total Demand Met	E-Bus consumption (%) wrt Total E-Bus consumption	Long Term (MU)	ST-Exchange (MU) BUY	Net Power Purchase (MU)	LT Price (Rs/kWh)	ST Price (Rs/kWh) BUY	Total available Long Term Power	Scenario-1		
											Existing E-Bus Charging Pattern	New E-Bus Charging	Cost Savings LT
0000-0030	23.99	0.0724	2.42%	3.43%	19.26	0.89	24.75	4.28	10.10		0.07	0.07	
0030-0100	23.57	0.0611	2.38%	2.90%	19.25	0.81	24.32	4.28	10.15		0.06	0.06	
0100-0130	23.10	0.0696	2.33%	3.30%	18.89	0.75	23.74	4.28	10.14		0.07	0.07	
0130-0200	22.61	0.0743	2.28%	3.52%	18.74	0.69	23.26	4.28	9.65		0.07	0.07	
0200-0230	22.07	0.0589	2.23%	2.79%	18.61	0.50	22.70	4.28	8.73		0.06	0.06	
0230-0300	21.51	0.0477	2.17%	2.26%	18.43	0.45	22.18	4.28	9.95		0.05	0.05	
0300-0330	20.95	0.0538	2.11%	2.55%	18.20	0.37	21.63	4.28	8.05		0.05	0.05	
0330-0400	20.40	0.0573	2.06%	2.72%	17.96	0.25	21.08	4.28	6.74		0.06	0.06	
0400-0430	19.74	0.0461	1.99%	2.18%	17.89	0.19	20.50	4.28	7.09		0.05	0.05	
0430-0500	19.21	0.0451	1.94%	2.13%	17.63	0.13	19.96	4.28	6.98		0.05	0.02	0.01
0500-0530	18.63	0.0560	1.88%	2.65%	17.39	0.13	19.28	4.28	9.76		0.06	0.03	0.02
0530-0600	18.08	0.0586	1.83%	2.78%	17.40	0.13	18.71	4.28	9.03		0.06	0.03	0.02
0600-0630	17.78	0.0488	1.79%	2.31%	17.48	0.17	18.41	4.28	9.01	69.90	0.05	0.02	0.02
0630-0700	17.58	0.0342	1.77%	1.62%	17.63	0.15	18.24	4.28	9.27	35.22	0.03	0.09	
0700-0730	17.28	0.0187	1.74%	0.89%	17.59	0.11	17.86	4.28	6.78	**34.68**	0.02	0.07	
0730-0800	16.91	0.0084	1.71%	0.40%	17.73	0.05	17.45	4.28	7.04		0.01	0.01	
0800-0830	16.55	0.0027	1.67%	0.13%	17.79	0.04	17.20	4.28	7.46		0.00	0.00	
0830-0900	16.46	0.0012	1.66%	0.05%	18.17	0.06	17.10	4.28	5.92		0.00	0.00	
0900-0930	16.85	0.0008	1.70%	0.04%	18.54	0.05	17.41	4.28	6.87		0.00	0.00	
0930-1000	17.62	0.0008	1.78%	0.04%	18.97	0.08	18.14	4.28	5.99		0.00	0.00	
1000-1030	18.28	0.0008	1.84%	0.04%	19.28	0.10	18.79	4.28	5.53		0.00	0.00	
1030-1100	19.00	0.0020	1.92%	0.09%	19.51	0.18	19.49	4.28	5.20		0.00	0.00	
1100-1130	19.62	0.0033	1.98%	0.16%	19.58	0.14	20.13	4.28	5.08		0.00	0.00	
1130-1200	20.21	0.0179	2.04%	0.85%	19.54	0.12	20.75	4.28	5.38		0.02	0.02	
1200-1230	20.76	0.0486	2.10%	2.30%	19.70	0.07	21.28	4.28	6.22		0.05	0.05	
1230-1300	21.17	0.0746	2.14%	3.53%	19.82	0.07	21.67	4.28	6.34		0.07	0.07	
1300-1330	21.38	0.0770	2.16%	3.65%	19.90	0.05	21.95	4.28	6.76		0.08	0.08	
1330-1400	21.82	0.0788	2.20%	3.73%	20.06	0.13	22.54	4.28	6.20		0.08	0.08	
1400-1430	22.25	0.0787	2.25%	3.73%	20.45	0.15	23.29	4.28	6.39		0.08	0.08	
1430-1500	22.70	0.0792	2.29%	3.75%	20.77	0.22	24.01	4.28	7.01		0.08	0.08	
1500-1530	23.00	0.0839	2.32%	3.98%	20.99	0.27	24.39	4.28	6.65		0.08	0.08	
1530-1600	23.24	0.0761	2.35%	3.61%	20.82	0.44	24.35	4.28	6.46		0.08	0.08	
1600-1630	23.14	0.0603	2.34%	2.85%	20.38	0.43	23.87	4.28	6.80		0.06	0.06	
1630-1700	22.67	0.0336	2.29%	1.59%	19.96	0.36	23.25	4.28	6.92		0.03	0.03	
1700-1730	22.14	0.0147	2.23%	0.70%	19.37	0.23	22.65	4.28	7.17		0.01	0.01	
1730-1800	21.50	0.0062	2.17%	0.30%	18.75	0.32	22.07	4.28	8.46		0.01	0.01	
1800-1830	20.78	0.0043	2.10%	0.21%	18.59	0.16	21.40	4.28	5.84		0.00	0.00	
1830-1900	20.17	0.0028	2.04%	0.13%	18.59	0.20	20.73	4.28	6.43		0.00	0.00	
1900-1930	19.72	0.0024	1.99%	0.11%	18.86	0.24	20.39	4.28	7.70		0.00	0.00	
1930-2000	19.77	0.0035	1.99%	0.17%	19.06	0.31	20.47	4.28	9.15		0.00	0.00	
2000-2030	19.89	0.0161	2.01%	0.76%	19.35	0.41	20.63	4.28	10.90	**39.48**	0.02	0.09	
2030-2100	20.28	0.0487	2.05%	2.31%	19.32	0.40	20.99	4.28	11.08	38.67	0.05	0.13	
2100-2130	20.76	0.0702	2.09%	3.33%	19.35	0.66	21.69	4.28	11.21	78.14	0.07	0.04	0.04
2130-2200	21.59	0.0857	2.18%	4.06%	19.50	0.93	22.69	4.28	11.34		0.09	0.04	0.05
2200-2230	22.56	0.0763	2.28%	3.62%	19.65	0.89	23.52	4.28	11.32		0.08	0.04	0.04
2230-2300	23.43	0.0742	2.36%	3.51%	19.66	0.73	24.54	4.28	11.37		0.07	0.04	0.04
2300-2330	24.02	0.0866	2.42%	4.10%	19.54	0.88	24.91	4.28	11.40		0.09	0.09	
2330-2400	24.19	0.0881	2.44%	4.17%	19.60	0.92	25.01	4.28	11.10		0.09	0.09	
Total	**990.93**	**2.11**	**100.00%**	**100.00%**	**913.47**	**16.01**	**1025.34**				**2.10**	**2.10**	**0.23**

E-BUS SCHEDULE | SCOPE FOR SHIFTING

Power Foundation of India

MORNING DUTY NPD

S. No.	Route	Duty No.	Schedule O/Shedding time	Route time	Schedule I/Shedding time
1	442	1	4:40	7:20	12:00
2	442	2	5:20	7:35	12:55
3	442	3	6:00	7:35	13:35
4	442	4	6:20	7:35	13:55
5	442	5	6:40	7:35	14:15
6	442	6	7:00	7:35	14:35
7	442	7	7:20	7:35	14:55
8	442	8	7:40	7:35	15:15
9	442	9	8:00	7:35	15:35
10	442	10	8:20	7:35	15:55
11	534 A	1	4:15	7:40	11:55
12	534 A	2	4:30	7:40	12:10
13	534 A	4	5:00	7:40	12:40
14	534 A	5	5:15	7:45	13:00
15	534 A	6	5:30	7:40	13:10
16	534 A	7	5:45	7:40	13:25
17	534 A	9	6:15	7:40	13:55
18	534 A	10	6:30	7:40	14:10
19	534 A	12	7:00	7:40	14:40
20	534 A	13	7:15	7:40	14:55
21	534 A	15	7:50	7:20	15:10
22	534 A	17	8:15	7:40	15:55
23	724	23	6:10	7:30	13:40
24	724	24	7:10	7:30	14:40
25	724	25	8:10	7:30	15:40

Bus No. 442 goes out of Depot at 4:40 am and return to Depot at 12pm, remain there for ~2 hrs. Booster charging for **just 1 hr.**

Again Bus No. 442 goes out of Depot at 1:45 pm and return to Depot at 9 pm, remain there for ~8 hrs. **Charge for just 2 hrs**.

Scope for Schedule shifting.

Charging time: ~2 hrs
(80% charge in 1 hr)

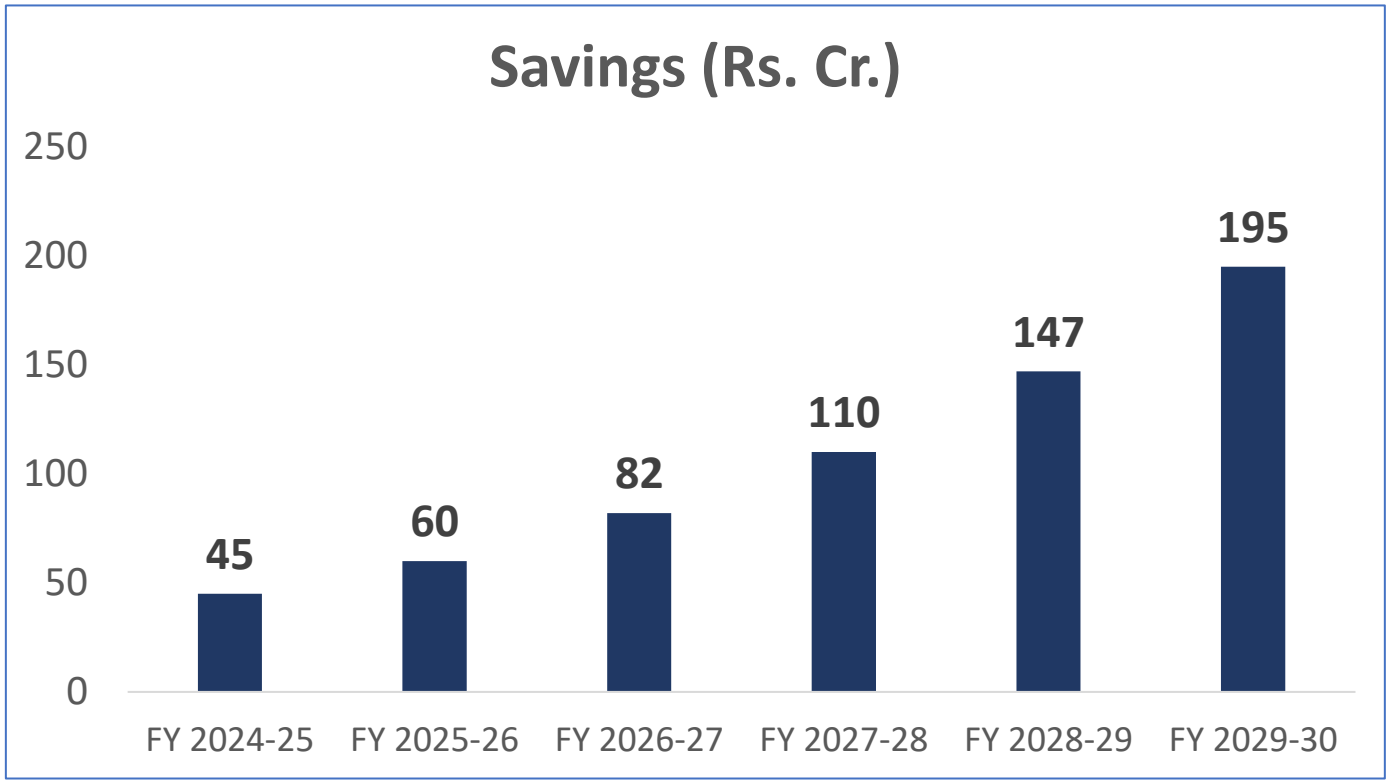
1ST OUT 1ST IN
Plying starts from 4:40 am till 8 am
Min 8 hrs running in 1 shift

Booster Afternoon Charging for ~1 hr
Night Charging for 2 hrs.

EVENING DUTY NPD

S. No.	Route	Duty No.	Schedule O/Shedding time	Route time	Schedule I/Shedding time
1	442	1A	13:45	7:15	21:00
2	442	2A	14:15	7:10	21:25
3	442	3A	14:38	7:37	22:15
4	442	4A	14:58	7:37	22:35
5	442	5A	15:18	7:37	22:55
6	442	6A	15:38	7:37	23:15
7	442	7A	15:58	7:37	23:35
8	442	8A	16:18	7:37	23:55
9	442	9A	16:38	7:37	0:15
10	442	10A	16:58	7:37	0:35
11	534 A	01A	12:55	7:45	20:40
12	534 A	04A	13:40	7:45	21:25
13	534 A	06A	14:10	7:45	21:55
14	534 A	09A	14:55	7:45	22:40
15	534 A	10A	15:10	7:45	22:55
16	534 A	12A	15:40	7:45	23:25
17	534 A	15A	17:00	7:20	0:20
18	534 A	17A	16:40	7:20	0:00
19	724	1A	13:20	7:05	20:25
20	724	24A	15:42	7:33	23:15
21	724	25A	16:45	7:30	0:15

PP Cost Optimization | Shifting of E-Bus Charging Slots



Cumulative savings of **Rs. 638 crore by FY 2029-30**

2. OPTIMIZATION THROUGH BATTERY ENERGY STORAGE SYSTEM (BESS)

DUAL PURPOSE –

SAVINGS IN POWER PURCHASE & NETWORK COST

BATTERY ENERGY STORAGE SYSTEM (BESS) | SCOPE

Power Foundation of India

DUAL PURPOSE OF BESS

Energy arbitrage

Energy arbitrage for DISCOMs in optimization of their Power Purchase Cost

Can be charged in off-peak hours and can be discharged in Peak hours

Network Cost Optimization

BESS can be deployed at local network to supply during peak hours to avoid high Power Purchase Cost + Capital Expenditure required to upgrade infra at DISCOMs and Transmission utility end.

BESS: Highly suited for meeting **intermittent Peak Demand of E-Bus Charging rather than through a tied-up source (PPA)**

OPTIMIZATION OF NETWORK + PPC | Funding of BESS through ARR or PSDF

Delhi

FY 2025-26

FY 2029-30

3,035 E-Buses
845 MU

12,000 E-Buses
3,343 MU

PFI Evidence Based Research

All India

1,50,000 E-buses Target by FY 2029-30

Consumption will reach **~42000 MU** by FY 2029-30

Rs. ~13,000 Cr. prospective savings, BESS through PSDF

Scenario 1:
PPC saving through shifting

Cumulative Savings till FY 2029-30 (Rs. Cr.)	
Shifting of E-bus charging load	638

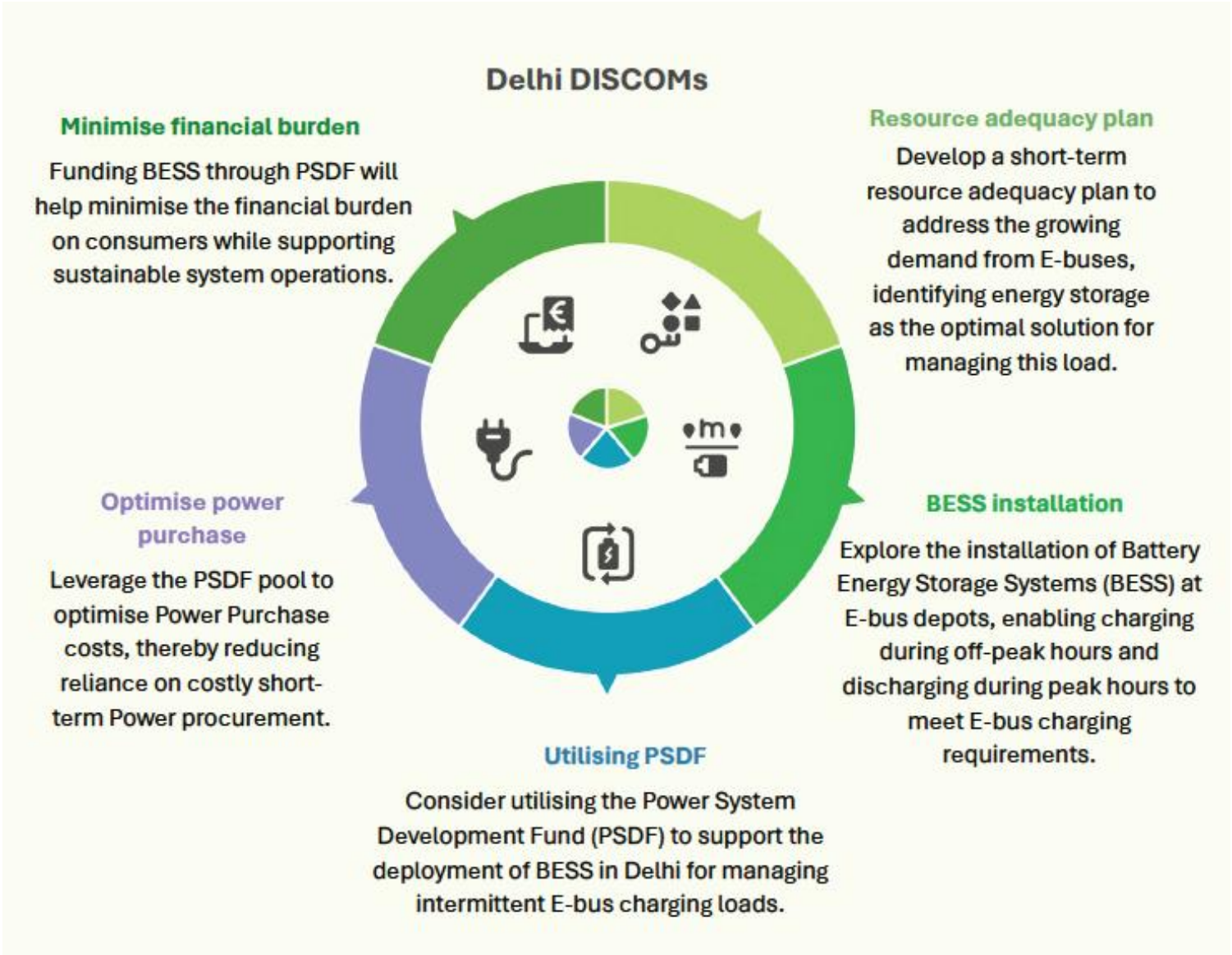
Scenario 2:
Saving in PPC and Network through BESS (2 Hr storage, 2 cycle) day and night hours

Cumulative Savings till FY 2029-30 (Rs. Cr.)	
BESS – ARR funded	**751**
BESS – PSDF funded **(no CAPEX Burden)**	**1,366**

Scenario 3:
Saving in Power Purchase through BESS (4 Hr storage, 1 Cycle) for night hours

Cumulative Savings till FY 2029-30 (Rs. Cr.)	
BESS – ARR funded	**722**
BESS – PSDF funded **(no CAPEX Burden)**	**1,725**

RECOMMENDATIONS TO STAKEHOLDERS



RECOMMENDATIONS TO STAKEHOLDERS

Delhi Electricity Regulatory Commission (DERC)

Revise the Tariff Schedule for EV charging stations

Tariff of Electric Vehicle Charging Stations should be in line with the provisions of the Tariff Policy, 2016 & Guidelines issued by Ministry of Power (9th September 2024).

Utilise the DERC PSDF Regulation

Support the installation of **Battery Energy Storage Systems (BESS)** at substations for managing intermittent E-bus charging loads. The Delhi PSDF pool currently holds approximately **Rs. 1,445 crore**, contributed by all participating entities, including Delhi DISCOMs.

Leverage PSDF Funding

To avoid loading the Aggregate Revenue Requirement (ARR) with costs of additional network infrastructure. This approach will optimise Power Purchase costs by reducing reliance on expensive short-term procurement or new Power Purchase Agreements (PPAs) to meet short-term load requirements.

RECOMMENDATIONS TO STAKEHOLDERS

STATE GOVERNMENT

DTC may be advised to align the charging schedule of E-Buses with the revised Schedule as recommended in the Study, to optimize on the Power Purchase Cost through shifting of Peak Demand.

Parking Space of DMRC may be utilised to charge E-buses during night hours.

TRANSPORT CORPORATIONS

Utilise the shed area / roof of admin, store & office buildings for installation of Rooftop solar generation.

Adhere to the revised Charging Schedule of E-Buses as worked out in the Study.

Central Assistance (CA) for E-Bus operations per km basis, development/ upgradation of E-Bus Depot, and for Behind the Meter Power Infra (Sub-Station & others)

AGGREGATORS

Aggregators should intimate all future load planning to respective DISCOMs, and **shift charging** from peak hours to normal / off-peak hours to the extent possible

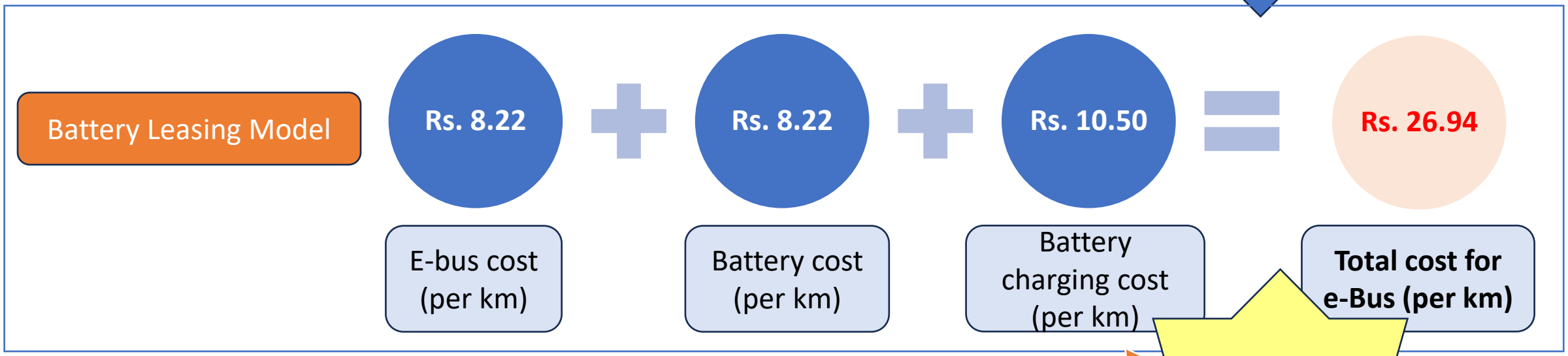
With **coordinated policy, regulatory, and operational interventions**, India can achieve its EV adoption goals while ensuring that the **power sector remains cost-effective and resilient, without increasing ACS much**.

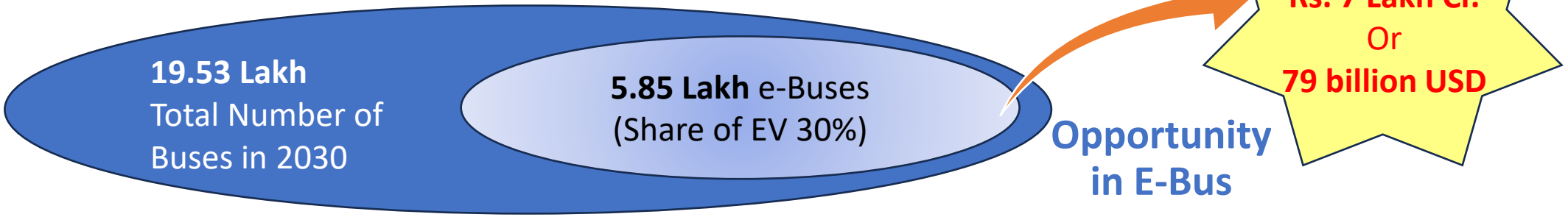
BUSINESS MODEL FOR E-Bus

- **Conventional bus Cost – Rs 60 lakh**
- **Electric buses cost – Rs 1.2 crore**
  (50:50 :: Bus : Battery)

- **DTC: Rs 43/km**
- **Haryana : Rs 38.50/km**
- **Rajasthan: Rs 39.75/km**

- **Charging cost: Rs. 6 per kWh**
- **Battery Size: 350 kWh**
- **Range: 200 km**

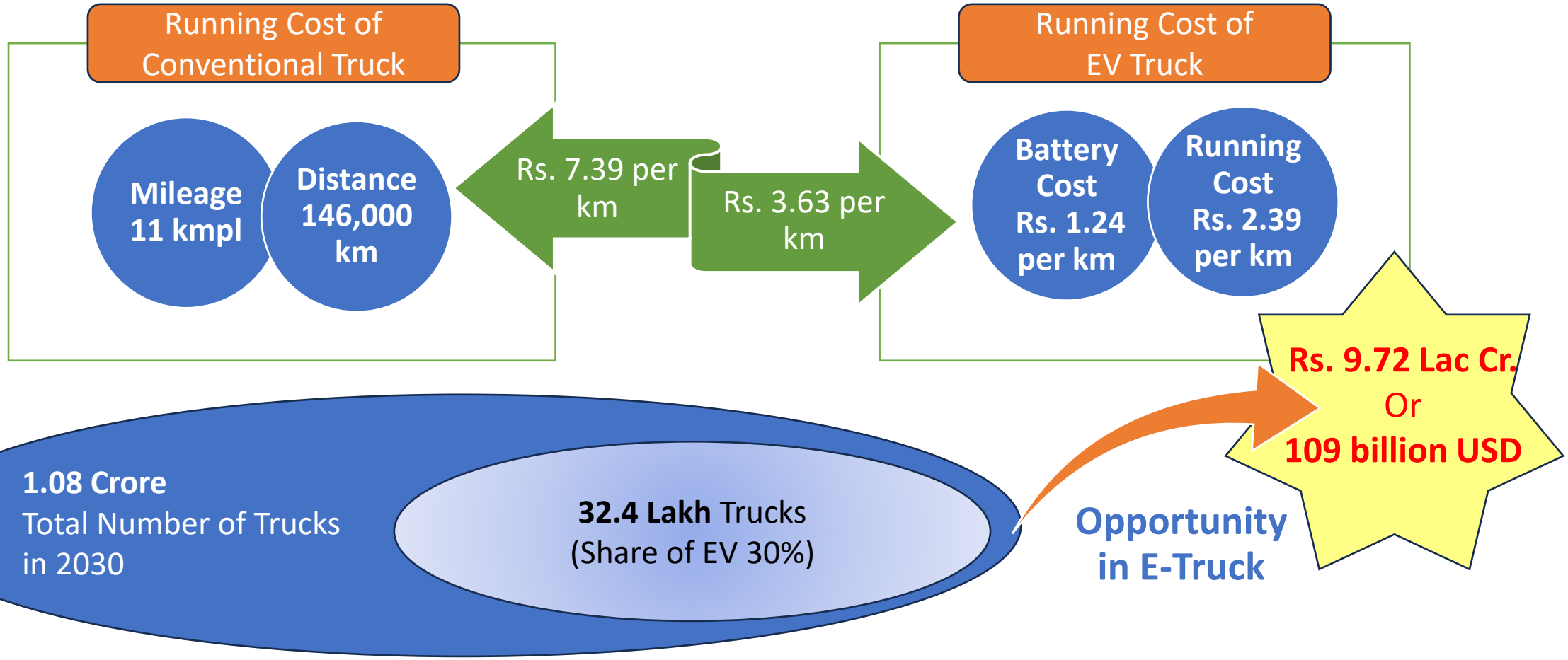




BUSINESS MODEL FOR E-Truck

- **Conventional Truck Cost – Rs 11.90 lakh**
- **Electric Truck cost – Rs 30 lakh**

- **Charging cost: Rs. 6 per kWh**
- **Battery Size: 64.5 kWh**
- **Range: 162 km**



OPTIMIZATION OF NETWORK COST | ASSUMPTIONS

Sl. No.	Particulars	UoM	FY 26	FY 27	FY 28	FY 29	FY 30
1	E-Bus Charging Capacity that can be avoided	MW	**24**	**10**	**14**	**20**	**28**
		MVA*	43	18	25	35	49
2	Capex Requirement for the network upgradation	Rs Cr/MVA	4	4	4	4	4
		Rs Cr	171	70	99	140	197
3	Capex Deferral	Rs Cr	171	70	99	140	197
4	Debt : Equity		70:30	70:30	70:30	70:30	70:30
5	Debt	Rs Cr	120	49	69	98	138
6	Interest Rate on Debt		12%	12%	12%	12%	12%
7	Useful life of the network	yrs	25	25	25	25	25
8	Loan repayment period	yrs	12	12	12	12	12
9	Equity	Rs Cr	51	21	30	42	59
10	Rate of RoCE		14.00%	14.00%	14.00%	14.00%	14.00%
11	Salvage value of Assets		10%	10%	10%	10%	10%
12	Depreciation rate	1st 12 years	5.83%	5.83%	5.83%	5.83%	5.83%
		for next 13 years	1.54%	1.54%	1.54%	1.54%	1.54%
13	Discount rate	9.71%					

- MW converted to MVA considering (n-1) impact with 1.75 redundancy
- CAPEX requirement for the Network Rs. 4 Cr./MVA, as provided by DISCOMs
- Impact of Network Cost computed using **applicable Regulatory provisions (DERC Regulations)**
- Depreciation & return on Capital Employed computed for 25 years
- Weighted Average Cost of Capital (WACC) as

$$WACC = \left[\frac{D}{D+E}\right] * r_d + \left[\frac{E}{D+E}\right] * r_e$$

Where, D= Debt, E=Equity

Re & Rd as Cost of Debt & Equity resp.

GOVERNMENT INITIATIVES

National Electric Mobility Mission Plan (NEMMP 2020)

In 2013, the Government of India **launched the National Electric Mobility Mission Plan 2020** with an aim to **achieve national fuel security** by promoting hybrid and electric vehicles in the country.

Targets under NEMMP: 6–7 million hybrid and electric vehicles on Indian roads by 2020.

NEMMP uses different policy-levers such as:

1. Demand side incentives to facilitate acquisition of hybrid/electric vehicles
2. Promoting R&D in technology including battery technology
3. Promoting charging infrastructure
4. Supply side incentives
5. Encouraging retro-fitment of on-road vehicles with hybrid kit

Faster Adoption and Manufacturing of Electric (&Hybrid) Vehicles in India (FAME)

As part of the NEMMP 2020, the Ministry of Heavy Industries formulated the FAME scheme in March 2015 with an aim to reduce dependency on fossil fuel and to address issues of vehicular emissions.

Scheme Period: FAME-I (2015 - 19); FAME-II (2019-24)
Total outlay: FAME-I (Rs. 895 Cr.); FAME-II (Rs 11,500 Cr.)

- FAME-I had four focus areas - Technological development, Demand generation, Pilot project and Charging infrastructure components
- Key elements of Phase-II included Demand incentives for EVs; Charging infrastructure development; and phased manufacturing programme for localisation of components

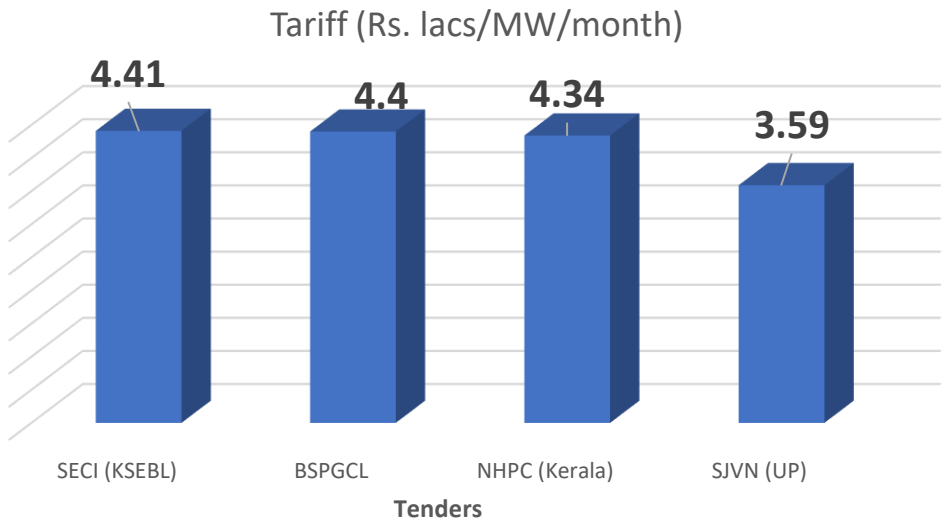
Achievements: ~2.5 lakh EVs supported; and ~520 charging stations sanctioned under Phase I.

Under Phase II, ~16.3 lakh EVs supported; and ~9,332 charging stations sanctioned. (as of June 2025)

ENERGY ARBITRAGE & AVOIDING NETWORK COST THROUGH BESS

ENERGY ARBITRAGE

- Battery Energy Storage (BESS) an effective tool for **Energy arbitrage** for DISCOMs in optimization of their Power Purchase Cost.
- Through BESS, Batteries can be charged in the off-peak hours and can be discharged in Peak hours, thus, avoiding reliance of DISCOMs on high-cost short term Power from markets or through tied up high-cost Power Plants.
- **Short duration Energy Storage Device,** as the load is intermittent
- As evident, Steep reduction in Battery prices witnessed in CY 2024. In 3 years, India's BESS tariffs dropped from ₹4.75 to ₹2.19 Rs. lakh/MW/month.



4-hr storage; 1-cycle with VGF → 30% of upto 27 lakhs/MW/ month

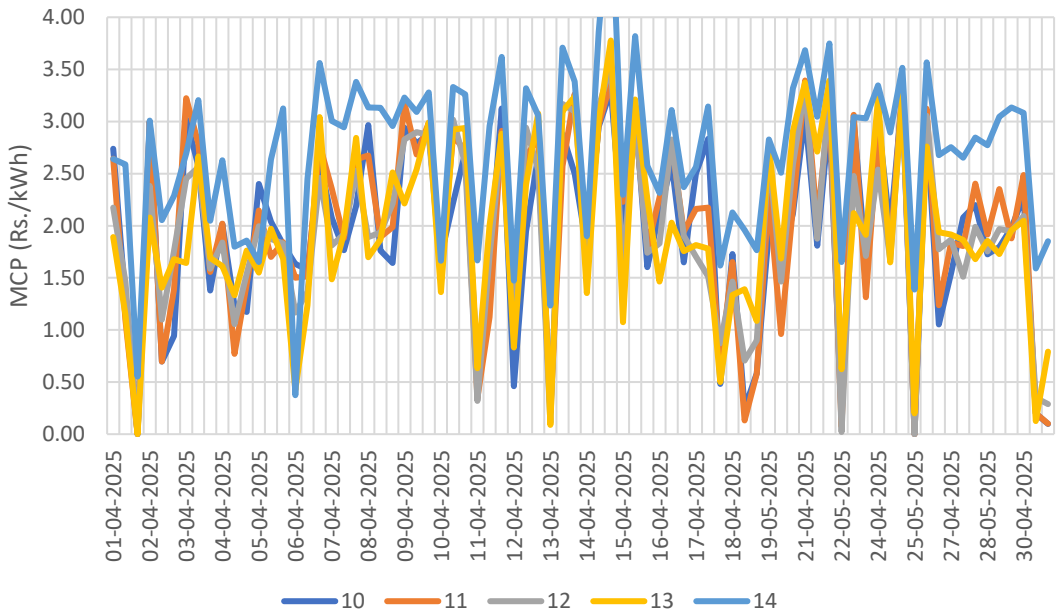
AVOIDING NETWORK COST

- To cater the Demand, DISCOMs and the State Transmission Utility (Delhi TRANSCO Ltd.) need to upgrade their Network
- With E-Bus Charging at Peak hours, surge in CAPEX requirement for maintaining the network (UPSTREAM & DOWMSTREAM)
- Benefit of BESS: available at local network, supply during peak hours to avoid CAPEX required to upgrade infra at DISCOMs and DTL.

- **BESS with 4-hr Storage & 1-cycle** can be installed to avoid the Peak during afternoon, **2 pm to 4-pm (2-hrs window) and Night hours 10 pm-12 am** to avoid requirement of CAPEX for network upgradation.
- 4- hrs BESS can be charged during **off-peak Solar hours (10am- 2 pm)** wherein the input Cost will be ~Rs. 2.5/kWh.
- At 75% redundancy, requirement of capacity addition will be 1.75X the peak demand to maintain the reliability.
- **CAPEX requirement of Rs. 4 Cr / MVA**

CHARGING COST FOR BESS

Market rate from 10 am to 2 pm, last 3 months



- Market rate during 10 am to 2 pm in last 3 months (April-June 2025) has been less than 2 Rs./kWh
- Average rate at 10 am: 1.92 Rs./kWh, 11 am: 1.97 Rs./kWh, 12 pm: 1.93 Rs./kWh, 1pm: 1.93 Rs./kWh, 2pm: 2.70 Rs./kWh

Source: IEX, RTM

Landed Cost of BESS, 4-hr Storage (Single cycle)

Particulars	UoM/ Formulae	4-hr Storage
Capital Recovery Factor	r(1+r)^n/(1+r)^n-1	14%
Useful life (n)	Years	12
CAPEX for BESS	Rs. Cr.	**3.02**
O&M Expenses	Rs. Cr.	0.04
Annual Fixed Cost	Rs. Cr.	**0.43**
Battery Duration	Hrs	4
No. of Cycles per day	Nos.	1
Capacity	MW	1
Battery Efficiency Factor	%	85%
Fixed Cost per unit (A)	**Rs./kWh**	**3.23**
Annual Generation	MU	1.46
Annual Input Energy	MU	1.72
Cost of Input Energy	Rs./kWh	2.50
Input cost	Rs. Cr.	0.43
Cost of Charging per unit (B)	**Rs./kWh**	**2.94**
Tariff (A+B)	**Rs./kWh**	**6.17**
WACC (r)		9.42%

Assumptions:

- Input Cost= 2.50 Rs/kWh, considering the avg rate at Power Market
- Interest on Loan 10.65% & RoE 14%; draft CERC RE 2024 & ITR @ 30%
- O&M expenses: $5/kW as per LBNL except in NREL scenario

FUNDING OF BESS | POWER SYSTEM DEVELOPMENT FUND

- DERC (Power System Development Fund) Regulations, 2019 provides for utilization of PSDF for Energy Storage projects

DERC (Power System Development Fund) Regulations, 2019

"4. UTILIZATION OF PSDF

(1) PSDF shall be utilized mainly for the following purposes:

Rs. 1,445 Cr., FY 2022-23

...

(e) Any other scheme/ project in furtherance of the above objectives such as technical studies, capacity building, installation of Phasor Measurement Unit (PMU), hardware/software for upgradation of SLDC, Smart Grid initiatives, ***Energy Storage****, Demand Side Management etc."*

https://www.derc.gov.in/sites/default/files/PSDF%20Regulations%2C%202019.pdf

Appraisal Committee

- Secretary, Power (GoNCTD) (Chairman) for techno-economic appraisal of projects
- Other member: ED (Engg./Tariff) of DERC, MD (DTL), ED (SLDC) and two members nominated by Chairperson of the DERC, each representing the DISCOMs and the GENCOs.

Monitoring Committee

- Member DERC (Chairman)
- Evaluate projects based on the recommendation of the Appraisal Committee and communicate DERC that such projects are in line with the Regulations

Release of Funds

- Based on the sanctions by the Monitoring Committee, funds released to the project entities from PSDF
- Release of funds regulated as per the extant instructions of the Dept. of Finance (GoNCTD)

- **Ministry of Power, GoI vide notification dtd. 9th June 2025** has also announced Viability Gap Funding for BESS through PSDF. Not applicable for Delhi.
- This favors the case for funding BESS projects through PSDF in Delhi.
- Otherwise, the cost of BESS can be recovered through Aggregate Revenue Requirement (ARR) and Tariff Petition filed by DISCOMs after obtaining prior approval from DERC.

Power Foundation of India

THANK YOU !