EV Competitiveness Beyond Incentives

Highlights

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Fiscal Incentives are a Mainstay of EVs in India

- While EV purchase decision depends on multiple factors, dominant driver is relative cost of ownership.
  - This is typically assessed in comparison with conventional ICE vehicles.
  - Although EVs benefit from lower running costs, higher upfront prices are believed to constrain widespread adoption.
- Central and state govt.s in India have offered EV fiscal incentives — purchase subsidies[1] and tax incentives.
  - These incentives help reduce the on-road price of an EV i.e., the final price at which a vehicle is sold to a customer.
- Purchase subsidies have strict eligibility criteria and are time-bound and gradually tapered down.
- Tax incentives include lower tax rates for EV sales under the national GST and the state-level MV tax[2] regimes.
  - EV tax concessions have been more stable and open-ended, forming the backbone of India's EV affordability strategy.

[1] Also known as demand incentives.

[2] Also known as road tax.

Acronyms: EV (electric vehicle); ICE (internal combustion engine); GST (Goods & Services Tax); MV (Motor Vehicle)

EVs Benefit from Tax Concessions at Central and State Levels

Applicable GST tax rates:

	On ICE vehicle	On EV
Pre-GST rate rationalization (pre-GST 2.0) on September 22, 2025	28% GST + 1% to 22% Cess [1]	5% (no additional Cess)
Post rationalisation of GST rates (GST 2.0 regime)	18% (no additional Cess)	

MV tax regime:

- EVs benefit full or partial waivers on MV tax at the time of vehicle registration.
  - Majority of states that are large vehicle sales markets offer MV tax waivers for purchase of e-cars and e-2Ws.
  - MV tax rates for ICE vehicles vary by type of fuel. For example, diesel cars attract on an average 11% tax rate [2].

[1] Compensation Cess whose rate depended on the fuel type, engine size, length, and ground clearance of an ICE vehicle.

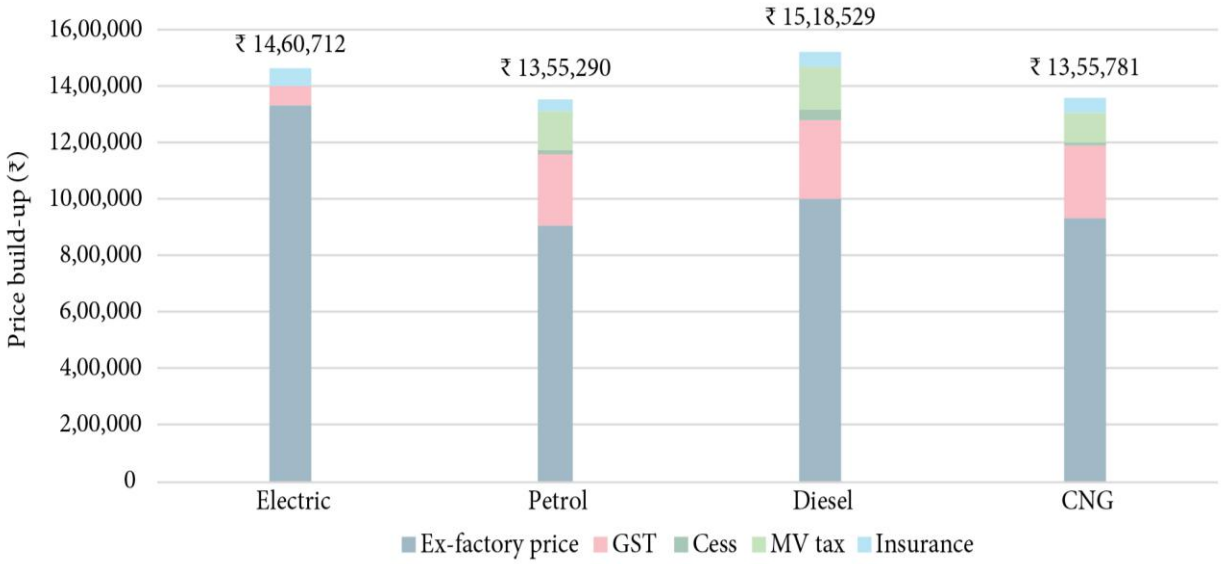
[2] Based on weighted average MV tax rate for top 10 states with the highest ICE vehicle sales.

Acronyms: e-2W (electric two-wheeled vehicle); e-car (electric passenger car)

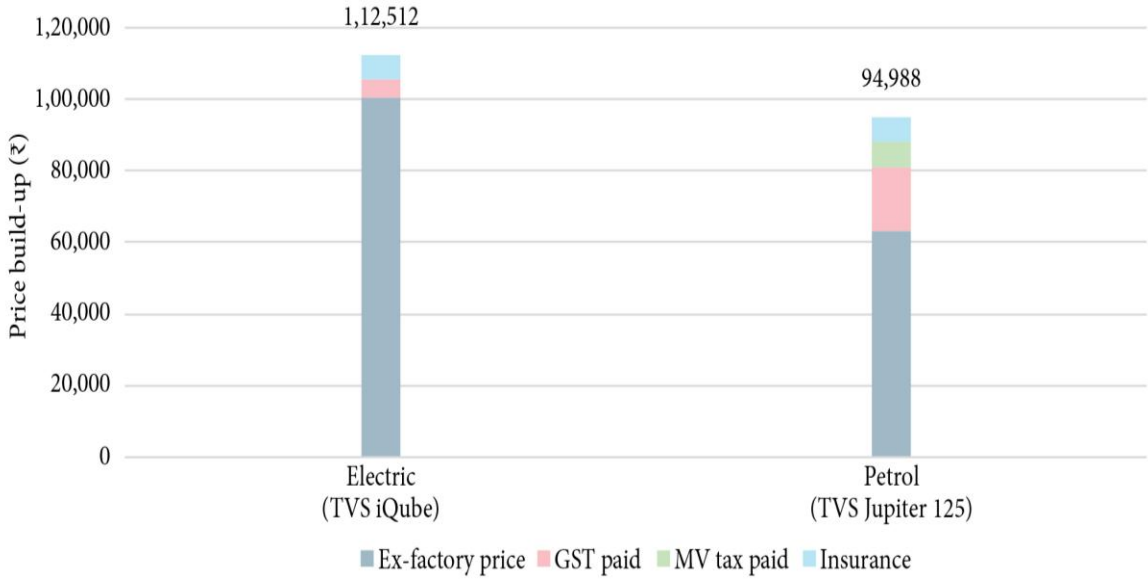
Tax Incentives Help Bridge Vehicle Cost Differential – The Case of Pre-GST 2.0 Regime

Breakup of On-road Vehicle Prices Considering Pre-GST 2.0 Rates

Passenger Car Segment



Two-wheeled Vehicle Segment



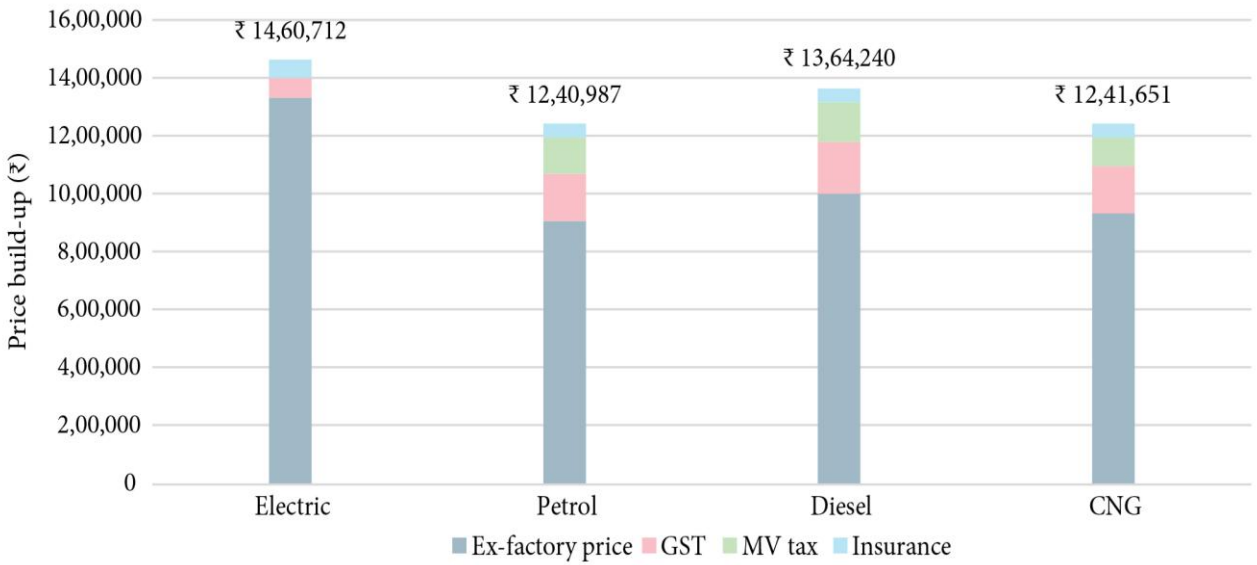
- Despite e-car having highest ex-factory price, its on-road price was lower than diesel.
- While ex-factory price of e-2W was ~ 58% higher than petrol, gap in final delivered price reduced to 18%.
- Clearly, tax incentives helped bring down the upfront cost of an EV.

Note:
- The ex-factory price refers to the cost of a vehicle set by the manufacturer before any taxes are applied.
- The given price build-ups are based on specific vehicle models. For details of the calculations, refer to the research paper.

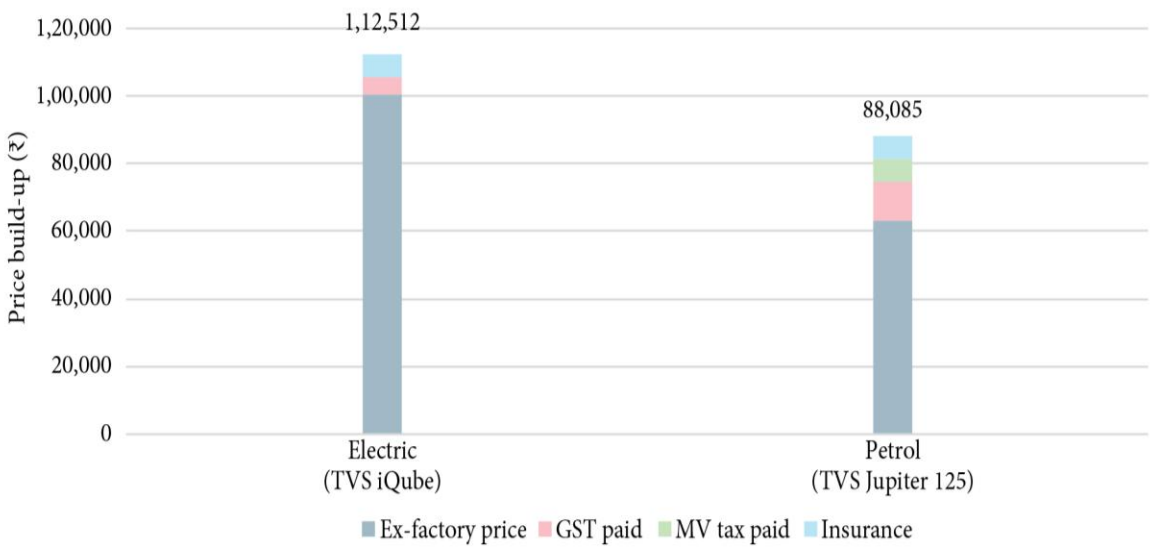
GST 2.0 has Reduced EV's Cost-competitiveness

Breakup of On-road Vehicle Prices Considering GST 2.0 Rates

Passenger Car Segment



Two-wheeled Vehicle Segment



- On-road price[1] gap between an e-car and ICE variant has widened by ₹ 1.1 lakh to ₹ 1.5 lakh.
- Similarly, for 2Ws, the price gap of electric has grown by ~ ₹ 7,000.
- While EVs retain lower operating costs, their upfront competitiveness has weakened post GST rate rationalisation.
- Important to consider that continued dependence of EVs on tax incentives may not be fiscally sustainable.
  - Calibrated tapering of e-2W and e-car incentives can free up fiscal resource to support hard-to-abate transport segments.

[1] On-road price of a vehicle is the final price (inclusive of all applicable vehicle taxes) at which a vehicle is sold to a consumer.

Important to Test the Thesis that EVs Rely on Tax Incentives

Premise:

- As EV penetration rises, preferential tax treatment could erode public revenues.
- Continued decline in LiB prices expected to reduce EV production costs and diminish need for heavy tax support.
  - Possibility that EV – ICE price parity could be achievable even under same tax rates in the near future.

Research objective:

- Assesses dependence of EVs on existing incentives, particularly tax concessions, to compete with ICE variants.
  - In practical terms, it is to understand how far EV tax incentives can be scaled back while keeping EVs financially attractive.
  - E-cars and e-2Ws in India are taken as a case in point.

USP of the research:

- Employs a TCO framework to evaluate which reveals the true cost beyond the initial purchase price.
- Sheds light on how future prices of EVs and the resulting vehicle cost-competitiveness may play out.
- Analyses even at a sub-segment level as fuel mix and duty-cycle vary.

Acronyms: LiB (Lithium-ion battery); TCO (total cost of ownership)

Evaluation Approach that is Grounded in Reality

- TCO framework allows one to factor in both cost of acquisition of vehicle and operational costs during use.
  - Cost of acquisition = ex-factory vehicle price + vehicle taxes + insurance cost + financing cost - subsidies (as applicable).
  - Operational costs cover fuel and maintenance costs (including battery replacement, if applicable) over the vehicle lifetime.

- Test of EV incentive dependence: per km TCO of an e-car or e-2W at par with baseline ICE vehicle w/o incentives.
  - Two separate cases considered: (i) based on current (2025) vehicle price, and (ii) based on projected 2030 vehicle price.
  - Parity should reach within the 5-year vehicle holding period.
  - TCO per km refers to adding up all costs of owning and using a vehicle over its lifetime and dividing by total kms driven.

$$\frac{TCO}{km} = \frac{(IPC - \frac{RV}{(1+r)^{N)}}) \times CRF + \frac{1}{N}\sum_{n=1}^{N}\frac{AOC}{(1+r)^n}}{Annual\ VKM}$$

IPC = Initial Purchase Cost of the Vehicle; RV = Resale Value; CRF* = Capital Recovery Factor; AOC = Annual Operational Cost of the Vehicle; Annual VKM = Annual Vehicle Kilometres Travelled; r = Discount Rate; N = Vehicle Holding Period (in years); CRF is calculated as follows:

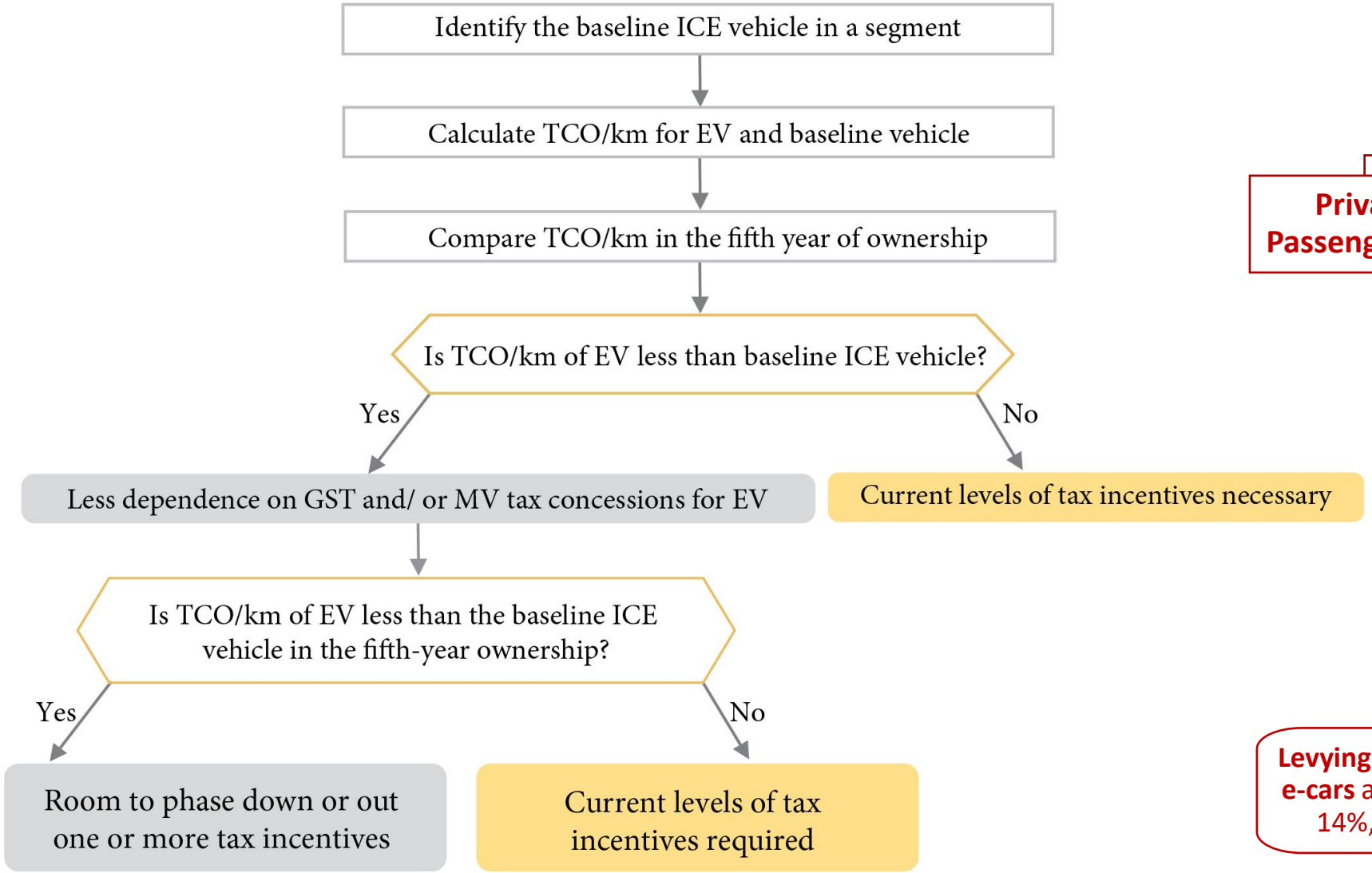
$$CRF = \frac{r \times (1+r)^N}{(1+r)^N - 1}$$

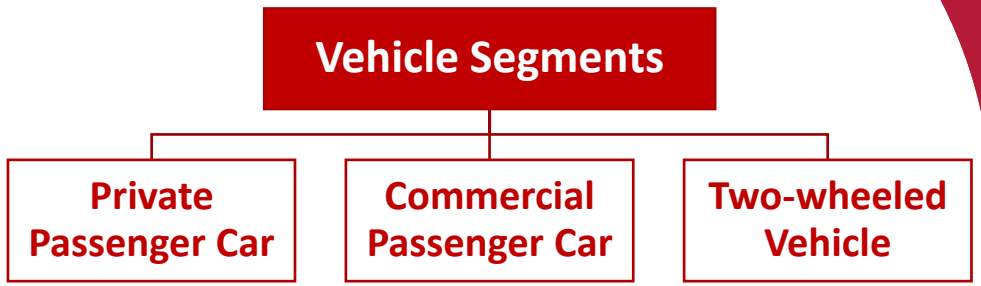
*It is used to annualise the capital cost, which determines the annual repayment required to purchase the vehicle.

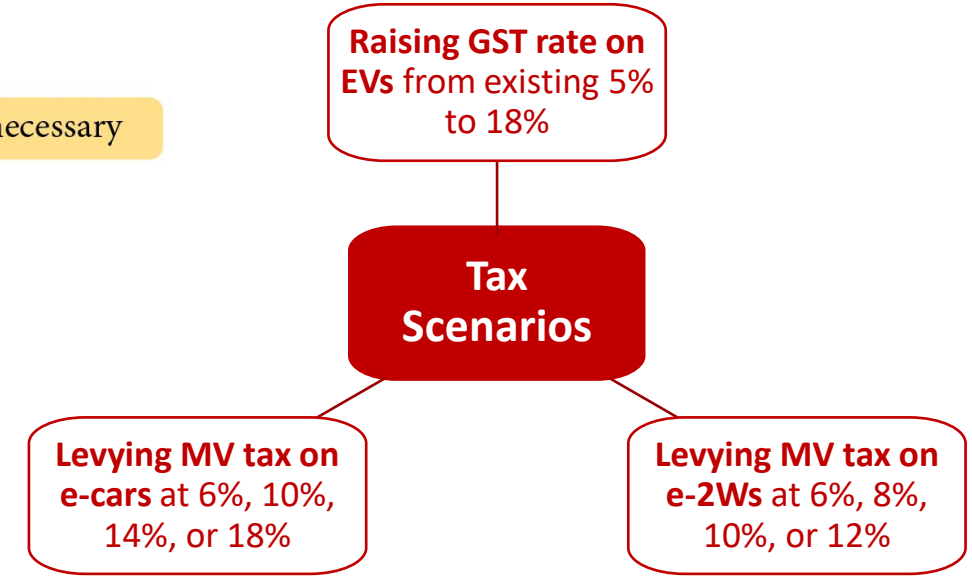
Acronyms: km (kilometre); w/o (without)

Decision Tree, Vehicle Segments, and Tax Scenarios

Step-by-Step Decision Tree







Note:
- The TCO estimation for an EV has been carried out based on 2025 and possible 2030 prices that takes into account the projected LiB price.
- For details of the calculations at each step, refer to the research paper.

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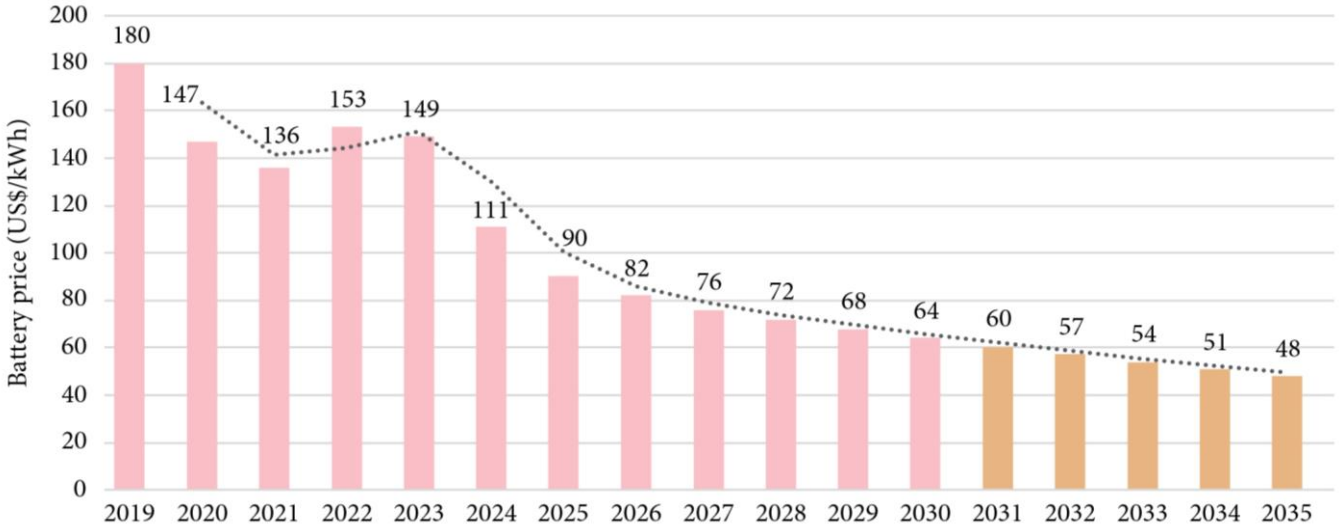
LiB Price Forecast and EV Price Projection

Historical LiB Prices and Projections (US$/kWh)



Note: Data from 2024 to 2030 are forecasts by Goldman Sachs (2024).
Projections from 2031 to 2035 (yellow bars) are estimated by taking into account the consistent decline in battery prices from 2028 to 2030, averaging around 5.6%.

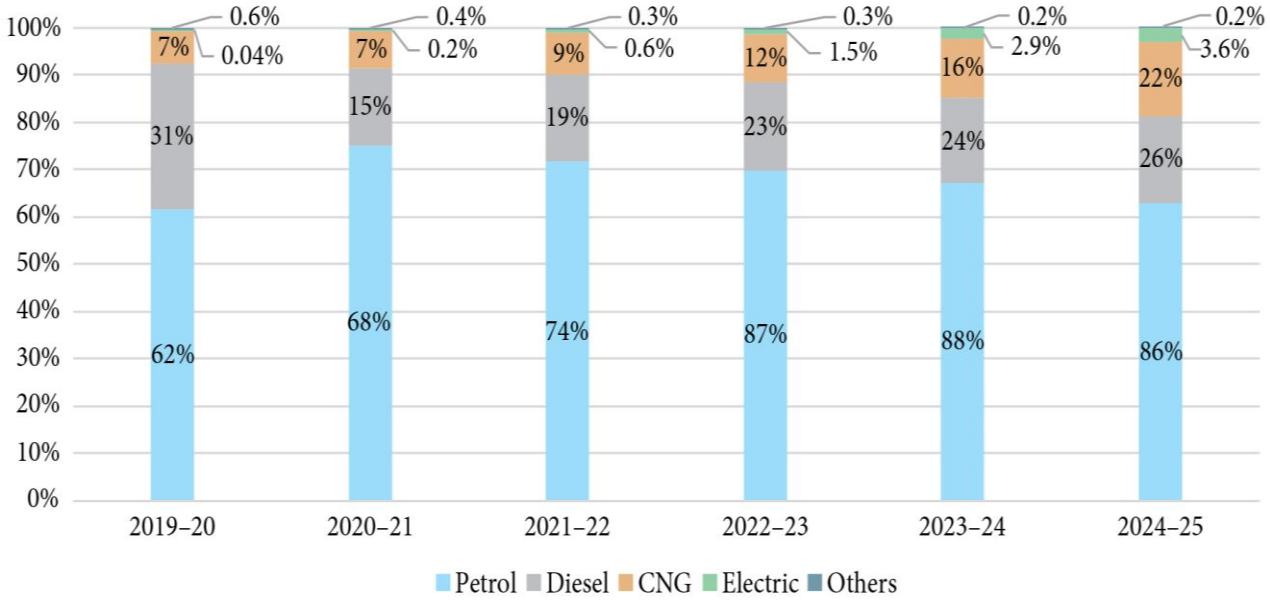
- TCO analysis incorporates projected decline in EV prices on account of fall in LiB prices.
- LiB price declined by 18% btw. 2019 and 2023.
  - Expected to reduce by 46% by 2030 w.r.t. 2023 price.

- Price projections for EVs in 2030 are estimated based on anticipated reduction in battery price.
- LiB price decline to translate to 7.5% ↓ in ex-factory price of e-car and 5% ↓ for e-2W, w.r.t. to 2025 prices.
- Possible inflation in cost of other vehicle components considered similar btw. an EV and its ICE counterpart.

Acronyms: kWh (kilo Watt-hour); btw. (between); w.r.t. (with respect to)

Shares of Fuels and Cost Comparison in Private Car Segment

Private Car Registrations by Fuel Type

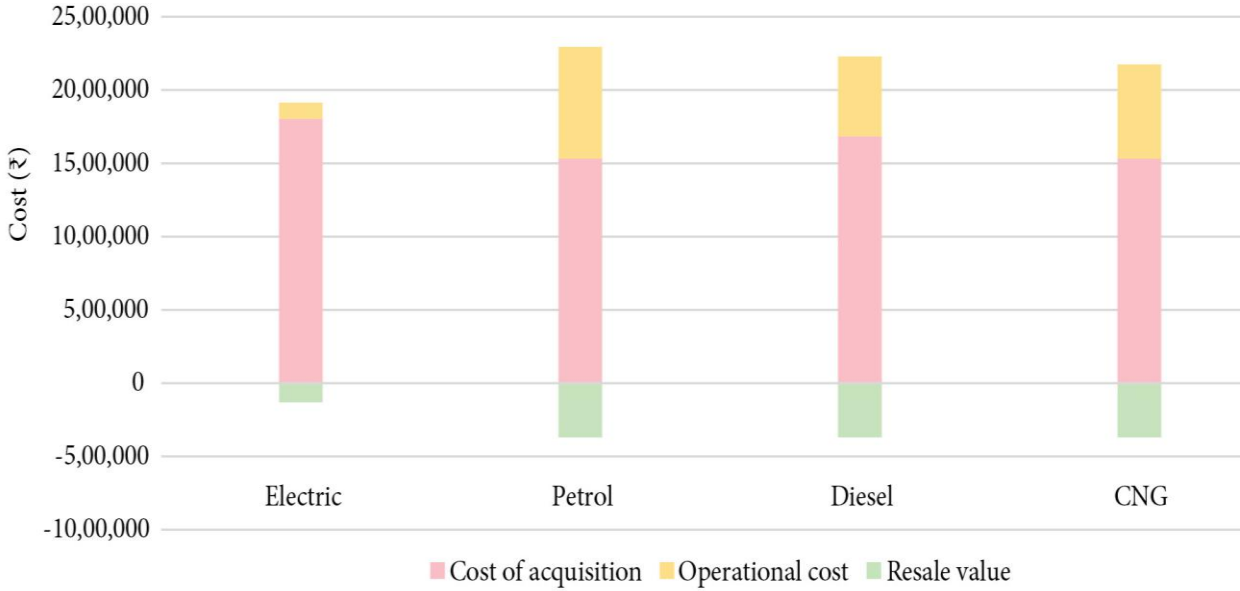


Note: Petrol car sales share includes petrol, petrol/ethanol, petrol/hybrid, and strong hybrid cars. Diesel car sales share includes diesel and diesel/hybrid cars. CNG car sales share includes CNG and petrol/CNG cars.

- Petrol variant has lowest acquisition cost but highest operational cost.
- Electric version has the lowest operational cost, which offsets its higher acquisition cost.

- In private passenger car segment, petrol variant is the most popular choice and considered the baseline vehicle.

Acquisition and Operational Cost of Private Cars After 10 Years of Ownership (based on 2025 prices)



Note: The costs are not discounted to present values.

Acronym: CNG (compressed natural gas)

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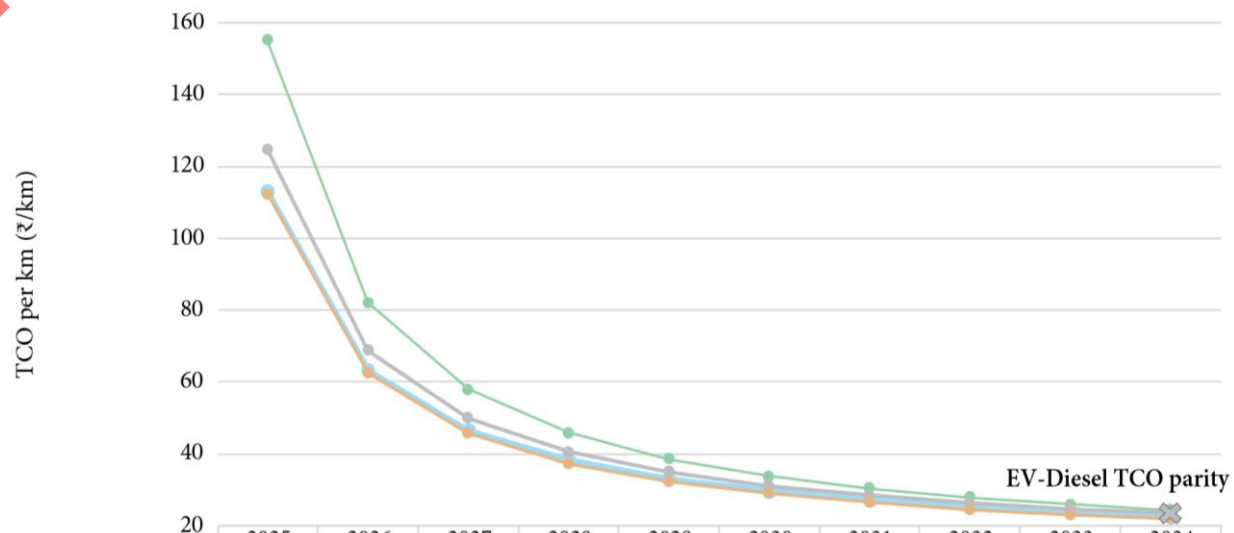
Per km TCO Comparison btw. Electric and ICE Private Cars

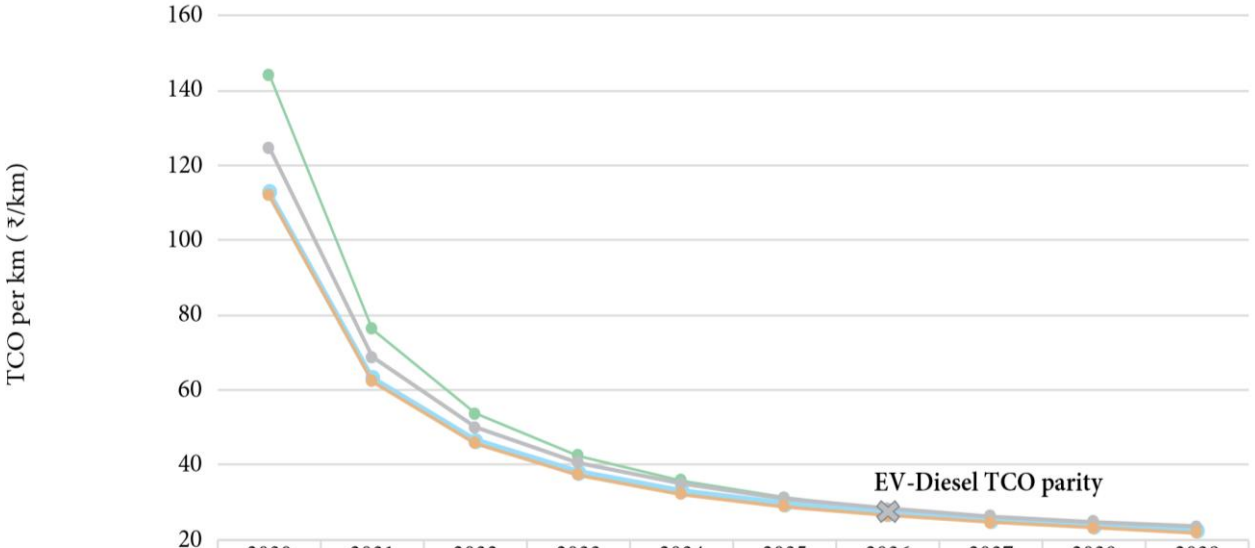
- E-car purchased in 2025 not reaching TCO parity with baseline petrol car in 10 years of ownership.
- W/o tax incentives, e-car's total cost per km will further increase.

TCO Comparison of Private Cars Purchased in 2025



	2025 (Year 1)	2026 (Year 2)	2027 (Year 3)	2028 (Year 4)	2029 (Year 5)	2030 (Year 6)	2031 (Year 7)	2032 (Year 8)	2033 (Year 9)	2034 (Year 10)
2025 Electric	155.25	82.17	57.86	45.74	38.51	33.71	30.31	27.78	25.83	24.29
Petrol	112.96	63.22	46.54	38.12	33.02	29.59	27.11	25.24	23.76	22.57
Diesel	124.73	68.69	49.95	40.55	34.89	31.10	28.38	26.34	24.74	**23.47**
CNG	112.09	62.37	45.71	37.33	32.26	28.86	26.41	24.56	23.12	21.95

TCO Comparison based on 2030 Car Prices



	2030 (Year 1)	2031 (Year 2)	2032 (Year 3)	2033 (Year 4)	2034 (Year 5)	2035 (Year 6)	2036 (Year 7)	2037 (Year 8)	2038 (Year 9)	2039 (Year 10)
2030 Electric	144.21	76.35	53.78	42.52	35.80	31.35	28.19	25.84	24.02	22.59
Petrol	112.96	63.22	46.54	38.12	33.02	29.59	27.11	25.24	23.76	22.57
Diesel	124.73	68.69	49.95	40.55	34.89	31.10	**28.38**	26.34	24.74	23.47
CNG	112.09	62.37	45.71	37.33	32.26	28.86	26.41	24.56	23.12	21.95

- E-car not cost-competitive by 5th year of ownership, even after factoring in decline in battery price in 2030.
- Increasing taxes on e-cars would further widen the gap in TCO per km.

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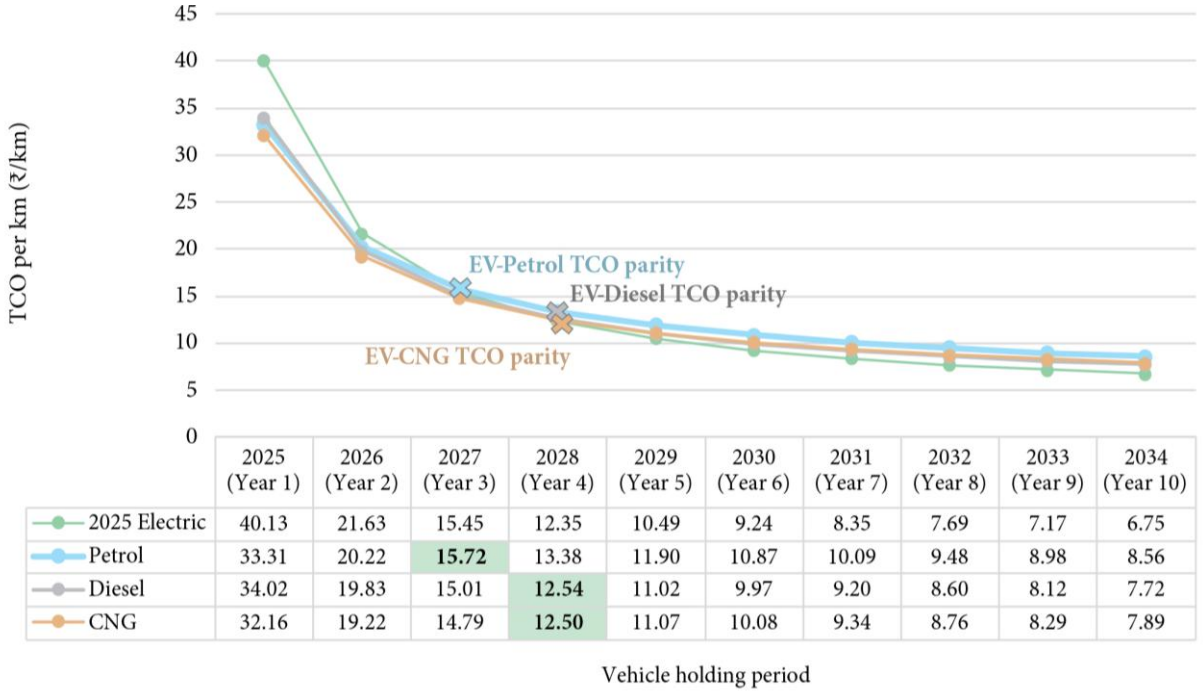
Dependence of Commercial Passenger E-Cars on Incentives

- CNG cars represent the baseline vehicle type in the commercial passenger car segment.
  - These account for 53% of commercial car registrations over the period from 2019-20 to 2024-25.

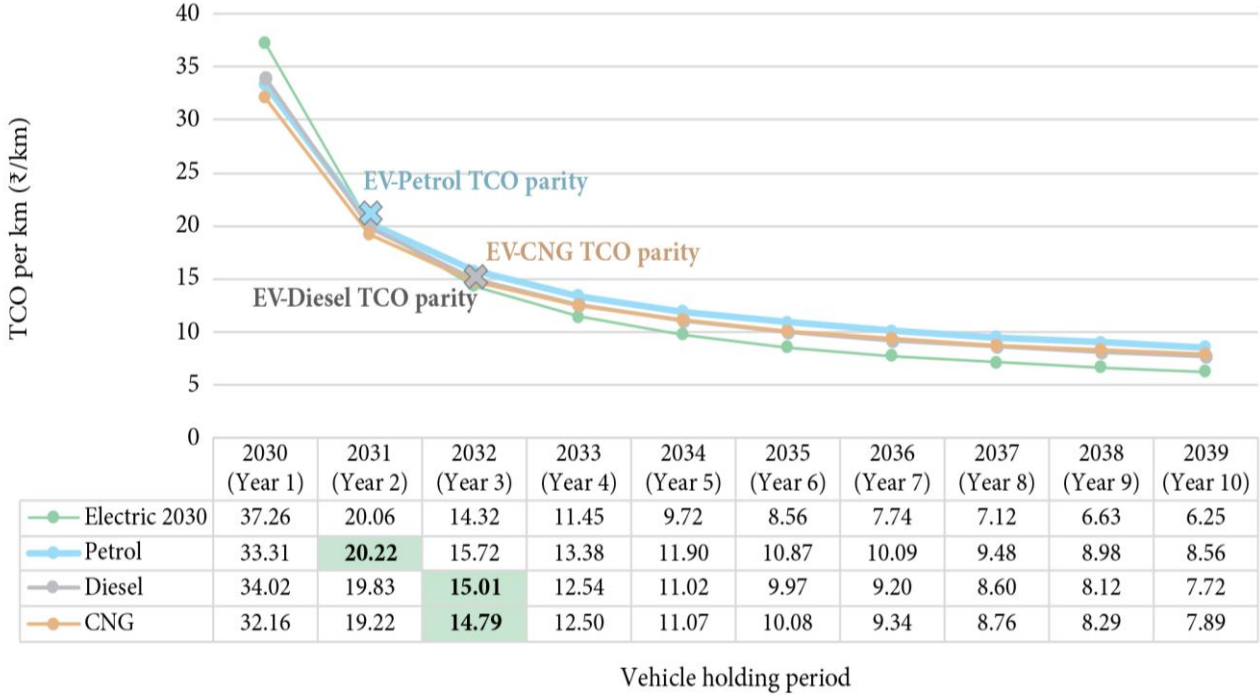
TCO Comparison of Commercial Cars Bought in 2025



	2025 (Year 1)	2026 (Year 2)	2027 (Year 3)	2028 (Year 4)	2029 (Year 5)	2030 (Year 6)	2031 (Year 7)	2032 (Year 8)	2033 (Year 9)	2034 (Year 10)
2025 Electric	40.13	21.63	15.45	12.35	10.49	9.24	8.35	7.69	7.17	6.75
Petrol	33.31	20.22	**15.72**	13.38	11.90	10.87	10.09	9.48	8.98	8.56
Diesel	34.02	19.83	15.01	**12.54**	11.02	9.97	9.20	8.60	8.12	7.72
CNG	32.16	19.22	14.79	**12.50**	11.07	10.08	9.34	8.76	8.29	7.89

- 2025 electric achieves TCO per km parity with CNG by 4th year of ownership.*
- This gives room to raise MV tax on commercial e-cars to 6% while retaining GST at 5%.

TCO Comparison based on 2030 Car Prices



	2030 (Year 1)	2031 (Year 2)	2032 (Year 3)	2033 (Year 4)	2034 (Year 5)	2035 (Year 6)	2036 (Year 7)	2037 (Year 8)	2038 (Year 9)	2039 (Year 10)
Electric 2030	37.26	20.06	14.32	11.45	9.72	8.56	7.74	7.12	6.63	6.25
Petrol	33.31	**20.22**	15.72	13.38	11.90	10.87	10.09	9.48	8.98	8.56
Diesel	34.02	19.83	**15.01**	12.54	11.02	9.97	9.20	8.60	8.12	7.72
CNG	32.16	19.22	**14.79**	12.50	11.07	10.08	9.34	8.76	8.29	7.89

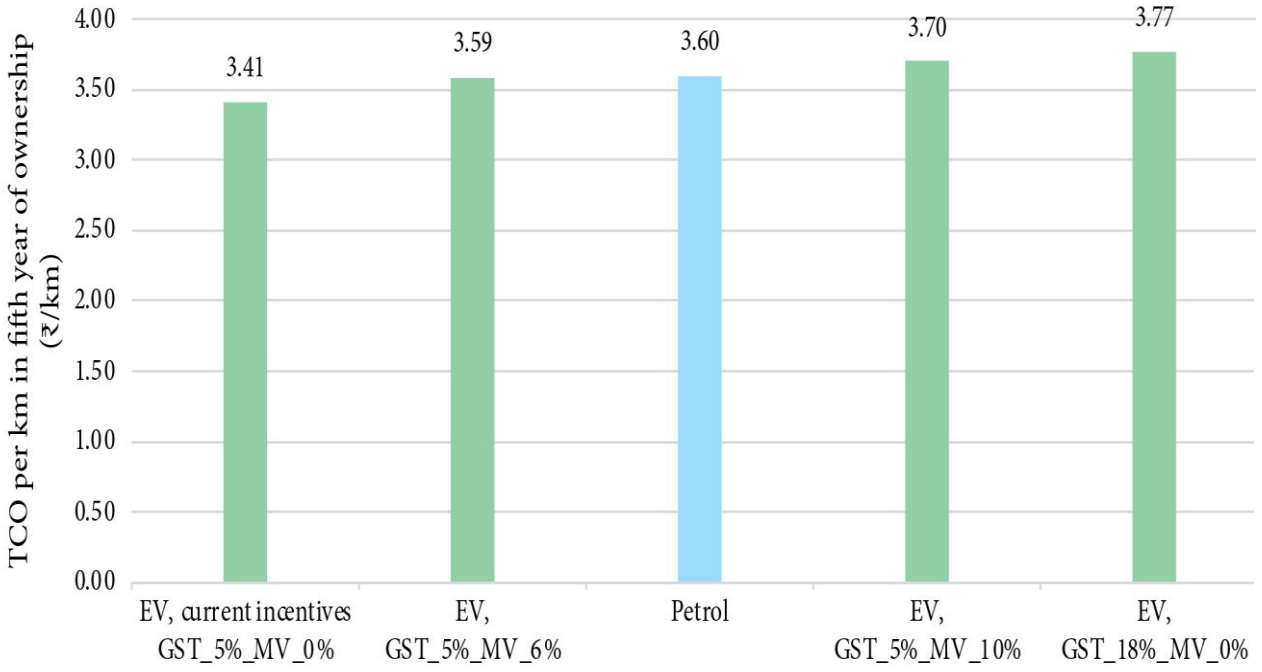
- 2030 price can allow increasing MV tax to 14% (continuing with 5% GST rate).*

* even after accounting one-time battery replacement cost.

Reliance of Electric Two-wheeled Vehicles on Incentives

- With 97% share in total e-2W registrations over the period, petrol is the baseline vehicle type.

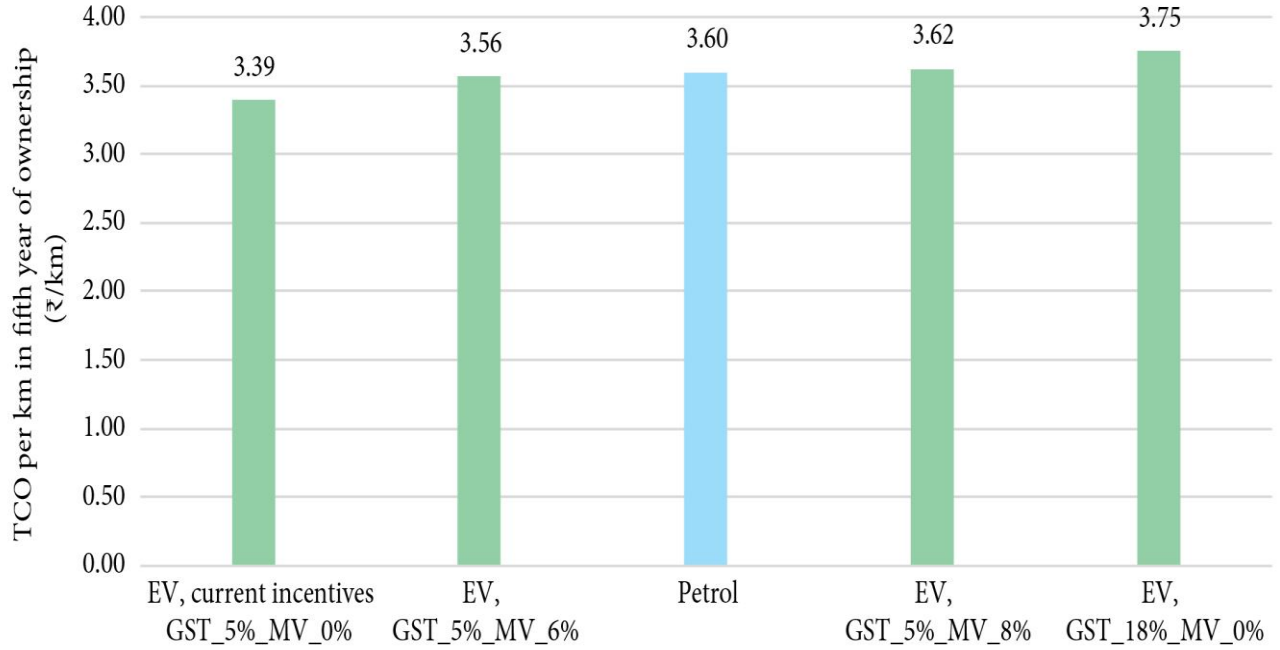
5th Year TCO per km of 2Ws Purchased in 2025



- TCO of e-2W stays competitive with petrol variant when MV tax increases to 6% (GST unchanged at 5%).
- 18% GST (with no MV tax) pushes TCO per km of e-2W higher than petrol in 5th year of ownership.

- 2030 e-2W can remain attractive even at 18% GST if MV tax waiver and demand incentive continue.

5th Year TCO per km based on 2030 Price*



* excluding demand incentives.

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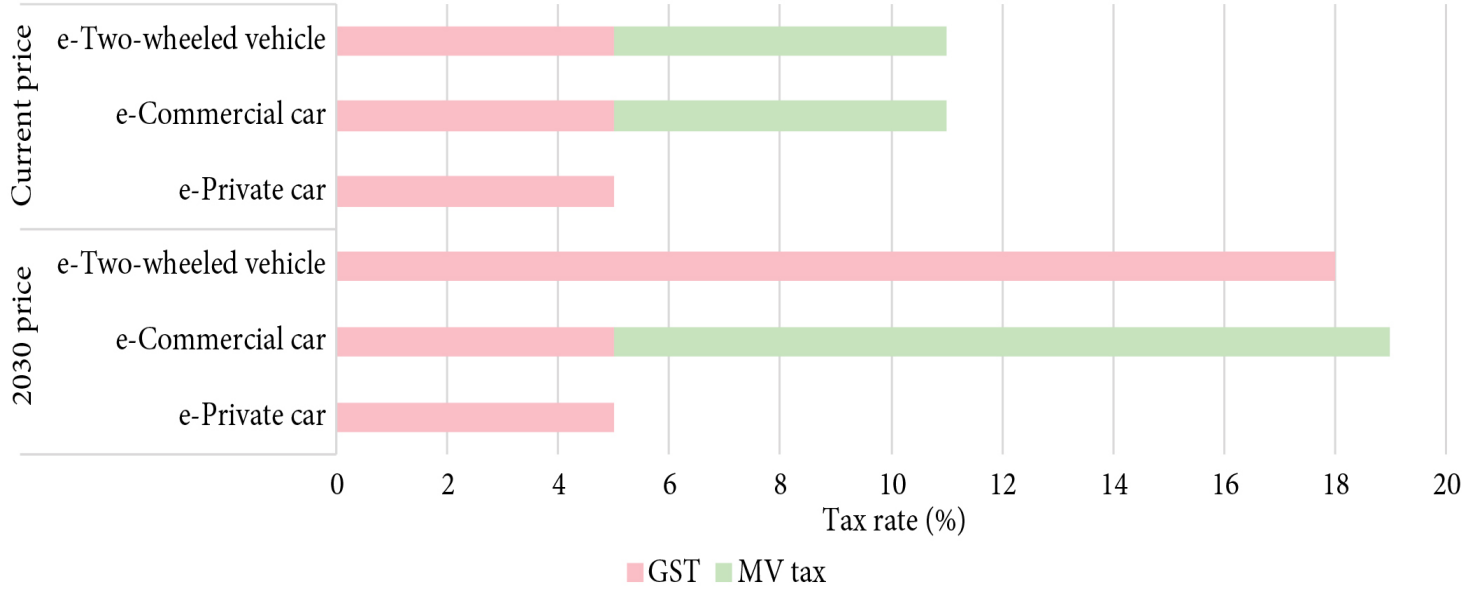
Summary: Possible Scope to Rationalise EV Incentives

- Continue current tax incentives (5% GST and MV tax exemption) for private e-car purchases until at least 2030.
  - Maintaining status quo is necessary until the costs of e-cars decrease further.
- Discontinue MV tax waiver for commercial e-cars while retaining 5% GST rate, effective immediately.
  - States can levy MV tax up to 6% rate. Rate can be further raised to 14% from 2030 onwards, with GST maintained at 5%.
- Levy MV tax up to 6%, with continuance of 5% GST on e-2Ws, considering their 2025 prices.
  - In this case, only States would be able to recover their tax revenue losses.
- Increase GST rate to 18% on e-2Ws from 2030 onwards (MV tax waiver and current demand incentives to continue).

Possible Tax Scenarios Based on Present and Future EV Prices



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Offering Visibility to Stakeholders

Policymakers (at central and state levels)

- Can get visibility of on the possible inflection point for the EV adoption to grow organically, which provides scope to revisit the current fiscal policy towards EV sales.

Industry

- Can get a sense of how to strategize the EV pricing in the future to reduce dependence on EV incentives.

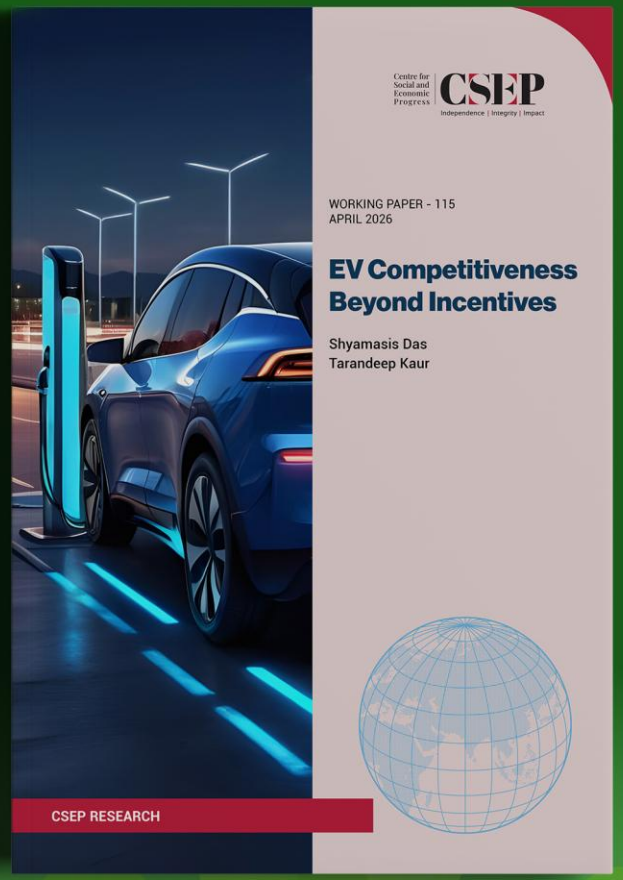
Public (consumers)

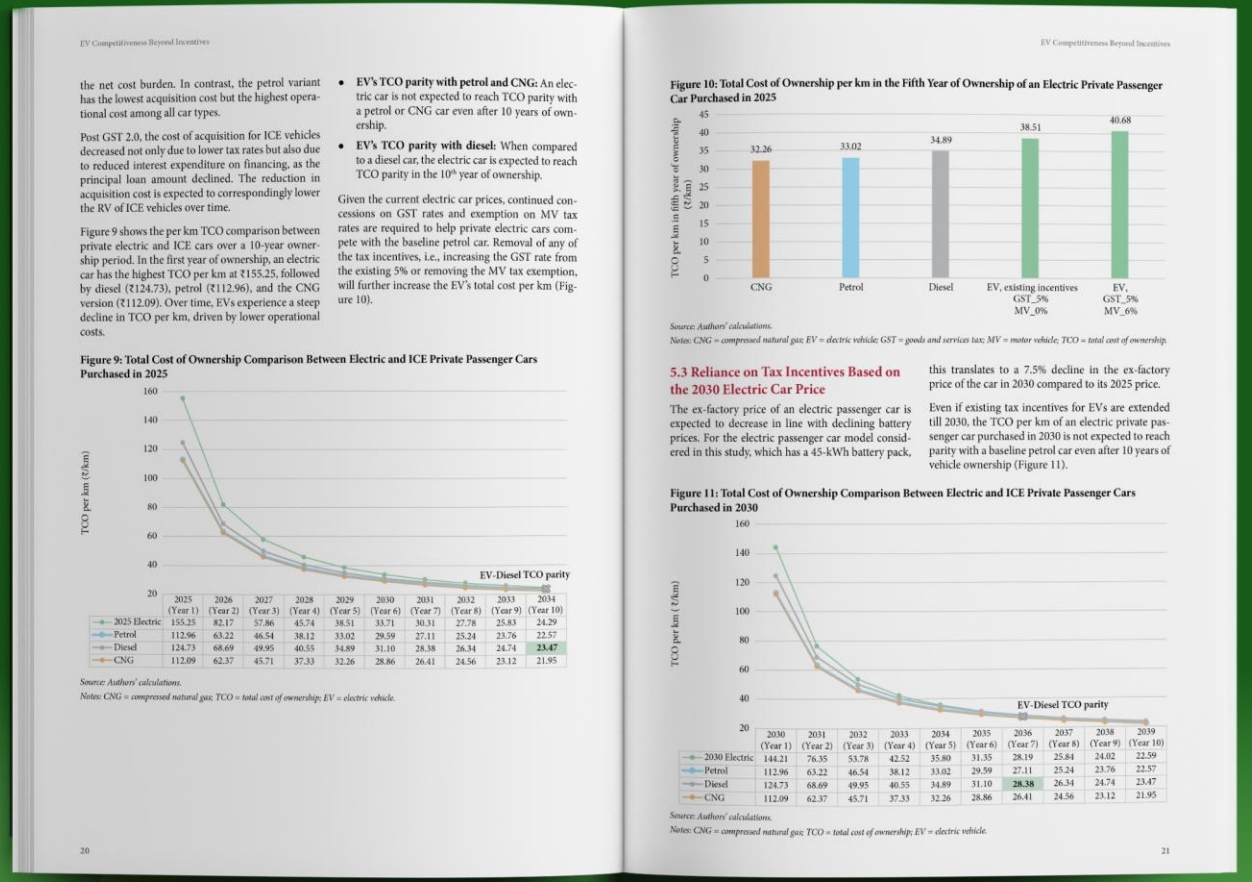
- Can benefit from understanding the true lifetime cost of EVs vis-à-vis the conventional vehicles and they can consider the new-age technology as the "first choice" with the given conditions.

Caveat:

- The study is a cost-comparison exercise and does not model actual consumer behaviour or adoption patterns.
- Results are contingent on several input parameters that can be dynamic in nature in a practical world.
  - For example, value of average daily VKM for a vehicle segment. This in reality varies from one user to another.
- Fuel and electricity prices considered constant; projecting future prices involves significant uncertainty.
- Price projection of electric variants for 2030 is linked to publicly available LiB price forecast.

For Details, Refer to the Working Paper





EV Competitiveness Beyond Incentives

the net cost burden. In contrast, the petrol variant has the lowest acquisition cost but the highest operational cost among all car types.

Post GST 2.0, the cost of acquisition for ICE vehicles decreased not only due to lower tax rates but also due to reduced interest expenditure on financing, as the principal loan amount declined. The reduction in acquisition cost is expected to correspondingly lower the RV of ICE vehicles over time.

Figure 9 shows the per km TCO comparison between private electric and ICE cars over a 10-year ownership period. In the first year of ownership, an electric car has the highest TCO per km at ₹155.25, followed by diesel (₹124.73), petrol (₹112.96), and the CNG version (₹112.09). Over time, EVs experience a steep decline in TCO per km, driven by lower operational costs.

- **EV's TCO parity with petrol and CNG:** An electric car is not expected to reach TCO parity with a petrol or CNG car even after 10 years of ownership.
- **EV's TCO parity with diesel:** When compared to a diesel car, the electric car is expected to reach TCO parity in the 10th year of ownership.

Given the current electric car prices, continued concessions on GST rates and exemption on MV tax rates are required to help private electric cars compete with the baseline petrol car. Removal of any of the tax incentives, i.e., increasing the GST rate from the existing 5% or removing the MV tax exemption, will further increase the EV's total cost per km (Figure 10).

Figure 9: Total Cost of Ownership Comparison Between Electric and ICE Private Passenger Cars Purchased in 2025

	2025 (Year 1)	2026 (Year 2)	2027 (Year 3)	2028 (Year 4)	2029 (Year 5)	2030 (Year 6)	2031 (Year 7)	2032 (Year 8)	2033 (Year 9)	2034 (Year 10)
2025 Electric	155.25	82.17	57.86	45.74	38.51	33.71	30.31	27.78	25.83	24.29
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Source: Authors' calculations.

Notes: CNG = compressed natural gas; TCO = total cost of ownership; EV = electric vehicle.

Figure 10: Total Cost of Ownership per km in the Fifth Year of Ownership of an Electric Private Passenger Car Purchased in 2025

Source: Authors' calculations.

Notes: CNG = compressed natural gas; EV = electric vehicle; GST = goods and services tax; MV = motor vehicle; TCO = total cost of ownership.

5.3 Reliance on Tax Incentives Based on the 2030 Electric Car Price

The ex-factory price of an electric passenger car is expected to decrease in line with declining battery prices. For the electric passenger car model considered in this study, which has a 45-kWh battery pack, this translates to a 7.5% decline in the ex-factory price of the car in 2030 compared to its 2025 price.

Even if existing tax incentives for EVs are extended till 2030, the TCO per km of an electric private passenger car purchased in 2030 is not expected to reach parity with a baseline petrol car even after 10 years of vehicle ownership (Figure 11).

Figure 11: Total Cost of Ownership Comparison Between Electric and ICE Private Passenger Cars Purchased in 2030

	2030 (Year 1)	2031 (Year 2)	2032 (Year 3)	2033 (Year 4)	2034 (Year 5)	2035 (Year 6)	2036 (Year 7)	2037 (Year 8)	2038 (Year 9)	2039 (Year 10)
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Link to download: *https://csep.org/working-paper/ev-competitiveness-beyond-incentives/*

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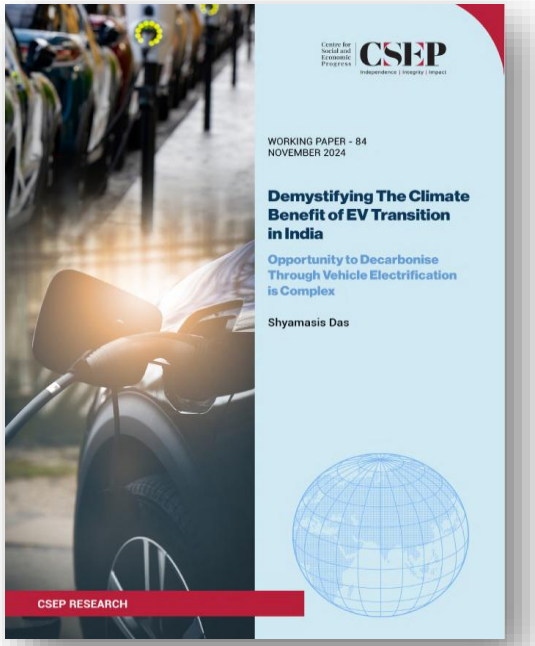
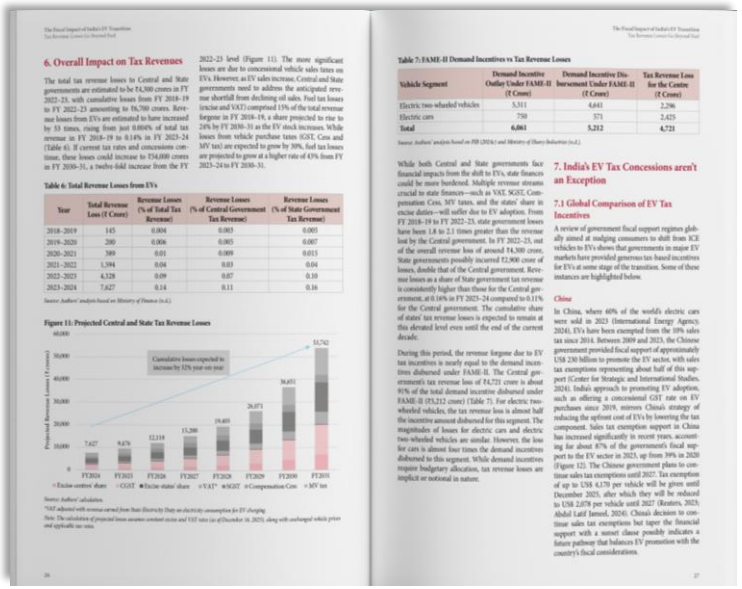
Other Recent Studies



https://csep.org/working-paper/demystifying-the-climate-benefit-of-ev-transition-in-india/



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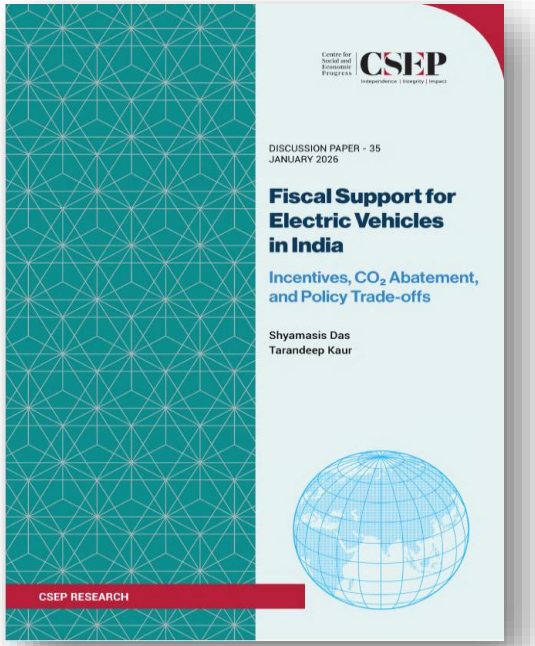
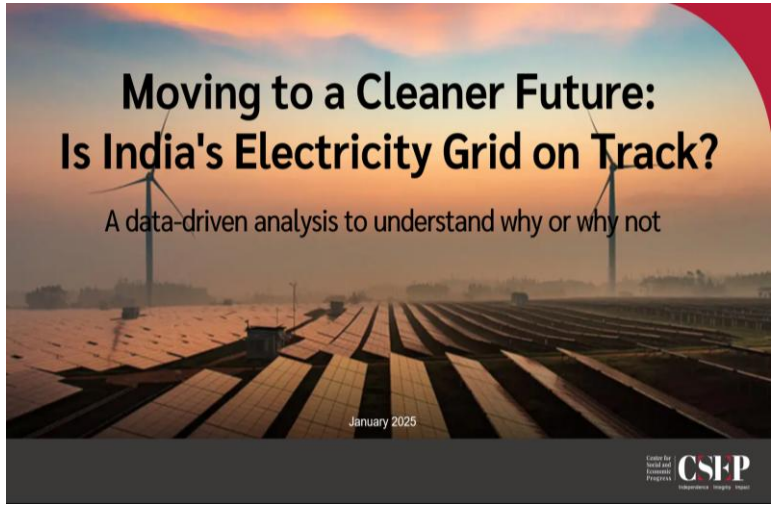


https://csep.org/discussion-note/fiscal-support-for-electric-vehicles-in-india-incentives-co%e2%82%82-abatement-and-policy-trade-offs/



https://csep.org/key-insights/moving-to-a-cleaner-future-is-indias-electricity-grid-on-track/

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