

Interim Report of the Expert Committee for abatement of air pollution caused by vehicular emissions constituted by the CAQM on 10.12.2025 for “*transition of Light Goods Vehicles (LGVs) in Delhi NCR*”

Light Goods Vehicle (LGV)

Light Goods Vehicle (LGV) is a goods carriage having a Gross Vehicle Weight (GVW) not exceeding 7,500 kg. This comes from the category of Light Motor Vehicle (LMV) under Section 2(21) of the Motor Vehicles Act, 1988.

Goods vehicles are generally classified as

- Light Goods Vehicle (LGV) $\leq 7,500$ kg
- Medium Goods Vehicle (MGV) $> 7,500$ kg and $\leq 12,000$ kg
- Heavy Goods Vehicle (HGV) $> 12,000$ kg

However, as per the VAHAN registration database and the Central Motor Vehicles Rules (CMVR), goods vehicles are classified under Category N1, N2 and N3 having GVW <3.5 tonnes, 3.5 to 12 tonnes and > 12 tonnes respectively.

Context - Globally urban freight vehicles are nudged to be electrified first as part of AQ management. LGV PM emissions contribution amongst active vehicle fleets – is 5.1 per cent within NCT of Delhi, 2.3 per cent in High Vehicle Density Districts (HVDs viz: Gurugram, Faridabad, Sonapat, Gautam Budhha Nagar and Ghaziabad) and 3.1 % in

rest of NCR. This reflects the segment's growing role in urban freight movement and exposure-related emissions. New vehicle sales of LGVs across NCR accounting for nearly ~2 per cent which contribute around ~1–2 per cent of incremental PM emissions (**Annexure**). Thus, LGVs are strategically important due to:

- High urban operating intensity (per vehicle - higher km)
- Rapid growth in urban freight demand (due to population and economic growth)
- Significant diesel dependence in HVDs and Rest of NCR, outside Delhi (approx 50 per cent new sales in 2025)
- Aggregator Policy (Direction 94) is nudging the platform companies to move towards electric LGVs to be electric. There is growing readiness for electrification in other freight vehicles too.
- Newer models introduced by Tata, Eicher, Montra, EKA, Switch etc during the last couple of years. The Total Cost of Ownerships (TOCs) is even more attractive, due to higher fossil fuel prices.

Key observations from the 2025 sales trends include: (**Annexure** - stock and new sales in LGV segment)

- CNG currently dominates new LGV registrations across Delhi & NCR, accounting for nearly >95 per cent and 70 per cent of sales respectively as compared to Diesel.
- Diesel continues to retain a substantial share, particularly in HVDs (25 per cent) and the Rest of NCR (50 per cent).
- EV penetration, though still moderate, is beginning to emerge in Delhi (~7 per cent) and urban freight applications.
- Sales of new Petrol and other ICE variants remain limited to <1 per cent in Delhi, HVDs and rest of NCR.

Strategic Recommendation -

1. Diesel phase-out as a key strategy

Diesel LGVs are twice as polluting as CNG – This necessitates restriction on registration of new Petrol and Diesel LGVs. This will lead to CNG and EV sales only in the short run.

A longer time-frame is envisaged for the transition, through CNG and EV, for higher payload and operationally constrained applications of LGVs of 3.5 tonnes to 7.5 tonnes GVW. Accordingly, a phased regulatory pathway is proposed for the LGV segment across Delhi-NCR:

2. Proposed EV registration mandates restricting the remaining CNG sales in the medium and long term.

While CNG may continue as a transitional fuel in the short term, EVs will remain the preferred pathway for the LGV segment.

Vehicle Category	Delhi	HVD NCR	Rest of NCR	Allowed Fuel	Remarks
LGVs (up to 3.5T GVW) (N1 category)	01.01.2027	01.07.2027	01.01.2028	(i) NCT of Delhi and HVD districts – EV only (ii) NCR Districts other than NCT of Delhi and HVD districts* – EV/CNG	EV options : 20 models, 9 registered OEMs
LGVs (3.5T to 7.5T GVW) (N2)	01.01.2028	01.07.2028	01.01.2029	(i) NCT of Delhi and HVD districts – EV only	EV options: – 6 models, 4

category)				(ii) NCR Districts registered OEMs; other than NCT of Delhi and HVD districts*- EV/CNG	
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*: EV infrastructure in Delhi-NCR is being augmented as per the targets of State Action Plans, which will ensure enabling charging infrastructure. However, charging infrastructure in districts (in rest of NCR) other than NCT of Delhi and HVD districts is still at a nascent stage, hence as CNG infrastructure is available, registration of CNG LGVs may be continued till charging infrastructure is augmented appropriately.

Estimated Impact of the above Mandates - Each year of delay results in avoidable emissions being permanently added to the NCR airshed. Transitioning away from diesel in new LGV sales would result in:

Direct Emissions Impact	System-Level Benefits
• Impacting new sales of 16k vehicles in Delhi annually, and 13k vehicles in HVD and 15k rest on NCR • Elimination of ~0.3 tonnes of PM_{2.5} annually from new e-LGV additions • Over a vehicle lifetime (10-15 years): ~3-5 tonnes of PM_{2.5} avoided per year of	• Immediate air quality improvement (no tailpipe emissions) • Lower operating costs for drivers (fuel + maintenance savings) • Ease of doing business and higher economic output - due to no or low entry constraints on E-LGVs. • Reduced noise pollution in urban areas • Energy security benefits through reduced fossil fuel dependence.

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Supporting Policy Ecosystem - The transition from diesel LGVs to EV and CNG

LGVs is further supported by existing policy and ecosystem enablers:

- PM E-Drive, Parivartan and Draft Delhi-State EV Policy:** Central and Central and State-Level Schemes are increasingly supporting commercial EV adoption, charging infrastructure deployment, and fleet electrification, creating an enabling policy environment for LGV transition.
 - Delhi Draft EV Policy 2.0 incentivises only LGVs N1 category (GVW < 3.5 tonnes)
 - Parivartan Scheme of GOI incentivises only EV LGVs in NCT of Delhi and EV, CNG, and ICE LGVs in NCR.
- Aggregator and Fleet Electrification Momentum:** Large logistics, e-commerce, and delivery operators are increasingly adopting EV targets and sustainability commitments, helping create early market demand for electric freight vehicles.
- Delhi Aggregator Policy 2023 mandated phased conversion to Electric goods vehicles by Delivery Services Providers and e entities within 5 yrs of the

notification of policy and complete switch to an all-electric fleet by April 1, 2030 in NCT of Delhi.

- CAQM Direction 94 dated 03.06.2026 as amended on 23.12.2026 mandated induction of only EV/CNG LGVs (N1 category upto 3.5 tonne) w.e.f 01.01.2026 in NCR

Expected Challenges: Despite improving EV readiness, several constraints continue to affect the immediate electrification plan for the entire LGV category.

- **Payload and Range Diversity:** The current LGV category includes vehicles up to 7.5 tonnes GVW, where higher payload requirements, longer travel distances, and comparatively higher charging downtime may pose operational challenges for EV adoption.
- **Charging Infrastructure Gaps:** While urban charging ecosystems are improving, significant gaps remain in shared, commercial, fast freight charging hubs, non-urban and highway charging infrastructure.
- **Financing Constraints:** A large share of LGV operators comprises small fleet owners and individually financed businesses. The higher upfront cost of EVs may be an adoption barrier without suitable financing products.
- **Limited EV Model Availability in Higher Payload Segments:** EV platforms are increasingly available for <3.5 tonnes urban delivery applications. However, suitable EV variants remain limited in the 3.5 - 7.5 tonnes GVW categories, limiting the EV penetration in this segment.

Annexure

Stock composition, New sales and their respective PM_{2.5} emissions.

An analysis of vehicle stock vis-à-vis their contribution to PM_{2.5} emissions highlights a critical policy insight: emissions are not proportional to fleet size. Certain segments, despite relatively smaller shares in total vehicle stock or sales, contribute disproportionately to particulate emissions due to higher utilisation and emission intensity.

Table 1: Active + fitness approved vehicle stock as on 31st Dec 2025 and their respective PM_{2.5} emissions.

Segment	Delhi NCT		HVD		Rest of NCR		Delhi + NCR (Combined)	
	Active stock	Emission % (2026 EFs)	Active stock	Emission % (2026 EFs)	Active stock	Emission % (2026 EFs)	Active stock	Emission % (2026 EFs)
LGV	1,09,450	5.1	61,803	2.3	91,695	3.1	2,62,948	3.3

Source: VAHAN database and BS VI 2026 EFs (made available by ARAI)

Table 2: Segment-wise new registrations in 2025 and their respective share in incremental PM emissions

Segment	Delhi NCT		HVD		Rest of NCR		Delhi + NCR (Combined)	
	New Sales in 2025	Emission % (2026 EFs)	New Sales in 2025	Emission % (2026 EFs)	New Sales in 2025	Emission % (2026 EFs)	New Sales in 2025	Emission % (2026 EFs)

		6 EFs)		EFs)		EFs)		
LGV	15,184	1.7	11,820	0.5	14,591	1.0	41595	0.9

Source: VAHAN database and BS VI 2026 EFs (made available by ARAI)

Freight vehicles, particularly Light Goods Vehicles (LGVs), are becoming increasingly important in urban transport ecosystems due to the rapid expansion of e-commerce, logistics, courier services, FMCG distribution, and urban goods movement. As freight demand rises across Delhi-NCR, continued additions of diesel-powered LGVs risk locking in avoidable emissions over the coming decade.

At the same time, the segment is beginning to demonstrate strong market momentum toward electrification, particularly in lower payload urban delivery applications. This presents a strategic opportunity for CAQM to steer the segment toward cleaner technologies through a phased regulatory pathway.

Current Fleet Composition and Fuel Trends in LGVs

An assessment of recent registration trends of LGVs across Delhi, HVD NCR, and the rest of NCR highlights a transition already underway away from diesel toward cleaner alternatives.

Table 3: LGV (N1) fuel-wise active fleet and new sales across the region

Fuel type	Delhi		HVD		Rest of NCR	
	Active Stock as on 31.12.2025	New sales During 2025	Active Stock as on 31.12.2025	New sales During 2025	Active Stock as on 31.12.2025	New sales During 2025
Diesel	501	35	20,402	2,354	54335	6276
Petrol	109	4	869	121	3203	312
Petrol/CNG	621	1	4,529	415	3008	99

CNG	1,03,512	13,646	31,948	7,341	27286	6485
EV	1,980	1,026	957	661	236	75
Total	1,06,723	14,712	58,705	10,892	88,068	13,246

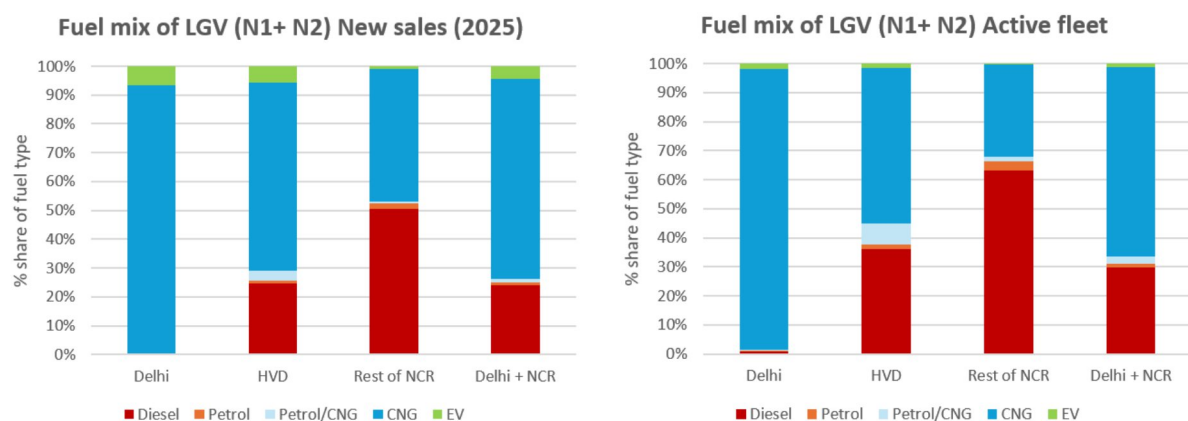
Table 4: LGV (N2) fuel-wise active fleet and new sales across the region

Fuel type	Delhi		HVD		Rest of NCR	
	Active Stock as on 31.12.2025	New sales During 2025	Active Stock as on 31.12.2025	New sales During 2025	Active Stock as on 31.12.2025	New sales During 2025
Diesel	493	40	1,954	562	2881	1131
Petrol	0	0	0	0	0	0
Petrol/CNG	0	0	0	0	0	0
CNG	2,234	432	1,144	366	746	213
EV	0	0	0	0	0	0
Total	2,727	472	3,098	928	3,627	1,344

Key observations from the sales trends include:

- CNG currently dominates new LGV registrations across NCR, accounting for nearly 70 per cent of sales in most regions.
- CNG sales dominate Delhi (>95%) as compared to Diesel.
- Diesel continues to retain a substantial share, particularly in HVD (25 per cent) and the Rest of NCR (50 per cent).
- EV penetration, though still moderate, is beginning to emerge in Delhi (~7 per cent) and urban freight applications.
- Petrol and other ICE variants remain limited.

Figure 1: Fuel mix of the active fleet and New registrations of LGVs across Delhi NCR.



The trends indicate that the market is already transitioning away from diesel toward cleaner fuels. However, without regulatory intervention, continued diesel registrations would continue adding avoidable emissions into the NCR airshed over vehicle lifetimes.

Unlike the 3W segment, where vehicle duty cycles and operational characteristics are relatively limited, the LGV segment encompasses a broad spectrum of freight applications across NCR, including:

- E-commerce and courier delivery
- FMCG distribution
- Municipal and utility services
- Cold chain logistics
- Regional freight operations
- Inter-city movement

This heterogeneity has important implications for electrification feasibility.

Targeting Diesel Phase-Out in LGVs

In this context, a clear and immediate opportunity exists in phasing out diesel LGVs from new registrations. Importantly, continued diesel registrations risk locking in avoidable emissions over vehicle lifetimes of 10–15 years. At the same time, unlike the 3W segment, where full electrification was immediately feasible, the LGV segment requires a calibrated transition pathway due to the diversity of payload classes and operational requirements.

Why Focus on LGVs?

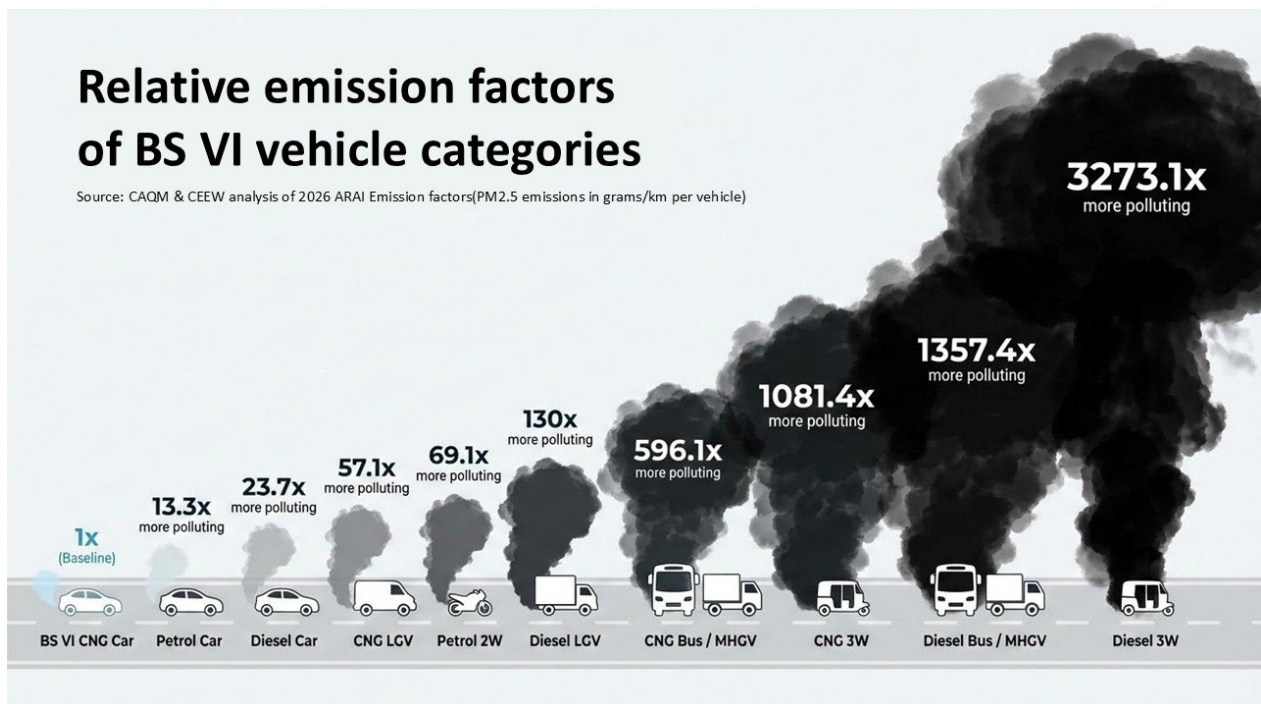
The LGV segment represents a strategically important opportunity for early freight electrification because:

- **Anticipated Shift in Urban Freight Operations:** With upcoming restrictions on entry of heavy-duty freight vehicles into city limits and potentially later across NCR regions, freight movement is expected to increasingly shift toward smaller LGVs for urban and regional distribution. In anticipation of this structural transition, early adoption of cleaner technologies in the LGV segment becomes critical to avoid future lock-in of high-emitting diesel vehicles.
- **Strong Emerging EV Applicability:** A large share of urban freight operations already exhibit characteristics favourable for electrification, including fixed routes, predictable travel distances, depot-based parking, and high daily utilisation.
- **Rapid Growth in Urban Freight:** Expansion of e-commerce, hyperlocal logistics, quick-commerce, and last-mile delivery services is rapidly increasing the LGV fleet, risking long-term lock-in of diesel vehicles.
- **High Urban Exposure Impacts:** LGVs operate extensively within dense urban areas and residential neighbourhoods, directly contributing to population exposure and urban air pollution.

- **Growing Market Momentum Toward EVs:** Multiple OEMs and fleet operators are increasingly adopting electric cargo vehicles due to lower operating costs, fuel savings, reduced maintenance, and corporate sustainability targets.

BS VI 2026 EFs (made available by ARAI) emission factors

Latest BSVI 2026 emission factors have shown some important results.



The above comparison of BS VI emission factors highlights the stark differences in real-world emissions across vehicle segments. Even within goods-moving and passenger transport, vehicles such as diesel 3-wheelers, diesel buses/MHGVs, and CNG 3-wheelers emit several times more pollutants compared to the cleanest reference—BS VI CNG cars.

- LGVs, when running on CNG, are polluting more than 57 times of CNG car whereas LGVs running on diesel, are around 130 times more polluting than a BS

VI CNG car, underscoring the urgent need to prevent future lock-in of high-emitting technologies through new sales mandates.

Why CNG vehicles will NOT solve the transport PM problem in Delhi

CNG vehicles are a major source of NO_x

Compressed Natural Gas (CNG) burns cleaner than diesel in terms of particulate matter and sulphur, but its **high combustion temperatures generate significant nitrogen oxides (NO_x)** — particularly NO and NO₂.

- CNG engines operate at lean air-fuel ratios and high flame temperatures (>1,300°C), the principal condition for thermal NO_x (Zeldovich mechanism) formation.
- Studies by ARAI (Automotive Research Association of India) show CNG buses emit 0.8–2.0 g/km of NO_x — comparable to Euro-III diesel and exceeding Euro-VI diesel standards.
- A 2019 study found that CNG auto-rickshaws in Delhi emitted NO_x levels 3–5× higher than petrol equivalents under real-world driving conditions.

CNG led NO_x-to-Secondary PM_{2.5} emissions

In Delhi's atmosphere — rich in sunlight, volatile organic compounds (VOCs), and ammonia — it undergoes rapid photochemical and heterogeneous reactions to form **secondary inorganic aerosols (SIA)**, the dominant form of secondary PM_{2.5}.

- $\text{NO}_2 + \text{OH} \rightarrow \text{HNO}_3$, which condenses with NH_3 (abundant from agricultural and waste sources in NCR) to form ammonium nitrate (NH_4NO_3) — a key PM_{2.5} component.

- NO_x also participates in ozone formation (O₃), which further oxidises SO₂ and VOCs to form sulphate and organic aerosol particles — all sub-2.5 micron in size.
- SAFAR (IITM Pune) data shows secondary aerosols peak in winter in Delhi, precisely when photolysis is lower but NO_x-NH₃ chemistry intensifies in cold, stagnant air.

CAQM Finding	The Commission for Air Quality Management (CAQM) meta-analysis report identifies secondary particulate matter as contributing 27 per cent of PM _{2.5} in Delhi NCR — making it the single largest identified source category, ahead of dust, biomass burning, and industry.
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Why CNG Does Not Solve the PM_{2.5} Problem

By substituting diesel with CNG without addressing NO_x, policymakers are **trading primary PM for secondary PM** — shifting the pollution upstream in the chemical chain, not eliminating it.

- Primary PM (exhaust soot) is reduced by CNG — this is visible and politically legible.
- Secondary PM formation, driven by NO_x + NH₃ chemistry, is invisible, delayed, and occurs kilometres downwind of the emission source.
- Delhi's ambient NH₃ burden (from agriculture in Haryana/Punjab, waste burning, and livestock) provides an abundant precursor for NO_x to convert to nitrate aerosol. CNG vehicles continuously 'feed' this system.
- A TERI analysis (2022) estimated that vehicular NO_x accounts for 18–22 per cent of total NO_x load in the NCR airshed and CNG fleets being a substantial share of this.

International Evidence: NO_x-PM Link Is Well-Established

Region	Finding	Source
Beijing, China	Post-CNG bus transition, NO _x -driven secondary nitrate aerosol became the dominant PM _{2.5} fraction in winter; primary PM fell but PM _{2.5} averages did not improve proportionally.	<u>Zhang et al., Atmos. Environ. (2015)</u>
London, UK	After Euro-VI diesel transition reduced primary PM, secondary PM from NO _x remained high;	<u>RCP Report: Every Breath We Take (2018)</u>
Po Valley, Italy	High NH ₃ from agriculture + NO _x from transport created severe ammonium nitrate PM _{2.5} episodes.	<u>EMEP/EEA Emission Inventory Guidebook (2019)</u>

The Policy Implication: What Needs to Change

The CNG transition was a necessary first step in the 1990s–2000s. But in the context of Delhi's current PM_{2.5} crisis, it is an incomplete solution.

- Emission Standards for CNG vehicles must be tightened to Bharat Stage VI equivalents with real-world driving emission (RDE) testing — current BS-VI norms are lab based engine-bench tested only.

- **Selective Catalytic Reduction (SCR) retrofits on high-emitting CNG buses — proven in Europe and the US — can cut NO_x by 80–90 per cent.**
- The 27 per cent secondary PM share demands a dual-pronged NO_x + NH₃ control strategy: **cutting vehicle NO_x by reducing CNG new vehicle sales**; must be accompanied by agricultural ammonia controls (fertiliser management in Punjab/Haryana).
- Accelerating transition to zero-tailpipe emissions vehicles (ZTEs) — which emit no NO_x — is the only way to **structurally decouple mobility from secondary PM formation.**