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MOBILITY

COMMENTS OF

HEXENSE LABS PVT. LTD.

SIX SENSE MOBILITY

ON

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Regulatory Framework for Vehicle-to-Everything (V2X) Communication

SIX SENSE MOBILITY

Section I: About Us

Hexense Labs Pvt. Ltd., operating under the brand Six Sense Mobility, is a New Delhi-based Automotive Technology company specializing in designing, developing, and manufacturing advanced engineering products, fleet telematics, vehicle intelligence, and connected mobility solutions for Automotive OEMs and enterprise fleet operators. We are dedicated to engineering robust hardware and software ecosystems that drive safety, operational efficiency, and data-driven decision-making across India's transportation and agricultural sectors.

As an innovative technology startup, we are highly focused on how our specialized capabilities in V2X technology and precision telematics can directly support the government's ongoing initiatives in smart city development, proactive road safety, and agricultural modernization.

Our positions in this submission are driven by what we believe is right for India's roads and road users, not by what is commercially convenient for us. In several instances, the positions we take here would actually create a more demanding environment for our own products. We take those positions anyway, because they are the right ones.

Section II: Two Foundational Observations

Design for India's Whole Fleet, Not Just Its Newest Vehicles

Any V2X framework built around factory-fitted, premium-vehicle OBUs will fail the majority of Indian road users. India's roads carry two-wheelers, three-wheelers, aging trucks, rural tractors, intercity coaches — a fleet whose diversity has no parallel anywhere in the world. Most of these vehicles will not have factory-fitted V2X systems for a generation.

Aftermarket telematics companies - are the primary path through which V2X benefits reach this existing fleet. A framework that disadvantages aftermarket solutions through complex certification, proprietary interoperability barriers, or licensing burdens for OBU-class devices will leave the majority of Indian vehicles outside the V2X ecosystem for decades.

A large share of India's fleet consists of older vehicles that will not receive factory-fitted V2X OBUs for many years. The regulatory framework should explicitly provide for a category of plug-and-play aftermarket OBUs, which are low-cost certified devices purchasable by individual owners and fleet operators without professional installation. These devices may not deliver the full functionality of an OEM-integrated OBU, as automatic emergency braking and other vehicle-control integrations would remain beyond their scope. However, they would be fully capable of communicating with all licensed RSUs over an open standardised

protocol, and of delivering the warning and alert functions that constitute the majority of V2X's safety value, including collision warnings, red-light violation alerts, curve speed warnings, and emergency vehicle notifications. A clear certification pathway, license-exempt status, and a mandatory open-protocol requirement for this device category would dramatically accelerate V2X coverage across India's existing fleet at minimal public cost. The safety benefit of partial V2X functionality reaching millions of older vehicles is substantially greater than full functionality reaching only the newest ones.

Section III: Our Responses

We have organised our responses by the five question groups in the consultation paper. Where questions are closely related, we have responded to them together.

Group A: V2I Service Authorisation (Q1–Q3)

Q1 *Is a formal V2I service authorisation needed? If yes - eligibility, validity, service area, scope, and technical conditions?*

OUR POSITION: Yes — with broad eligibility, a 10-year term, and a mandatory open-access obligation on every licensed RSU.

The case for authorisation is clear. RSUs are fixed radio transmitters operating in a licensed frequency band, interacting continuously with vehicles carrying life-critical safety applications. Coordinated deployment and interference management are legitimate regulatory objectives. Every jurisdiction that has deployed V2X at scale — USA, Canada, China, South Korea — requires RSU operators to hold an authorization, and for good reasons.

What matters equally is how the authorisation is designed. A framework with excessive financial barriers, narrow eligibility, or complicated administration will concentrate RSU deployment in the hands of a few entities — and slow the national rollout of infrastructure that exists to protect lives.

Key design principles we recommend:

- Eligibility must be broad — central and state government bodies, NHAI, city corporations, AND private technology companies, fleet operators, and telematics providers. Deployment at the required density will not happen through the government alone.

- 10-year initial validity — RSU infrastructure investment has a multi-year payback; shorter terms deter deployment. Renewal should be administrative, not competitive.
- Corridor or district-level service areas — not national-level, which risks monopoly concentration.
- Single authorisation covering all use cases — safety, traffic management, and commercial. No tiered structure that adds bureaucratic layers.
- Open access obligation as a binding condition — every licensed RSU must communicate with any certified OBU, regardless of manufacturer. This is what prevents V2X from fracturing into proprietary silos. It must not be voluntary.

Q3 *Any other suggestions on the V2I authorisation framework?*

Two things TRAI could add:

A National V2X Coordination Body

India needs a standing forum — not a regulator, but a structured coordination mechanism — that brings together RSU operators, OBU manufacturers, OEMs, aftermarket companies, highway authorities, and city planners. Without it, India's V2X ecosystem will develop in silos, with coverage gaps wherever operator zones meet. The C-ROADS platform in Europe and the connected vehicle coordinating councils in the USA are useful models.

A Data Governance Framework for V2X-Generated Information

V2X generates continuous data on vehicle trajectories, speeds, and events. This consultation does not address who owns that data, what RSU operators can do with it, or how it interacts with the Digital Personal Data Protection Act 2023. Left unresolved, this will either deter deployment (operators fearing liability) or enable surveillance applications never contemplated in the public interest rationale for V2X. TRAI should flag this as a governance gap and recommend a structured follow-on consultation.

Group B: Technology Standards and Certification (Q4–Q7)

Q4 *Should a specific C-V2X technology (LTE or NR) be mandated?*

OUR POSITION: No mandate for LTE-V2X. Technology-neutral standards that accommodate both LTE-V2X and NR-V2X — with performance parameters specified, not a 3GPP release locked in.

Mandating LTE-V2X today would build obsolescence into India's V2X infrastructure on day one. RSUs deployed in 2026–2027 will still be operating in 2035. NR-V2X — the 5G-era standard — is where the world is heading. It offers lower latency, higher reliability, better spectrum efficiency, and support for advanced cooperative driving applications.

What the early adopters tell us:

- South Korea chose LTE-V2X in December 2023 — but simultaneously reserved 50 MHz for NR-V2X, explicitly treating LTE-V2X as transitional, not final.
- The FCC (November 2024) refused to mandate any specific 3GPP release — instead specified performance parameters and left technology to evolve.
- The EU has operated on technology-neutral principles since 2019.

India should do the same — specify EIRP limits, OOBE limits, channel bandwidth, and message priority hierarchy, without locking to a release. This gives manufacturers the freedom to build for both standards today, and protects RSU infrastructure from being stranded by the next generation.

On interoperability during the transition:

- Require RSUs on national highway corridors to support dual-mode operation in the initial phase — LTE-V2X and NR-V2X.
- The cost of dual-mode capability in RSUs is modest. The cost of an emergency alert failing to reach a vehicle because of a standard mismatch is not.

Q5 *Should RSUs and OBUs be brought under MTCTE certification?*

OUR POSITION: Different answers for RSUs and OBUs. RSUs: yes to MTCTE. OBUs: extend AIS-140, without creating a parallel certification.

For RSUs - MTCTE is appropriate:

RSUs are fixed radio infrastructure in a licensed band. MTCTE certification covering EMC, interference characteristics, power limits, and protocol conformance is reasonable and consistent with how comparable equipment is treated. We support it — provided certification timelines are defined, testing criteria are publicly notified, and enough accredited laboratories exist to prevent bottlenecks.

For OBUs - Build on AIS-140:

India already has a rigorous certification framework for vehicle-mounted communication devices - AIS-140, administered by ARAI and ICAT under MoRTH. Creating a parallel MTCTE process for OBUs would mean:

- Two separate testing processes for the same device
- Two sets of timelines, two sets of compliance costs
- Potential inconsistency between two regimes run by different ministries
- No safety or technical benefit whatsoever

We could approach it by: incorporating V2X OBU certification as a module within AIS-140. TEC and DoT specify the V2X-specific parameters to be tested — spectrum compliance at 5.9 GHz, sidelink protocol conformance, security certificate handling — and ARAI/ICAT test them alongside existing AIS-140 parameters. One process, one lab visit, one certificate.

There is also a Make in India argument here. A fragmented, duplicative certification regime disadvantages domestic manufacturers against imported products that already carry

international certifications (FCC, CE, ETSI type approval). A single AIS-140-anchored path levels the playing field.

Q6 *Should India standardise the ITS communication stack for higher protocol layers?*

OUR POSITION: Yes — the ETSI ITS stack as a binding mandate for all licensed RSUs and certified OBUs, not a voluntary industry standard.

Interoperability is the fundamental condition for V2X to save lives. A red-light violation warning only prevents accidents if every approaching vehicle can receive it — not just vehicles from one manufacturer. A pedestrian detection alert only works if every vehicle in range can process it.

Without standardised higher-layer protocols, V2X in India will fragment into proprietary islands. Safety warnings will only reach vehicles whose OBUs happen to speak the same 'language' as the RSU. This is a structurally unacceptable outcome for a safety technology.

Why the ETSI ITS stack:

- Deployed across European markets for several years — proven in real-world conditions
- Vendor-neutral — no single company controls it
- Backed by a mature ecosystem of conformance testing tools
- Allows India to participate in its ongoing evolution through ITU and ISO

The mandate must have teeth: non-compliance should be a disqualifying condition for RSU authorisation, and a ground for OBU certification rejection.

Q7 *Is a formal V2X security framework needed? If yes — what framework, which agency, and how does it coexist with India's existing PKI?*

OUR POSITION: Yes — non-negotiable. A spoofed V2X message is dangerous. Security is a safety requirement.

A fabricated collision warning that causes unnecessary braking in dense traffic could cause the very accident it claims to prevent. V2X security is not a cybersecurity nicety — it is a load-bearing part of the safety architecture.

Our recommendations:

- Framework: Adopt ETSI TS 103 097 or IEEE 1609.2 PKI — both use pseudonymous certificates that authenticate messages without permanently identifying the vehicle. This protects privacy under the DPDP Act 2023 while ensuring message integrity.
- Root authority: CCA under MeitY — consistent with India's existing PKI governance. Operational functions (issuance, revocation, pseudonym management) delegated to a V2X-specific subordinate CA, ideally operated by an industry consortium under CCA oversight.
- Coexistence with RCAI/X.509: Keep them as distinct systems. V2X certificates are short-lived, pseudonymous, machine-to-machine — fundamentally different from the identity-assurance certificates in RCAI. No need to merge them. A shared governance umbrella under CCA ensures consistency in revocation standards.

Group C: Spectrum Assignment (Q8–Q11)

Q8 *What should the spectrum assignment framework look like? (9 sub-parts)*

OUR POSITION: Shared spectrum. Dynamic MAC-layer priority for safety messages. Mandatory RSU registration database. 10-year assignment with rollout milestones.

Sub-question	Our Position
(a) Partition 30 MHz?	No rigid partition. Dynamic MAC-layer priority — safety messages at Tier 1, public safety at Tier 2, commercial at Tier 3 (FCC's November 2024 model). More efficient and avoids managing two parallel sub-bands.
(b) Shared or exclusive?	Shared. V2X traffic is short-range, event-driven, low duty-cycle — inherently suited to shared channel access. Exclusive assignment would reduce the number of participating operators with no performance benefit. EU, UK, and Australia all share.

(c) Interference management?	Shared model + mandatory RSU registration database (maintained by WPC). Every RSU registered with coordinates, power, and antenna config. Proactive interference analysis before deployment, not reactive disputes after.
(d) Technical parameters?	Adopt the Task Force recommendations: max EIRP 4W (36 dBm), conducted power 200mW over 20 MHz+ for RSUs, antenna up to 8m, OOBE per Table 3.1 of the Task Force report.
(e) Prior clearance (SACFA)?	Yes — but streamlined. 30 days for standard installations; 60 days for complex environments; deemed clearance at 45 days. Digital process end-to-end.
(f) Adopt Task Force parameters?	Yes, in full. They are well-calibrated and multi-stakeholder endorsed. Adopt without modification so industry can begin product development immediately.
(g) Assignment period?	10 years, aligned with authorisation validity. Administrative renewal, not competitive re-award.
(h) Rollout obligations?	Yes — milestone-based, not coverage-percentage based. RSU density targets at defined intervals post-assignment. Non-compliance: spectrum reduction, not forfeiture.
(i) Spectrum surrender?	Yes — 90-day notice minimum; coordinate with RSU database to avoid coverage gaps. TRAI/WPC authority to direct interim continuation on safety corridors.

Q9 *Should processing timelines for spectrum assignment applications be defined?*

OUR POSITION: Yes — emphatically. Undefined timelines are how infrastructure deployment stalls in India.

- 60 days maximum for a complete, technically compliant application
- 15 days to return an incomplete application with a written deficiency notice
- Deemed approval if no decision within 90 days
- TRAI should track compliance with these timelines as a published monitoring metric

Q10 *Any other suggestions on spectrum assignment?*

OUR POSITION: Protect the reserved 20 MHz (5,905–5,925 MHz) for at least 15 years.

The 20 MHz band reserved for future ITS applications is what allows India to accommodate NR-V2X as it matures. If this reservation is diluted - through Wi-Fi lobby pressure, adjacent spectrum users, or short-term revenue thinking - India will have foreclosed its own future V2X options before the first V2X deployment has even reached scale. The commitment to protect this band must be explicit and durable.

Q11 *Any other issues or suggestions on the V2X regulatory framework overall?*

OUR POSITION: The aftermarket telematics sector must be explicitly accommodated — not designed around.

India has a substantial, functioning industry of companies providing V2N-equivalent services today — fleet management, GPS tracking, diagnostics, crash detection - to millions of commercial vehicles. These companies are the natural conduit for V2X benefits to reach the existing fleet. Four things must be true for this to work:

- OBUs must remain licence-exempt - so aftermarket V2X-capable devices can be deployed without individual approvals
- Certification must be through AIS-140 - not a parallel MTCTE regime that raises barriers for smaller companies
- Interoperability must be mandated - so aftermarket OBUs can communicate with any RSU, not just OEM-branded ones
- Private technology companies must be explicitly eligible as V2I operators - not just government bodies and large OEMs

If this sector is designed into the framework rather than designed around, V2X benefits will reach India's fleet of hundreds of millions of vehicles far faster. The scale of the safety benefit depends directly on the breadth of participation.

Group D: Spectrum Charges and Revenue Definitions (Q12–Q20)

Our position on Groups D and E is a consistent one, stated plainly: V2X is road safety infrastructure, not a commercial service. The financial conditions attached to it should reflect that. Any charge, fee, or financial burden that makes RSU deployment less attractive is, in effect, a charge on road safety.

Q12 *Should spectrum charges be levied on V2I authorised entities?*

OUR POSITION: No. Zero spectrum charges during the initial deployment phase, with a review no earlier than 5 years after the first authorisations are issued.

The spectrum assigned to V2X is not being used to deliver a commercial service for which anyone pays. It is broadcasting safety warnings, collision alerts, emergency vehicle priority signals - public goods that benefit all road users. Treating this spectrum as a revenue-generating commercial asset could be a category error.

The precedents already support this:

- Machine-to-Machine (M2M) service authorisations under the draft Miscellaneous Telecommunications Services Authorisations rules: zero authorisation fees
- Aeronautical data communication service authorisations: nominal fee
- In-Flight and Maritime Connectivity service authorisations: nominal fee

V2X road safety applications sit in exactly the same category. Zero spectrum charges is not a concession to industry, it is a policy decision to prioritise lives over revenue. We urge TRAI to make that recommendation clearly and without qualification.

Q13 / Q14 / Q15 *Spectrum charge methodology, AGR-based levies, and alternatives.*

OUR POSITION: Our answer to Q12 is no charges — so Q13–Q15 are moot. But if TRAI disagrees, here is how charges should be structured.

If charges are ultimately imposed for non-safety commercial V2X activities:

- Use a flat per-RSU annual fee — not an AGR-based levy. V2I operators in the initial phase will mostly be public entities (NHAI, city corporations, state highway departments) with no commercial AGR.
- Keep charges nominal — consistent with M2M and aeronautical precedents.
- Do not design charges to generate material revenue. The goal of spectrum management for V2X is deployment at scale.

Q16 *Payment terms for spectrum charges, if applicable?*

Annual advance payment. Minimises administrative overhead. Consistent with other auxiliary service authorisation precedents.

Q17 / Q18 / Q19 *Potential revenue sources for V2I operators; GR, ApGR, and AGR definitions; revenue inclusions and exclusions.*

OUR POSITION: India's road network spans over 67 lakh kilometres, a scale that demands a sustainable financial model for RSU deployment from the outset. We recommend that TRAI consider a subscription-layer mechanism built on the existing AIS-140 framework as a structural instrument to incentivise RSU operators nationwide. A modest per-vehicle annual subscription collected through the existing AIS-140 compliance infrastructure could be pooled to fund RSU deployment across the entire road network. This creates a direct and logical financial link between the vehicle-side ecosystem, which already has a functioning subscription and compliance model, and the roadside infrastructure ecosystem, which currently has no revenue base. RSU operators would receive a predictable revenue stream that makes deployment commercially viable across all corridors, whether urban, inter-city, or remote, without requiring government capex at every point. We urge TRAI to explore this as a foundational funding instrument for RSU rollout at national scale.

V2I operators in the initial phase will earn little to no commercial revenue. Their income will largely be government grants, viability gap funding, and infrastructure management fees from highway authorities. The revenue definition framework needs to clearly separate safety-use revenue (zero charges) from commercial-use revenue (potential nominal levy). Beyond that, detailed GR/ApGR/AGR definitions are premature and should be developed when — and if — charges are ever actually introduced.

Q20 *Should revenue from safety-related V2X services be excluded from AGR?*

OUR POSITION: Yes, without reservation — and the definition of 'safety service' should be written with a clear presumption in favour of inclusion.

Safety-related V2X services are not sold to end-users. They are not commercial in any meaningful sense. Including them in AGR would be administratively incoherent and would create a perverse incentive: operators who deliver less safety service have a lower fee base. This is exactly backwards.

The rule should be simple: any application whose primary purpose is reducing road accidents, protecting vulnerable road users, or supporting emergency response is a safety application and is excluded from AGR. Commercial applications — traffic data licensing, non-safety fleet services, advertising — may be included.

Group E: Financial Conditions (Q21–Q26)

OUR POSITION: Financial conditions must not deter deployment. The entities most likely to build V2X infrastructure are not ones for whom high fees are a minor inconvenience.

City corporations, highway authorities, NHAI, and early-stage private operators will form the backbone of India's V2X RSU rollout. For a city corporation deploying RSUs at urban intersections, a high minimum net worth or a large bank guarantee is not a nuisance — it is a direct barrier that may prevent deployment altogether.

Question	Our Position
Q21 Entry Fee	Nil. An entry fee for safety infrastructure serves no purpose and creates a barrier where none is warranted.
Q22 Bank Guarantee	Minimal — calibrated to deployment scale, not a fixed lump sum. Public entities should be exempt. Private operators' guarantees should scale with the number of RSUs deployed.
Q23 Equity / Net Worth	Should not apply to public entities. For private operators, set at the lowest level consistent with demonstrating operational credibility. These criteria make sense for large commercial licences; they are inappropriate here.
Q24 Processing Fee	Nominal — recover costs only, consistent with M2M and IFMC authorisation precedents.
Q25 Annual Authorisation Fee	Nil or nominal. The goal is deployment at scale, not fee recovery.
Q26 Other Conditions	None beyond what is discussed. We recommend a non- revenue-sharing arrangement, universal service obligations, or spectrum auction mechanisms — all would add financial burden with no corresponding public benefit.

Section IV: Summary of Our Positions

Q	Topic	Six Sense Mobility Position

Q1–Q3	**Authorisation Framework**	Formal V2I authorisation; broad eligibility including private sector; 10-year validity; open access obligation on all RSUs — non-negotiable.
Q4	**Technology Standard**	Technology-neutral standards — no LTE-V2X ceiling; dual-mode RSU requirement during transition.
Q5	**Device Certification**	RSUs via MTCTE. OBUs via AIS-140 extension — not a parallel regime. Single path, lower cost.
Q6	**Interoperability**	ETSI ITS stack mandated for all higher-layer protocols. Binding rule, not voluntary commitment.
Q7	**Security / PKI**	ETSI TS 103 097 / IEEE 1609.2; CCA/MeitY as root authority; separate from X.509/RCAI.
Q8	**Spectrum Assignment**	Shared model; MAC-layer priority; mandatory RSU registration database; 10-year term; milestone rollout obligations.
Q9	**Processing Timelines**	60-day max; 15-day deficiency notice; deemed approval at 90 days.
Q10	**Spectrum Reservation**	5,905–5,925 MHz protected for ITS/NR-V2X — no reallocation for at least 15 years.
Q12–Q15	**Spectrum Charges**	Zero charges during initial phase. If ever applicable, flat per-RSU fee — not AGR-based.
Q20	**Safety Revenue**	Safety-use V2X revenue excluded from AGR entirely. Non-negotiable.
Q21–Q26	**Financial Conditions**	Nil entry fee; nil/nominal authorisation fee; minimal bank guarantee; no conditions that deter deployment.

Closing

India has an opportunity with V2X that most countries did not have - to start with a clean slate, adopt the right technology from day one, build an open and competitive ecosystem, and deploy safety infrastructure that genuinely reaches all road users.

We have argued throughout for positions we believe serve the national interest: open standards, coherent certification, spectrum conditions that prioritise deployment over revenue, and financial conditions that do not deter the entities whose investment in RSU infrastructure will determine how quickly V2X delivers its safety benefits.

We want to say this plainly: some of these positions are not commercially convenient for us. A more complex certification regime, or a proprietary interoperability environment, would in some respects favour established players. We have argued against those outcomes not because they would hurt us, but because they would be wrong for India.

We thank the Authority for a thorough consultation paper and for the opportunity to contribute to what we hope will be a landmark framework for road safety in this country.

Respectfully submitted,

Hexense Labs Pvt. Ltd. (Six Sense Mobility)
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www.sixsensemobility.com