04 June 2026

Shri Akhilesh Kumar Trivedi,
Advisor (Networks, Spectrum and Licensing),
Telecom Regulatory Authority of India
Tower F, NBCC World Trade Centre,
Nauroji Nagar,
New Delhi-110029

Subject: Tata Communications Ltd. Submission of Comments on TRAI Consultation Paper on "*Regulatory Framework for Vehicle-to-Everything (V2X) Communication*"

Dear Sir,

This is with reference to the TRAI consultation Paper No. 08/2026 dated 30-04-2026 and TRAI press release No. 64/2026 dt. 27-05-2026 on "**the Regulatory Framework for Vehicle-to-Everything (V2X) Communication**"

In this regard, please find enclosed herewith Tata Communication Limited's inputs for your kind consideration as **Annexure**.

We request you to kindly consider our submissions while finalizing the consultation paper and would be happy to provide any additional information, if required.

Thanking You,

Yours Sincerely,

Alka Selot Asthana
Global Head - Regulatory
Tata Communications Limited

Annexure

Tata Communications Ltd.'s Comments to TRAI Consultation Paper on the "Regulatory Framework for Vehicle-to-Everything (V2X) Communication"

Tata Communications welcomes TRAI's Consultation Paper on V2X Communication and commends TRAI for initiating this consultation at a moment of strategic national importance. As India stands at the cusp of large-scale transformation in mobility, digital infrastructure, and urban systems, this consultation arrives at a critical juncture where early policy direction will have long-lasting structural impact. V2X is not merely an incremental advancement in telecommunications; it represents a foundational layer for the convergence of transportation, connectivity, safety, and digital intelligence. The timeliness of this initiative provides India with a unique opportunity to define the architecture of its intelligent mobility ecosystem proactively, drawing on global learnings while aligning with national priorities for economic growth, public safety, and technological leadership.

V2X is not merely an enabling technology—it is the communications backbone of India's emerging intelligent transportation ecosystem

In our considered view, the regulatory choices made at this stage will determine how mobility, infrastructure, safety systems, and digital networks integrate over the coming decades—and will have long-term implications for economic competitiveness, public safety, and urban development. V2X, properly understood and regulated, is not a technology framework. It is the communications backbone of India's intelligent transportation future. The regulatory decisions made here will echo for decades.

Globally, V2X is transitioning from a narrow vehicle-to-vehicle and vehicle-to-infrastructure paradigm toward a broader *Transportation-to-Everything (T2X)* ecosystem — linking vehicles with infrastructure, pedestrians, logistics systems, AI-driven traffic platforms, emergency services, and wider urban digital fabric. In this context, V2X policy is not only about spectrum or connectivity - it is about shaping a national intelligent transportation architecture.

India is uniquely positioned to act with the benefit of global hindsight. Early adopter markets, including the United States, European Union, and Japan, experienced extended periods of fragmentation driven by premature technology mandates, competing standards, and siloed ecosystem development. Those experiences now provide clear lessons.

India has the opportunity to avoid these inefficiencies and design a unified, interoperable, and future-ready framework from the outset. However, this advantage is time sensitive. It can only be realized if the regulatory approach prioritizes flexibility, interoperability, and ecosystem openness over prescriptive technology choices. Accordingly, this consultation must be approached not as a narrow sectoral exercise, but as a strategic inflection point—an opportunity to define how India will build, govern, and scale its intelligent mobility ecosystem in alignment with national priorities, anchored in openness, security, scalability, and global competitiveness.

Evolution of the Global V2X Ecosystem and India's Strategic Opportunity

Over the past decade, global V2X ecosystems have evolved from a narrow focus on spectrum allocation, technology choices, and telecom infrastructure toward a far more integrated and system-level model encompassing orchestration platforms, OTA lifecycle management, cloud-edge architectures, AI-driven mobility, software-defined vehicles, and interoperable multi-

stakeholder ecosystems. In leading markets such as Europe and North America, V2X is now embedded within broader Intelligent Transportation System (ITS) frameworks, reflecting lessons from early fragmentation and competing standards.

Core Regulatory Principles for India's V2X Ecosystem

India enters this landscape at a uniquely advantageous moment: with the benefit of global experience and without legacy constraints, it can bypass intermediate inefficiencies and directly design a mature, interoperable, and future-ready ITS ecosystem. Realizing this late-mover advantage will require a regulatory approach that looks beyond current V2V and V2I needs and is flexible enough to support the full evolution toward autonomous, AI-enabled, and software-defined mobility systems.

Tata Communications' recommendations focus on the core regulatory levers that will determine the long-term effectiveness, scalability, and global competitiveness of India's V2X ecosystem. At the outset, it is critical that the framework is designed with a forward-looking, system-level perspective—avoiding legacy regulatory constructs and instead enabling a dynamic, innovation-led ecosystem. In this context, we highlight the following key policy priorities:

- **Ensure technology neutrality** to allow evolution across C-V2X, satellite, hybrid, and future 6G pathways.
- **Adopt a lightweight, open V2I authorisation framework** that enables participation beyond traditional telecom operators.
- **Mandate interoperability and open standards** to attract OEM investment and avoid ecosystem fragmentation.
- **Embed security-by-design** aligned with global automotive cybersecurity frameworks.
- **Enable balanced spectrum policy** with support for both licensed and shared models, including freight corridors.
- **Rationalise AGR and revenue frameworks** to reflect the broader V2X value chain beyond connectivity.
- **Implement outcome-based certification frameworks** aligned with global standards and suited for software-defined systems.

Taken together, these measures will ensure that India's regulatory framework enables a secure, interoperable, innovation-friendly, and globally competitive V2X ecosystem, aligned with the full scope of its intelligent mobility ambitions.

Intelligent Transportation Systems, Pedestrian Safety, and India's Strategic Deployment Opportunity

India's V2X framework should be conceived not as a standalone telecommunications initiative, but as the foundational layer of a broader Intelligent Transportation System (ITS) ecosystem that integrates mobility, infrastructure, safety, and urban digital systems. The opportunity extends across intelligent freight corridors, AI-enabled traffic optimization, emergency response integration, multimodal transport, and smart city platforms, with India's commercial vehicle and logistics sector presenting the most immediate and scalable deployment pathway. Use cases such as smart freight corridors, predictive maintenance, fleet intelligence, connected tolling, and driver safety are already deployable with measurable economic and safety benefits and should be explicitly prioritized within the policy framework. At the same time, the Vehicle-to-Pedestrian (V2P) dimension remains underemphasized despite India's uniquely high density of pedestrians, cyclists, and two-wheeler users; it must be elevated to a first-order policy priority through

mandated interoperability standards and adoption of deployable technologies such as wearables, smartphone-based V2P applications, and AI-assisted pedestrian safety systems. Finally, a fully realized V2X ecosystem will extend beyond transport into adjacent domains such as urban planning and building regulations, requiring embedded digital infrastructure in future developments; accordingly, TRAI should catalyse cross-ministerial coordination with MoHUA, MoRTH, and smart city bodies to ensure that V2X policy is aligned with the broader evolution of India's urban and infrastructure systems.

The Tata Group and Tata Communications: Enabling India's Connected Mobility Future

The Tata Group is uniquely positioned to support India's connected mobility transformation, reflecting both integrated capability and strategic responsibility. Under Chairman N. Chandrasekaran, the Group spans the full value chain—from automotive and software-defined vehicles (Tata Motors, JLR), to digital engineering (TCS, Tata Technologies), to global connectivity orchestration (Tata Communications).

Tata Communications brings critical enablers including global connected vehicle platforms (MOVE™), multi-network orchestration, eSIM and SGP.32 expertise, V2X applications, and end-to-end cybersecurity frameworks.

Together, this "One Tata" capability offers a practical, end-to-end perspective to inform India's V2X framework, positioning Tata Communications not just as a participant, but as a key enabler of a future-ready ecosystem.

A Defining Moment for India's Mobility Future

The TRAI V2X consultation is, fundamentally, a decision about the kind of mobility nation India aspires to become. While issues such as spectrum, authorisation, certification, and security are critical, they serve a larger objective: creating an intelligent transportation ecosystem that is open, innovative, globally competitive, and safe for all road users.

India is well-positioned to lead—global lessons are available, technologies are mature, and market momentum is building across OEMs, logistics, and smart city initiatives. The opportunity now is to translate this advantage into a forward-looking regulatory framework that matches the scale of this moment.

With the right policy choices and regulatory decisions, India can emerge as a global leader in intelligent mobility. This consultation is the starting point of that journey.

In light of the above, Tata Communications Ltd. submits its issue-wise comments as follows:

Q1. Whether there is a need to introduce an authorisation for vehicle-to-infrastructure (V2I) communication service under Section 3(1)(a) of the Telecommunications Act, 2023? If yes, please provide input with respect to the following aspects:
(a) Eligibility conditions for the authorisation;
(b) Period of validity of the authorisation and conditions for its renewal;
(c) Service area of the authorisation;
(d) Scope of service of the authorisation;
(e) Technical, operating, security related conditions etc. of the authorisation;
(f) Any other related aspect. Kindly provide a detailed response with justification.

Tata Communications Response:

Tata Communications submits that, in the event a separate V2I authorisation framework is introduced, it must be fundamentally distinct from legacy telecom licensing regimes. The connected mobility ecosystem as it exists today in 2026 and is expected to evolve further, is structurally and functionally different from the traditional mobile telephony market of the early 2000s. Applying legacy licensing constructs to V2I services would be misaligned with the technological and commercial realities of this sector.

Accordingly, any such framework must be expressly designed to be light-touch (akin to M2MSP Registration framework), technology-neutral, and non-discriminatory in its applicability. It should explicitly enable participation beyond Mobile Network Operators (MNOs), including but not limited to automotive OEMs, digital orchestration providers, cloud-native mobility platforms, and enterprise mobility operators. In particular, the orchestration layer—comprising over-the-air (OTA) lifecycle management, AI-driven mobility services, data analytics platforms, and software-defined vehicle functionalities—must remain open and contestable. Restricting this layer to traditional telecom licensees would create unjustified entry barriers, stifle innovation, and hinder the development of a competitive and interoperable V2I ecosystem.

A progressive regulatory approach that recognises the separation between connectivity provision and service orchestration is therefore essential to ensure scalability, innovation, and alignment with global best practices in connected mobility.

(a) Eligibility conditions: Eligibility should be broad-based and non-discriminatory, permitting participation by telecom service providers, M2MSPs, OEMs, connectivity/platform providers, ITS infrastructure operators, and enterprise service providers. The eligibility criteria should focus on technical capability, security compliance, and operational readiness, avoiding restrictive entry barriers.

(b) Period of validity and renewal: The authorisation may be granted for a long-term period (15–20 years) to ensure investment certainty. Renewal should be simple and compliance-based, without requiring fresh licensing for next 10 years, and should allow technology evolution within the validity period.

(c) Service area: The authorisation should preferably be pan-India, with flexibility for corridor-based or use-case-specific deployments (e.g., highways, freight corridors).

(d) Scope of service: The scope should be broad and enabling, covering V2I communication, V2N-enabled V2X services, safety and traffic applications, OTA services, diagnostics, fleet management, and integration with ITS and smart city systems.

(e) Technical, operational, and security conditions: The framework should ensure -

- Technology neutrality (supporting C-V2X, hybrid, satellite and future technologies);
- Interoperability through open standards and APIs;
- Security-by-design, aligned with global standards (e.g., UNECE WP.29, ISO/SAE 21434), including PKI-based frameworks and secure OTA mechanisms;
- Service reliability and QoS, especially for safety-critical applications.

(f) Any other related aspects:

- The framework should follow a light-touch regulatory approach, avoiding direct application of legacy constructs such as AGR across the V2X value chain on the revenue earned from this service.
- The authorisation fee should be kept nil, recognizing V2I services as an essential element of public transport infrastructure and public good enablement
- Spectrum flexibility (licensed and shared) should be supported and must be aligned with global earmarking of spectrum and V2I deployments.
- The framework should promote an open, multi-stakeholder ecosystem and remain future-ready to accommodate evolving technologies such as SDVs and AI-enabled mobility.

While a V2I authorisation is necessary to provide regulatory clarity, it must be enabling rather than prescriptive, to support innovation, attract investment, and facilitate the development of a secure, interoperable, and scalable V2X ecosystem in India.

Q2. In case your reply to Q1 is no, what should be the mechanism for enabling, facilitating and regulating vehicle-to-infrastructure (V2I) communication service in India? Kindly provide a detailed response with justification.

Tata Communications Response:

Alternatively, it recommended that instead of introducing a new full-fledged licensing regime for V2I Communication services:

- Extend the M2MSP registration framework to explicitly include V2I service providers.
- Allow entities to operate V2I platforms under a registration-based regime, provided they procure connectivity from authorized TSPs.

This reduces regulatory burden while maintaining oversight.

Q3. Any other suggestions relevant to the authorisation for vehicle-to-infrastructure (V2I) communication service may be submitted with proper explanation and justification.

Tata Communications Response:

To effectively enable and facilitate Vehicle-to-Infrastructure (V2I) communication services in India, a coordinated, multi-layered regulatory and operational framework is required. This framework should ensure innovation, interoperability, security, and efficient use of telecom and transport infrastructure, while maintaining regulatory clarity.

Q4. Whether a specific technology (such as LTE-based C-V2X, NR-based C-V2X etc.) should be prescribed for the implementation of C-V2X in India? If yes, which technology should be adopted for the implementation of C-V2X? If no, in what manner, the issues related to inter-operability between different technologies should be addressed? Kindly provide a detailed response with justification.

Tata Communications Response:

Tata Communications is of the view that no specific technology should be mandated for the implementation of C-V2X in India. Instead, a technology-neutral regulatory framework should be

adopted to enable flexibility, innovation, and future-readiness of the connected mobility ecosystem.

The V2X ecosystem is rapidly evolving, with multiple competing and complementary technologies such as LTE-based C-V2X, NR (5G)-based C-V2X, and other short-range communication protocols. Prescribing specific technology at this stage may:

- Lead to technology lock-in, limiting future upgrades;
- Restrict innovation by excluding emerging or superior technologies;
- Increase costs due to premature standardization;
- Reduce India's ability to align with global technological evolution.

A technology-neutral approach ensures that the most efficient and scalable solutions emerge organically based on market dynamics, performance requirements, and use-case maturity.

Over the past decade, global V2X ecosystems have evolved materially. Initial industry discussions were heavily centred on spectrum allocation, DSRC versus Cellular-V2X technology choices, and telecom infrastructure ownership. These issues remain important, but global markets have learned that technology selection alone does not create a scalable intelligent transportation ecosystem. The global industry has gradually moved toward a broader and more integrated model involving orchestration platforms, OTA lifecycle management, cloud-edge integrated transportation, AI-assisted mobility, software-defined vehicle architectures, vehicle identity frameworks, certificate lifecycle management, and interoperability across multi-stakeholder ecosystems. In Europe and North America, the V2X conversation has increasingly converged into broader Intelligent Transportation System frameworks rather than remaining isolated as a telecom initiative. This convergence reflects hard-won lessons from early deployments, standards fragmentation, competing technologies, and ecosystem formation challenges.

It is also suggested that rather than prescribing specific technologies, the regulator should define:

- Performance-based criteria (e.g., latency, reliability, coverage, scalability);
- Use-case classifications (e.g., safety-critical vs non-safety applications);
- Minimum Quality of Service (QoS) standards;
- Security and data protection requirements.

This approach allows multiple technologies to coexist and compete while ensuring that critical service benchmarks are met.

In our view, a technology-neutral approach:

- Promotes innovation and competition;
- Avoids unnecessary regulatory constraints;
- Enables cost-efficient deployment;
- Supports a diverse ecosystem of stakeholders, including MNOs, OEMs, and digital service providers;
- Ensures long-term sustainability and adaptability of V2X deployments.

India enters this evolution at a strategically advantageous point. Unlike early-mover markets that experienced costly fragmentation, India can leverage global learnings from the 5G Automotive Association ecosystem, European C-ITS evolution, and the US transition from DSRC toward C-V2X. This creates a genuine late-mover advantage. India can architect directly toward a mature, interoperable, and future-ready ITS framework from the outset. The regulatory framework should therefore be designed not only for today's V2I and V2V requirements but also be flexible enough for the broader future of intelligent transportation, software-defined vehicles, autonomous mobility, and AI-assisted infrastructure.

Accordingly, Tata Communications strongly recommends that India adopt a technology-agnostic, performance-driven regulatory framework for C-V2X implementation, while addressing interoperability through standards, certification, and architectural guidelines, rather than through prescriptive technology mandates.

Q5. Whether there is a need to bring road-side units (RSUs) and on-board units (OBUs) under the regime of Mandatory Testing Certification of Telecom Equipment (MTCTE)? If no, in what manner, Electromagnetic Interference (EMI), Electromagnetic Compatibility (EMC), safety, technical and security requirements prescribed by TEC/ DoT may be ensured? Kindly provide a detailed response with justification.

Tata Communications Response:

Tata Communications recognises the importance of certification frameworks for Roadside Units and On-Board Units to ensure interoperability, safety, security, and ecosystem reliability. However, certification approaches should remain globally aligned, standards-based, implementation-flexible, and innovation-friendly. Certification should focus on outcomes rather than overly prescriptive implementation models.

Certification frameworks should prioritise interoperability, security compliance, OTA update integrity, safety validation, and standards alignment. Since future vehicles and roadside systems will increasingly be software-defined, certification frameworks should also account for software lifecycle changes, security patching, and OTA updates after deployment.

Overly restrictive or fragmented certification structures may slow ecosystem deployment, increase implementation complexity, reduce innovation velocity, and weaken India's integration with globally sourced V2X ecosystems.

Therefore, Tata Communications is of the considered view that RSUs and OBUs should not be mandatorily brought under the MTCTE framework in its current form, as these devices are part of a heterogeneous, multi-layered V2X ecosystem and are not purely telecom equipment in the traditional sense. Instead, India should adopt a harmonised, standards-driven, multi-regulatory compliance framework, ensuring that EMI/EMC, safety, technical, and security requirements are effectively met while preserving flexibility, innovation, and scalability in the V2X ecosystem.

Q6. To ensure inter-operability among different RSUs/ OBUs, whether there is a need to standardize the layered communication framework (stack) for higher layers (other than the access layer in which C-V2X will be used) of Intelligent Transportation System (ITS)? If yes, which standard for ITS stack and security should be adopted? Specifically, whether the

ETSI standard for ITS stack and security, as recommended by the Task Force on Intelligent Transportation System for the use of 5.9 GHz (mentioned at para 3.5 of this consultation paper) should be adopted? If no, in what manner, inter-operability among different RSUs/ OBUs can be ensured? Kindly provide a detailed response with justification.

Tata Communications Response:

Tata Communications respectfully submits that there is a need to standardize the higher layers of the ITS communication framework (beyond the access layer) to ensure interoperability across Road-Side Units (RSUs) and On-Board Units (OBUs). However, such standardisation must be principle-based, flexible, and technology-neutral, and should avoid mandating any single regional standard. India should adopt a hybrid and interoperable standards framework.

Tata Communications further submits that the ETSI ITS stack and security framework may be considered as an important reference but should not be mandated as the exclusive standard in India. This will ensure scalable, secure, and inclusive deployment of V2X services across India.

Rationale:

- ETSI standards have regionally evolved and may not fully align with Indian deployment conditions;
- Other global ecosystems (e.g., 3GPP, IEEE, SAE) also provide widely adopted and evolving standards;
- Mandating ETSI exclusively could:
    - Restrict participation from global OEMs aligned to other ecosystems;
    - Limit flexibility in adopting future technologies;
    - Create integration challenges in multi-standard environments.

Q7. Whether there is a need for prescribing a security framework for ITS/ C-V2X in India? If yes,

(a) What should be the security framework for ITS/ C-V2X?

(b) Which agency [such as Controller of Certifying Authorities (CCA), Ministry of Electronics & Information Technology (MeitY)] should implement the Public Key Infrastructure (PKI) framework for ITS/ C-V2X in India?

(c) How to ensure coexistence of V2X PKI certificates with the legacy PKI mechanism in India i.e. based on X.509, operated by Root Certifying Authority of India (RCAI)?

Please provide a detailed response with justifications.

Tata Communications Response:

India's V2X framework should be conceived as the foundation of a broader Intelligent Transportation System (ITS) ecosystem - not solely a telecommunications initiative. The future opportunity spans intelligent freight corridors, AI-assisted traffic optimisation, emergency response integration, multimodal transport, and smart city ecosystems. India's commercial vehicle and logistics sector represents the most compelling near-term deployment opportunity: smart freight corridors, predictive maintenance, fleet intelligence, connected tolling, and driver safety

are deployable today with quantifiable economic and safety impact, and should be explicitly recognised in the framework as priority deployment environments.

Tata Communications is of the considered view that a robust, unified, and future-ready security framework is essential for ITS/C-V2X deployments in India, given the safety-critical nature of vehicular communications and the sensitivity of real-time mobility data. Such a framework should be standards-based, scalable, interoperable, and aligned with global best practices, while being tailored to Indian regulatory and operational conditions.

Accordingly, Tata Communications strongly recommends the adoption of a comprehensive, Public Key Infrastructure (PKI)-based security framework for ITS/C-V2X, implemented through a federated institutional model anchored by CCA/MeitY in coordination with DoT, MoRTH & Industry Stakeholders, and designed to coexist seamlessly with India's existing X.509-based PKI ecosystem. Such a framework is essential to ensure secure, interoperable, and future-proof deployment of connected mobility services in India.

Q8. What should be the regulatory framework for the assignment of frequency spectrum to the entities holding the proposed V2I communication service authorisation? Specifically,

(a) Whether there is a need for partitioning the 30 MHz spectrum (5,875-5,905 MHz) for specific applications such as "safety applications" and "operational applications (non-safety applications)"?

(b) In case more than one authorised entity has to operate in the same geographical area, what should be the mechanism for simultaneous use of the spectrum? Specifically, whether the spectrum should be divided amongst the authorised entities in an exclusive manner, or should the authorised entities utilize the spectrum in a shared manner?

(c) If your response to part (b) is "in an exclusive manner", what should be the minimum quantity of spectrum to be assigned to each entity holding the proposed V2I communication service authorisation? If your response to part (b) is "in a shared manner", whether there is a need to prescribe a mechanism for interference management?

(d) For interference management, whether there is a need to prescribe –

(i) minimum directionality of road-side unit (RSU), or

(ii) protection distance between the RSUs, or

(iii) maximum antenna height for RSUs? If yes, what should be such parameter(s)?

(e) Whether there is need to mandate a mechanism for obtaining prior approval (analogous to SACFA clearance) for the establishment of RSUs by the entities holding the proposed V2I communication service authorisation? If no, in what manner, the establishment of RSUs should be regulated?

(f) For avoiding (i) interference between RSUs, (ii) interference between RSUs and OBUs, and (iii) interference between OBUs, whether the radiated power limits for OBUs and RSUs and OOBE limits, recommended by the Task Force on Intelligent Transportation System for the use of 5.9 GHz (mentioned at para 3.4 of this consultation paper) should be

adopted? If no, what should be the radiated power limits for OBUs and RSUs and OOBE limits?

(g) What should be the maximum period of assignment of spectrum to the entities holding the proposed V2I communication service authorisation?

(h) Whether there is a need to prescribe roll-out obligations associated with the assignment of spectrum to the entities holding the proposed V2I communication service authorisation?

(i) Whether there is a need to introduce a provision for the surrender of frequency spectrum? Kindly provide a detailed response with justification.

Tata Communications Response:

India should support both licensed and shared spectrum models, with dedicated provisions for intelligent freight corridors - India's most immediate V2X deployment opportunity and alignment with global spectrum harmonisation to ensure interoperability with internationally sourced vehicles and equipment. Cross-network orchestration and multi-network continuity must be structurally enabled, not regulated around.

Tata Communications submits that the regulatory framework for spectrum assignment for V2I services should be technology-neutral, shared, and light-touch, reflecting the public-interest character of connected mobility, with a strong emphasis on safety, efficiency, and optimal spectrum utilisation. The 5.9 GHz band (5855–5925 MHz / 5875–5905 MHz range under consideration) should not be rigidly partitioned between safety and non-safety applications; instead, a dynamic prioritisation mechanism should be adopted wherein safety-critical communications receive precedence while non-safety applications operate on a best-effort basis.

Spectrum usage should be shared and non-exclusive, enabling multiple authorised entities to operate within the same geography, thereby avoiding fragmentation and promoting interoperability. Such a shared regime should be supported by standardised interference management mechanisms, including congestion control protocols, coexistence norms, and, where necessary, geo-coordination tools, rather than overly prescriptive measures such as fixed protection distances or rigid antenna constraints.

Technical parameters such as RSU directionality, antenna height, and deployment configurations should be guiding principles rather than mandatory conditions, allowing flexibility across diverse deployment environments. Further, a self-declaration and registration-based approach should be adopted for RSU deployment instead of a SACFA-like prior approval process, with provision for audits to ensure compliance. The radiated power and out-of-band emission limits recommended by the ITS Task Force may be broadly adopted, subject to periodic review in line with evolving global standards.

Spectrum assignment should be long-term (15–20 years) to provide investment certainty, accompanied by phased and realistic roll-out obligations focused on priority corridors and safety use cases. Additionally, a structured spectrum surrender mechanism should be introduced to ensure flexibility and efficient utilisation. Overall, a light-touch, shared, and performance-driven spectrum framework is essential to enable scalable, interoperable, and innovation-friendly deployment of V2I services in India.

Q9. Whether there is a need for prescribing timelines for processing the applications for the assignment of spectrum to the entities holding the proposed V2I communication service authorisation? Kindly provide a detailed response with justification.

And

Q10. Whether there are any other suggestions related to assignment of spectrum to the entities holding the proposed V2I communication service authorisation? Please provide a detailed response with justification.

Tata Communications Response to Q9 & Q10:

Tata Communications is of the considered view that clear and time-bound processing timelines for spectrum assignment are essential to ensure regulatory certainty, accelerate deployment, and support time-sensitive V2I use cases, particularly those related to road safety and intelligent transport systems while ensuring administrative alignment with the provisions of the Telecommunications Act, 2023 and the National Frequency Allocation Plan (NFAP), 2025.

In the absence of prescribed timelines, delays in approvals could hinder infrastructure rollout, increase deployment costs, and slow down the adoption of connected mobility solutions. Accordingly, a defined service-level framework should be introduced, prescribing transparent timelines for each stage of the application process (e.g., application acknowledgment, technical evaluation, and final assignment), supported by a digital, single-window clearance mechanism.

At the same time, the process should remain streamlined and light-touch, avoiding unnecessary procedural complexity. Provision may also be made for deemed approvals in case of delays beyond stipulated timelines, subject to compliance with prescribed conditions. Such an approach would enhance ease of doing business, provide predictability to stakeholders, and enable faster realisation of the public safety and efficiency benefits envisaged from V2I deployments.

Overall spectrum framework for V2I communication service should be balanced and future-ready supporting both licensed and shared models, including freight corridors.

Q11. Any other issues/ suggestions relevant to the regulatory framework for V2X communication may be submitted with proper explanation and justification.

Tata Communications Response:

No Comments.

Q12. In view of the public welfare-oriented nature of V2X applications and the need to encourage the deployment of such infrastructure and services, should there be spectrum charges levied on spectrum assigned to the V2I communication service authorised entities under the proposed V2I communication service authorisation? Please provide detailed justification in support of your response.

Tata Communications Response:

Tata Communications respectfully submits that spectrum charges should not be levied, or should be kept nominal, for spectrum assigned to entities providing V2I communication services, given

the public welfare-oriented, safety-critical nature of V2X applications. V2I services are fundamental to enhancing road safety, traffic efficiency, and overall transport system optimisation, and therefore should be treated as public-interest digital infrastructure rather than purely commercial telecommunications services.

Imposing spectrum charges could act as a disincentive for investments in RSU deployment and associated infrastructure, thereby slowing down the rollout of intelligent transport systems. A nil or minimal pricing approach would encourage wider participation from diverse stakeholders, including infrastructure providers, OEMs, and service platforms, and support rapid scaling across highways, urban corridors, and logistics networks.

This approach is also consistent with global best practices, where spectrum for safety-critical ITS applications is often made available on a shared or lightly licensed basis. At the same time, administrative costs may be recovered through nominal administrative fees to ensure regulatory oversight without imposing undue financial burden. Overall, a non-revenue-maximising, facilitative spectrum policy is essential to realise the full socio-economic benefits of V2I deployments in India.

Q13. If answer to Q12 is affirmative, whether the spectrum charges for the V2I communication service authorised entities under the proposed V2I communication service authorisation should be determined based on the spectrum charging methodology prescribed by the Department of Telecommunications (DoT) vide its order dated 11.12.2023? If yes, then which of the radiocommunication services specified in the said order, should be taken as basis for calculation of spectrum Charges? Please provide detailed justification in support of your response.

Tata Communications Response:

Tata Communications submits that the Department of Telecommunications (DoT), vide its order dated 11 December 2023, has laid down a revised framework for administrative assignment of spectrum to captive users, based on a transparent, formula-driven methodology for determination of spectrum charges. The said order reinforces the principle that spectrum for non-public, enterprise or private use cases may be assigned administratively rather than through auction, with defined procedures such as issuance of Letter of Intent (LoI), time-bound payment obligations, and structured validity periods. In this context, V2I communication services being safety-critical and public-interest oriented, may be aligned with a similar administrative assignment framework; however, given their significantly higher public welfare implications compared to typical captive uses, a more facilitative approach through nil or nominal spectrum charges would be appropriate to enable rapid and widespread deployment.

Q14. If answer to Q12 is affirmative, whether the spectrum charges for the V2I communication service authorised entities under the proposed V2I communication service authorisation should be levied as a percentage of Adjusted Gross Revenue (AGR)? If yes, are there any specific operational/ non-operational revenue items that should be included in/ excluded from AGR for the purpose of determination of spectrum charges? Please provide your response with detailed justification.

Tata Communications Response:

As recommended in our earlier submissions, the overall V2I Communication Service framework should follow a light-touch regulatory approach, avoiding direct application of legacy constructs such as AGR across the V2X value chain on the revenue earned from this service.

Tata Communications is of the considered view that, even if spectrum charges are to be levied for V2I communication services, the AGR-linked charging mechanism should not be adopted, as it is neither appropriate nor proportionate for the V2I ecosystem. AGR-based levies are designed for traditional telecom service providers offering commercial communication services to end users; however, V2I services are fundamentally public-interest, safety-critical, and infrastructure-oriented, with limited direct revenue generation and multiple non-telecom stakeholders in the value chain. Imposing an AGR-based model could create disproportionate compliance burdens, regulatory ambiguity, and disincentives for investment, particularly where revenues are derived from bundled digital services, analytics, or mobility platforms rather than pure connectivity.

In the alternative, if AGR linkage is nevertheless considered, it is essential that the definition of AGR be narrowly and clearly scoped, limited only to direct revenues attributable to V2I communication services, and explicitly exclude non-operational and ancillary revenues, such as revenues from hardware, vehicle sales, data analytics, platform services, cloud services, and other value-added or enterprise offerings not directly linked to spectrum usage. This is critical to ensure that entities are not subjected to double counting or regulatory overreach across converged service layers.

Accordingly, Tata Communications respectfully submits that a fixed, nominal, or administrative fee-based framework rather than an AGR-linked model for spectrum charges would be more appropriate and aligned with the public-good character, multi-stakeholder ecosystem, and early-stage nature of V2I deployments in India.

Q15. If response to questions 13 and 14 is negative, then what should be the appropriate methodology for determination of spectrum charges for the V2I communication service authorised entities under the proposed V2I communication service authorisation? Please provide detailed justification in support of your response.

Tata Communications Response:

Tata Communications reiterates that the determination of spectrum charges for V2I communication services should be administrative, light-touch, and aligned with the public-interest nature of the ecosystem. In this regard, a nominal, cost-recovery-based fee structure may be adopted, reflecting only the administrative and regulatory costs incurred by the Government in spectrum management, coordination, and monitoring, rather than any revenue-maximisation objective. Such a framework may draw guidance from the DoT order dated 11 December 2023, which provides for formula-based spectrum charges for administratively assigned frequencies to captive users, thereby establishing a precedent for non-auction, transparent, and predictable pricing mechanisms for non-commercial or enterprise use cases. However, given that V2I services are inherently safety-critical, infrastructure-centric, and public-good oriented, the

applicable charges should be significantly lower, or even nil for core safety use cases, as compared to captive enterprise networks.

Further, the methodology may incorporate a tiered or use-case-based approach, wherein: (i) safety-critical applications (e.g., collision avoidance, traffic signalling) are either exempt from spectrum charges or subject to minimal administrative fees; and (ii) non-safety or value-added applications (e.g., infotainment, fleet analytics) may attract modest usage-based or flat annual charges. This ensures proportionality and avoids overburdening essential public safety functions.

Additionally, spectrum charges if any, should be decoupled from revenues, subscriber base, or data usage, and instead be linked to objective parameters such as bandwidth assigned, geographic coverage, and deployment scale, thereby ensuring transparency, predictability, and ease of compliance. Provision may also be made for shared spectrum usage without additional financial burden, to promote efficient utilisation and interoperability.

Overall, a nominal, predictable, and non-revenue-maximizing spectrum charging framework is critical to incentivise investment, accelerate deployment, and fully realise the socio-economic and safety benefits of V2I services in India.

Q16. For spectrum assigned to the V2I communication service authorised entities under the proposed V2I communication service authorisation, what should be the appropriate payment terms for spectrum charges, if any? Please provide your response with detailed justification.

Tata Communications Response:

Tata Communications submits that the payment terms for any spectrum charges applicable to V2I communication services should be flexible, predictable, and aligned with the infrastructure-led and public-interest nature of the ecosystem. In this regard, entities should be provided with the option to pay nominal spectrum charges on an annual, advance basis, rather than requiring large upfront payments, so as to reduce financial burden and support phased deployment of V2I infrastructure. Such an approach is consistent with the principles followed in administratively assigned spectrum regimes, including the DoT order dated 11 December 2023, which provides flexibility for annual payment of spectrum charges for multi-year assignments.

Q17. What are the potential sources of revenue, if any, for an V2I communication service authorised entity under the proposed V2I communication service authorisation? Please provide your response with detailed justification.

Tata Communications Response:

Tata Communications is of the considered view that the potential sources of revenue for an entity authorised to provide V2I communication services are likely to be ancillary, indirect, and ecosystem-driven, rather than arising from traditional telecom service provisioning. Given the public-interest and safety-centric nature of V2I, the revenue model is expected to be diversified and layered across multiple stakeholders. Key potential revenue streams may include: (i)

enterprise and fleet service offerings, such as fleet management, predictive maintenance, and logistics optimisation solutions enabled through V2I data; (ii) smart mobility and traffic management services for urban local bodies, highway authorities, and government agencies; (iii) data analytics and insights services, including anonymised traffic pattern analysis, infrastructure utilisation, and mobility intelligence; and (iv) platform and application services, such as subscription-based access to mobility platforms, APIs, and value-added digital services for OEMs and application providers. Additionally, revenue may be generated through partnership-driven models, including collaborations with automotive OEMs, insurance companies (e.g., usage-based insurance), infrastructure operators, and smart city platforms. Limited revenues may also arise from non-safety applications, such as infotainment, in-vehicle services, and location-based offerings. However, such revenues are typically indirect, bundled, and incremental, rather than standalone monetisation streams directly attributable to V2I communication services.

It is important to note that core safety-related V2I functions are not designed to be monetised, and therefore, the overall revenue potential of V2I-authorised entities is constrained and uncertain in the initial stages of deployment. In this context, AGR-based levies are designed for traditional telecom service providers offering commercial communication services to end users; however, V2I services are fundamentally public-interest, safety-critical, and infrastructure-oriented, with limited direct revenue generation and multiple non-telecom stakeholders in the value chain. Imposing an AGR-based model could create disproportionate compliance burdens, regulatory ambiguity, and disincentives for investment, particularly where revenues are derived from bundled digital services, analytics, or mobility platforms rather than pure connectivity.

Accordingly, Tata Communications submits that V2I revenue models should be viewed within the broader digital mobility ecosystem, and regulatory frameworks—including spectrum charging—should take into account the indirect, evolving, and public-good-oriented nature of such revenues to ensure sustainable ecosystem development.

Q18. What should be the definitions of Gross Revenue (GR), Applicable Gross Revenue (ApGR), and Adjusted Gross Revenue (AGR) for V2I communication service authorised entity under the proposed V2I communication service authorisation? Further, what should be the relevant items of revenue, exclusions and deductions and consequent definitions of GR, AGR and ApGR? Please provide your response with detailed justification.

And

Q19. What revenue components should be included in, or excluded from, the computation of Gross Revenue (GR), Applicable Gross Revenue (ApGR) and Adjusted Gross Revenue (AGR) for the purpose of determining authorisation fees or spectrum charges for the proposed V2I communication service authorisation? Please provide your response with detailed justification.

Tata Communications Response to Q18 and Q19:

Tata Communications respectfully submits that the definitions of Gross Revenue (GR), Applicable Gross Revenue (ApGR), and Adjusted Gross Revenue (AGR) for V2I communication service authorised entities should be clearly scoped, narrowly defined, and aligned with the unique

characteristics of the V2I ecosystem, which is fundamentally public-interest driven, infrastructure-oriented, and not comparable to traditional telecom service models.

This is considering the fact that the V2X value chain extends well beyond connectivity into software platforms, OTA services, AI-assisted mobility, and cloud orchestration. Legacy telecom AGR constructs applied wholesale across these categories will systematically disincentivise the investment India needs. Revenue definitions, entry fees, and bank guarantee requirements should be calibrated to the actual nature of V2I services -not inherited from a regulatory framework designed for a fundamentally different market.

The definition of revenue from V2I Communication service should ensure clear separation between connectivity-related revenues and digital/service-layer revenues.

Further, AGR-based levies are designed for traditional telecom service providers offering commercial communication services to end users; however, V2I services are fundamentally public-interest, safety-critical, and infrastructure-oriented, with limited direct revenue generation and multiple non-telecom stakeholders in the value chain. Imposing an AGR-based model could create disproportionate compliance burdens, regulatory ambiguity, and disincentives for investment, particularly where revenues are derived from bundled digital services, analytics, or mobility platforms rather than pure connectivity.

Tata Communications views on this subject are as follows:

- Gross Revenue (GR): The Gross Revenue (GR) definition should include only the total revenue accrued from V2I communication services that are directly attributable to the use of assigned spectrum.

  Given the multi-layered V2I ecosystem, revenues arise largely from digital services and applications, not from pure connectivity. Therefore, GR must be restricted to spectrum-linked revenue only. Accordingly, Gross Revenue should exclude revenue earned from:
  - hardware/devices (RSUs, OBUs, modules)
  - Revenue from vehicle sales or OEM components
  - Revenue from platform services, cloud services, APIs, and software solutions
  - Revenue from data analytics, AI, and mobility intelligence services
  - Income from consulting, integration, or system deployment services
  - Government grants, subsidies, or viability gap funding
  - Pass-through charges and taxes (GST)

- Applicable Gross Revenue (ApGR): Applicable Gross Revenue (ApGR) should represent that portion of GR, which is directly attributable to spectrum usage, after excluding clearly identified non-relevant components. Further exclusions in ApGR:
  - Inter-operator or inter-platform settlements
  - Roaming or shared infrastructure costs (if applicable)
  - Revenue components linked to non-communication layers

- Adjusted Gross Revenue (AGR): AGR should be derived from ApGR after deducting allowable operational exclusions, ensuring that only net, spectrum-relevant revenues are considered.

Q20. Whether revenue derived from safety-related V2X services under the proposed V2I communication service authorisation should be excluded from the computation of AGR, in view of their public interest and non-commercial nature? Please provide your response with detailed justification.

Tata Communications Response:

Tata Communications respectfully submits that revenue derived from safety-related V2X services should be excluded from the computation of AGR, given their public-interest, non-commercial, and safety-critical nature. Such services are designed to enhance road safety and mobility efficiency rather than generate direct revenue, and any associated income is typically incidental or indirectly derived. Including these revenues within AGR would be misaligned with the intent of AGR-based levies, create disincentives for investment in safety infrastructure, and introduce regulatory complexity in a multi-stakeholder ecosystem.

This position is further supported by global practices, where spectrum for V2X/ITS is generally treated as a public resource. For instance, jurisdictions such as the United States and the European Union have allocated the 5.9 GHz band for ITS primarily to support safety-of-life applications, with regulatory focus on interoperability, technology neutrality, and efficient utilisation rather than revenue maximisation. Accordingly, excluding safety-related revenues from AGR is essential to ensure a proportionate, facilitative, and globally aligned regulatory framework that promotes investment and accelerates deployment of life-saving V2X technologies.

Q21. What should be the appropriate entry fee for V2I communication service authorised entities under the proposed V2I communication service authorisation? Please provide detailed justification in support of your response.

Tata Communications Response:

Tata Communications is of the considered view that the entry fee for entities seeking authorisation to provide V2I communication services should be nil or nominal, keeping in view the public-interest, safety-critical, and infrastructure-oriented nature of the V2X ecosystem. Unlike traditional telecom services, V2I does not represent a revenue-maximising commercial market but rather constitutes a foundational digital infrastructure layer aimed at enhancing road safety, traffic efficiency, and smart mobility outcomes.

Q22. What should be the appropriate terms and conditions for bank guarantees for the proposed V2I communication service authorisation? Please provide detailed justification in support of your response.

Tata Communications Response:

We propose there should not be any Bank Guarantees for the proposed V2I communication service authorisation. Instead of provision of BGs, this should be replaced by an Undertaking (on Non-Judicial Stamp Paper) from the authorized entity at the time of signing the Authorization document for payment of dues. This will be sufficient to safeguard Licensor's dues.

Q23. What should be the applicable minimum equity and minimum net worth requirements for authorised entities under the proposed V2I communication service authorisation? Please provide detailed justification in support of your response.

Tata Communications Response:

Tata Communications is of the considered view that the minimum equity and net worth requirements for entities seeking authorisation to provide V2I communication services should be kept minimal, reasonable, and proportionate to the nature of the ecosystem, rather than aligned with traditional telecom licensing thresholds. V2I services constitute a multi-stakeholder, infrastructure-driven ecosystem, involving diverse participants such as automotive OEMs, infrastructure operators, digital platforms, system integrators, and M2M/IoT service providers, many of whom may not have the financial profile of licensed telecom operators.

Q24. What should be the applicable application processing fee for the proposed V2I communication service authorisation? Please provide detailed justification in support of your response.

Tata Communications Response:

Tata Communications is of the considered view that the application processing fee for the proposed V2I communication service authorisation should be nominal and strictly based on cost recovery, reflecting only the administrative expenses incurred by the regulator in processing and evaluating applications—for instance, ₹10,000, in line with the processing fee proposed under the draft DoT Service Authorisation Rules. Given the public-interest, safety-critical, and infrastructure-driven nature of V2I services, the objective of the authorisation framework should be to facilitate market entry and foster ecosystem development, rather than serve as a revenue-generating mechanism.

Q25. What should be the applicable rate of authorisation fee for proposed V2I communication service authorisation? Please provide detailed justification in support of your response.

Tata Communications Response:

Tata Communications submits that the authorisation fee for the proposed V2I communication service should be kept nil or, at most, very nominal, limited to recovery of administrative expenses, recognising V2I services as an essential component of public transport infrastructure and public good enablement, particularly in view of their public-interest, safety-critical, and infrastructure-oriented nature. Unlike traditional telecom services, V2I does not constitute a revenue-driven commercial market but rather represents a foundational digital mobility layer aimed at enhancing road safety, traffic efficiency, and intelligent transport systems.

Accordingly, imposing a revenue-linked or significant authorisation fee would be disproportionate and misaligned with the underlying objectives of V2I deployment, and may act as a deterrent to participation and investment. A nil or nominal fee framework would ensure a facilitative, inclusive, and innovation-friendly ecosystem, enabling rapid and large-scale rollout of V2I services across the country while aligning with broader public policy objectives.

Q26. Apart from the financial provisions discussed earlier, are there any other financial terms and conditions that should be made applicable for the proposed V2I communication service authorisation? Please provide detailed justification in support of your response.

Tata Communications Response:

The V2X value chain extends well beyond connectivity into software platforms, OTA services, AI-assisted mobility, and cloud orchestration. Legacy telecom AGR constructs applied wholesale across these categories will systematically disincentivise the investment India needs. Revenue definitions, entry fees, and bank guarantee requirements should be calibrated to the actual nature of V2I services -not inherited from a regulatory framework designed for a fundamentally different market.