BIF™
BROADBAND INDIA FORUM
"Think Tank for Digital Transformation"

Suites- 401 & 410, Avanta Business Centre,
4th Floor, Statesman House, Barakhamba Road,
Connaught place, New Delhi-110001

02 March 2026
Ref. No.TVR/BIF/41/2026

Shri D. Manoj,
Principal Advisor (F&EA),
Telecom Regulatory Authority of India,
4th, 5th, 6th & 7th Floor, Tower-F,
World Trade Centre, Nauroji Nagar,
New Delhi – 110 029.

Sub: BIF response to TRAI Consultation Paper No. 01/2026 on "Review of Tariff for Domestic Leased Circuits (DLCs)"

Dear Sir,

Please find attached the response of the Broadband India Forum (BIF) to the Consultation Paper No. 01/2026 on "Review of Tariff for Domestic Leased Circuits (DLCs)" issued by the Telecom Regulatory Authority of India on 23rd January 2026, for your kind consideration.

We trust that our submissions will be found useful and constructive. We would be pleased to provide any further clarifications, if required.

Thanking you,

Yours sincerely,

TV Ramachandran,
President,
Broadband India Forum

BIF Response to TRAI Consultation Paper on Review of Tariff for Domestic Leased Circuits (DLCs)

Q1: What is expected to be the likely impact on competition and tariffs in the DLC sector, if the ISPs are permitted to provide DLCs in the future? Please provide your response with justification.

BIF RESPONSE

As per clause 78 (2) (c) of draft authorization for main telecommunication service rules the Internet service authorization for NSO and VNO are allowed to provide DLC.

If this is allowed in final rules then this provision is likely impact positively on the sector is an increase in competition, a reduction in tariffs, and improved infrastructure utilization, particularly in remote and underserved regions. Further, it is likely to have a positive impact on competition, particularly in enterprise connectivity markets and high-capacity corridors serving data centres and cloud providers. Further, Clause 4.2 of unified licensing agreement do not allow resale of domestic bandwidth. This condition is detrimental to service providers and it increases cost of their services. If domestic bandwidth resale is allowed then vacant capacity of ISPs and other operators will get consumed fasters and help in utilization of existing optical fiber resources particularly of local leads or last mile.

Further, service providers must be allowed deduction of bandwidth cost for the purpose of AGR calculation. By allowing deduction the cost of DLCs purchased from other service providers would help in use of spare capacity, better maintenance of cables, increasing service life of cable due to increased maintenance. The move is expected to improve competition in remote, hilly, and underserved areas where, currently, limited competition leads to high prices.

The entry of ISPs in DLC market is expected to lower prices, as current tariffs (last revised in 2014) are significantly higher than actual market rates. In remote areas, where tariffs remain high, increased competition is expected to reduce prices significantly. Besides, the adoption of new technologies like DWDM and SD-WAN, alongside improved competition, will allow for cheaper, faster, and more reliable bandwidth.

The cost of bandwidth has decreased significantly due to advances in fiber optics and DWDM, but the 2014 ceiling tariffs did not reflect this. Operators are currently offering significant discounts below the 2014 ceilings on busy routes, indicating that the current ceiling is outdated. The move is crucial for enhancing the digital backbone required for e-commerce, government services, banking, and SMEs.

Overall, the policy is expected to transform the DLC market from a high-cost, limited-competition environment to a more dynamic and affordable one.

Q2: What is the likely impact of tariffs for DLC on the bandwidth charges (including the transmission costs) or any other costs incurred by ISP operators, especially for ISP B & C operators who do not have their own transmission infrastructure? Further, what are the specific elements of DLC tariff which can be addressed in the regulation to make it more relevant for ISP B & C business? Please provide your response with justification.

BIF RESPONSE

a) Tariffs on DLCs directly increase operating costs for ISP B & C operators lacking their own infrastructure, as they rely heavily on leasing these lines for backhaul, particularly in remote areas. This cost is further augmented by the fact that cost of purchasing DLC is not allowed to be deducted for the purpose of calculation AGR. Increased DLC tariffs result in higher, less competitive bandwidth charges and potentially higher consumer prices. Since most of these ISP-B & C level players operating at LSA/SSA levels, often lease capacity from NLDOs or Tier-1 ISPs, increased DLC tariffs directly raise their Opex. This reduces their margin, making it harder to offer competitive rates, especially in remote regions. Further, they can not sell this capacity to other service providers despite value addition in the form of building local leads as cost of subscription of DLC bandwidth is not allowed to be deducted from ApGR for arriving AGR.

DLC is a primary input for connecting to national/international backbones, higher tariffs lead to elevated, inflexible bandwidth charges. Increased costs for leasing, combined with high, non-uniform fees for infrastructure (like towers), create a cumulative burden on these smaller ISPs, inhibiting their ability to expand service. The high cost of fiber backhaul can force smaller ISPs to reduce their reach, as they are dependent on third-party infrastructure. While the TRAI has previously looked to fix tariff ceilings to reduce bandwidth costs, increased tariffs on DLC directly counteract these efforts

b) DLC tariff regulation can support ISP B & C (smaller/regional) operators by focusing on cost-reflective pricing, promoting infrastructure sharing, and enforcing transparent, non-discriminatory SLAs. Key elements include lowering last-mile connectivity charges, reducing minimum contract durations, providing volume-based discounts, and implementing strict, time-bound Right of Way (RoW) policies to reduce infrastructure setup costs.

c) The other elements of DLC tariffs that are relevant for regulatory intervention include local lead charges i.e. end link connectivity charges, installation fees and transparency in discount structures. Local access circuits often represent the primary bottleneck due to limited infrastructure duplication and high right of way costs. Similarly, non-transparent discounting practices can disadvantage smaller operators relative to larger integrated players.

Here are the specific elements of DLC tariff regulation that can be addressed:

- Regulations should ensure that DLC tariffs for ISPs, which are generally lacking their own transmission infrastructure (often ISP Category B & C operating at LSA/SSA levels), are not prohibitively high compared to large operators.
- Shorter, more flexible contract periods for leasing circuits are necessary, as long-term, rigid contracts hinder smaller ISPs from scaling up or changing providers.
- Introducing tiered tariff structures that offer competitive rates for lower-capacity requirements (e.g., 10 Mbps, 100 Mbps) allows small ISPs to compete without paying large-volume premium prices.
- Regulation should mandate uniform, standardized, and lower RoW charges across states to reduce the high cost of laying fiber, which directly impacts connectivity costs.
- Enforce strict regulations for incumbent operators to provide equal access to transmission infrastructure at transparent, non-discriminatory rates to smaller players.
- The tariff for the last mile connection should be capped to aid small-scale providers

Q3: Should the MPLS-VPN DLCs be brought under the tariff regulation framework? Please provide your response with justification.

BIF RESPONSE

BIF recognises a need to focus on balancing market competition with consumer protection and technological innovation. While there are arguments against tariff forbearance and that regulations might stifle innovation, there is a school of thought that suggests that MPLS-VPNs need to be customized based on SLAs, thereby making it difficult to set a one-size-fits-all tariff. Also it is felt by some that current market conditions often see MPLS-VPN prices far below old, benchmarked tariff ceilings, indicating that competition is already driving down costs.

The 2025 Draft Rules may allow smaller Internet Service Providers (ISPs) to offer managed DLC services, which could increase competition and reduce the need for strict, centralized regulation.

MPLS-VPN services are fundamentally different from traditional point-to-point DLCs as they constitute managed network services incorporating routing, traffic engineering, quality of service management, monitoring and customer premises equipment. Pricing for MPLS-VPN is, therefore, driven not only by transport capacity but also by service design, network management capabilities and service level commitments.

SD WAN is another popular technology which is now being deployed in large numbers for lower bandwidth configurations SD-WAN (Software-Defined Wide Area Network) is a virtualized network architecture that uses software to manage, automate, and optimize connectivity between geographically dispersed branches, data centers, and cloud services. It replaces traditional, rigid hardware-based networking with a centralized, application-aware, and transport-independent approach, allowing businesses to use MPLS, broadband, or 5G simultaneously for improved performance and lower costs.

Traditional WAN architectures struggled with cloud adoption, causing inefficient traffic backhauling. SD-WAN solves this by providing direct, secure cloud access and improved application performance, which is critical for SaaS applications.

Given these characteristics, imposing rigid ceiling tariffs on MPLS-VPN services could distort market incentives and inhibit innovation. Instead, regulatory intervention should focus on ensuring fair access to underlying bottleneck infrastructure, such as local access circuits, while allowing market forces to determine pricing for managed services.

Transparency requirements, including disclosure of service parameters and pricing structures, would be more appropriate than direct tariff controls for MPLS-VPN offerings.

Q4: What are the key differences in cost structure and service delivery between traditional P2P-DLCs and MPLS-VPNs that should be reflected in tariff regulation? Please provide your response with justification.

BIF RESPONSE

Key differences in cost structure and service delivery between traditional Point-to-Point Domestic Leased Circuits (P2P-DLCs) and MPLS-VPNs center on resource utilization and network architecture. This should drive a shift from rigid, distance-based pricing to flexible, value-based, or are under tariff forbearance.

Key Considerations due to Cost Structure and Service Delivery.

- P2P-DLCs require dedicated, physical, and often distance-based capacity. In contrast, MPLS-VPNs use shared, packet-switched infrastructure, allowing for significantly lower costs, especially for connecting multiple sites, as bandwidth is shared rather than dedicated end-to-end.

- P2P costs are heavily driven by distance and capacity (Layer 1/2). MPLS-VPN costs are driven by port speed, Class of Service (CoS) requirements, and managed services, making a pure cost-based tariff modelling difficult.

- P2P-DLCs have high setup costs due to dedicated physical infrastructure, while MPLS-VPNs offer lower, more flexible entry costs, allowing for better "pay-as-you-grow" models.

- P2P is limited to connecting two specific locations and the pipe may remain idle and utilized some period of time e.g DLCs if connect to bank branch then the DLC pipe shall remain idle during Non-working hours and it cannot be used by other customer. While MPLS-VPN is shared resource and thus it is highly flexible, allowing any-to-any or hub-and-spoke connectivity.

- P2P provides guaranteed, consistent bandwidth and low latency. MPLS-VPN provides Quality of Service (QoS) mechanisms, which are superior for managing application-specific traffic (e.g., voice, video) over a shared network rather than raw, dedicated bandwidth.

- MPLS-VPN can be scaled easily by adding a link to the nearest Point of Presence (PoP). P2P is difficult to scale and time-consuming to deploy.

- **Forbearance:** Given the high competition and cost-effectiveness of MPLS-VPNs (often 80-90% below older P2P ceilings), we suggest tariff forbearances for MPLS-VPN to allow market-driven pricing rather than restrictive ceilings.

In short, traditional P2P DLCs are infrastructure-centric services where costs are primarily driven by fibre deployment, route distance, optical equipment and network maintenance. Pricing structures are, therefore, closely linked to physical infrastructure costs.

In contrast, MPLS-VPN services rely on shared network cores, routing platforms, service orchestration systems and customer-specific configurations. Costs are influenced by factors such as port capacity, quality of service classes, network utilisation and operational support systems. Service delivery is also more complex, involving dynamic traffic management and multi-site connectivity.

These differences imply that tariff regulation should treat the two services separately, applying cost-based approaches primarily to infrastructure products while adopting transparency-based oversight for managed services.

Q5: What has been the impact of deployment of DWDM, SD-WAN and Ethernet over **Fibre on provisioning of DLCs, in terms of operations, costs and tariffs? Should the regulation incorporate these technological changes in the ceiling tariff framework? Please provide your response with justification.**

BIF RESPONSE

a) The introduction of DWDM, and Ethernet over Fibre has revolutionized DLCs by enabling massive bandwidth, reducing operational overhead, and lowering costs through virtualized management and increased capacity efficiency. Reason of this reduction is that the change in terminal equipment to increase the capacity while fiber remain the same. Further, cost of maintenance of fiber is agnostic to type of terminal equipment. A fiber over which STM1 bandwidth was transported 10 years ago can carrying traffic of 4 – 16 Tbps. These technologies allow for burstable, high-speed, and flexible connections, shifting away from rigid, legacy, distance-based circuits towards more competitive and dynamic network architectures.

SD-WAN provides centralized control, enabling faster provisioning and, in some cases, automating network monitoring, reducing the need for manual configuration.

DWDM tremendously boosts fiber capacity, allowing multiple channels on a single fiber and enabling efficient scaling for high-bandwidth demands. DWDM reduces the overall cost of transmission by improving capacity efficiency, thereby lowering capital and operational expenditures for service providers. SD-WAN optimizes bandwidth usage, reducing over-provisioning costs and enabling the use of cheaper, commercial-grade links alongside private circuits. The combination of these technologies lowers the cost of provisioning circuits, particularly for high-capacity requirements, driving down the overall cost per Gbps/Mbps.

Ethernet over Fibre provides standard, easy-to-manage interfaces that allow for quick bandwidth upgrades compared to older, dedicated technologies.

The rise of IP-based networks has led to a shift away from distance-based, rigid pricing slabs to more flexible, competitive, and often lower, flat-rate pricing models. Tariffs are increasingly bundled with SLAs and managed services, providing higher value rather than just raw capacity.

The new and advanced technologies viz. DWDM, FoE all enable higher capacity with lower operational cost.

b) Yes-Regulatory frameworks should incorporate technological changes into ceiling tariff frameworks to ensure that tariffs remain relevant, competitive, and reflective of modern, lower-cost operating environments. Technological developments such as DWDM, Ethernet over Fibre and network automation have materially reduced unit costs of transmission infrastructure and improved network utilisation. These developments should therefore be reflected in cost models used for determining ceiling tariffs for infrastructure-based services, particularly P2P DLCs and local access segments where cost-based regulation is appropriate.

However, for managed services such as MPLS-VPN and SD-WAN-based offerings, pricing is driven by service architecture, network intelligence, and SLA commitments rather than underlying transport costs alone. Accordingly, technological evolution in these services should be addressed through transparency and disclosure requirements rather than incorporation into ceiling tariff frameworks.

This differentiated treatment ensures that regulation remains aligned with market realities while preserving incentives for innovation.

Q6: Are there any other technological changes apart from the ones mentioned in above paragraphs in provisioning of DLCs in India? If yes, what has been the impact of deployment of such technologies on provisioning of DLCs, in terms of operations, costs and tariffs? Should the regulation incorporate these technological changes in the ceiling tariff framework? Please provide your response with justification.

BIF RESPONSE

a) DLCs in India are rapidly shifting from traditional, rigid, point-to-point circuits to flexible, high-capacity, fiber-based solutions like SD-WAN and DWDM. These advancements enable "burstable" bandwidth, improved SLAs, and a significant shift towards flexible cost based managed VPNs.

Key technological and regulatory changes include:

- VPN-based DLCs are becoming dominant, increasing from 30% to 47% market share over the last decade, allowing more cost-effective and agile connectivity.

- Deployment of SD-WAN, DWDM, and Ethernet over Fiber has reduced transmission costs and increased efficiency.

- Modern technologies support flexible/dynamic bandwidth, allowing enterprises to temporarily exceed contracted speeds without provisioning a higher-capacity line.

- Demand is moving towards higher capacities, often reaching up to 10 Gbps and above, to support cloud, video conferencing, and ERP systems.

These changes have necessitated the need to review the tariff ceilings prescribed in 2014, reflecting the reduced cost of technology and infrastructure.

b) The deployment of advanced technologies like fiber-based networks, SD-WAN, and DWDM has transformed DLCs from rigid, high-cost links to flexible, high-capacity, and lower-cost services. Operationally, this enables faster provisioning, flexible/dynamic bandwidth, and better SLAs. While initial capital expenditure can be high, these technologies significantly reduce operational costs, resulting in reduced, competitive tariffs.

c) Yes, regulatory frameworks should incorporate technological changes into ceiling tariff frameworks to ensure they remain relevant, promote competition, and reflect current market costs. A flexible tariff framework allows for the introduction of new services (e.g., managed services, VPNs) that provide better bandwidth, uptime, and latency.

There is a need for updating ceiling tariffs to reflect technological improvements as it is essential for balancing provider sustainability with consumer affordability.

Technological advances since 2014:
A single optical fiber strand is today capable of carrying tens of terabits of traffic today through modern techniques such as Dense Wave Division Multiplexing (DWDM), Optical Amplification, Reconfigurable Optical Add-Drop Multiplexing (ROADM) and coherent optical processing.

OTN (ITU G.709) uses a frame structure with Optical Data Units (ODU) and Forward Error Correction (FEC) to map diverse services—like Ethernet, SDH, and storage—into wavelengths, allowing dozens to hundreds of channels per fiber.

Combined with DWDM, it maximizes spectrum use through flexible bandwidth allocation (e.g., ODUflex) and higher rates from 100G to over 1Tbps per wavelength, pushing single-fiber-pair capacities from tens of Tb/s to 30 Tb/s or more in real deployments like submarine cables.

Traditional DWDM set the raw "physics" ceiling for fiber capacity, while OTN-based systems push much closer to that ceiling and enable newer, higher per-lambda rates. In practice we can think of DWDM as defining the *maximum possible* Tb/s per fiber, and OTN as what lets operators actually realize and scale that in networks.

Traditional DWDM capacity (without OTN).

- Early DWDM typically used 2.5–10 Gbps per wavelength, with 40–80 channels, giving of the order of 0.1–0.8 Tbps per fiber strand.

- Modern coherent DWDM platforms can carry 100 Gbps and above per wavelength, with 40–120 channels, so single-fiber capacities of about 4–10 Tbps are now common (for example, 40 × 100 Gbps ≈ 4 Tbps; 80 × 100 Gbps ≈ 8 Tbps).

- Some current C-band systems support up to 64 Tbps per fiber (e.g., 1.2 Tbps per wavelength × ~50+ wavelengths), but this is a theoretical/physical limit of the DWDM layer, not accounting for grooming inefficiencies.

OTN-based DWDM capacity.

- OTN does not change fiber physics, but allows 100G/200G/400G/1.2T class wavelengths with strong FEC and better spectral efficiency, so the *per-wavelength* usable rate goes up at a given OSNR.
- Vendors quote up to 1.2 Tbps per wavelength and total fiber capacities up to 64 Tbps on OTN over DWDM platforms, essentially matching the DWDM physical limit but with far higher utilization and reach.
- With full C+L band DWDM and advanced OTN/FEC, lab and early commercial systems now demonstrate >100 Tbps per single fiber, showing where OTN-managed DWDM is heading.

Thus, cost of per Gbps transport has come down drastically over last one decade. Further, going forward Hollow core fiber (HCF) will boosts data carrying capacity per fiber by enabling higher transmission rates, wider bandwidths, and reduced nonlinear limits compared to traditional solid-core fiber.

Q7: As an alternative to Q5 & Q6, should the Authority consider technology-neutral tariff models, focussing on bandwidth and service commitments rather than provisioning technologies? If yes, what should be the criteria for the same? Please provide your response with justification.

BIF RESPONSE

DLC is foundational links which carries not only dedicated but shared traffic also e.g DLC links between the MPLS routers carries traffic in shared mode. DLCs excel for constant, symmetric high-capacity needs like data center interconnects or financial trading links, where physical fiber delivers raw DWDM/OTN speeds without MPLS routing overhead. DLCs are also preferred choice of ISPs. Therefore, cost of DLC has bearing on the cost of MPLS, SDWAN, internet leased lines, and broadband connectivity.

Therefore, a technology-neutral tariff framework would be appropriate, provided it is applied specifically to infrastructure-based components of DLC services where cost-based regulation is warranted, such as access and transport segments that may exhibit bottleneck characteristics. Technology neutrality in this context means that tariff constructs should not be linked to particular transmission technologies (such as DWDM, Ethernet, or other optical platforms), but should instead reflect the economic function of providing dedicated capacity.

At the same time, this principle should not be interpreted as extending tariff regulation to competitive managed services such as MPLS-VPN, SD-WAN, or other overlay-based offerings, where pricing is driven by service functionality, network intelligence, and service level commitments rather than underlying transport costs.

Such services are appropriately governed by market forces, and should be supported by transparency and disclosure requirements rather than ceiling tariffs.

For infrastructure segments where tariff regulation applies, the criteria for a technology-neutral framework may include committed bandwidth capacity, service availability levels, restoration and repair commitments, protection or redundancy features and geographic cost variations where relevant.

In our view this approach ensures that regulatory treatment remains aligned with cost drivers while preserving flexibility for technological innovation and competitive service differentiation.

Q8: What are the various service commitments (such as bandwidth, SLA requirements such as uptime, latency, packet loss, response time etc.) bundled as part of managed DLC service, for both P2P & VPN based DLC? How are the service commitments offered as part of managed DLC services linked with the tariffs? Please provide your response with justification.

BIF RESPONSE

a) Managed Domestic Leased Circuit (DLC) services—whether Point-to-Point (P2P) or MPLS/Virtual Private Network (VPN) based—are premium, dedicated connectivity solutions that come with strict Service Level Agreements (SLAs) regarding uptime, performance, and support. These services are evolving to include software-defined features and are increasingly used to connect global capability centers, demanding high-capacity and low-latency.

Here are the key service commitments and typical SLA requirements for both P2P and VPN-based managed DLCs:

1. Common Service Commitments (P2P & VPN).

- **Bandwidth:** 100% dedicated, non-shared, and symmetrical (equal upload/download speeds). Capacity ranges from 64 Kbps to STM1 and higher.
- **Network Availability (Uptime):** Generally >99.5% per month, with elite services offering up to 99.999% (five nines).
- **Latency:** Domestic latency is typically <60ms to <80ms (peak hours), while international latency is <180ms to <250ms.
- **Packet Loss:** Typically guaranteed to be <0.1% to 1%.
- **Jitter:** Generally <10ms, crucial for VoIP and video conferencing.
- **Proactive Monitoring & Reporting:** 24/7 monitoring with performance reports submitted weekly/monthly.
- **Support Response Time:** Faults are typically addressed within 1 hour, with repair times within 12 hours.

2. Specific Commitments: Point-to-Point (P2P) DLC.

P2P circuits provide a direct, physical, or logical connection between two specific locations.

- **Performance Stability:** Because the circuit is strictly dedicated, it offers the highest consistency with the lowest fluctuations in speed and latency.
- **Security:** High-level, direct connection that is inherently secure.
- **Use Case:** Ideal for mission-critical, high-throughput applications like data center replication.

3. Specific Commitments: MPLS VPN: MPLS VPN offer more flexibility, allowing a single access point to connect to multiple locations (Multipoint-to-Multipoint).

- **QoS Provisions:** VPN SLAs often include Quality of Service (QoS) to prioritize critical traffic, ensuring VoIP and real-time data are prioritized during congestion.
- **Scalability:** Often features "burstable" bandwidth, allowing temporary higher traffic loads.
- **Routing Control:** Uses predefined, managed routes to ensure performance, sometimes with "back-to-back" MPLS facility options.
- **Security:** Encrypted data transmission, crucial for data integrity.

Penalty Clauses (Service Credits).

- If the above KPIs are not met, the service provider offers financial penalties, often in the form of service credits based on the amount of downtime, for instance, a deduction in payment for outages. In some cases, if the latency or packet loss metrics exceed the promised levels, a service credit of a certain number of days' service might be provided.

b) Managed Domestic Leased Circuit (DLC) service commitments—such as bandwidth, high uptime, and low latency—are increasingly integrated into tariff structures, moving beyond just distance-based pricing to reflect value-added, quality-of-service (QoS) guarantees. These service-level agreements (SLAs) are crucial for updating ceiling tariffs to match modern, managed, and secure, high-speed data transmission requirements. Therefore, additional capacity is required to be built in the system to give fallback in case of fiber cut by creating a ring/mesh network depending upon criticality of route. While in case of class of service takes care of SLAs by giving priority to customers with better SLAs.

Q9: Should the proposed regulation include staggered tariffs in line with service commitments, possibly further staggered for different regions, for both VPN & P2P based DLC? If yes, what are the service commitments, mentioned as reply to Q8, which should be considered for tariff regulation.

BIF RESPONSE

Staggered tariffs based on service commitments can improve transparency and enable users to choose services aligned with their performance requirements. However, as mentioned earlier, such differentiation should be applied primarily to infrastructure components where regulation is warranted, rather than competitive managed services like VPN.

Key service commitments to consider with respect to infrastructure include availability levels, restoration times and latency thresholds. Regional differentiation is certainly appropriate where cost structures vary significantly due to terrain or infrastructure constraints.

Q10: What reporting mechanisms should be mandated to ensure transparency in discounts and service bundling for DLCs? Please provide your response with justification.

BIF RESPONSE

To ensure transparency in discounts and service bundling for Domestic Leased Circuits (DLCs), the Authority should mandate reporting mechanisms that focus on tariff clarity, consistent valuation of bundled components, and proactive disclosure.

Based on emerging regulatory trends and best practices, the following reporting mechanisms are recommended:

Mandated Reporting and Transparency Mechanisms.

- Service providers should be required to publish standardized, easy-to-compare tariff charts for all DLC offerings, including baseline prices for individual components in a bundle.
- Service Providers should submit annual reports detailing their content moderation, and in the context of commercial services, detailed reports on their pricing and discounting practices to ensure they are not anti-competitive.
- TRAI should conduct biennial (once every two years) cost studies and mandate that service providers report cost-based justifications for their tariffs, particularly in non-competitive areas.
- Mandatory reporting on SLA metrics (latency, uptime, Mean Time To Repair - MTTR) should be provided.

- For dynamic or usage-based bundled discounts, service providers should be mandated to offer customers real-time, digital dashboards that clearly show the consumption of services and the application of discounts.

Key Objectives of Mandatory Reporting.

- **Preventing Anti-Competitive Bundling:** Ensuring that bundled discounts do not create illegal tie-in arrangements where a dominant player forces the purchase of multiple services including less popular ones.
- **Improving Comparability:** Allowing SMEs and smaller users to compare different service providers, as complex pricing currently acts as a barrier to entry.
- **Fair Valuation:** Ensuring that when a bundle is sold, the discount is proportionally allocated to the services in the contract, reducing hidden subsidies.

These mechanisms are designed to compel the service providers to transition towards transparent pricing, helping to eliminate "bait-and-switch" tactics and ensuring that this does not result in disproportionate pricing in remote areas.

Q11: Should the Authority mandate standardized tariff disclosure formats for all DLC service providers? Please provide your response with justification.

BIF RESPONSE

Standardised tariff disclosure formats would improve comparability across providers, facilitate procurement decisions, and enhance transparency. Uniform templates should include bandwidth, SLA parameters, installation charges, provisioning timelines and applicable penalties or credits.

Q12: Should TRAI use the same cost methodology i.e. BU-FAC for computing cost-based ceiling tariffs for P2P DLCs as was used in 2014? Please provide your response with justification.

BIF RESPONSE

It is felt that TRAI should use updated cost methodologies to reflect technological advancements, increased fiberization, and enhanced competition since the last revision that took place in 2014, instead of continuing with the Bottoms-Up Fully Allocated Cost (BU-FAC) methodology for Point-to-Point Domestic Leased Circuits (P2P DLC).

Why?

- The telecom landscape has evolved significantly since 2014, with increased fiber penetration.
- High tariffs persist in remote/hilly areas due to limited competition and infrastructure constraints, necessitating a review of the 2014 cost model.

Q13: In case response to the above question is affirmative, what values of the following items should be used for estimation of ceiling tariffs for DLCs: (i) Return of Capital Employed (ROCE) (ii) Useful lives of transmission equipment and Optical Fibre Cable separately (iii) Average no. of fibre pairs lit in OFC in trunk segment and local lead segment separately (iv) Utilization factor of OFC system in trunk segment and local lead segment separately (v) % of use for the transmission equipments used at local lead junction points and in trunk segment for DLCs (vi) If the repeaters are still being used in the trunk segment, what is the average distance between two repeater sites? (vii) What is the factor of use (no. of circuits in underlying OFC system) to be taken into consideration at local lead and trunk segment for computation of ceiling tariffs?

BIF RESPONSE

The following values are proposed for estimating Domestic Leased Circuit (DLC) ceiling tariffs:

- Return on Capital Employed (ROCE) should be at least 20%, to account for high Capex
- with useful life for transmission equipment at 7-10 years and
- Useful Life of Optical fiber at 25 years.
- Key utilization factors for Optical Fibre Cable (OFC) are 30-45% (trunk) and 40-75% (local).
- **Average Fibre Pairs Lit:** Typically, for bandwidth up to 2 Mbps, the equipped capacity is assumed to be STM-1, and for higher, it is assumed to be STM-16.
- **(iv) Utilization Factor of OFC System:**
  - **Trunk Segment:** 30% - 45%.
  - **Local Lead Segment:** 40% - 75%.
- **(v) % of Use for Transmission Equipment:** Equipment used at local lead junction points and in the trunk segment is generally assumed to be 100% dedicated for the purpose of the leased circuit in calculating the base tariff.
- **(vi) Average Distance between Repeaters:** Modern systems often do not use repeaters; however, for older systems, this depends on the technology used (e.g., span lengths of 40-80 km).
- **(vii) Factor of Use (Number of Circuits):** The capacity calculations are typically based on the total designed capacity of the STM system (e.g., STM-1 or STM-16) rather than individual circuits, divided by the utilization factor mentioned above.

Q14: As an alternative to the BU-FAC methodology, or in addition to it, should LRIC or any other methodology be considered for computing ceiling tariffs for P2P DLCs? Please support your view with detailed justification along with data and assumptions.

BIF RESPONSE

There is a strong argument for considering alternative methodologies to the **Bottom-Up Fully Allocated Cost (BU-FAC)** model for computing ceiling tariffs for Peer-to-Peer Domestic Leased Circuits (P2P-DLCs). While BU-FAC has been the traditional approach, evolving network technologies and market conditions suggest that Long Run Incremental Cost (LRIC) or, in some scenarios, forbearance (market-driven pricing), should be considered.

Here is an analysis of why LRIC or other methodologies should be considered as alternatives or in addition to BU-FAC:

1. Why LRIC is a Strong Alternative (or Addition).

- **Reflects Modern Technology:** BU-FAC often relies on historical costs, which may not accurately reflect the reduced per-unit costs of modern, high-capacity, fiber-based networks (e.g., DWDM, SD-WAN). LRIC is better suited to calculating the cost of adding new capacity, which is crucial for modern network investments.
- **Promotes Efficient Investment:** LRIC represents the level of costs that would occur in a competitive market, discouraging the recovery of inefficiently incurred costs.
- **Handles Technological Advances:** With DLCs moving towards IP-based, managed services rather than just raw bandwidth, LRIC can better handle the marginal costs of capacity expansion compared to fully allocating all overheads.

2. Other Methodologies to Consider.

- **Forbearance / Market-Based Pricing:** Given the presence of multiple National Long-Distance Operators (NLDOs) and increased competition in metropolitan areas, many

stakeholders have advocated for leaving tariffs to market forces (forbearance). This prevents regulatory overreach while allowing competitive pricing.
- **Hybrid Model (BU-FAC for legacy + LRIC for high-capacity):** The Authority can use BU-FAC for lower, older capacities (e.g., E1) and LRIC for high-capacity circuits (e.g., STM-1 and above), reflecting the different cost structures of legacy and modern networks.
- **Regional/Tiered Ceilings:** Rather than a national ceiling, considering different ceilings for remote, hilly, and underdeveloped regions might be necessary, as competition is lower and infrastructure costs are higher in these areas.

3. Key Factors for Future Methodology Adoption.
- **Shift from Distance to Bandwidth:** The 2014 framework used a distance-based approach. Modern, IP-based networks make costs largely independent of distance. Future methodologies should focus more on bandwidth capacity and service quality promises (SLAs) rather than distance intervals.
- **Right of Way (RoW) Costs:** Any new methodology must accurately account for the significantly increased costs of Right of Way in different regions.
- **Inclusion of VPN Services:** With Virtual Private Networks (VPN) comprising a large portion of the market, the methodology must account for the flexibility and shared nature of these services, which differ from traditional P2P dedicated lines.

Conclusion:

While BU-FAC has provided a stable framework, Long Run Incremental Cost (LRIC) is a superior alternative for determining cost-based tariffs that reflect current technology. However, in developed areas, forbearance is often recommended to foster competition, while targeted cost-based models (like LRIC) are more appropriate for ensuring affordability in remote areas.

Q15: What should the bandwidth capacities be, including the minimum and maximum bandwidth capacity, of P2P DLC for which ceiling tariffs need to be prescribed? In case of bandwidth capacities not regulated in the 2014 TTO, what should be the concomitant value of the relevant factors mentioned at Q13? Please provide your response with justification.

BIF RESPONSE

a) P2P DLC (Domestic Leased Circuits) ceiling tariffs currently focus on capacities ranging from 2 Mbps (E1) up to 10 Gbps (STM-64) or higher to reflect modern high-speed data needs, while capacities below 2 Mbps often fall under forbearance.

Key Bandwidth Capacities proposed for Ceiling Tariffs:
- **Minimum Capacity:** Generally 2 Mbps (E1).
- **Intermediate/Common Capacities:** 45 Mbps (DS3), 155 Mbps (STM-1), 622 Mbps (STM-4), and 1 Gbps.
- **Maximum Capacity (Proposed/High-End):** Up to 10 Gbps (STM-64).

While historical tariffs covered 64 kbps, current market trends and regulatory reviews suggest focusing on higher capacities (2 Mbps and above) due to increased demand. For very high-speed, competitive services (e.g., 10 Gbps+), strict ceiling tariffs may not be necessary.

b) Based on the Telecom Regulatory Authority of India (TRAI) 57th Amendment to the Telecommunication Tariff Order (TTO) of July 14, 2014, for Domestic Leased Circuits (DLCs), bandwidth capacities not specifically regulated (i.e., those other than E1, DS3, STM-1, and STM-4) were placed under **forbearance**.

For these unregulated capacities, the concomitant value of the relevant factors (such as price) should be determined by mutually agreed commercial terms between the service provider and the customer, rather than by a fixed TRAI-mandated ceiling.

Q16: Should the Authority consider the cost methodologies used in other countries for determining tariffs for P2P-DLCs? If so, which methodologies would be appropriate for the present exercise? Please provide your response with justification along with data and assumptions.

BIF RESPONSE

The most appropriate cost methodologies for determining tariffs for Point-to-Point Domestic Leased Circuits (P2P-DLCs) focus on reflecting current, lower-cost infrastructure and ensuring fair, competitive pricing.

Appropriate cost methodologies include:

- **Bottom-Up Fully Allocated Cost (BU-FAC) Method:** This is considered the primary approach for calculating cost-based ceiling tariffs, offering high accuracy, transparency, and regulatory control over the modeling process.
- **Long-Run Incremental Cost (LRIC/TELRIC):** As an alternative to BU-FAC, this method is used to calculate costs based on forward-looking, modern, efficient network components (e.g., DWDM technology).
- **Hybrid Regulatory Approach:** A combination of performance-based regulation and cost-of-service, which considers actual costs alongside normative parameters, balancing market freedom with consumer protection.
- **Segmented/Tailored Costing:** Due to regional disparities, specific methodologies may be needed for remote or hilly areas, potentially diverging from the standard, lower-cost, city-based models.

Key Considerations in Cost Calculation:

- **Technology Modernization:** Tariffs should account for Wavelength-Division Multiplexing (WDM) and IP-based networks, which have reduced the per-bit transport cost.
- **Components to Include:** The calculation should include CAPEX and OPEX, depreciation, return on capital employed (ROCE), and local lead (last-mile) costs.
- **Distance-Based to Bandwidth-Based Shift:** There is a move away from traditional distance-based pricing toward models focusing on bandwidth capacity and service quality.

Q17: Is there a need for prescribing separate ceiling tariffs for local lead and trunk segment? Should the Authority adopt different cost methodology for local lead and trunk segment for provisioning of DLCs? If yes, please provide your response with justification.

BIF RESPONSE

- **Higher Costs in Local Leads:** The capital investment and maintenance costs for local leads (last-mile connectivity) can be significantly higher—ranging from Rs 10 Lakhs to 20 Lakhs per km in some areas—compared to trunk routes (Rs 4-8 Lakhs per km).
- **Lower Utilization:** Capacity utilization in local lead, aggregator, and access routes is generally lower compared to high-capacity trunk routes, justifying a different cost basis.
- **Remote/Hilly Areas:** In specific areas like the North East, Assam, and J&K, where competition is limited, separate and higher price ceilings may be needed to ensure viability.

In summary, while there are distinct cost differences there is a need for separate tariffs which better reflect the distinct cost structures of local vs. trunk, particularly in niche or non-competitive geographical areas. Further, low utilization of fiber in local lead is due to bar on deduction of cost of bandwidth for calculation of AGR. If cost of bandwidth is allowed to be deducted for the purpose of AGR there will less requirement of laying overhead fiber which negatively impact city aesthetics and better utilization of spare fiber capacity available in local networks.

Q18: Should the Authority adopt BU-FAC, LRIC or any other methodology for computing ceiling tariffs for VPN DLCs? Please support your view with a detailed justification along with data and assumptions.

BIF RESPONSE

Given the competitive nature of VPN services, direct ceiling tariffs may not be necessary.

Q19: What should the bandwidth capacities, including the minimum and maximum bandwidth capacity, of VPN DLC for which ceiling tariffs need to be prescribed? Please provide your response with justification.

BIF RESPONSE

- Given the competitive nature of VPN services, direct ceiling tariffs may not be necessary.
- If regulation is considered, it should focus on commonly used enterprise bandwidth tiers where market power concerns exist, while leaving high-end bespoke services under forbearance.

Q20: Should the Authority consider the cost methodologies used in other countries for determining tariffs for VPN-DLCs? If so, which methodologies would be appropriate for the present exercise? Please provide your response with justification along with data and assumptions.

BIF RESPONSE

- International practice generally avoids direct tariff regulation of managed services, focusing instead on wholesale access regulation. A similar approach would be appropriate in our view.

Q21: Should the spectrum charges recommended for a point-to-point link of 28 MHz paired bandwidth in the 6 GHz(lower) band, be taken as reference for DLC ceiling tariff? If yes, what could be the approximate order of multiple between the backhaul link charges and DLC ceiling tariff? Should the reference be considered for local lead or trunk segment or on overall basis? Please provide your response with justification.

BIF RESPONSE

Spectrum charges may not be an appropriate benchmark due to fundamental differences between wireless and fibre cost structures. At most, they may serve as a reference in remote areas where wireless backhaul substitutes fibre. However, traffic carrying capacity of fiber is much more than wireless.

Q22: Is the distance-based pricing, based on distance slabs contained in the 2014 TTO (57th Amendment), still relevant for prescribing ceiling tariffs for P2P DLCs? Should

the Authority consider new distance slabs, separately for both the local lead and trunk segments, for prescribing ceiling tariffs for P2P DLC? Please provide your response with justification.

BIF RESPONSE

The 2014 TTO (57th Amendment) distance-based pricing for Domestic Leased Circuits (DLCs) is under review, as its relevance is questionable due to modern IP-based networks where costs are less distance-dependent.

The rise of IP-based technology means bandwidth costs no longer strictly correlate with distance, challenging the 57th Amendment's reliance on distance slabs. While distance-based pricing may be outdated for major routes, high tariffs persist in remote/hilly areas due to limited competition and infrastructure constraints, necessitating a, review of how to balance costs.

The current review aims to address P2P and VPN-based DLCs, considering them as managed services with specific service level agreements (SLAs), rather than just raw bandwidth.

It is suggested to have separate, updated slabs for local leads (up to 50 km) and trunk segments (beyond 50 km) to reflect cost variations.

There is a need to distinguish between them, for instance, defining local leads as up to 50km and trunks beyond that, due to different cost drivers.

Q23: Is there a need for prescribing separate ceiling tariffs for remote and hilly areas? What criteria should be used to define such regions? Please provide your response with justification.

BIF RESPONSE

It is felt that there is a need for prescribing separate, often higher or specially subsidized, ceiling tariffs for remote and hilly areas in sectors like telecommunications and electricity. This is primarily driven by the significantly higher cost of infrastructure development and maintenance in challenging terrains.

Separate Ceilings (Remote/Hilly Areas) is proposed due to :

- **High Infrastructure Costs:** Laying fiber or building transmission lines in hilly terrains is much costlier. For instance, in telecommunications, OFC in hilly terrain can cost around ₹5.5 lakh per km, compared to ₹3.5 lakh in plain terrain.
- **Low Competition/Monopoly:** In many remote regions, there is a lack of competition, with only one provider (often a public sector unit) operating, leading to higher prices near existing ceilings.
- **High Operational Costs:** Remote locations face logistical challenges, making operational, maintenance, and repair costs higher.
- **Lower Economic Capacity:** Consumers in these areas often have lower purchasing power and, in the case of electricity, are less able to afford "cost-reflective" tariffs.

Conclusion:

There is a recognized need to address the unique challenges of remote and hilly areas. If not through separate higher ceilings, regulatory frameworks typically require mechanisms like cross-subsidies, special grants, or Public-Private Partnerships (PPP) to make services affordable and sustainable in these regions

Defining remote and hilly areas requires a multi-criteria approach that combines topographical, geographical, and socio-economic indicators to guide development planning, infrastructure provision, and ecological protection. These areas are generally classified based on their difficult terrain, lack of connectivity, and vulnerability.

Criteria for Defining Hilly Areas.

Hilly areas are typically defined by elevation, slope, and ecological vulnerability:

- **Altitude (Elevation):** A common criterion for a "hill area" is any location at a height of 600 meters or more above sea level.
- **Slope and Terrain:** Areas with a slope greater than 30 degrees are considered steep and less suitable for construction. Some definitions incorporate rugged terrain or slopes above 10 degrees.
- **Topography:** Regions characterized by significant rises, dips, and distinct summits that differ from surrounding plains.
- **Ecological Sensitivity:** Areas prone to landslides, soil erosion, and mudflows, or those with significant forest cover, are considered hilly.

Criteria for Defining Remote Areas.

Remoteness is defined by isolation, lack of infrastructure, and distance from major economic nodes:

- **Accessibility and Connectivity:** Areas lack proper road networks, are far from major towns, or take a long time to travel to the nearest urban center.
- **Distance/Isolation:** Locations more than a specific travel time (e.g., >1 hour or >20 km) or distance (e.g., 65 km or more) from major service centers.
- **Infrastructure Deficit:** Lack of essential services such as electricity, healthcare, education, and communication networks.
- **Population Density and Structure:** Sparse population, small, scattered settlements, and, in some cases, high reliance on subsistence agriculture.

Key Indicators for Integrated Planning.

- **Socio-Economic:** Low income levels, low population density, and high dependence on seasonal or traditional livelihoods.
- **Environmental:** High forest cover, water scarcity (declining natural springs), and exposure to natural disasters (e.g., glacial lake outbursts, landslides).
- **Infrastructure:** Limited access to markets, financial services, and digital technology.

Technical Methodologies.

- **GIS and Remote Sensing:** Satellite imagery is used for mapping terrain, slopes, and land use.
- **Analytical Hierarchical Process (AHP):** Used to assign weights to various factors (e.g., slope, forest cover) for vulnerability mapping.
- **Spatial Suitability Assessment:** Combines 22 criteria, including soil type, ground water level, and infrastructure availability to identify suitable development areas.

Q24: How can the Authority ensure affordability in low-competition areas, such as remote and hilly areas, without distorting market incentives? Please provide your response with justification.

BIF RESPONSE

Ensuring affordability in low-competition, remote, or hilly areas requires a balanced approach that combines targeted financial support with regulatory frameworks that foster, rather than replace, market forces. Regulatory authorities can achieve this by implementing mechanisms that minimize infrastructure costs, subsidize only the "gap" in profitability, and encourage shared infrastructure.

Here are the key strategies for ensuring affordability without distorting market incentives:

1. Targeted Subsidy Mechanisms (Avoid "Blanket" Subsidies).

To avoid market distortion, subsidies should be narrowly targeted, transparent, and designed to phase out.

- **Universal Service Obligation (USO) Funds:** Utilize specialized funds to support operators in high-cost areas, specifically to offset the higher infrastructure and operational costs.
- **"Gap" Funding (Reverse Auctions):** Instead of giving subsidies to all providers, the authority can hold a "reverse auction" for a specific area, where the contract is awarded to the provider requiring the lowest subsidy to deliver services at a set, affordable price.
- **Input-Based Subsidies:** Rather than capping final prices (which can stifle investment), subsidize the inputs to make it cheaper to operate in remote areas, such as providing free spectrum, lower-cost bandwidth, or subsidized power for network equipment.
- **Direct Benefit Transfer (DBT):** Instead of subsidizing the operator, provide direct financial support to consumers in remote areas to pay for services, which keeps the market price-sensitive and competitive.

2. Infrastructure Sharing and Reducing Barriers to Entry.

Remote and hilly areas have high entry barriers. Reducing these costs increases the likelihood of competitive entry.

- **Mandatory Infrastructure Sharing:** Regulators can enforce the sharing of passive infrastructure (towers, poles) and active infrastructure (fiber, radio access network) among providers, reducing duplication and costs.
- **"Dig-Once" Policies:** Promote policies that require utilities to install fiber-optic cables whenever road or utility infrastructure is being laid, significantly cutting down deployment costs.
- **Simplified Licensing/Right of Way (RoW):** Reduce bureaucratic hurdles and fees for obtaining permits for tower installation and fiber laying in difficult terrain.

3. Light-Touch and Smart Regulation.

"Light-touch" regulation allows for flexibility while maintaining oversight, particularly for smaller, local operators.

- **Niche Operator Support:** Encourage small, local operators or community-based networks, providing them with technical support and enabling access to the backbone network of larger providers.
- **Quality of Service (QoS) Focusing:** Instead of regulating prices strictly, set mandatory minimum quality standards and let providers compete on quality, ensuring that the high costs of infrastructure do not result in poor service.
- **Performance Monitoring:** Use digital tools and mobile technology to monitor service quality, allowing for proactive, data-driven regulation rather than heavy-handed intervention.

4. Encouraging Alternative Technology.

- **Promoting Low-Cost Technologies:** Encourage the use of satellite internet (VSAT), long-range Wi-Fi, which may be more cost-effective for connecting remote, mountainous, or sparsely populated areas.
- **Focus on Backhaul Infrastructure:** Improve the underlying infrastructure (e.g., fiber connectivity to rural exchanges) rather than just the final service, which lowers costs for all operators in the area.

By using these targeted approaches, authorities can ensure that residents in remote areas have access to affordable, quality services, while maintaining the incentives for private firms to invest and innovate

Q25: Are there any other relevant issues related to revision of tariff framework for DLCs which the Authority should keep in mind, while carrying out the present review exercise, to further the broad objectives as espoused in this Consultation Paper? Please provide full details and justification for consideration of the same.

BIF RESPONSE

The Authority may consider periodic review of cost parameters, strengthening data reporting requirements, ensuring non-discriminatory access to essential infrastructure, and aligning the framework with the needs of data centre and cloud ecosystems to support digital growth.