Telecom Regulatory Authority of India

Recommendations on Regulatory Framework for Promoting Data Economy Through Establishment of Data Centres, Content Delivery Networks, and Interconnect Exchanges in India

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INTRODUCTION

Background

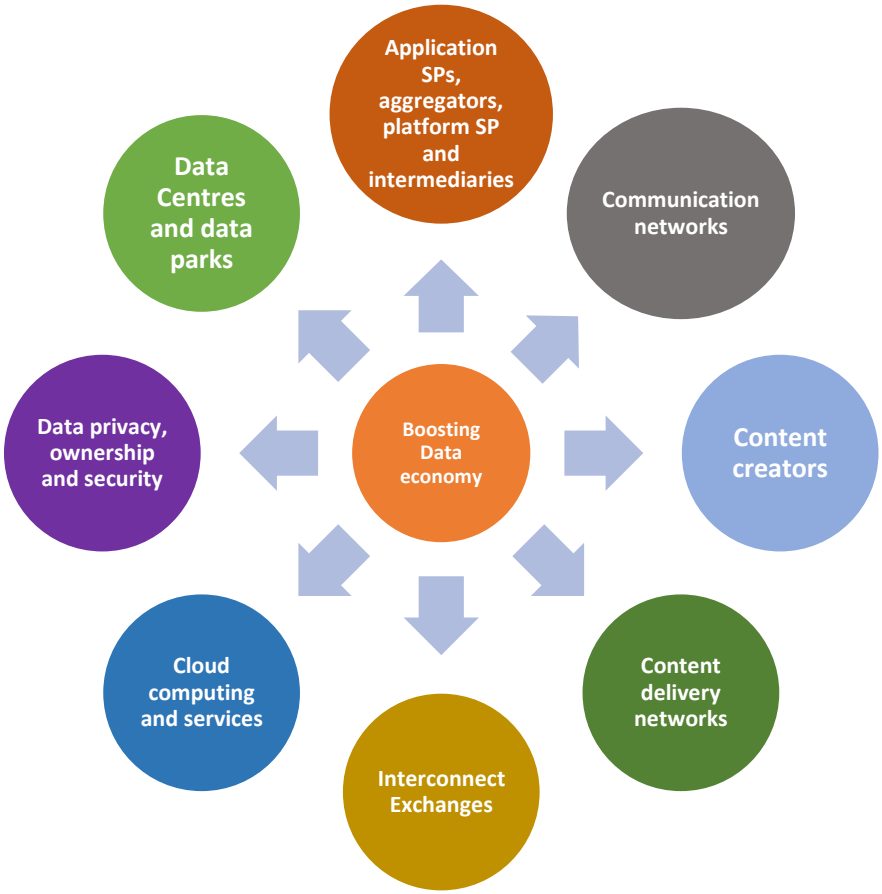
1.1 The rising usage of Information and Communication (ICT) services has facilitated establishment of a range of innovative business models in the country. During the pandemic, the majority of service requirements shifted to the online mode, resulting in a massive rise in data usage. As 5G, Internet of Things, and Artificial Intelligence based applications proliferate, the data usage will rise further. Enhanced Mobile Broadband (eMBB), Ultra-Reliable Low Latency Communications (URLLC), and Massive Machine Type Communications (MMTC) would all give rise to new use cases for 5G. Edge computing and 5G together, would provide ultra-reliable, low-latency, and high-throughput communications. The country will benefit from the convergence of computer and communication services. Widespread edge computing infrastructure, large data storage facilities, and a stable and efficient internet will further pave the way for a boom in the data economy.

1.2 The government's Digital India programme, which began in 2015, moved the digitalization to the forefront. National Digital Communications Policy (NDCP)-2018 also emphasizes that *"Digital infrastructure and services are increasingly emerging as key enablers and critical determinants of a country's growth and well-being. With significant capabilities in both telecommunications and software, India, compared to most countries, stands poised to benefit from harnessing new digital technologies and platforms to unlock productivity, as well as to reach unserved and underserved markets; thus, catalyzing economic growth and development, generating new-age jobs, livelihoods and ensuring access to next-generation services for its citizens."*

1.3 The data economy growth is dependent on availability of digital infrastructure. Data is the most important input for organizations that are developing and delivering digital services and products. With more

individuals connected to the internet and large and small businesses adopting innovative technologies, it's imperative that digital infrastructure and service offerings are upgraded to the best in class. Distributed edge computing infrastructure, massive data storage facilities, and a robust, and efficient internet exchange point infrastructure are pre-requisites for undertaking successful data economy initiatives by any nation. Figure 1.1 depicts the notable key drivers for boosting data economy of India.

Figure 1.1: Boosting data economy



1.4 To keep pace with the global data economy initiatives, it would be necessary to formulate reliable frameworks and policies that would encourage development of 5G, IoT, Data Centres, and associated services, data analytics, edge computing, digital platforms, and applications. As these services can be delivered remotely, India can become a global hub for such systems and services.

1.5 Following are components of a digital ecosystem that are critical for the success of data economy:

a. **Data Centres** – utilised for content hosting, edge computing, and cloud-based service delivery.
b. **Content Delivery Networks** – used for delivering the content from the cloud to the edge of the network.
c. **Internet Exchange Points (IXPs)**- in the internet infrastructure, IXPs allow networks to exchange traffic with one another.

These three components together make up for "digital communication infrastructure and services".

Data Centres (DC)

1.6 A DC is a physical location where applications and data are stored. Real estate, construction, hardware equipment, utilities (like power, water, cooling), networking, and software services are among the elements that make up its value chain. The digital data and applications are stored on cloud servers in DC and accessible to users via broadband connectivity. Servers at these DCs, compute and process the relevant data in response to user requests, making the desired information available to the user. Because of the critical role that DCs play in this digital age, the development of local DC ecosystem is a top priority for both commercial companies and governments worldwide.

1.7 The Indian DC industry is expanding rapidly. India has become a fast-growing Data Centre hub thanks to a massive and growing internet userbase, explosion of data, and establishment of a favourable environment through the government's Digital India initiative. According to an analysis on the Indian DC market, this sector would grow at a CAGR of 12% through 2026[1] with emerging trends and technologies fueling this expansion.

[1] http://https//www.dqindia.com/trends-that-will-cascade-and-crystallize-growth-in-dcs/#:~:%20text=A%20report%20on%20the%20Indian,continue%20to%20impact%20across%202022

Content Delivery Network (CDN)

1.8 A CDN is a system of dispersed servers and networks that provide pages and other web content to a user, based on the user's geographic location, the webpage's origin, and the content delivery server. A CDN keeps a cached version of its contents in many geographical locations (Points of Presence or PoPs) to reduce the distance between the user's computer and the website's server. Each PoP has many cache servers that are in charge of delivering material to users in the area. The set of servers in a CDN works together to provide internet content quickly. CDNs have evolved as an excellent internet overlay network to render high quality, feature rich support for providing commercial content services compared to what the erstwhile simple, best-effort internet packet transport services could offer.

1.9 CDNs have grown in prominence in recent years, and they now transport the considerable amount of online traffic, including traffic from large websites like Amazon, Facebook, and Netflix. Furthermore, a well-built CDN may aid the protection of websites from some of the most typical malicious cyberattacks. The Indian content delivery network (CDN) market is predicted to grow to a value of USD 49.61 billion by 2026, at a CAGR of 27.30%, over the forecast period (2021-2026)[2].

Interconnect Exchange Points (IXP)

1.10 IXP is a technological facility that enables connections between various network members to route traffic swiftly and cost-effectively. They're essentially big local area networks made up of Ethernet switches that are linked. ISPs and CDNs use the IXPs to connect their networks locally. This results in a smoother internet, better international bandwidth usage, and lower interconnection costs and delay. IXPs can operate in a Not-for-profit (e.g., industrial groups, academic institutions, government agencies) and for-profit model. While offering

[2]https://www.mordorintelligence.com/industry-reports/content-delivery-market

public, neutral peering services, IXP operators may also offer commercial value-added services (VAS), such as security, cloud access, transportation services, synchronization, and caching.

1.11 Data Centres hosting CDNs are connected to each other and the internet cloud via IXPs. To enable the access to the content of a parent CDN or website hosted on an international DC, global IXPs interconnect with the local IXPs to pass the traffic to the Indian DCs and thereby to the child CDNs. ISPs provide the last mile connectivity to users for accessing the services. A CDN pays ISPs, carriers, and network operators for hosting its servers in their DC.

Data Ownership, Data Portability and Data Ethics

1.12 As data is so pervasive in today's world, the issue of protecting users' personal data is a major concern for everyone. Data collection, generation, analysis, and dissemination, both structured and unstructured, have the potential to harm individuals and the society. As a result, it is necessary to look at issues related to a telecom subscriber's control over their data and how secure portability of trusted data between TSPs and other institutions can be ensured. For a thriving data economy, it is equally important to address issues related to data ethics as well.

The Consultation Process

1.13 Out of the notable key drivers for boosting the data economy of India, as shown in Figure 1.1, the Authority (TRAI) has already addressed some of the issues through its following recommendations:

1) Recommendations on Privacy, Security, and Ownership of the Data in the Telecom Sector dated 16th July 2018.
2) Recommendations on Cloud Services dated 16th August 2017 and 14th September 2020.

1.14 However, not much work has been done in respect of regulatory framework for Data Centres, Content Delivery Networks, and Interconnect exchanges in India. National Digital Communications

Policy (NDCP-2018) seeks to unlock the transformative power of digital communications networks to achieve the goal of digital empowerment and improved well-being of the people of India. The missions envisaged in the policy are as follows:

1) **Connect India:** Creating robust digital communications infrastructure to promote 'Broadband for All' as a tool for socio-economic development.
2) **Propel India:** To harness the power of emerging digital technologies, including 5G, AI, IoT, Cloud, and Big Data to enable the provision of future-ready products and services; and to catalyse the fourth industrial revolution (Industry 4.0) by promoting Investments, Innovation and IPR generation.
3) **Secure India:** To secure the interests of citizens and safeguard the digital sovereignty of India with a focus on ensuring individual autonomy and choice, data ownership, privacy, and security, while recognizing data as a crucial economic resource.

1.15 Under the Propel India mission, various strategies have been laid out in the Policy. Strategy no 2.2 mentioned under the Propel India mission relates to *'Ensuring a holistic and harmonized approach for harnessing Emerging Technologies'*. Under this strategy, provision number 2.2(f) envisages:

2.2 (f) Establishing India as a global hub for cloud computing, content hosting and delivery, and data communication systems and services.

1.1 Evolving enabling regulatory frameworks and incentives for promoting the establishment of International Data Centres, Content Delivery Networks, and Independent Interconnect exchanges in India.

1.2 Enabling a light-touch regulation for the proliferation of cloud-based systems.

1.3 Facilitating Cloud Service Providers to establish captive fiber networks.

1.16 The government has proposed to formulate a scheme to incentivize investments to set up hyper-scale Data Centres in India and boost the

capacity of the existing Data Centre ecosystem. MeitY, in November 2020, had released the draft Data Centre policy, which proposed to designate Data Centres as infrastructure and group Data Centres under the essential services category, among other measures. The draft document proposes a policy, including various structural/regulatory interventions, investment promotion in this sector, and seeks to strengthen the *"Atmanirbhar Bharat"* initiative by identifying possible opportunities for manufacturing Data Centre equipment in the country. The draft policy document discusses issues at a macro level, and it may be followed by a detailed implementation scheme. Keeping in mind the above-mentioned NDCP provisions and need for pronouncing concrete action points for making India a global Data Centre hub, the Authority had taken up this initiative on suo moto basis to issue a consultation paper on '*Regulatory frameworks for promoting data economy through establishment of Data Centres, Content Delivery Networks and interconnect exchanges in India*'. This consultation paper (hereinafter referred to as CP) was issued by TRAI on 16 December 2021. Its purpose was to seek views of the concerned stakeholders on promoting the establishment of (i) Data Centres, (ii) Content Delivery Networks, and the (iii) Internet Exchange Points in the country and connected issues.

1.17 Written comments and counter comments on the consultation paper were invited from stakeholders by 13th and 27th January 2022 respectively. In view of the onset of the third wave of COVID-19, the date of submission of comments and counter comments was extended to 10th and 24th February 2022 respectively.

1.18 This consultation elicited numerous responses. Comments were received from 33 stakeholders and counter comments were received from 9 stakeholders. On this issue, an Open House Discussion (OHD) was conducted on 06/05/2015. Based on the written submission of the stakeholders, the discussions in the OHD and the Authority's own analysis, the issues have been examined, and these recommendations have been framed.

1.19 Chapter 1 of these recommendations provides a brief background to the subject. A detailed analysis of the issues raised on Data Centres in the consultation paper, along with the Authority's recommendation have been dealt with in Chapter 2. Chapter 3 and 4 comprise of a detailed review of issues raised along with the Authority's recommendation on Content Delivery Network and Interconnect Exchange Points respectively. Chapter 5 comprises of detailed analysis of issues raised on "Data Ethics - Privacy, Ownership and Security" along with the Authority's recommendation. While finalizing the recommendations contained in Chapter 2 to 5 respectively, the authority has taken a holistic view of the emerging needs of the DC, CDN and IXP sector. Chapter 6 summarizes the recommendations. The Authority is of the view that an early implementation of these recommendations in totality will accord due impetus to the envisaged orderly growth of DC, CDN and IXP in the country. The Authority is also of the view that the recommendations related to DCs are very detailed and will further supplement the Data Centre policy initiative of the Government.

CHAPTER 2

DATA CENTRES

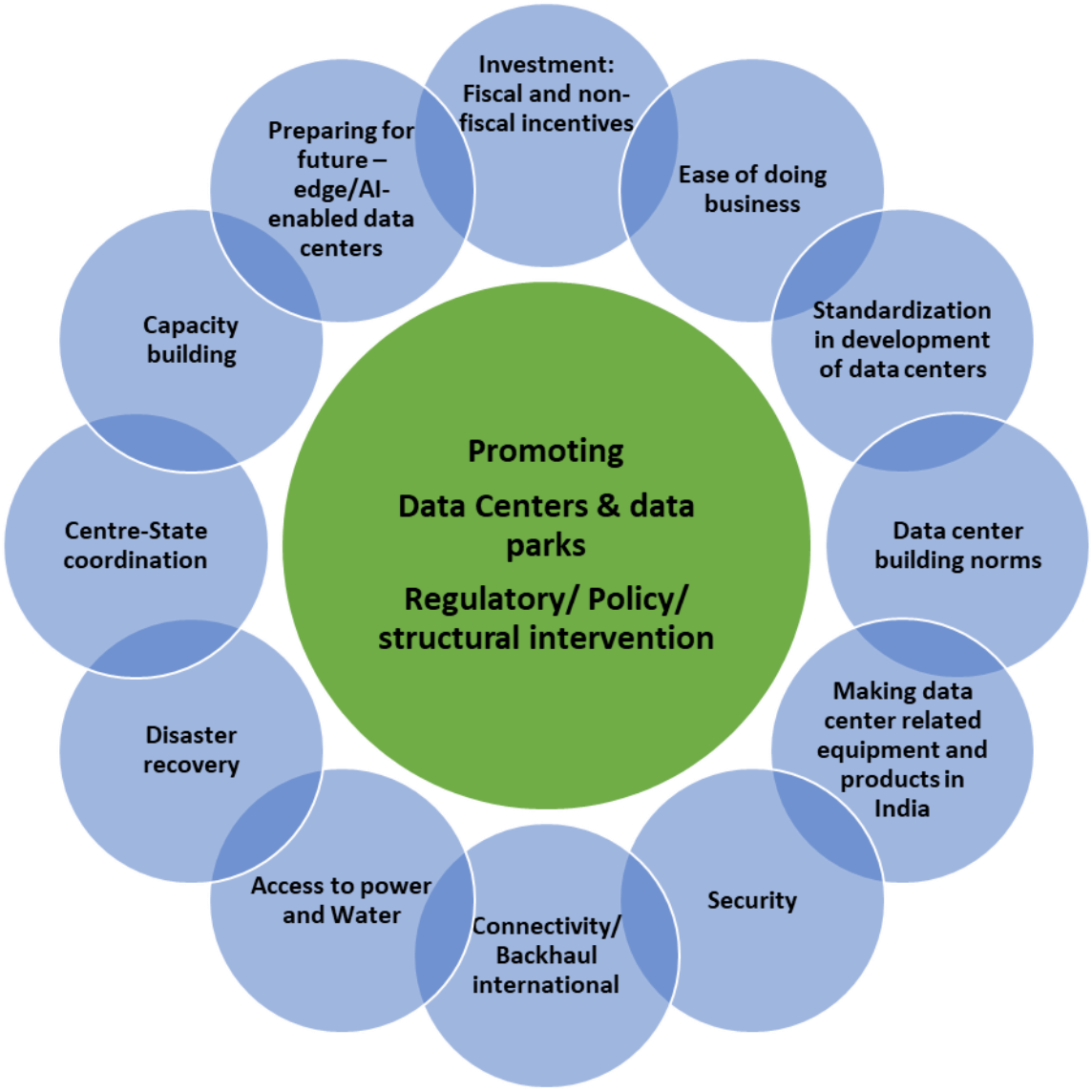
2.1 The DC sector is witnessing a significant growth in the country. It is becoming a basic digital infrastructure driving economic growth and, in the process, generating large-scale investments and jobs. Routers, switches, firewalls, storage systems, servers, and application delivery controllers are the main components of a DC design. These components are responsible for storing and managing mission-critical data and applications. The increased application of new technologies like 5G, edge computing & the IoT and government initiatives such as Digital India, emphasize on self-reliance and data protection through data localisation are likely to result in transformation from captive to colocation Data Centres[4]. In India also, colocation service model is witnessing growth.

2.2 Data Centres have evolved significantly in recent years. In the past, they were highly controlled physical infrastructures, but the adoption of the cloud has changed that model. When enterprises migrate their data and applications to cloud, these reside in physical infrastructures present across Data Centres. As the data markets continue to move toward on-demand services, the infrastructure has shifted from on-premises servers to virtualized infrastructure that supports workloads across both the physical infrastructure and cloud environments.

2.3 The Government of India is also becoming increasingly reliant on Data Centres for the Government-to-Citizen (G2C) delivery platforms, such as the National e-Governance Plan (NeGP), e-visa, and National CSR Data portal. However, factors like high upfront costs, higher power tariffs, maintenance-related issues, security, and high real estate costs need to be addressed to ensure further growth of Data Centres. Lack of status as infrastructure to DCs, complex clearance processes, time-consuming approvals, lack of published standards, absence of specialized building norms for building the Data Centres, geographically limited submarine cable network connectivity, high cost

of capital and operational expenditure, etc. are other known issues that need to be addressed for the growth of DCs. Various elements that need to be taken care of, for promoting growth of DCs and DC parks are shown in Figure 2.1 and are discussed in the following paras:

Figure 2.1: Various elements for promoting Data Centres and parks



2.4 In India, the DC business has made considerable strides. Both foreign and Indian players have either launched DCs or announced significant DC investments in major cities in India. DC sector is benefiting from increased local and international demand from sectors such as banking, financial services, telecommunications, technology, and

infrastructure. The existence of well-trained and skilled personnel further helps the growth. The creation of DC parks will also lead to investments and growth of companies that provide DC solutions such as cooling, reliable electricity, and high-speed internet connectivity.

2.5 Globally, DC investments have grown significantly in the past years. The government of Singapore has placed an embargo on the construction of new DC on the island, reversing the trend of DC proliferation there. This restriction resulted in a noticeable impact on the proliferation of greener and more power efficient DCs in Southeast Asia, especially in India.

2.6 Owing to rapid digital development, data localization regulations are gaining traction across the globe, such as Personal Data protection Law of Kingdom of Saudi Arabia, reform of Russian data protection and information laws, General Data Protection Regulation (GDPR)in Europe and Cybersecurity Law in China. With many firms retiring captive DC and migrating to the cloud, the need of data localization and to protect data privacy has grown increasingly critical in the context of organizations, especially considering emerging threat scenarios and likely data breach.

2.7 Land, Power, Telecom, IT Element/Networks, and Ease of Doing Business (EoDB) are the critical attributes of a Data Centre. A new Data Centre requires close to 30 approvals/permissions[3] from different central and state government departments before a Data Centre can start its operations. Promoting ease of doing business in itself is one of the most important non-fiscal incentives that a government can offer to Data Centre players. The CP had brought out practices/policy initiatives (including various fiscal and non-fiscal incentives) that have been adopted in various countries to promote DCs.

[3]https://community.nasscom.in/sites/default/files/report/25264-nasscom-recommendations-data-centre-policy.pdf NASSCOM: Recommendations for Data Centre Policy

2.8 In view of aforesaid, following issues were raised in the consultation paper for comments of the stakeholders:

1. *What are the growth prospects for Data Centres in India? What are the economic/financial/infrastructure/other challenges being faced for setting up a Data Centre business in the country?*
2. *What measures are required for accelerating growth of Data Centres in India?*
3. *How Data Centre operators and global players can be incentivized for attracting potential investments in India?"*
4. *What initiatives, as compared to that of other Asia Pacific countries, are required to be undertaken in India for facilitating ease of doing business (EoDB) and promoting Data Centres?*
5. *What specific incentive measures should be implemented by the Central and/or the State Governments to expand the Data Centre market to meet the growth demand of Tier-II and Tier-III cities and least focused regions? Is there a need of special incentives for establishment of Data Centres and disaster recovery sites in Tier-II and Tier-III cities in India? Do justify your answer with detailed comments.*

Comments of the stakeholders on growth prospects of DCs and challenges faced

2.9 Majority of stakeholders have expressed that the growth prospects of DCs in India are good. The associations and TSPs are of the opinion that increased internet penetration amongst all strata of the society, migration from captive DC infrastructure to cloud infrastructure by business enterprises, proposed data sovereignty law and its likely implication of mandatory onshoring of domestic data are the key contributors of growth of DCs in India.

2.10 A few stakeholders have also opined that rising domestic data consumption per subscriber as witnessed due to pandemic induced lockdown in the recent past, government initiatives like Digital India, National e-Governance plan and e-visa, rise in digital commerce usage, escalated growth and use of futuristic data intensive technologies like AI, ML, Big Data, IoT, edge computing, 5G and recently introduced moratorium on new DCs by Singapore due to environmental concerns

are going to boost the prospects of DC expansion and proliferation in the country.

2.11 In response to the challenges faced for setting the DC business in India, the received responses are as mentioned below: -

i. A few stakeholders and associations have cited reasons like enormous power consumption requirements for DC operations, inadequate and unreliable power supply infrastructure, relatively high-power tariffs, heavy reliance on diesel generators (DG) for DC operations, prevailing issues regarding sourcing of sustainable green power for DC operations, and high cost of secondary batteries for power storage under extant power related challenges prevailing in the country.

ii. Few stakeholders were of the view that poor availability of pan-India terrestrial OFC network infrastructure coupled with poor quality OFC connectivity, sole dependence on IP-I and licensed TSPs for connectivity between DC to DC and DC to Cable Landing Station (CLS), high cost of right of the way (RoW) permissions for laying of terrestrial OFC, lack of required skillsets for DC operations and no separate categorization of DC building under NBC and long outstanding formulation of India-specific DC building standards are some of the prevailing infrastructure related challenges in India.

iii. Few DC operators as well as TSPs are of the view that exorbitant land costs coupled with non-availability of suitable land parcels in desired cities where demand exists, enormous capital investment, uncertainty over extension of fiscal and non-fiscal incentives to foreign investors/stakeholders in Indian DCs are some of the major economic and financial challenges for growth of DCs in the country.

iv. Some stakeholders and associations opined that lack of clarity on prospective data protection bill (DPB) and the manner in which the domestic and foreign data will be treated post its promulgation i.e., likely mandatory onshoring of domestic data and prevailing uncertainty over accord of very broad exemption standards to state law enforcement agencies under Section 35 of the bill, enabling them

to carry out surveillance may pose data security related challenges for setting up DC business in the country.

v. Majority of the stakeholders and associations are of the opinion that lack of a national level policy framework for establishing DCs in India, prolonged time taken in processing pre-commencement and post-commencement approvals for DC and non-availability of single window clearance mechanism at national level are the key procedural, administrative and policy related challenges to growth of DCs in the country.

Comments of the stakeholders on measures for accelerating growth of DCs in India

2.12 Citing the core issues, majority of the stakeholders have suggested some key policy-based measures as follows:

i. Support formulation of a uniform national DC policy with pan-India applicability, and a periodic review of proposed national DC policy to maintain its parity with global policies,
ii. Implementation of single window clearance for time-bound processing of pre-commencement and post commencement approvals,
iii. Accord of recognition to DC infrastructure under separate building code with NBC,
iv. Inclusion of DC under ESMA,
v. Ramping pan-India fiberization efforts,
vi. Formulation of policy for DISCOMs to ensure adequate and uninterrupted power supply to support DC operations with permission to establish dual electricity connection (each connection from alternate grid to cater for redundancy against grid level failure) at a DC.

2.13 Many stakeholders have suggested infrastructure improvisation related measures such as provision of dual water supply connection to DC, provision to make land parcels available to DC at choicest

locations (i.e., at close proximity to demand pockets), provisions to allow DC to lay captive OFC between DC to DC and DC to CLS.

Comments of the stakeholders on incentives and initiatives

2.14 On electricity usage and captive power generation issue, one stakeholder has proposed to implement 'Open Access Power Purchase and Trading Policy' across all states to allow DC to choose from a number of competitive power companies rather than being forced to buy and/ or trade power with the local utility monopoly. Many stakeholders have also suggested for provision of power to DC at industrial rates with accord of power tariff subsidy for initial 5 to 7 years of DC operation. It has also been suggested that deemed distribution and franchisee license for electricity may be given to DC Parks.

2.15 On fiscal incentivization, some stakeholders have suggested following measures:

i. Provision of land/ real estate for DC establishment at subsidized cost.
ii. Provision of GST holiday window for existing as well as upcoming DC coupled with 100% re-imbursement of GST component for initial 5 to 10 years of operation.
iii. DC registered under IT/ ITES to be exempted from octroi, local body tax, entry tax or any other cess as applicable.
iv. Provision for subsidy to be offered to DC on lease rentals, accord of import duty exemption to critical DC items, and accord of up to 50% rebate on building permit fee to DC.
v. Accord of fee waiver to DC on using part of existing industrial building and accord of stamp duty exemption.
vi. Exemption to DC from factories act, shop and commercial establishment act, labour act, and property tax on DC to be levied at residential rates.

Comments of the stakeholders on promoting DCs in India vis-à-vis APAC region

2.16 To promote DC operation in India compared to APAC regions, various associations and stakeholders have submitted several key measures to facilitate Ease of Doing Business (EoDB) as follows:

i. Constitution of a central level task force to engage with state government administrators to coordinate extension of benefits for promoting the development of local DC deployment and its management in respective states as well as digitization of all DC related approvals from the government with time-bound processing.
ii. Development of '*DC Readiness Index (DCRI) framework'* (akin to extant broadband readiness index) to rank various states based on availability of supporting infrastructure, forward looking polices and incentives to attract DC investment.
iii. Initiation of '*Performance Linked Incentivization*' (PLI) scheme under make in India initiative for promoting manufacturing of DC linked equipment in the country.

Comments of the stakeholders on establishment of data centres in Tier-II and Tier-III cities

2.17 Majority of the stakeholders including DC operators have stressed upon carrying out following measures to promote establishment of data centres in Tier-II and Tier-III cities:

i. Pan-India improvement in power infrastructure for uninterrupted power availability and stability with special emphasis on Tier II & Tier III cities.
ii. Ramping up of nationwide fiberization efforts to include laying out of high-quality low latency OFC.
iii. Developing SEZs in Tier II & III cities.
iv. Construction of highways and dedicated freight corridors connecting the abovementioned SEZs under PPP model to encourage DC investment in these locations.

v. Promoting establishment of new CLSs at cities other than Mumbai or Chennai, which will give due impetus to DC sector in Tier II & III cities.

2.18 Other stakeholders mostly comprising of associations have suggested for accord of following fiscal incentives such as:

i. Lower lease rentals and provision of subsidy in fuel in Tier II & III cities.
ii. Regulatory support along with incentives in form of RoW clearances for TSPs to extend OFC connectivity to Tier II & III cities.
iii. Extension of incentives under existing DC policies to existing network of edge DC and disaster recovery sites in these cities.
iv. Incentivization initiatives to upskill the human resource in such cities.

Analysis of the issues and views of the authority

2.19 The authority agrees with the views of stakeholders that there exist favourable growth prospects for proliferation of the DC industry in India. India has become a fast-growing DC market owing to a massive and continuously expanding internet user base, the explosion of data, and the creation of a favorable environment through the government's Digital India initiative. Business enterprises will accelerate the transition from captive to multi-tenant DCs as they react to a changing technology landscape. As a result, the DC market is anticipated to see an increase in enterprise use of "as-a-service" solutions. The major drivers of this adoption will be greater scalability and high-quality DC infrastructure.

2.20 The colocation DC sector in India is predicted to quadruple by 2023, to 1008 megawatts.[4] To fulfil this demand, the DC real estate sector needs to gear up to cater to the enormous a requirement of space.

[4]https://www.jll.co.in/en/newsroom/india-colocation-data-centre-industry-to-double-to-1008-mw-by-2023#:~:text=India's%20colocation%20data%20centre%20(DC,estate%2C%20as%20per%20JLL%20research.

2.21 Indian telecom companies, technology providers, and the telecom department are putting in necessary efforts to guarantee that India meets its countrywide 5G deployment objective by the second quarter of 2022. In this regard, TRAI has also released its recommendations on "*Auction of spectrum in frequency bands identified for IMT/5G"* on 11 April 2022. The massive amounts of data presently being created are likely to be further supplemented by 5G. Edge Computing will aid in the processing of this data as technology advances. Edge computing and 5G will co-evolve to use each other's strengths, with DC acting as a conduit between them. According to an estimate, a combination of 5G, Internet of Things (IoT), Artificial Intelligence (AI), and Cloud, will produce a demand for 15 to 18 million square feet space for DCs.[5]

2.22 As IT infrastructure of businesses get modernized, multi-cloud setup will become increasingly common. Multi-cloud allows businesses to choose from a wide range of products that are better suited to their enterprise needs, even though it adds some degree of complexity to the structure. India's strategic relevance in the APAC digital ecosystem, if aided by the availability of high bandwidth speeds, relatively low power prices, cutting-edge infrastructure, and the presence of hyperscale DC, can lead to India's rise as a DC hub. However, there are certain critical issues that need to be addressed at the national level to ensure that the growth prospects of DC market in India are not thwarted. These include, relatively poor power grid infrastructure, non-availability of nation-wide high bandwidth low-latency OFC infrastructure especially in Tier II/III cities and rural areas, lack of a national level DC framework, absence of a single window clearance mechanism with provision of time-bound clearance and lack of India specific standards of DC buildings with no separate building code.

2.23 MeitY in its draft Data Centre policy of November 2020, has mentioned that a Data Centre Incentivization Scheme (DCIS) will be formulated by Government of India which would specify the intended

[5]https://pdf.savills.asia/asia-pacific-research/india-research/poised-for-growth-data-centres-in-india-2021.pdf

beneficiaries, applicability criteria and fiscal and non-fiscal incentives for the sector. Incentives shall also be provided on usage of domestic IT hardware including servers, storage, network devices, etc. and non-IT equipment such as mechanical, electrical, plumbing, cooling equipment etc. MeitY policy also mentions that continuous functioning of Data Centres is critical for continued delivery of services and to maintain the normalcy of day-to-day activities. Inclusion of Data Centre as an Essential Service under "The Essential Services Maintenance Act, 1968 (ESMA) will enable seamless continuity of services even during times of calamities or crisis.

2.24 As per allocation of business rules, 'data' is allocated to Department of Telecommunication (DoT). However, policies related to DCs are being handled by MeitY. The Authority is of the opinion that Data Centres, Content Delivery Networks, and Internet Exchange Points (IXPs) are integral components of "digital communication infrastructure and services". The policy aspects of these should be handled by Digital Communication Commission (DCC). In the converged technological environment, it is not in the interest of a sector that it is handled by different ministries and hence, there is a need of a converged policy and regulatory environment for managing growth of this sector. Authority is handling the issue of convergence through a separate consultation paper.

2.25 The Authority has brought out in the CP that certain states in India have released their DC policy while others have issued policy pertaining to promotion of IT/ITES in the state with DC operations pegged under it. In the USA, several State Governments offer low property and sales tax rates on power infrastructure, equipment, and electricity to attract Data Centres, subject to certain investment and employment thresholds. Many countries in one or other way are providing incentives/tax benefits to promote Data Centre sector. Similarly, some states in India like Maharashtra, Telangana, Gujarat, and Andhra Pradesh have formulated their own state DC policies and are already providing considerable incentives in their state-level

policies. For instance, the Maharashtra Government announced the GST refund for a maximum period of 10 years for the companies that participate in the development of integrated facilities. Similarly, the Andhra Pradesh Government announced a 50% reimbursement of SGST on the purchase of raw materials and equipment for three years from the date of approval of the project. **Annexure-I** summarizes fiscal and non-fiscal incentives offered by some of the states in India for establishing data centres. Some of the fiscal and non-fiscal incentives that the states are giving have been listed in table below:

Table 2.1 –Fiscal and non-fiscal incentives offered by States (illustrative only)

Non- Fiscal incentives	Fiscal incentives
1. DC industries are classified under ESMA act 2. 24x7 water supply 3. Special provisions in building norms 4. Open access system to purchase power, deemed distribution license, deemed franchisee status, 24x7 power supply, etc. 5. Exemption from inspections under factories, wages acts, etc. 6. Preference in public procurement 7. Power and internet facilities to edge DCs 8. Single-window approvals and permits for companies willing to establish captive firms 9. RoW provisions for laying OFC to and from DCs 10. Exemptions from provisions of factories act; shops and commercial establishment act; labour act, etc. 11. Waiving of import restrictions on essential Data Centre operational equipment.	1. Power tariff subsidy 2. Reimbursement of electricity duty paid 3. Electricity tariff – power supply at industrial rates 4. Exemption from wheeling/ transmission charges 5. Establish dual power grid networks, renewable energy under open access system, provide power at the cost of generation 6. Registered IT/ITES units shall be exempt from octroi/Local Body Tax (LBT)/entry tax/escort tax or any other cess 7. Allowing setting-up of IT/ITES units in any zone 8. Allotment of Govt. land based on eligibility criteria 9. Land provided at a subsidized cost 10. Property tax levied at par with residential rates 11. Rebate on the building fees 12. Lease rental subsidy for eligible IT/ITES units 13. Capital subsidy in buildings and infrastructure 14. Interest subsidy 15. Reimbursement of stamp duty, conversion fee, transfer duty and registration fee

	16. VAT/CST/GST reimbursement 17. Patent assistance in form of reimbursements 18. Internet bandwidth subsidy

2.26 The Authority has analyzed the fiscal and non-fiscal incentives being extended for promotion of the DC sector in the states and has noted that there is disparity in the quantum of incentives offered by the states as can be seen from the comparative summary shown in Table 2.2.

Table 2.2 – Comparative summary of incentives offered by States to Data Centres

States	Land Subsidy	Stamp Duty Exemption	Building Fees Subsidy	Electricity Duty Waiver	Patent Filing Cost	Considered under Essential Services	Interest Subsidy	Other Subsidies/ Exemption	Other Incentives
Maharashtra	N/A#	Y* (100%)	N/A	Y (10 years)	N/A	Y	N/A	Exemption from octroi / Local Body Tax (LBT) / entry tax / escort tax	Power Tariff Subsidy
Telangana	Y	Y (100%)	Y (50%)	N/A	Y (up to INR 2 lakh)	Y	N/A	100% exemption from transfer duty and Registration fee.	Lease Rentals (25% for3 years), exemption from Power Cuts, Inspections under Factories Act; Wages Act; Shops and Commercial Establishment Act
Gujrat	N/A	Y (100%)	N/A	Y (5 years)	Y (75%)	N/A	Y (up to INR 2 lakh per year)	Capital subsidy @ 25% of capital expenditure	Lease Rental Subsidy, Skill Certification Grant, Marketing & Product Development Assistance, Matching Equity Support
Odisha	Y (Linked with employee strength)	N/A	Y (50%)	Y (5 years)	Y (75%)	Y	Y (50%)	Internet Bandwidth Subsidy (50%),	Exemption from Odisha Shops and Commercial Establishment Act (section 9, 10, 11 and 23),

Uttar Pradesh	Y (Linked with location)	Y (100%)	N/A	Y (10 years)	N/A	N/A	N/A	Interest subsidy (up to INR 50 crore), Capital subsidy (7%), Transmission & Wheeling Charges (50% for 25 years)	Uninterrupted water supply, exemption from Inspections under Factories, Wages acts
West Bengal	N/A	Y (100%)	N/A	Y (5 years)	N/A	Y	N/A	N/A	Uninterrupted power, water supply & internet connectivity; special provisions in building norms.

Notes: * - Y = Yes # - N/A = Not Available

2.27 While fragmented and state-centric individualistic approach can go against projecting India as a promising DC destination to the international diaspora, the Authority also understands that there may be constraints in offering similar incentives across all states. The Authority is of the opinion that though fiscal benefits can be offered for a limited period to attract investments; but it is not prudent to continue them on a perpetual basis. Whenever, the fiscal benefits are withdrawn, the profitability of the industry is affected adversely resulting in either closing the business or moving it to greener pastures that are still offering those incentives. It's the non-fiscal benefits including ease of doing business that helps in creating the conducive environment for attracting investments.

2.28 **The Authority therefore recommends that as part of Data Centre Incentivization Scheme (DCIS), the Government of India should define certain fiscal and non-fiscal incentives for the sector that should be made applicable across all states while leaving the flexibility to the states to announce further fiscal and non-fiscal incentives through their policies. Accordingly, Government should spell out two lists of incentives for Data Centre and DC Park operators. The list of the Central Government will contain Centre specific incentives. The other should be in form of guideline for the States for adoption by them.**

Recommendations on specific incentives that can be included in the two lists have been provided in the subsequent sections.

2.29 The DCs provides crucial information infrastructure 24 hours a day, seven days a week, 365 days a year. The continuing delivery of services and the regularity of day-to-day activities are dependent on relentless yet uninterrupted operations of a DC. Its therefore imperative to ensure smooth service continuity of Data Centres even during disasters or crises. Several states have Essential Services Maintenance Acts that cover various utility services to ensure their continuity. Data Centres are nerve Centres where data and applications of various critical sectors are hosted including utility sector, finance, health. Any discontinuity in service at Data Centres can adversely impact the service delivery across several sectors to which they cater. However, the decision on applicability of a State specific Act rests with the States.

2.30 **The Authority recommends that guidelines for States DCIS should enlist inclusion of Data Centres as an essential service under respective Essential Services Maintenance Acts of the states as one of the items. For incorporating in DCIS guidelines for States, the Authority also recommends inclusion of DCs in the list of exemptions from inspections under provisions of the Factories Act, 1948, Shops and Commercial Establishment Acts, other labor laws, and laws on wages.**

2.31 The Authority also understands that leaving implementation of certain incentives or facilitators for establishing DCs at the hands of states will result in a mix bag of response from them. While some of the states have already been proactive in implementing policies to attract investments in the DC sector, many others are yet to recognize the importance of the sector. This is resulting in asymmetrical concentration of DCs within few states and the divide can widen in future. This is a matter of concern and Authority feels that the State Governments should be sensitized on the issue.

2.32 For the same, **the Authority recommends a two-prong approach – A) As part of these recommendations, the Authority recommends operationalizing a Data Centre specific portal on National Single Window System (NSWS) for various time-bound single window clearances (refer para 2.233). The portal should also list out all policy initiatives and benefits offered by individual states for DC sector. States should be enabled to upload and update the benefits offered as per their policies on this portal. A comparative statement of such benefits and the time taken for issuing clearances on the portal should be displayed to sensitize the states and infuse competitive spirits amongst them.**

2.33 The Authority also agrees with suggestion of stakeholders for formulating a *DC Readiness Index (DCRI) framework* for the ranking of various Indian states as per their suitability to attract DC investment.

2.34 **The Authority recommends that a national level DCRI (Data Center Readiness Index) framework be implemented by Central Government to rank Indian states as per their policy and regulatory environment to promote the DC sector. The Data Centre Industry Council (DCIC) proposed to be formed under MeitY's draft DC policy, should be entrusted with the work of finalizing the parameters, their weightages, and methodology for giving marks against each parameter. However, an indicative list of parameters and their weightages for ranking the states is suggested below:**

S. NO.	PARAMETER	SUGGESTED WEIGHTAGE (%)
STATUTORY CLEARANCE & EODB (35%)		
1	States giving separate category/ recognition to DC/DC Parks building infrastructure vis-à-vis commercial office buildings or malls within the state in the building byelaws of the state.	**8**
2	Performance of states to grant permissions for establishing DC/DC Parks on centralized online portal within specified timeline	**10**

3	States categorizing DC/DC Parks for exemption from inspections under provisions of various Acts/Laws related to factories, Shops and Commercial establishment, and Labour & Wages	**5**
4	States categorizing DC/DC Parks as 'Essential Services' in respective Acts	**5**
5	Availability of Free ROW permission for laying OFC for connecting DC/DC Parks	**5**
6	Data Centre building norms included in building norms of State policy	**2**
FISCAL INCENTIVES (25%)		
7	Various fiscal incentives offered to DC/DC Parks	**12**
8	Whether Capital and interest subsidy offered to DCs and DC Parks	**10**
9	Whether Capital and interest subsidy or any other fiscal incentive linked to Green Data Certification	**3**
INFRASTRUCTURE RELATED (15%)		
10	Pre-provisioned availability of DC parks with the requisite infrastructure supply to host multiple DC **OR** Availability / identification of land for DCs/ DC Parks	**10**
11	Whether available Land in DC Parks or otherwise is being offered at special rate	**5**
POWER RELATED (17%)		
12	Separate lower/ Special power tariff for DCs/DC Parks	**5**
13	Waiver of Electricity Duty for DC/ DC Park	**3**
14	Ab-initio availability of Power supply from dual power grid networks for DC/ DC parks	**4**
15	Permission to DC/DC Parks to consume Renewable Energy directly from power producers via open access system, with no restrictions and additional surcharge	**3**
16	Whether fixed demand charges on electricity have been waived off	**2**
WATER RELATED (8%)		
17	Policy for making available redundant/alternate water supply to DC/DC Parks	**3**
18	Declare water supply to DCs and DC Parks as special purpose supply and not subject to any interruption	**3**
19	Separate lower water charges for DC/DC Parks	**2**
TOTAL		**100**

2.35 Authority has noted that six states have aligned themselves to single window clearance system in their notified rules. However, the pre-commencement and post-commencement approval procedures for DCs are complex, time-consuming and need to be digitized and transposed online for time-bound single window deemed clearance in absence of any major observations.

2.36 A new Data Centre requires close to 30 approvals/permissions[6] from different central and state government departments before a Data Centre can start operations. For instance, **Annexure II** shows the large number of clearances required to build a Data Centre even in a Tier 1 city like Mumbai, Delhi-NCR, Bengaluru, Chennai, etc. The land acquisition process faces bottlenecks of multiple clearance/compliance, several restrictions based on building codes, industrial zones, etc. Approvals and land acquisitions continue to challenge the Data Centre project propositions, leading many international cloud providers to reconsider their capacity expansion plans in India. Accordingly, specified timelines for clearance should exist to prevent delays. Promoting ease of doing business, in itself, is one of the most important non-fiscal benefits that the government can offer to Data Centre players. Accordingly, MeitY's draft policy on Data Centres discusses the issue of simplifying clearances through a single window, time-bound clearance system by State Government/Union Territories. It also mentions publishing a list of approvals/clearances required with the defined timelines to obtain the same.

2.37 The Authority has noted that National Single Window System (NSWS) that has been conceptualized and announced by the Department for promotion of Industry and Internal Trade (DPIIT). NSWS will enable investors/entrepreneurs/businesses to identify and obtain all clearances needed to start a new business operation in India through

[6] https://community.nasscom.in/sites/default/files/report/25264-nasscom-recommendations-data-centre-policy.pdf NASSCOM: Recommendations for Data Centre Policy

a single online portal. This platform provides the investors with information on pre-operations approvals required to commence a business. Currently, the portal has more than 568 approvals/licenses from across 31 central ministries/departments and approvals/licenses from across 17 states. The ministry-wise approvals, which are onboarded, are identified as most critical, critical, and non-critical. Invest India, under the guidance of DPIIT, is managing the Maadhyam (NSWS) project and is involved in onboarding various ministries and states on the portal. In addition, the NSWS will systematically integrate with existing State Single Window Systems as well. From the portal, 45 approvals of the Department of Telecom and 19 approvals of the Ministry of Information and Broadcasting have been identified and are being integrated on the portal.

2.38 Accordingly, **Authority recommends that all the permissions/clearances required by Centre/States/UTs to build and operationalize a Data Centre should be listed on National Single Window System (NSWS) and such permissions/clearances should be given through this portal within prescribed timelines. The various permissions should be categorized as most critical, critical, and non-critical categories. It is recommended that all such permissions that fall under the non-critical category be deemed to have been granted after the prescribed timelines elapse. The Authority further recommends that NSWS portal should be interactive in nature, with provision to use new technologies like Artificial Intelligence, Machine learning etc. to facilitate active interaction (including FAQs) between stakeholders and states with provisions to raise queries/grievances and seek responses/resolutions etc.**

2.39 Authority has noted that currently in India, there is no proper mechanism to capture the number of data centres that are installed. As per one of the websites, India is ranked ninth worldwide based on

the density of data centres[7]. As per this site, as of August 2022, there are 133 colocation data centres and 516 cloud service providers in India. Focus of Data Centre players has primarily been on Tier-I cities like Mumbai, Delhi-NCR, Bengaluru and Chennai for various reasons like the presence of robust connectivity, uninterrupted power supply, excellent local market, availability of skilled manpower, etc. Table 2.3 gives a distribution of Data Centres in major cities in India as per this site. As there is no authentic mechanism currently in place to capture details of all DCs in India, the authority would like to state that the below mentioned information on DCs may not reflect the actual position of DCs in the country

Table 2.3 Distribution of Data Centres in major cities in India[8]

Location	No. of DCs	Capacity installed (in MW) in top 7 cities[9]
Delhi-NCR	22	72
Bengaluru	20	162
Chennai	13	57
Pune	6	32
Mumbai	33	289
Coimbatore	1	-
Kolkata	6	5
Hyderabad	11	38
Other cities	21	-
Total	**133**	**655**

2.40 It is evident that coastal states (where there is with no dearth of water and which can also be near to submarine cables) like West Bengal, Odisha, Telangana, Andhra Pradesh, Kerala, Goa, Gujarat, etc. have very scanty data centre footprint. Further, states in the hinterland like Chhattisgarh, Jharkhand, Bihar, Uttar Pradesh, Madhya Pradesh and hilly regions of north and northeast show clear lack of Data Centres

[7] https://discover.cloudscene.com/market/data-centres-in-india/all

[8] https://discover.cloudscene.com/market/data-centers-in-india/all

[9] https://www.cushmanwakefield.com/en/india/insights/whats-next-for-data-centres-in-india

presence, though there is a substantial internet penetration and digital services explosion in those regions now.

2.41 As per another source, as of June 2022, there are 164 co-location Data Centres from 26 areas in India[10].

Data Centres in India (Location Wise) *(Source:dataCentremap.com/India/)*		
Ahmedabad (7)	Guntur (1)	Mumbai (22)
Alappuzha (1)	Gurgaon (3)	Nashik (3)
Alwar (1)	Hyderabad (12)	Nashik (3)
Amaravati (1)	Indore (2)	Navi Mumbai (6)
Bangalore (28)	Jaipur (7)	New Delhi (17)
Chennai (13)	Kolkata (8)	Noida (7)
Cochin (4)	Lucknow (1)	Pondicherry (1)
Coimbatore (3)	Ludhiana (1)	Pune (10)
Faridabad (1)	Madurai (1)	

2.42 Based on this information, some of the states have no major DC presence. The table below lists such States which has major DC presence as well as those that are lagging behind.

Table 2.4 States where DCs are installed and those that are lagging

States where major DCs have been established	**States that are lagging in DCs**
Gujarat	Arunachal Pradesh
Kerala	Assam
Rajasthan	Bihar
Maharashtra	Chhattisgarh
Karnataka	Goa
Tamil Nadu	Himachal Pradesh
Haryana	Jharkhand
Andhra Pradesh	Manipur
Haryana	Meghalaya
Telangana	Mizoram
Madhya Pradesh	Nagaland
West Bengal	Odisha
Uttar Pradesh	Sikkim
Punjab	Tripura
Delhi	Uttarakhand

[10] https://www.dataCentremap.com/india/

2.43 As mentioned previously, in absence of formal mechanism to register DCs, the Authority has no mechanism to authentic this data. Therefore, the above table may not reflect the actual position of establishment of DCs in various states.

2.44 Whilst the data requirements of Tier-II and Tier-III cities are on the rise, there will be an increased demand for rapidly deployable smaller colocation Data Centres built closer to smaller cities. Building Data Centres in new Tier-II cities where internet use is booming is also a strategic business move, as it would help in easing congestion and speed up internet services, creating increased opportunities for edge DCs in the country. Tier II and Tier III locations offer significant cost advantages and have the potential to overtake Tier-1 cities, especially because of the low labour costs, manpower requirement of the industry, and economically valued real estate available in those regions. Favourable policies offered by States can also play a part in attracting investment in the establishment of DCs. The Authority feels that if the digital infrastructure creation is not supported in the States that lacks the same, the digital divide will further increase. Also, the investments will keep flowing into industrially advanced states and the backward states will remain where they are.

2.45 **The Authority therefore recommends that the Central Government should prepare guidelines listing out the incentives for the Data Centres and DC Parks for the states that have scanty DC footprints, in line with other advanced states. The scheme should, inter-alia, offer incentives in form of land, capital subsidy and Interest subsidy. In such a scheme, while the land may be offered by respective states, the expenses on other offered incentives including capital and interest should have at least 75% contribution from central government. The proliferation of digital infrastructure in such states will not only help in boosting economy but will also promote other linked industries in these States.**

2.46 To keep track of the establishment of data centres and to make schemes to promote the sector, it is must that all data centres are registered with the Government. **The Authority therefore recommends that it should be mandatory for all existing and new DCs to register themselves online on the NSWS centralized portal. The data in respect of ownership, capacities and the benefits availed from the Government to establish the DC should be captured on the portal. The registration of DCs should be without any fee or any other obligation. The States should be asked to ensure that all existing DCs availing any benefits from States or even otherwise should register with NSWS centralized portal. Any recurring or new permissions to existing DCs must be processed only after verifying such a registration.**

2.47 The incentives and other related suggestions with respect to electricity, water supply, DC building code, Capacity building, telecom connectivity related issues have been separately dealt in subsequent sections.

Data Centre Parks

2.48 DC parks are specialized secure Data Zones strategically located with the most conducive non-IT and IT infrastructure, and regulatory environment for housing a mix of small scale/large scale clusters of DC to serve the high needs of computing, storage, networking, and the provision of a wide range of data-related services. DC Parks/Data Centre Special Economic Zones can be a good approach to stimulate the development of large-scale DC due to the services that are often provided to enterprises who build up DC inside such parks.

2.49 The development of DC Parks in India will boost the country's position as an economic Centre by inviting MNCs and firms to establish their headquarters and premium DC operations here. It will also assist in establishing the country as a digital hub by attracting world-class

Internet and media enterprises to host their content and services, resulting in increased internet traffic and international network providers. In the years ahead, this will bolster India's global interconnectivity and competitiveness.

2.50 In this background, following issue was raised in CP to get the opinion of stakeholders: -

6. *"Will creation of Data Centre Parks/Data Centre Special Economic Zones (SEZ) provide the necessary ecosystem for promoting setting up of more Data Centres in India? What challenges are anticipated/observed in setting up of new Data Parks/zones? What facilities/additional incentives should be provided at these parks/zones? Do give justification."*

Comments of the stakeholders

2.51 Majority of the stakeholders are of the view that the creation of DC parks/ DC SEZs will definitely provide the necessary ecosystem to promote setting up of more DCs in India. With the necessary permissions and infrastructure in place ab-initio, DC Parks will allow stakeholders to lease infrastructure and begin operations. This will also allow DC players to focus on technology while DC Park operators can focus on providing state-of-the-art infrastructure.

2.52 Most of the stakeholders have opined that the primary challenges observed in setting up of new DC Parks/zones are limited industrial real estate for space acquisitions and high real estate costs to develop them. Some stakeholders have also submitted the limited availability of road infrastructure, power infrastructure, water supply and fiber connectivity as other major impediments. A few stakeholders brought out the anticipated challenges in terms of disaster recovery and service continuity in case of a utility failure or any other disruption.

2.53 Few stakeholders are of the opinion that DC operators should be allowed to construct DC entirely driven by geographical location of consumer needs in the hinterland. While sector-specific incentives

should be extended to industry participants but, the choice of the DC location should be left to the DC operators. Further, DC Park locations should be determined based on the availability of resources for the local population, as DC require a significant quantity of electricity and water.

2.54 While suggesting additional facilities and incentives to be provided in DC Parks, stakeholders have submitted the following measures:

i. The government should enable DC investors in setting up pre-provisioned DC Parks in a 'plug and play' format.
ii. Subsidized land should be granted for big hyperscale data centre parks, and incentives provided to DC Park developers should also be offered to DC firms installing DCs in these parks.
iii. DC Parks should be coupled with renewable energy farms devoted to the DC for boosting the renewable energy industry in the country and minimize the DCs' reliance on traditional sources of power.
iv. Licenced TSPs should build high-capacity network backhaul in such DC parks. RoW charges for TSPs should be either subsidised or waived off.

Analysis of the issue and views of the Authority

2.55 The Authority agrees with stakeholders that the creation of DC/ DC SEZs will provide the necessary ecosystem to promote the setting up of more DCs in India. The government intends to encourage the private sector to build DC parks in major metropolitan cities, preferably in semi-urban areas as is evident from recent announcement in 2022 budget speech[11].

2.56 The Authority has also looked at international experience in this regard. The Singapore Economic Building Board, the Infocomm Development Authority of Singapore, and JTC Corporation collaborated on the development of a DC Park (DCP) to boost

[11] https://www.indiabudget.gov.in/doc/budget_speech.pdf

Singapore's position as an economic and information technology Centre. The DC Park was to cover around 13 hectare and may include six to eight DC buildings with up to 105,000 sq mt of DC rack space[12]. The key features include:

i. The DC parks infrastructure will be built to provide fully redundant and resilient configuration.
ii. Supporting infrastructure will be available and easily scalable for plug-and-play DC deployment.
iii. A dedicated on-site power plant will be built to meet the high-power requirements of next-generation DCs and ensure reliable power supply with minimal transmission losses.
iv. For the connectivity requirements of DCs, telecommunication infrastructure such as high-capacity fibre networks and Internet exchanges will be constructed.
v. Within DC parks, land plots will be demarcated and made accessible for DC investments. Using DCP's economies of scale, investors can easily establish their own DC plant, leveraging numerous supporting infrastructures to go to market quickly and decrease total capital investment and operational costs.

2.57 The National Development and Reform Commission (NDRC) of China has recently announced plans for 10 national DC mega clusters. The project will be able to extend effective investment by building DC around the country to connect investment from DC businesses, as well as promote coordinated regional development through the architecture of computing facilities.[13]

2.58 Korea Land & Housing (LH) and Korea Data Centre Council (KDCC) signed a Memorandum of Understanding (MoU) to establish a DC Park in South Korea. The two companies are collaborating with local power company Korea Hydro & Nuclear Power to construct a green energy-

[12] https://www.imda.gov.sg/programme-listing/data-centre-park
[13] https://en.ndrc.gov.cn/news/mediarusources/202203/t20220319_1319694.html

based data Centre complex that will employ energy efficiency and recycling techniques.[14]

2.59 MeitY's draft Data Centre policy mentioned that as a part of Central Sector Scheme - DCEZ Scheme, the Government of India also proposes to establish at least four (4) Data Centre Economic Zones (DCEZ) across the country. These DCEZs would be specialized Data Zones with the most conducive non-IT and IT infrastructure, connection, electricity, and regulatory environment. The planned Data Centre Economic Zones will establish an ecosystem of Hyperscale Data Centres, Cloud Service Providers, IT firms, R&D units, and other connected businesses. The DCEZ Scheme will be implemented by inviting state proposals. However, the Authority feels that some of the States that are already proactive in announcing DC policy might end up submitting proposals for establishing DC Parks.

2.60 The Uttar Pradesh Government plans to develop a Data Centre Park which will be set up near Greater Noida. Another entity in this space has signed an MoU with the Government of Tamil Nadu to set up a Data Centre Park in Chennai. Similarly, the Andhra Pradesh government has accorded clearance to set up an Integrated Data Centre Park, Integrated IT and Business Park, and Recreation Centre in Visakhapatnam.

2.61 DC Parks are included in the Tamil Nadu DC Policy 2021, with a provision to provide land, park area (water, sewage, road, parking, green area, etc.), and DC essentials setup / equipment (electricity, network / fiber connectivity, mechanical, electrical, and plumbing equipment (MEP) to all DC units in the park. The DC policy will apply to companies that are involved in the development and operation of data centres, including greenfield data centres and Data Centre

[14] http://www.koreaherald.com/view.php?ud=20201109000851

parks.[15] The following support shall be provided to Data Centre parks by the State Government:

i. The State shall make water available on payment of cost subject to the developmental procedures and regulation in force. Data Centres shall be encouraged to recycle water.

ii. In the event of lands given by Electronic Corporation of Tamil Nadu (ELCOT)/State Industrial Promotion Corporation of Tamil Nadu (SIPCOT)/ Tamil Nadu Small Industrial Development Corporation (SIDCO), DC parks will be authorized to sub-lease the land/buildings to DC units without any sublease or transfer charges.

iii. According to Tamil Nadu Electricity Regulation Commission (TNERC) rules, DC parks can acquire electricity from Tamil Nadu Generation and Distribution Corporation Ltd at current industrial tariff rates.

iv. A DC Park shall be eligible for 100% subsidy of Electricity Tax on power purchased from the Tamil Nadu Generation and Distribution Corporation Ltd. or generated and consumed from captive sources for five years from the date of commencement of commercial operation.

v. DC Parks will be charged 60% of the conventional cross-subsidy charge for Wind Energy and 70% of the conventional charge for Solar Energy respectively.

vi. Data Centre Parks with a sanctioned load of 50 MW or more shall be provided with dual power (two different grids from two different locations/providers).

vii. An additional feeder shall be provided to developer if the sanctioned load of the Data Centre Park is more than 100 MW as a Deposit Contribution Work (DCW).

viii. Augmentation of Power: Tamil Nadu Generation and Distribution Corporation (TANGEDCO) will augment the supply of power to DC/ DC parks (in MVA) from 11 kV, 33kV, 110 kV and 220 kV substations by 50%.

[15] https://cms.tn.gov.in/sites/default/files/documents/TN_Data_Centre_Policy_2021.pdf

ix. To facilitate the development of the DC market in the State, concessions on Stamp duty/ Registration fee paid on sale/lease/transfer of land for DC and DC parks also being offered.

2.62 Many other state governments in collaborations with private players have already started setting up DC parks in prominent Tier-I and Tier-II cities. Some of the key efforts are summarized as follows:

i. NTT Global DC has built India's first and largest operational hyperscale DC park in Chandivali, Mumbai with 100 MW of load capacity.[16] NTT envisions that in next 18 months, four new hyperscale DC parks will also become operational: two in Navi Mumbai and one each in Chennai and Delhi.

ii. The Uttar Pradesh Government plans to develop a DC Park which will be set up near Greater NOIDA. The government has given approval to Yotta Infrastructure to set up the first DC park in the state.[17]

iii. Similarly, recently Nxtra by Airtel has inaugurated a new 38 MW LEED certified hyper scale DC park in Chennai.[18]

iv. The Andhra Pradesh government has accorded approval to Adani Enterprises to set up an Integrated 200 MW DC Park, Integrated IT and Business Park, and Recreation Centre in Visakhapatnam.

2.63 The Authority is of the view that if the DCEZs are established in only four States (as has been envisaged in MeitY's draft DC policy), that too based on the proposal submitted by the States, we might end up setting DCEZs in States that are already progressive. This will result in lop sided economic development in country. **The Authority recommends that the number of Data Centre Economic Zones (DCEZ) that have been envisaged in MeitY's draft Data Centre Policy, needs to go beyond four.**

[16] https://services.global.ntt/fr-be/newsroom/ntt-ltd-expands-its-hyperscale-data-Centre-footprint-in-india
[17] https://www.yotta.com/media/yotta-infrastructure-to-set-up-20-acre-dataCentre-park-in-greater-noida-at-an-investment-of-inr-7000-crore/
[18] https://www.nxtra.in/data-Centre/chennai

2.64 It is to be noted that there are 349 notified SEZs in the country, including 234 notified SEZs for IT/ITES/electronic hardware dispersed around the country. However, only 129 of these IT/ITES/electronic hardware SEZs are functioning, while the rest 105 are not operational. Due to lack of demand from 100% IT export-oriented entities, majority of the 129 active IT/ITES/electronic hardware SEZs have not been able to realize their full development potential. Therefore, state governments can take initiatives to make use of the infrastructure and other facilities existing in under-utilized SEZs for establishing DC Parks, where required.

2.65 The Authority has collected data from the Ministry of Commerce regarding pan-India details of Special Economic Zones (SEZ) suitable for the establishment of Data Centres based on the availability of surplus power, DISCOM infrastructure, availability of water, and ab-initio availability of subsidized lands within SEZ. The details have been summarized in **Annexure- III**. The Authority has identified 33 existing SEZs where Data Centre Parks can be established. These are located in Andhra Pradesh, Kerala, Karnataka, Maharashtra, Haryana, UP, MP, Gujarat, Rajasthan and Odisha.

2.66 Since approvals for these SEZ's are already in place from the state governments, including clear land title with approved use, building sanctions, road connectivity, availability of utility services etc., this will enable considerable savings in capital and time to set up new units.

2.67 **The Authority recommends that out of the list of 33 SEZs, one SEZ each from State of Andhra Pradesh, Kerala, Karnataka, Maharashtra, Haryana, UP, MP, Gujarat, Rajasthan, and Odisha, can be identified for either converting them into DCEZs or for carving out zones out of these SEZs for establishing DCs/DC parks. Further, in order to avoid the concentration of further Data Centre Parks in already developed locations, those States that are lagging in DCs, should be supported by the Centre for setting up of a Data Centre Parks in such states. For such States, the Center**

should prepare a scheme for setting up DC Parks, either in line with other states who have come up with Data Park Schemes or independently. The scheme should, inter-alia, offer incentives in form of land, capital subsidy and interest subsidy. While the land is to be offered by respective states, the expenses on other offered incentives including capital and interest subsidy should have at least 75% contribution from central government.

2.68 Table 2.1 and Table 2.2 mention several fiscal and non-fiscal initiatives already provided by several State Governments as part of their respective state DC policy. The Ministry of Commerce & Industry[19] also offers several facilities and incentives to the units in SEZs which have been summarized in Table 2.5 as follows:

Table 2.5: Incentives and facilities offered by Ministry of Commerce & Industry

Incentives offered to units in SEZ	Incentives offered to SEZ developers
i. Duty free import/domestic procurement of goods for development, operation and maintenance of SEZ units. ii. 100% Income Tax exemption on export income for SEZ units under Section 10AA of the Income Tax Act for first 5 years, 50% for next 5 years thereafter and 50% of the ploughed back export profit for next 5 years. (**Sunset Clause for Units will become effective from 01.04.2020**) iii. Exemption from Minimum Alternate Tax (MAT) under section 115JB of the Income Tax Act. ***(withdrawn w.e.f. 01.04.2012)*** iv. Exemption from Central Sales Tax, Exemption from Service Tax and Exemption from State sales tax. These have now subsumed into GST	i. Exemption from customs/excise duties for development of SEZs for authorized operations approved by the BOA. ii. Income Tax exemption on income derived from the business of development of the SEZ in a block of 10 years in 15 years under Section 80-IAB of the Income Tax Act. (**Sunset Clause for Developers has become effective from 01.04.2017**) iii. Exemption from Minimum Alternate Tax (MAT) under Section 115 JB of the Income Tax Act. ***(withdrawn w.e.f. 01.04.2012)*** iv. Exemption from Dividend Distribution Tax (DDT) under Section 115O of the Income Tax Act. ***(withdrawn w.e.f. 01.06.2011)*** v. Exemption from Central Sales Tax (CST).

[19] http://sezindia.nic.in/cms/facilities-and-incentives.php

and supplies to SEZs are zero rated under IGST Act, 2017. v. Other levies as imposed by the respective State Governments. vi. Single window clearance for Central and State level approvals.	vi. Exemption from Service Tax (Section 7, 26 and Second Schedule of the SEZ Act).

2.69 After analyzing the various submissions and the incentives offered by Government for SEZs, **the Authority recommends that following incentives should be provided by Central Government for establishing DC Parks (DCEZs)**

(i) **Time-bound single window clearance for Central and State level approvals.**

(ii) **Waiver of import restrictions on essential Data Centre operational equipment**.

2.70 **In addition to incentives rolled out by the Centre, the Authority recommends that guidelines should be issued for the States for rolling out incentives for DC Parks (similar to DCIS guidelines for DCs). The decision on implementing these guidelines for rolling out incentives for DC Parks should be left to the States. Following incentives can be included in the guidelines for DC Parks:**

(i) **Deemed distribution licensee status for electricity for DC Park developers**

(ii) **Provision of Power and water at reduced rates**

(iii) **Waiver of Electricity Duty**

(iv) **Capital subsidy in buildings and infrastructure**

(v) **Reimbursement of stamp duty, conversion fee, transfer duty and registration fee**

(vi) **Providing free Right of Way for Telecom Service/Infrastructure Providers for building telecom networks to and within DC Parks**

(vii) **Time-bound single window clearance for central and state level approvals.**

Data Centre - Building Norms and Standardization

2.71 Data centres need to provide modular, scalable and flexible facilities and infrastructure to easily accommodate the rapidly changing requirements of the market. These needs and objectives influence the design of data centres in terms of building construction, power distribution, environmental control, telecommunications cabling and physical security. Effective management and operational information are required to monitor achievement of the defined needs and objectives.

2.72 Data Centre building are unique in many aspects as they are basically an infrastructure for IT systems (stack of racks for servers, computers, hard discs and other devices) having higher roof height, back-up components and power supply systems, cooling system and unlike commercial office/shopping complexes they require less parking space. Data Centre building architectures and requirements differ significantly as compared with other commercial office. In India, the National Building Code of India (NBC 2016) does not recognize 'Data Centre' as a separate category. In absence of separate building norms, DCs have to follow commercial office building norms. This unnecessarily raises costs as various requirements based on personnel presence that are relevant to other commercial buildings may not be relevant to Data Centres.

2.73 In India, presently there are no guidelines for minimum or specific design requirements and standards that are required for ensuring data integrity, data safety, etc., which is crucial for DCs. Though there are a set of other associated standards that are recognized in India that Data Centres can comply with. These include ISO 9001 standards on quality management, ISO 14001 standards on environmental performance enhancement and OHSAS 18001 standards on occupational health and safety management. There are multiple standards that Data Centres across the world comply with for both

infrastructure and QoS. The most common standards are ISO 27000, PCI DSS, HIPAA, TIA 942, or AICPA SOC. The standards largely specify the telecommunications standards for Data Centres and other similar facilities by standardizing cabling specifications and layout. The maintenance of minimum standards for Data Centres are essential for operation and for establishing trust with end-users by ensuring a basis for QoS requirements. These standards become even more significant to maintain DC for third-party storage centres. Independent auditors can be used to certify these standards many of which are already doing so domestically.

2.74 India being a large market for DCs, it may therefore be necessary that minimum standards for Data Centre operations should exist considering the local needs. Countries like Germany and Mexico have defined their independent DC standards and Tiers, which also provide Tier certifications. It can be argued that in India too, independent DC standards can be adopted, which will specify the minimum quality and safety requirement/provisions to minimize chances of any disruption. Thus, there can be a case for standardization and certification in form of the Indian national standards. Besides, there is a need for a testing and certification framework for hardware equipment as well as the software used in Data Centre facilities. Additional steps can be taken to form a body that can coordinate for training, certification, and standards. Certification of DCs can make it easier to confer benefits, tax incentives, exemptions, and security requirements upon Data Centres.

2.75 With the objective of having building norms and standards for Data Centres operating in India, the following issue was also raised to get the opinion of stakeholders: -

7. *What should be the draft broad guidelines to be issued for Data Centre buildings, so as to facilitate specialized construction and safety approvals?"*
8. *"Is there a need to develop India-specific building standards for construction of Data Centres operating in India? If yes, which body should*

be entrusted with the task? Do provide detailed justification in this regard."

9. *"Till India-specific standards are announced, what standards should be followed as an interim measure?"*
10. *"Should there be a standard-based certification framework for the Data Centres? If yes, what body should be entrusted with the task?"*
11. *"Should incentives to Data Centres be linked to the certification framework?"*

Comments of the stakeholders

2.76 In response to above question, most of stakeholders have opined that National Building Code of India (NBC 2016) should recognize 'Data Centre' as a separate category. In absence of separate building norms, DCs are required to follow commercial office building norms.

2.77 Further, in this regard, some of the stakeholders have suggested that Government should initiate a consultation with stakeholders before finalizing any building standards for construction of a DC. DoT and MeitY with coordination of MoHUA should be entrusted for the enablement of the above framework. Standardization Testing and Quality Certification (STQC) can be entrusted for the audits. Few Stakeholders have opined that BIS be entrusted with the responsibility for developing India specific standards and BIS should frequently consult with Data Centre Industry Council (DCIC) (being formed as per MeitY policy).

2.78 Stakeholders have suggested the following specified broad guidelines:

I. **<u>Building Related</u>**

i. Floor to Ceiling height of 5.5 meter and above.
ii. Load Bearing capacity >1500 Kg per sq. meter.
iii. Standardized FSI (Floor Space Index) Norms of > 3 or 4 or 5.
iv. Need for a Utility building to house generators and other associated utilities to support DC load.
v. Parking requirements to be 10% of what are normally specified for an equivalent sized commercial building.

vi. Least number of windows (as per requirement of Fire Code).
vii. Special platform structure on top of terrace to place Chillers / HVAC system (without charging extra FSI for the same).
viii. Boundary walls of the DC park to be > 14 ft.
ix. Minimum benchmarking of physical & electronic security standards to be deployed.
x. Integration with nearest fire, police station & hospitals to deal with any threat or untoward incident.
xi. Online mapping of availability of space and related information.
xii. DC building design as per seismic standards.
xiii. Minimum two entry routes for building premises and two separate entry exit routes for OFCs at DC.

II. **Power Related**

i. Need for storage of underground diesel fuel (in excess of 1 Lakh litres for a middle-sized DC of 5 MW IT load).
ii. Need to establish own sub-station (with 2 express feeders) in the DC park to take care of high-power demand etc.
iii. Approval for multi-level DG stacking within the campus.
iv. Connections to different parts of the power grid for redundancy.

2.79 In response to the questions related to standards, most of the stakeholders have responded in favour of Indian specific standards. Many stakeholders have suggested adopting global standards (like TIA 942 & Uptime Institute standards), guidelines and benchmarks to facilitate serving global customers. One of the stakeholders favoured EN 50600 European standard.

2.80 Most stakeholders have opined that there should be a standard-based certification framework which can be linked to incentivize DC. Further in this regard, many have suggested that TIA 942 & Uptime Institute standards/ Global Certification Standards can be resorted to. Some stakeholders have stated that a government body like STQC should be entrusted to do an audit/overall governance of the adoption of this

framework. The Uptime Institute based Certification standards should be made applicable to data centres in India and can be used as benchmarks to extend benefits/incentives to the players.

2.81 Few of stakeholders have opined that some Indian specific building/ Data Centre certification should neither be mandated nor linked to any incentives for certifications.

Analysis of the issue and views of the Authority

2.82 The National Building Code of India (NBC) is a national instrument providing guidelines for regulating the building construction activities across the country. The Code mainly contains administrative regulations, development control rules and general building requirements, fire safety requirements, stipulations regarding materials, structural design and construction (including safety), building and plumbing services, approach to sustainability, and asset and facility management. It serves as a Model Code for adoption by all agencies involved in building construction works (Public Works Departments, other government construction departments, local bodies or private construction agencies).

2.83 The Authority recognizes that DC buildings are unique and different as compared to other office/ commercial buildings. In the absence of any guideline or separate building norms, DCs are required to follow commercial office building norms. MeitY's draft DC policy also recommends recognizing Data Centres as a separate category under the National Building Code. Data Centre buildings require different standards than typical office/commercial buildings, necessitating the inclusion of a specific category code for Data Centres in the National Building Code of India (NBC 2016). As a stopgap measure, MeitY should collaborate with approved Central Government organizations to create broad criteria for Data Centre structures, easing specialized construction and safety permits.

2.84 The Authority is of the view that there is a need for different India-specific building standards for construction of DCs and **recommends that Bureau of Indian Standards (BIS) may be entrusted with developing the standards in a fixed timeframe. For this, BIS should carry out a detailed consultation with the industry, inter-alia, covering following aspects of building norms –**

A. **For DCs**

i. **Floor to Ceiling height**

ii. **Load Bearing capacity**

iii. **Floor Space Index Norms**

iv. **Norms for housing generators, Chillers / Heating, ventilation, and air conditioning (HVAC) system, and other associated utilities like batteries to support DC load.**

v. **Parking requirements**

vi. **Window requirement**

vii. **Boundary walls**

viii. **Mandatory rainwater harvesting and recycling arrangements to be included in DC building.**

ix. **Water and diesel storage**

x. **Entry routes for Information & Communication Technology (ICT) connectivity and High Tension (HT) power lines with redundancies**

xi. **Seismic standards**

B. **For DC Parks - In addition to some of the above points that are also applicable for DCs, covering the following:**

i. **Own sub-station**

ii. **Common DGs for multiple DCs**

iii. **Integration with nearest fire, police station & hospitals**

iv. **Mandatory rainwater harvesting and recycling arrangements to be included in DC parks.**

2.85 **The Authority also recommends that till necessary changes are done in National Building Code of India by BIS, as an interim measure, MeitY should collaborate with approved Central Government organizations to create broad criteria for Data Centre structures, easing specialized construction and safety permits.**

2.86 As far as standards for Data Centres are concerned, the EN 50600 standard is the first European-wide, transnational standard that provides comprehensive standards for the holistic planning, construction, and operation of a data Centre. It establishes requirements for data Centre operations and outlines requirements in the areas of building, power supply, air conditioning, cabling, and security systems. The EN 50600, developed by the European standardization body CENELEC (European Committee for Electro technical Standardization), provides multiple degrees of flexibility and is to some extent, a modular system. EN 50600 is a standard for new data centres.

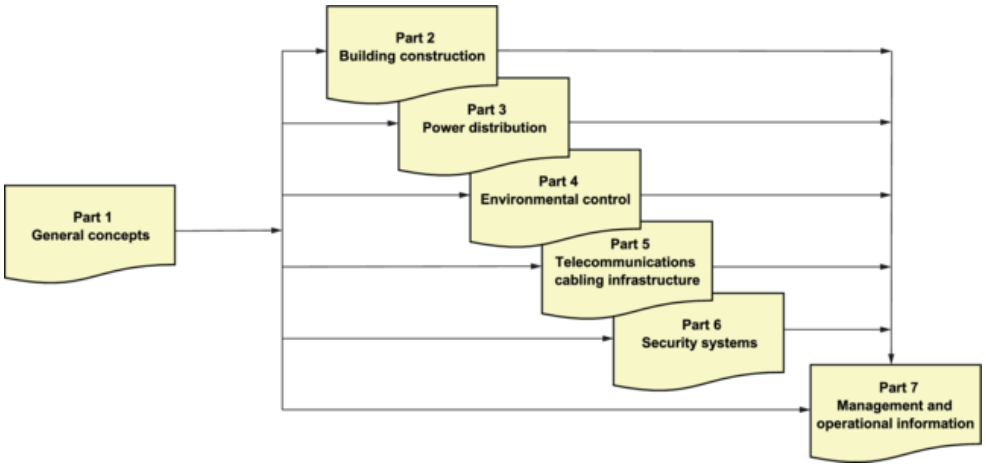
2.87 While ISO management standards, such as ISO/IEC 27001, are equally applicable in the data Centre environment, the requirements of EN 50600 are more concerned with physical security.[20]

2.88 The International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC) have defined ISO/IEC 22237 series standards that specifies requirements and recommendations to support the various parties involved in the design, planning, procurement, integration, installation, operation and

[20] https://www.future-tech.co.uk/european-standards-for-data-centre-design-and-built-infrastructure/ https://www.tuvit.de/en/services/data-Centres-colocation-cloud-infrastructures/din-en-50600/

maintenance of facilities and infrastructures within data centres. The inter-relationship of the specifications within the ISO/IEC 22237 series is shown in figure below.

Figure 2.3: Specifications covered under ISO/IEC 22237 series



2.89 ANSI/TIA-942 Telecommunications Infrastructure Standard for Data Centres specifies the minimum requirements for data centres and covers all physical infrastructure including, but not limited to, site location, architectural, electrical, mechanical, fire safety, telecommunication, security and other requirements. ANSI/TIA-942 describes the four rating levels in which data centres can be classified. The details in this respect were dealt in CP.

2.90 As far as standards-based certifications for DCs are concerned, **the Authority recommends that there is a requirement of India specific standard-based certification framework for the DCs and for the same, BIS be entrusted with the task. In the meantime, till BIS comes up with India-specific standards, the Authority recommends that BIS may ask DCs to follow any one or more of the international standards like EN 50600.**

Disaster Recovery (DR)

2.91 A disaster recovery (DR) site is a facility that any organization can use to recover and restore its infrastructure and operations when its

primary Data Centre becomes unavailable. Most of the data-based companies carefully plan and decide about what kind of DR site they require, its location, and a balance of costs against any risks. Since operational disruption is a risk for the operatives, the DR site should always be chosen taking into consideration the weather patterns, seismic risk profile, capability of the ground to withstand the foundations, and other natural phenomenon. Disaster Management is one of the top priorities for all organizations to lay specific emphasis while choosing building designs, location, and standards for a Data Centre. In the CP, Authority has discussed different disasters and that the Disaster mitigation plans should include provisions to address earthquakes, floods, tsunamis, or any other natural/technological/man-made disasters for the setting up of Data Centres. In the CP, the Authority had acknowledged the fact that Data Centre players already provide disaster recovery site planning depending on the type of data handles, uptime required, customer insistence and technical standards, and accordingly the Authority has not specifically dealt with the aspect in this consultation paper. However, stakeholders were asked to bring out any specific issue in this regard if they so desire and for the same following question was asked :

12. Are there any specific aspects of the disaster recovery standard in respect of Data Centres that needs to be addressed? If so, then provide complete details with justification.

Comments of the stakeholders

2.92 In response to the above questions, many stakeholders have stated that there is no additional requirement to address disaster recovery standards for DC as DC already have Disaster mitigation plans. A stakeholder opined that DCs already have Disaster mitigation plans. Hence, there is no additional disaster recovery standards should be prescribed. However, there should be availability of Reliable Power and

Water Supply, Redundant/backup sources of power and water supply, and Right of Way for laying fiber for connectivity.

2.93 Many stakeholders have opined that there are no specific standards which cater to the disaster recovery DC and various aspects, however, ISO 22301 focuses on business continuity management framework, whereas service continuity process in DC is adhered to the ISO 20000 standards. ISO 27031 is a tool to implement the technical part of ISO 22301, providing detailed guidance on how to deal with the continuity of ICT elements to ensure that the organization's processes will deliver the expected results to its clients.

2.94 One of stakeholders has opined that all the aspects applicable to DC should be also applicable for the disaster recovery sites. If a primary site is hosted in a DC in one region, the disaster recovery site for the same is hosted in a DC in another region which comes under a different seismic zone.

Analysis of the issue and views of the Authority

2.95 As discussed in the CP and pointed out by few stakeholders, Tier II and Tier III cities in India are emerging as new locations for disaster recovery and edge Data Centres. RailTel, a central government PSU, announced plans to establish edge data centres at railway premises across 102 locations, especially Tier-II and Tier-III towns in the country[21].

2.96 The Authority noted that existing DC already have their disaster mitigation plans and all the aspects applicable to DC will also be applicable on disaster recovery DC. Clients are already using DC sites as Data Recovery sites. They are already taking care of standards based on their applications.

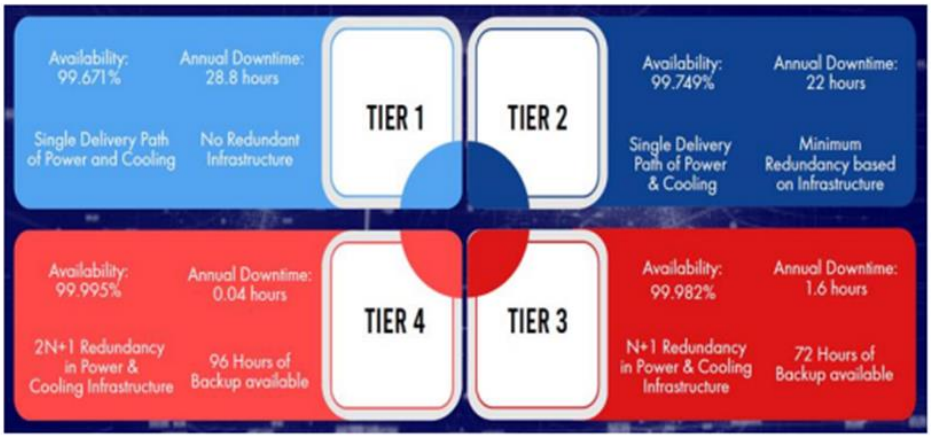
21https://www.livemint.com/companies/news/railtel-to-create-edge-data-centres-across-102-locations-11641980872885.html
https://www.railtelindia.com/component/content/article.html?id=232&Itemid=

2.97 ISO 22301 addresses business continuity as a whole, considering any sort of occurrence as a possible disruption source (e.g., pandemic illness, economic crisis, natural disaster, etc.) and employing plans, policies, and processes to avoid, respond to, and recover from disruptions caused by them. These strategies, policies, and procedures are divided into two categories: those to keep the business running in the case of a disruption event and those to restore the information and communication infrastructure if the ICT is interrupted.

2.98 ISO 27031 is a tool to implement the technical part of ISO 22301, providing detailed guidance on how to deal with the continuity of ICT elements to ensure that the organization's processes will deliver the expected results to its clients. ISO Standard 27031 is focused on the information and communications technology (ICT) requirements for business continuity and disaster preparedness. ISO 27031 includes both crucial data security and enterprise operations of an organization or business.

2.99 Data Centre Tiers are an indication of the type of Data Centre infrastructure to be considered for a given application. It is a standardized methodology used to define uptime of a Data Centre. A Data Centre Tier, or level, in other words, is used for differentiating key Data Centre requirements, the focus being redundant components, cooling, load distribution paths, and other specifications. It is a measure of Data Centre performance, investment, and return on investment. The Tier classes (I to IV) characterize the prospects, showing to what extent a system will be functional.

Figure 2.4: Data Centre Tiers



2.100 The existing DCs will mostly have their disaster mitigation plans. The Authority also noted that DC DR requirements and standards are purely based on a commercial and business requirement of customers/ clients. **In view of above, the Authority is of view that there is no need to address DR standards separately.**

Data Centre Security (Trusted Source Procurement)

2.101 Data Centre facilities hold confidential information or proprietary information and hence must be both physically and digitally secure. Compliance and security are top priorities to guarantee that data is protected in a Data Centre. Everything from networks and power generators to the physical infrastructure should be designed and installed, keeping the Data Centre security standards in mind.

2.102 In view of concerns over national security, the government has mandated that Internet service providers (ISPs) must purchase equipment approved by it. As part of the aforementioned security concerns, DoT in this regard had also amended its License Agreements in March 2021 and National Cyber Security Coordinator (NCSC) has been appointed as the nodal agency by the government for all ISPs to provide information as and when sought. NCSC has also been tasked to notify a list of trusted procurement sources along with the equipment that does not pose any threat to India's national security.

2.103 The following issues were raised to get the opinion of stakeholders: -

13. "Whether trusted source procurement should be mandated for Data Centre equipment? Whether Data Centres should be mandated to have security certifications based on third-party Audits? Which body should be entrusted with the task? Should security certifications be linked to incentives? If so, please give details with justifications."

Comments of the stakeholders

2.104 The stakeholders gave divergent views regarding the trusted source procurement for Data Centre. Few stakeholders have opined that the trusted source procurement is applicable only for licensees creating telecom infrastructure under section 4 of India Telegraph act 1885. Few others are of the view that DCs should be kept out of this ambit. Few stakeholders have stated that trusted source procurement should not be mandated for DC, but only recommendatory guidelines may be issued.

2.105 Some of the stakeholders have favoured for a mandate of trusted source procurement. One of stakeholders has stated that DC must be mandated to have security certifications based on Third-Party Audit. Security Certification should not be linked to incentives.

2.106 Few Stakeholders have opined for trusted source procurement and stated that it there is a need of certification on this account. Standardization Testing and Quality Certification (STQC) Directorate may be entrusted for audits and the incentives for DC must be linked to the adoption of security certifications.

2.107 One stakeholder stated that trusted source procurement requires oversight of the MeitY, DoT, the Ministry of Power and the National Cyber Security Coordinator. The rightful authorizing agency is unclear and hence such regulatory oversight should be avoided. In India, ISPs are already mandated by their license arrangement to purchase equipment which has been approved by Government. The same approach of approved equipment/software purchase should be applicable for DC also.

2.108 One of stakeholder stated that an industry body should be entrusted with the responsibility of security certification based on audit of hardware equipment and software deployed by DC operating in India.

2.109 One of the stakeholders opined that there should be a cut-off of at least one year in advance when the information of OEMs/products should be sought and only after the verification is complete, should this be implemented.

2.110 Some stakeholders stated that confusion remains around how the trusted source program works and how products are evaluated. This confusion makes it difficult to get products approved and delays timely rollout. Indian government recognizes the Common Criteria Certification Scheme (C3S). The C3S is an international standard for computer security that allows product users and developers to identify relevant security requirements and evaluate solutions accordingly. TRAI should refer any concerns to the Standardization Testing and Quality Certification (STQC) Directorate which oversees C3S compliance on behalf of the GoI and the industry.

Analysis of the issue and views of the Authority

2.111 Security is fundamental to the architecture of DC design, and they are highly security sensitive. Several State Governments, Central Government, as well as corporate entities, store their confidential data in these Data Centres. Therefore, the Authority is of the view that the security aspects need to be looked at.

2.112 Recently, with the launch of www.trustedtelecom.gov.in portal[22], the National Security Directive on Telecommunication Sector (NSDTS) has come into effect from 15th June 2021. Consequently, Telecom Service Providers (TSPs) are mandatorily required to connect in their networks only those new devices which are designated as 'Trusted Products' from 'Trusted Sources'. Necessary amendment had been made by the Government in this regard to the license conditions for the provision of telecommunication services by the TSPs.

[22] https://www.trustedtelecom.gov.in

2.113 Trusted Products are products whose critical components and the products themselves are sourced from Trusted Sources. The TSPs and vendors through the Trusted Telecom Portal will indicate the telecom products and the vendor from whom they intend to procure the products. The details of the telecom products, the vendor, the products, their critical components, and their sources are then populated into the portal by the TSPs and respective vendors. An assessment is made of the vendors and the sources of the components to determine Trusted Sources and Trusted products which are then intimated to the vendor concerned and the applicant TSPs to make their procurements.

2.114 The National Cyber Security Coordinator (NCSC) is the Designated Authority (DA) for the determination of inclusion of a vendor as a Trusted Source, of a Telecom product as a Trusted Product and the methodology for the said inclusion. The Designated Authority makes its determination based on approval of a committee called 'National Security Committee on Telecom' (NSCT) headed by Deputy NSA. The committee consists of members from relevant departments/ministries and also has two members from industry and an independent expert.

2.115 The arguments of some stakeholders that trusted source procurement applicable on telecom licensee, should not be applicable on DC are not tenable and is against the objective of NSDTS/ NCSC as the DC are part of digital economy and therefore, **the Authority recommends that trusted source procurement applicable for licensees under section 4 of India Telegraph Act 1885, should also be made applicable for DCs for security sensitive equipment.** This is required to discourage any further introduction of insecure equipment in the network.

2.116 Data centres are responsible for ensuring secure data handling on behalf of an organization's customers. A single data outage or breach can devastate the business that relies on that data. At the same time, it can also be appalling for a data centre facility. An effective compliance strategy can help any data centre secure the sensitive data it handles. Data centre certification, standards and compliance ensure operational safety and continuity. Data Centre's certifications and ratings reflect the

quality of security, operations, engineering excellence and energy efficiency of data centres. Like ISO 27000, PCI DSS, HIPAA, AICPA SOC, SSAE 18 have different guidelines.

2.117 The Authority has noted that currently there are security audit related terms in the Unified Licenses issued by DoT. Some of the relevant terms and conditions are reproduced below:

"39.6 In furtherance of organizational security policy, the LICENSEE shall audit its network or get the network audited from security point of view once in a financial year from a network audit and certification agency. The first audit may be carried out in the financial year succeeding the financial year of the signing of the LICENSE/ Service authorization. The LICENSEE is free to engage the service of any agency for this purpose, which is certified to carry out the audit as per relevant ISO standards. Presently ISO 15408 and ISO 27001 standards are applicable.

39.7 The LICENSEE shall induct only those network elements into its telecom network, which have been got tested as per relevant contemporary Indian or International Security Standards e.g. IT and IT related elements against ISO/IEC 15408 standards, for Information Security Management System against ISO 27000 series Standards, Telecom and Telecom related elements against 3GPP security standards, 3GPP2 security standards etc. The certification shall be got done only from authorized and certified agencies/ labs in India or as may be specified by the Licensor. The copies of test results and test certificates shall be kept by the LICENSEE for a period of 10 years from the date of procurement of equipment."

2.118 Standardisation Testing and Quality Certification (STQC) Directorate, an attached office of the MeitY, has the objective of Formulation of e-Governance Standards/ Guidelines/Frameworks in emerging areas/technologies and to provide accredited certification services for processes and products for global compliance. Similarly, Telecom

Engineering Centre (TEC) under DoT has been mandated to develop new specifications and standards for Telecom sector. Hence, **the Authority recommends that Telecommunication Engineering Centre (TEC) and Standardisation Testing and Quality Certification (STQC) Directorate should jointly work to develop DC security certification framework based on third party Audits.**

2.119 As far as linking incentives for DC to the adoption of security certifications is concerned, **the Authority feels that till the security certification framework is fully developed and in place, the incentives should not be linked to it. The Authority may review this later, if required.**

Fiber Connectivity and Access to Dark Fibers

2.120 High-quality telecom connectivity is a must requirement for Data Centre operations as they run critical applications that need 24x7 uninterrupted connectivity to store and distribute the data. In India, Data Centre operators must undergo commercial agreements with these TSPs to connect their data centres or with Cable landing Stations. There is a viewpoint that TSP's OFC networks are suited for conventional voice and data services but not suitable for low latency Data Centre oriented services. Therefore, there has been a demand that entities like data Centre providers may be allowed to construct, operate, and efficiently manage their own captive optical fiber networks. For the same Data Centres in India can use captive dark fibers for better network performance like avoiding latency, accessing greater bandwidth, stability, and security.

2.121 To seek the views of the stakeholders on this issue, following questions were raised in CP to get the opinion of stakeholders: -

14. "What regulatory or other limitations are the Data Centre companies facing with regards to the availability of captive fiber optic cable connectivity, and how is it impacting the Data Centre deployment in the hinterland? How can the rolling out of captive high-quality fiber networks

be incentivized, specifically for providing connectivity to the upcoming Data Centres/ data parks? Do justify."

15. "What are the necessary measures required for providing alternative fiber access (like dark fiber) to the Data Centre operators? Whether captive use of dark fiber for DCs should be allowed? If so, please justify."

Comments of the stakeholders

2.122 In response to the above questions, stakeholders have given divergent views. Some of stakeholders (non-TSPs and some of associations) have stated that DC/ CDN/ Cloud service operators are forced to procure network connectivity services from local TSPs/ISPs. These OFC networks are not suitable for low latency DC oriented services. One of the stakeholders has stated that state of inter and intra-city OFC networks are inferior compared to developed countries.

2.123 Few stakeholders who are TSPs or their Associations have opined that availability of fiber connectivity is subject to approvals and permissions for RoW, and associated charges and timelines. Issues in obtaining timely and affordable RoW permissions are continually being faced by TSPs/IP-1 for rolling out optical fiber networks, either for Data Centres or for other purposes. These stakeholders are also of the opinion that allowing DCs to establish their own fiber connectivity without an appropriate authorization is not only a revenue loss to the exchequer but will also lead to all enterprises establishing their own captive fiber networks, making the TSPs business case unviable for establishing fiber networks. Data Centre companies keen to set up captive fiber connectivity can be achieved by taking relevant registration/license under the provisions of Indian Telegraph Act. Any type of fiber connectivity (for captive or commercial purposes) should be done under existing regulatory framework by obtaining IP-1 Registration and if it wants to operate a network should obtain relevant authorization under Unified License (NLD or Access).

2.124 On the suggested incentivization measures, few stakeholders suggested the ease of RoW permissions with single window clearance for licensed

TSPs. One of the stakeholders has suggested to incentivize creation of common duct/ corridor for non-discriminatory sharing between licensed TSPs, mandate co-deployment of common ducts during construction of any roads, railways, water/ gas pipeline.

2.125 One of the stakeholders has opined in favor of waiver/ reduced Licence fee on revenue from OFC connectivity by TSPs to DC. Another stakeholder suggested for ab-initio grant of RoW permission once DC site is finalized and also to issue policy for TSPs/ ISPs to lay fiber alongside public infrastructure (alongside electric/ gas companies) at pre-decided charges. Some stakeholders have also requested to rationalize RoW fee for fiber connectivity to DCs.

2.126 Many stakeholders have stated that captive dark fiber should be allowed, and fiscal incentive should be provided for this to DC operators. DC operators should be allowed to lay their own fiber among themselves and to connect to the international fiber landing stations and also to the various internet exchange points and the nodes of the content delivery networks.

2.127 One of the stakeholders has suggested sharing of active-passive infrastructure in rural areas and promoting access to RoW. Few stakeholders have opined suggesting 'Dig Once Build Once' (DOBO) policy model to share cost of infrastructure among TSPs. Another stakeholder stated that shared fiber network approach be adopted over parallel fiber networks.

Analysis of the issue and views of the Authority

2.128 High-quality telecom connectivity is a must for Data Centre operations as they run critical applications that need 24x7 uninterrupted connectivity to store and distribute the data. Availability of connectivity and latencies involved are playing key criteria in deciding the site for a DC construction in India, and thereby majority of the Data Centres are concentrated in Tier-I cities like Mumbai, Chennai, and Hyderabad. As newer Data Centres are constructed, and the utilization of optical fiber cable grows, more capital expenditures on the creation of new fiber infrastructure will be required. Services provided by DC or CDN require

very high bandwidth, high reliability, and low latency for extremely high amounts of data and achieving these is especially difficult given India's vast geography.

2.129 The Authority noted that Data Centre operators/ providers or any unlicensed entity, is not allowed to own, build, or access passive infrastructure such as dark fiber/ captive fiber. This means they are unable to buy or lease dark fiber or build captive fiber network in order to construct, operate, and efficiently manage their own networks. Instead, Data Centres providers/ operators undergo commercial agreements with TSPs for their telecom requirement. Presently, Infrastructure Providers-I (IP-I), can establish and maintain the assets such as Dark Fibre, Right of Way, Duct space, and Tower for provisioning on lease/rent/sale basis to the licensees of Telecom Services on mutually agreed terms and conditions. IP-I can create active infrastructure limited to antenna, feeder cable, Node B, Radio Access Network (RAN) and transmission system for and on behalf of licensees only. IP-I providers are not permitted to own and share active infrastructure. The sharing of passive infrastructure such as Dark fibres, Right of Way, Duct space, and Tower is permitted to TSPs as well as IP-I. The active infrastructure sharing is permitted amongst TSPs only.

2.130 The Authority is of the view that it is essential to implement policies which will encourage greater access to digital communications infrastructure and increase investment in such infrastructure. Permitting DCs and other entities to build captive fiber and /or lease passive infrastructure such as duct and fiber from IP-I/ TSPs can stimulate further investment in India's telecommunications/ OFC infrastructure.

2.131 According to Rule 472 of Indian Telegraph Rules 1951 framed under Indian Telegraph Act 1885, provides that, "Any person may without a licence establish, maintain and work a telegraph (not being a wireless telegraph) within the limits of a single building, compound or estate:

Provided that no telegraph line pertaining to the telegraph shall pass over or under a public road."

2.132 The existing licensing and regulatory framework clearly do not allow non-licensed entities to establish captive fiber networks beyond a single building/campus. Even within campus there is a limitation that no telegraph line pertaining to the telegraph shall pass over or under a public road.

2.133 Recently in its Notice Inviting Applications (NIA) for Auction of Spectrum dated 15.06.2022, Department of Telecom have incorporated provisions related to Captive Non-Public Network. It has been provided that Government from time to time shall make/publish required provisions/rules/guidelines and licensing terms and conditions etc., for enabling the setting up of Captive Non-Public Network (CNPN). CNPNs may be set up in following ways:

A. Telecom Service Providers (TSPs) having Access Service Authorization may provide Captive Non-Public Network as a service to an enterprise by using network resources (such as through network slicing) over its Public Land Mobile Network (PLMN).

B. TSPs having Access Service Authorization may establish isolated Captive Non-Public Network for the enterprises using IMT spectrum acquired by them.

C. Enterprises setting up Captive Non-Public Network may obtain the spectrum on lease from TSPs having Access Service Authorization and establish their own isolated network. Required Licensing terms & conditions and Spectrum Leasing guidelines shall be issued by DoT.

D. Enterprises setting up CNPNs may obtain the spectrum directly from DoT and establish their own isolated network. In this regard, DoT will undertake demand studies and thereafter seek TRAI recommendations for direct assignment of spectrum to such enterprises.

2.134 DoT has also issued amendment to unified license on 27-06-2022 vide which Captive Non-Public Networks (CNPN) has been defined as *"CNPN mean a terrestrial wireless telecommunication network established for captive use within a specified geographical area. Such networks cannot*

be used for providing commercial telecommunication services." DoT guidelines for CNPN license dated 27th June 2022 have defined the scope of CNPN license whereby it has been mentioned that CNPN licensee can establish indoor/within premises isolated CNPN for own use. It has also been mentioned that CNPN license cannot be used for providing commercial telecommunication services. These guidelines also mentions that CNPN licensee shall not connect its network to public networks in any manner. The public networks include but are not limited to PSTN, PLMN, GMPCS and network. Licensee can connect its CNPN established at multiple locations through lease lines/from the licensed TSPs.

2.135 The Authority agrees with the views of the stakeholders that if DCs are allowed to establish their own fiber connectivity without an appropriate license/authorization it will result in revenue loss to the licensed service provider as well as exchequer. The Authority also took notice of the fact that several similarly placed entities (like OSPs, CDNs, private companies etc) may also start demanding to build their own captive network infrastructure outside the existing licensing framework, which is untenable. If different enterprises start establishing their own captive fiber networks, this will make TSPs business case unviable for establishing fiber networks. Further, if DC operators are allowed to build connectivity between different data centres, it will be very difficult to limit it only for transmission of data of the DC operating entity and DC operators will end up giving services for data transmission to all entities whose data is hosted in their DC. This is nothing but a licensed telecom service activity. The Authority is of the opinion that since entry condition and fee for NLD license and NLD VNO License are not onerous, there seem to be no inhibition on DC entity / players to obtain NLD license for laying out its own fiber network.

2.136 **In view of above, the Authority recommends that if DCs have to establish captive fiber network, they should be allowed to do so under existing licensing framework**.

2.137 The Authority also agrees with the views of some stakeholders that issues in obtaining timely and affordable RoW permissions are

continually being faced by TSPs/IP-1 for rolling out optical fiber networks, either for Data Centres or for other purposes. Authority has addressed these issues in detail in its recommendations on **"Roadmap to Promote Broadband Connectivity and Enhanced Broadband speed"** dated 31st August 2021 where it has recommended for action/ measures for creation of robust Digital Communications infrastructure creation as stated below: -

- *Creation of National RoW Portal to overcome the issues of RoW permissions for telecom infrastructure as well as for other essential utility services.*
- *Incentivize establishment of common ducts and posts, to be shared on non-discriminatory basis with service providers and infrastructure providers.*
- *Establish a central entity, 'Common Ducts and Posts Development Agency (CDPDA)' for planning and development of common ducts and posts infrastructure across the country, on non-exclusive basis.*
- *Mandate co-deployment of common ducts during the construction of any roadway, railway, water pipelines, and gas pipelines receiving public funding.*
- *To facilitate the sharing of passive infrastructure such as ducts, optical fibers, posts, etc., all the passive infrastructure available in the country should be mapped by each service provider and infrastructure provider using Geographic Information System (GIS). The Telecom Engineering Centre (TEC) should notify the standards for this purpose.*
- *Establishment of e-marketplace(s) on common GIS platform to facilitate leasing and trading of passive infrastructure.*

2.138	DoT has informed TRAI that Government is in agreement with most of the above recommendations of Authority. **The Authority reiterates that Government should implement its recommendations on "Roadmap to Promote Broadband Connectivity and Enhanced Broadband speed" dated 31st August 2021 in totality and on priority.**

International Connectivity

2.139 Submarine cables connect the digital economy across the world. If Data Centres are the heart of the digital economy, then submarine cables are the arteries of modern connectivity. These cables terminate in the country through Cable Landing Stations (CLS). Access to submarine CLS is an essential input for services requiring international connectivity. Submarine Cable provides better access to connectivity, low latency, and high capacity required by DC for services offered.

2.140 As of December 2021, there are 17 under-sea cables landing in 15 cable landing stations in 5 cities across India[23]. Mumbai and Chennai have the maximum concentration of cable landing points and these two cities remain the favorites for most operators to locate their initial Data Centres. Further, Mumbai and Chennai, which have a fair share of existing and upcoming landing stations, will be the preferred locations for future supply also. The non-availability of submarine cables and fiber networks for international connections is the main drawback for the companies not establishing DCs in the north, central, and northeast regions. However, some new location other than Mumbai and Chennai are being planned like Digha (West Bengal) and Mahua (Gujarat).

2.141 The location of the Data Centre can affect the speed and latency of critical applications and new services. Hence, DC are concentrated near to Cable landing stations which reduces the distance the data has to travel, thus reducing latency. In India, submarine cables coming from different parts of the world connect at the Cable landing stations near the coast and as of now Cable landing stations are in Mumbai, Chennai Cochin, Trivandrum and Tuticorin only. Accordingly, in the CP, following issues were raised to get the opinion of stakeholders: -

16. *"What are the challenges faced while accessing international connectivity through cable landing stations? What measures, including incentive provisions, be taken for improving the reliable connectivity to CLS?"*

23 https://www.submarinenetworks.com/stations/asia/india

Comments of the stakeholders

2.142 On the issue of challenges for accessing international connectivity through cable landing station many stakeholders (mainly TSPs and associations) have stated that there are no challenges in accessing the International Bandwidth as the International Bandwidth market in India is already very competitive and there is no requirement to have any regulatory provision. One of the stakeholders stated that the international connectivity and bandwidth cost is already below-cost due to intense competition in the market. The market factor will take care of the cost of bandwidth and hence there is no requirement to have any regulatory provision. Another stakeholder has stated that the cross connect at the cable landing station should be at a reasonable cost. The current Access Facilitation Charges (AFC) is hindrance to bring in IPLC to India at a reasonable cost. One of the stakeholders suggested that international cable providers should be permitted to distribute bandwidth to DC provider buildings using point to point connectivity with diverse paths. A stakeholder intimated that there is lack of firm and expedited timelines for obtaining requisite regulatory approvals for cable repairs in Indian territorial waters. Currently, submarine cable repairs in Indian territorial waters require approvals from multiple agencies.

2.143 On measures, including incentive for improving the reliable connectivity to CLS, many stakeholders (mainly TSPs and associations) have stated that TSPs should be incentivized and there should be simplified approval process for setting up and maintaining the CLS. RoW charges for connectivity to the CLS being established by the ILDO/Access Operator/ISP licensee should be waived off. Provision should be made to ensure the safety of submarine cables in coastal areas. One of the stakeholders stated that CLS should be mandated as infrastructure of national importance and measures must be taken to protect, both subsea as well as terrestrial fiber cables connecting to the CLS. Cable laying & repair services should be designated as 'Critical & Essential Services' and should have priority for 'Permits-In-Principle' and

Clearances from Government agencies. There has been a suggestion that Access facilitation charges, and co-location charges paid to CLS should be allowed as pass-through expenses to help the ILDO make the connectivity charges more competitive. RoW charges for connectivity to the CLS being established by the ILDO/Access Operator/ISP licensee should be waived off. A stakeholder has suggested incentivizing new entrants to build, land and operate submarine cable systems by rationalizing access charges, removing regulatory hurdles and minimizing barriers to investment in submarine cable systems landing in India. One of the stakeholders suggested that international connectivity service providers should be incentivized for providing such connectivity to reduce hops and increase reliability to DC service providers. Few stakeholders have suggested that TSPs should be incentivized through rationalization of regulatory levies and simplified approval process for setting up and maintaining the Cable Landing Stations.

2.144 One stakeholder has suggested that CLS owned by one ILDO should be allowed to connect through terrestrial links with other CLS owned by another ILDO for ensuring that in case of failure of subsea cable at one CLS the traffic can be redirected through another CLS.

2.145 Few stakeholders have suggested to promote competition by opening CLS and CNC facilities to private or foreign investment, exercising regulatory oversight. They have suggested that both private investors and foreign investors should be permitted to terminate a subsea cable for private use, and to invest in and operate CLS and carrier neutral colocation (CNC) facilities in India. Incentives, tax holidays for 'open' CLS and CNC operators have also been suggested.

Analysis of the issue and views of the Authority

2.146 International connectivity is a key driver for global players to consider India as a preferred destination for their Data Centre & cloud services investments. The international connectivity/ bandwidth other than satellite mode, can be accessed through CLS only. The owner of CLS means service provider who owns and manages submarine cable

landing station in India and has been granted license to provide ILD service or internet service provider. As per existing licensing/ regulatory framework: -

A. ILDOs can establish Cable Landing Station (CLS) for submarine cable with prior permission of Licensor/ DoT. Also, ISP licensee may install operate and commission International Internet Gateway in the service area using satellite or submarine cable as medium after obtaining security clearance/approval from Licensor.

B. Access/ Co-location at the CLS shall be governed by the orders/regulations/directions issued by Licensor/ TRAI from time to time.

C. Equal access to bottleneck facilities at the Cable Landing Stations (CLS) including landing facilities for submarine cables for licensed operators on the basis of non-discrimination shall be mandatory. The terms and conditions for such access provision and the charges for such access provision shall be governed by the regulations/ orders as may be made by the Licensor/TRAI from time to time.

2.147 The following Regulations were issued by TRAI to regulate the access to essential facilities at Cable Landing Station: -

A. The International Telecommunication Access to Essential Facilities at Cable Landing Stations Regulations, 2007 (5 of 2007) dated 07.06.2007.

B. The International Telecommunication Access to Essential Facilities at Cable Landing Stations (Amendment) Regulations, 2012 (No. 21 of 2012) dated 19.10.2012.

C. The International Telecommunication Cable Landing Stations Access Facilitation Charges and Co-Location Charges Regulations, 2012 (No. 27 of 2012) dated 21.12.2012.

D. The International Telecommunication Cable Landing Stations Access Facilitation Charges and Co-Location Charges (Amendment) Regulations 2018 on 28.11.2018

2.148 The Authority noted that as per extant licensing/ regulatory framework, provision have been made to provide, on fair and non-discriminatory

terms & conditions, access to any eligible Indian International Telecommunication Entity for accessing international submarine cable capacity on any submarine. Also, Access Facilitation Charges and co-location charges are prescribed which shall be payable by a class or classes of eligible Indian International Telecommunication Entity to the owner of CLS. As per the international telecommunication access to essential facilities at cable landing stations regulations, 2007 (5 of 2007) dated 07 June 2007[24] ,

(a) "eligible Indian International Telecommunication Entity" means an International Long Distance Operator, holding licence to act as such, and, who has been allowed under the licence to seek access to the international submarine cable capacity in submarine cable system landing at the cable landing stations in India; or

an Internet Service Provider, holding valid international gateway permission or licence to act as such, and, who has been allowed under the licence to seek access to the International submarine cable capacity in submarine cable system landing at the cable landing stations in India;

(b) "owner of cable landing station" means a service provider who owns and manages submarine cable landing station in India and has been granted licence to provide international long-distance service or Internet service provider;

2.149 In view of the above, the Authority noted that as the CLS being a licensed activity, both the OCLS and the seeker of International Submarine Cable Capacity at the CLS must have the valid ILD/ISP license holding valid international gateway permission from DoT. Non-licensed entity is not allowed for accessing international capacity at CLS directly considering the security requirement as per the license conditions. Hence, it may be inferred that for any eligible licensee (ILD/ ISP with International

[24] https://www.trai.gov.in/sites/default/files/Regulation_07june07.pdf

Gateway) there is no challenge in accessing international capacity at CLS.

2.150 Based on the data submitted by OCLS and the information received from DoT, the status of CLS their capacities and utilization is as follows:

(a) At present there are a total of 15 functional cable landing stations in India (at Mumbai-9, Chennai-3, Cochin-1, Trivandrum-1 and Tuticorin-1).

(b) The following eight (08) new cable landing stations are under planning/ construction in Mumbai, Chennai, Digha (WB), Mahuva (Gujarat).

(c) As per the report submitted by Owners of CLS (OCLS) regarding the international bandwidth/capacity at CLS as on 31.12.2021,

(i) Total Designed Capacity is 276.05 Tbps,

(ii) Total Lit Capacity is 123.8 Tbps and

(iii) Total Activated capacity is 83.8 Tbps.

In view of above, it may be noted that the 23 CLSs in India (including the upcoming ones) not only provide for adequate international bandwidth availability but are also indicative of fair competition in this segment in the market.

2.151 The Authority noted the suggestion of stakeholders that Submarine cable repairs in Indian territorial waters require approval from multiple agencies. Authority is addressing the issue as part of its consultation process on 'Ease of doing business' dated 08th December 2021.[25]

2.152 As far as submissions made by some of the stakeholders on allowing access facilitation charges and co-location charges paid to cable landing station operators as pass through for AGR is concerned, the Authority would review it through a separate consultation process, if the need be. **As far as submissions made by some of the stakeholders on allowing access facilitation charges and co-location charges paid to cable landing station operators as pass through are concerned, the Authority may review it through a separate consultation process, if required**.

[25]https://www.trai.gov.in/sites/default/files/CP_08122021.pdf

2.153 NDCP 2018, under one of strategies 'Catalyzing Investments for Digital Communications sector', envisages, introducing various fiscal and non-fiscal benefits for the development of telecom clusters around cable landing stations to foster innovation in Digital Communications Technologies. As noted above, many states have released their DC policy while others have issued policy pertaining to promotion of IT/ITES in the state with DC operations pegged under it. The Authority has noted that Gujarat IT/ITeS Policy 2022-27 which focuses on attracting investment and generating employment across the state along with propelling growth through incentives and facilitations. The policy, to promote the development activities and boost the cloud ecosystem in the state, has spelt out that setting up of a CLS will be facilitated by way of support in land identification and allotment along with necessary utility infrastructure support at the doorstep. Further, the Gujarat Government shall provide fiscal support in the following way: -

(a) CAPEX support- One-time CAPEX support of up to 25 per cent of the eligible CAPEX expenditure subject to a maximum ceiling of INR 20 Cr. The disbursement will be done in twenty (20) equal quarterly instalments. (Only expenditures incurred on civil works for constructing the building of CLS along with network hardware, excluding expenditure towards cable laying and network cables, shall be admissible under GFCI).

(b) OPEX Support – Power tariff subsidy of INR 1/ unit for period of five years.

2.154 TRAI in its recommendations on "Roadmap to Promote Broadband Connectivity and Enhanced Broadband speed" dated 31st August 2021 has recommended that in line with RoW waiver for BharatNet project, the Central Government to coordinate with State Governments to waive right of way (RoW) charges for next five years (2022-23 to 2027-28) for expeditious laying of common ducts and posts. The Government should implement TRAI's recommendations on "Roadmap to Promote

Broadband Connectivity and Enhanced Broadband speed" dated 31st August 2021 in totality without any further delay.

2.155	In view of above, **the Authority recommends that other coastal states intending to promote setting up of Cable Landing Stations (CLS) may consider incentives and facilitations as has been done by State of Gujarat in its IT/ITeS Policy 2022-27.**

2.156	**In addition, the Authority recommends that Right of Way (RoW) charges for laying and maintaining Optical fibre cables (OFC) infrastructure to CLS may be waived off for encouraging and supporting the new CLS establishment for submarine cables.**

Access to Power

2.157 According to the International Energy Agency, global Data Centre electricity usage in 2020 was 200-250 TWh[26], or around 1% of global final electricity demand. The majority of the energy consumed is used to power the servers, however they generate heat and must be cooled. Heating and cooling demand is substantial since the servers need to be kept at a constant temperature of 18 to 27°C. The availability of sufficient 24x7 power for data centres is a primary need for the uninterrupted delivery of mission-critical services. With unstable grid connectivity in many sections of the country, dependable power supply remains a challenge. Many rural locations in the northern and eastern states often receive less than 20 hours of grid power. The average daily power supply in urban regions (22 hours) is slightly longer than in rural areas (20 hours), with an overall average of 20.6 hours of grid power supply each day.

2.158 Green Data Centres are modern-day Data Centres that can reduce emissions. Most large data centres could reduce their greenhouse gas

[26] https://www.iea.org/reports/data-centres-and-data-transmission-networks

emissions by using more efficient off-the-shelf technology and better energy management. Green Data Centres must be given a solid foothold in the country. There are certifications for green Data Centres that can be obtained from a variety of organizations that are used all around the world. In India, the Indian Green Building Council (IGBC), a division of the Confederation of Indian Industry (CII), certifies enterprises seeking a LEED certification. In addition, the IGBC provides a Green Data Centre accreditation, which focuses on Data Centres and includes numerous criteria to assess efficiency. This has been discussed in detail in subsequent sections.

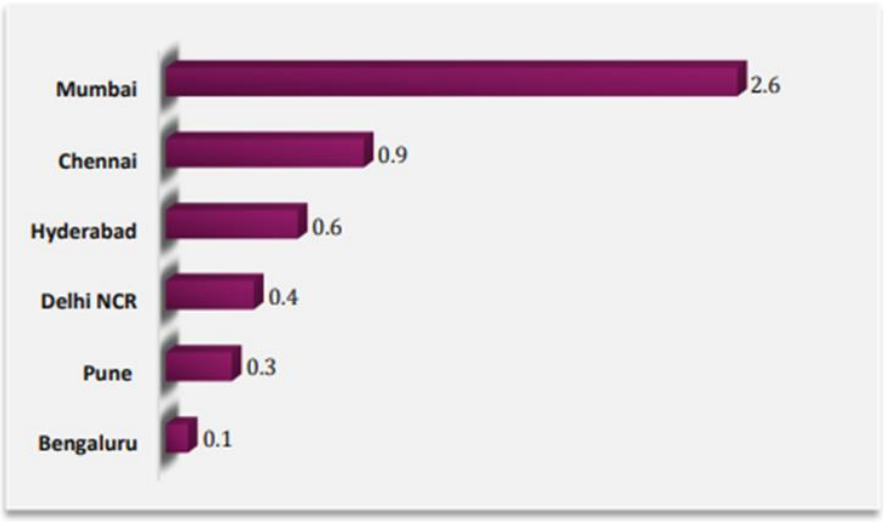
2.159 The push towards Green Data Centres can be from a combination of incentives provided for Data Centres that use energy-efficient mechanisms, certification for voluntary standards that give businesses a better selling point, and environmental requirements mandated by the Governments. There is a fine balance maintained in most countries across the three approaches to ensure that Data Centres become environmentally efficient without greatly increasing the burden of compliance and diminishing the ease of doing business.

2.160 Naturally cooled regions in India, which are largely untapped for Data Centre ventures, are the best-suited alternatives for greenfield rollout due to their low Capital Expenditure (CapEx) and Operational Expenditure (OpEx) and relatively lower land cost, cheaper labour, low water-based cooling requirements.

2.161 India's Data Centre capacity is expected to grow from 375 MW in H1 2020 to 1,078 MW by 2025[27], presenting a USD 4.9 billion investment opportunity (refer figure 2.5 below). For the increased energy consumption of DCs, and with the IT activities, the power related challenges to be addressed.

Figure 2.5 : Distribution of USD 4.9 bn Greenfield investments by 2025

[27] https://www.jll.co.in/content/dam/jll-com/documents/pdf/research/apac/india/jll-re-imagine-data-centres-running-india-s-digital-economy-h1-2020.pdf



(Source: JLL Research)

2.162 In view of aforesaid, following power related issues were raised in CP to get the opinion of stakeholders: -

17. *"Is the extant situation of power supply sufficient to meet the present and futuristic requirements for Data Centres in India? What are the major challenges faced by Data Centre Industry in establishment of Data Centres in naturally cooled regions of India? What are the impediments in and suggested non-conventional measures for ensuring continuous availability of power to companies interested in establishing Data Centres in the country? What incentivization policy measures can be offered to meet electricity requirements for Data Centres?"*
18. *"Should certification for green Data Centres be introduced in India? What should be the requirement, and which body may look after the work of deciding norms and issuing certificates?"*
19. *"Are there any challenges/restrictions imposed by the States/DISCOMs to buy renewable energy? Please elaborate. Please suggest measures to incentivize green Data Centres in India?"*
20. *"What supportive mechanisms can be provided to Data Centre backup power generators?"*

Comments of the stakeholders

2.163 Majority of stakeholders have viewed the current state of electricity supply in India as insufficient. Some stakeholders have opined that the power producing capacity is adequate, but there are feasibility and procedural challenges pertaining to last mile distribution link to take bulk electricity to Data Centres, as well as regulatory and procedural difficulties related to access to green energy. Others stated that while

sufficient power sources are available to support current DC in Tier I cities, power infrastructure in Tier II and III cities needs to be reinforced.

2.164 Most stakeholders think the major problems in establishing DC in naturally cooled parts of India stem from a lack of electricity and manpower, as well as lack of adequate transmission and distribution infrastructure in these areas. The lack of big contiguous land parcels, as well as restricted local demand and access, provide obstacles for the operation of large DCs. Furthermore, possible security considerations and natural calamities might be a barrier in attracting DC investments in naturally cooled regions.

2.165 While advocating for incentivization policy and necessary measures, stakeholders have suggested the following:

A. Power supply from two different substations, one acting as backup to ensure reliable and continuous power availability.

B. Approved/registered DC should be free from paying electricity taxes for a period of 20 years. The telecommunications industry should be completely exempted from power duty in monthly electricity bills.

C. A minimum of 40-50 MW should be consistently accessible to all new DC plants, with the capacity scaling up to 200-300 MW.

D. Power upgrade/downgrade requirements and processes should be made easy, and time-bound.

E. A partial reimbursement mechanism for power for a specified period be extended to improve commercial competitiveness and project viability.

F. Electricity connection should be given on priority within 15 days max for telecom sites on discounted/industrial price.

G. The authorities should make it easier for DC and DC Parks to establish their own power producing units. To complement electricity supply, captive power sources such as solar and wind farms should be constructed. DC players interested in deploying energy-efficient servers may be given additional benefits such as easier approvals and permits and subsidies for investing in renewable energy power plants.

H. States should agree to provide necessary HT/EHV connections to data centre operators in a reasonable timeframe, with no limit on the scale of the solar power plant.

I. Deemed distribution licences should be made accessible by default to data centre Park operators.

2.166 Albeit many stakeholders are supportive of introduction of certification for green DCs in India, there are contrasting views about the deciding body for overseeing rules and giving certifications. Different authority like IGBC, STQC under the Ministry of Electronics and IT (MeitY), Ministry of New and Renewable Energy (MNRE), the Bureau of Indian Standards (BIS), and BEE or EESL have been suggested for certifying green DCs. One individual has submitted that the Ministry of Environment, Forestry, and Climate Change along with IGBC to operate as the apex and certifying body.

2.167 Stakeholders have submitted different kind of issues and challenges faced from the States/DISCOMs to buy renewable energy. These are summarized as follows:

A. In many states, energy banking is restricted to daily or monthly. Energy banked during peak ToD slots can be drawn during off peak ToD slots but the vice-versa is not allowed.

B. Renewable Energy Certificates (REC) buyers must go through a cumbersome registration process that necessitates the use of sophisticated software applications.

C. Commercial and Industrial (C&I) customers purchase Renewable Energy (RE) independently from solar and wind power plants. In most cases, respective project developers set up these plants on separate land parcels and use separate power transmission system for transmitting the produced renewable energy to their C&I consumers.

D. Many state governments levy a plethora of fees, such as wheeling, cross subsidies, and state transmission utility rates, which make green energy uncompetitive. During peak hours/months, some states prohibit the usage of renewable energy settlement.

E. Due to regulatory constraints, Open Access (OA) is currently not permissible in multiple states such as Delhi, Maharashtra, or Telangana to acquire renewable energy from the market.

2.168 Measures suggested by the stakeholders to incentivize green Data Centres in India are summarized below:

A. Green Data Centre accreditation may be used as a criterion for offering fiscal and non-financial incentives to DCs. After a reasonable period of establishment of a particular DC, a minimum proportion of green energy should be enabled for operations. DCs should be incentivized to boost renewable energy usage by including the cost of acquired RECs in the CSR cost.

B. Mandate banking on an annual basis and allow energy saved during off-peak ToD slots to be used during peak ToD slots. Enabling data centre operators to enter into bilateral agreements with RE generators for RECs and to increase the quantum of RE acquisition from individual power plants.

C. Open access should be allowed in those states with listed DISCOM to meet the power at affordable rate.

D. Charge reductions to encourage DC operators to adopt green energy. To encourage the use of renewable energy, DC firms should be granted a remission of the Cross Subsidy Surcharge and the Additional Surcharge.

2.169 In addition to the above-mentioned measures, one association has submitted that FAME – II (Faster Adoption and Manufacturing of Electric Vehicles) for automotive sector and Kisan Urja Suraksha Evam Utthaan Mahabhiyan (KUSUM) for farmers can be extended for the telecom sector and RESCOs respectively. On the other hand, one organization has suggested that the 'Green Term-Ahead Market' (GTAM) may be extended to data Centre operators.

2.170 While suggesting measures for support mechanisms for Data Centre backup power generators, majority of the stakeholders are of the view that the fuel subsidies should be granted to benefit the data Centre industry and DG sets should be allowed to operate as backup power

infrastructure without any hinderance from state pollution control boards (SPCB) or Central pollution control board (CPCB). In this regard, an exemption should be granted to DCs as has been done for hospitals/emergency/essential services. One DC operator has suggested that High-Capacity Generator manufacturing must be promoted under "Make in India" policy with associated PLI schemes, or the DC operators may be incentivized to procure such HCGs manufactured in India to promote the manufacturing industry in India. Few stakeholders have suggested alternatives such as the use of lithium-ion batteries, solar panels, wind power, natural gas-based generators, and dual fuel generators as a flexible path towards sustainable power backup.

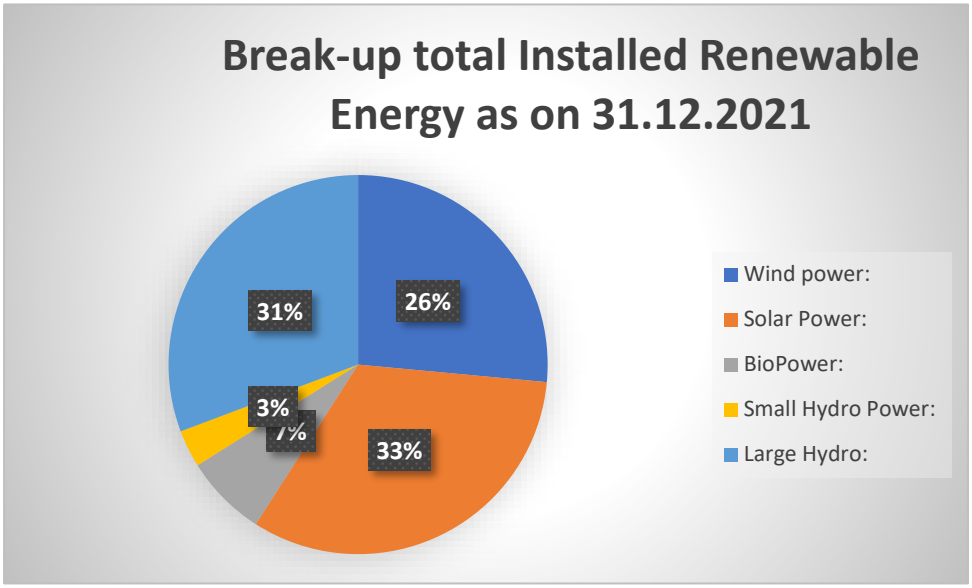
Analysis of the issue and views of the Authority

2.171 The Authority has noted that the installed power generation capacity in India is around 391 Giga Watts, which is more than enough to meet the 200 GW peak demand for power.[28] The government is also preparing to have enough generation capacity to fulfill future electricity demand. India's installed renewable energy capacity has increased 396% in the last around 9 years and stands at more than 159.95 Giga Watts (including large Hydro), which is about 40% of the country's total capacity (as on 31st March 2022)[29]. According to the Renewables 2022 Global Status Report (GSR 2022) published by the global renewable energy community REN21, India is placed third in the world for total renewable power capacity additions in 2021, with 15.4 GW (gigawatts),

28https://powermin.gov.in/sites/default/files/uploads/RS07122021_Eng.pdf

[29] https://www.investindia.gov.in/sector/renewable-energy#:~:text=India's%20installed%20renewable%20energy%20capacity,as%20on%2031st%20March%20202

following only China (136 GW) and the United States (US) (43 GW).



2.172 The Ministry of New and Renewable Energy[30] has taken a series of steps to promote development of Small Hydro Plants (SHPs) in a planned manner and improve reliability & quality of the projects. By giving various physical and financial incentives, investments have been attracted in commercial SHP projects apart from subsidizing State Governments to set up small hydro projects. The Ministry is also giving special emphasis to promote use of new and efficient designs of water mills for mechanical as well as electricity generation and setting up of micro hydel projects up to 100 KW for remote village electrification.

2.173 In order to encourage generation of solar power in the country, various scheme like Solar Park Scheme, Viability Gap Funding (VGF) Schemes, CPSU Scheme, Defence Scheme, Canal bank & Canal top Scheme, Bundling Scheme, Grid Connected Solar Rooftop Scheme etc. are also undertaken to promote the grid connected solar power plants.

2.174 The Government is also promoting wind power projects in entire country through private sector investment by providing various fiscal and financial incentives such as Accelerated Depreciation benefit; concessional custom duty exemption on certain components of wind electric generators. India is blessed with a coastline of about 7600 km surrounded by water on three sides and has good prospects of

[30] https://mnre.gov.in/

harnessing offshore wind energy as well. Tidal, bio-mass, and geothermal energy are other renewable energy sources that hold great potential for power generation.

2.175 In the Union Budget 2022-23, the government allocated Rs. 19,500 crore (US$ 2.57 billion) for a PLI scheme to boost the manufacturing of high-efficiency solar modules. India has also launched the Mission Innovation Clean Tech Exchange, a global initiative that will help accelerate clean energy innovation.

2.176 Central Electricity Authority's Load Generation Balance Report 2021-2022 states that the country is likely to have 8.2% of an overall peak surplus. Energy surplus is anticipated of the order of 24.0%, 7.9%, 7.6% and 7.5% in the North-Eastern, Western, Southern, and Northern Regions respectively.[31] The power supply position in India has improved considerably in last few years. However, stakeholders have flagged following challenges that need to be addressed to improve the power related aspects for growth of data centre in India:

(a) **Last mile power connectivity through dual grid setup -** Data centres being power guzzlers require High Tension (HT) power connection to meet their power requirements for data servers, air conditioning chillers and other associated building load. As per stipulated norms of uptime institute, a Tier-III and Tier-IV data centres are required to have redundant power supply arrangements to mitigate the crisis in case of power failure of the primary source. Power supply arrangement from alternate grid can create redundancy to address even grid level failures. However, data centres are facing difficulties in arranging redundant power arrangements from two distinct HT grid connections due to following reasons :–

(i) Non-feasibility from alternate feeders.

(ii) Time-consuming procedures/ non-existence of such provision in many states.

31https://cea.nic.in/wp-content/uploads/l_g_b_r_reports/2020/LGBR_2021_22.pdf

(iii) Capital Intensive - The cost incurred in erecting poles, extending power lines, installing transformer, laying of electrical lines etc. is substantial and it effects overall viability.

(b) **Deemed power distribution license -** Government of India using the power conferred under Section 49 of the Special Economic Zone Act has authorized developers of Special Economic Zones (SEZs) as a "*Deemed Licensee*" under clause (b) of Section 14 of the Electricity Act by issuing notification No.S.O.528(E) Dated 03-03-2010. Deemed Power Distribution licences if given to developers and operators of data centre parks, will enable them to directly purchase electricity from generation firms (including renewable energy) without any qualification requirements. This will boost cost competitiveness for end users (data centre operators). Deemed power distribution licensee status has several benefits like allowing an option to purchase electricity for the SEZ from any State Electricity Company or Corporation and any other generator of electricity including Central Power Supply Undertakings (CPUs). Several states have their own State SEZ policy whereby they have allowed other benefits to be passed to such deemed licensees. For example ., State policy for SEZs of Karnataka allows that any sale of electricity to the SEZ or units therein shall be exempted from payment of Electricity Duty or Taxes on the electricity consumed[32]. Such purchaser shall be deemed to have an approval to use the transmission and distribution system of the transmission and distribution agency under the Electricity Act 2003, subject to payment of appropriate wheeling charges and availability of transmission capacity. The Authority has already recommended that some identified SEZs should be converted into DC Parks. In case the DC Parks are setup outside SEZs, it will be logical to declare these DC Parks as SEZs so that

[32]http://sezindia.nic.in/upload/uploadfiles/files/4state%20policy%20of%20sez%2020091.pdf

the benefits passed on under SEZ Act or rules/notifications issued under the Act will be made applicable for DC Parks.

(c) **Waiver of electricity duty to data centres** - Electricity duty is a tax component that is applicable on the use of electricity and the tax proceeds goes to the state government rather than the Electricity Distribution Company or DISCOM. Stakeholders have suggested "Waiver of electricity duty" to DCs and DC parks. As has been mentioned above, some of the State Governments have waived off these charges as part of their policies.

(d) **Flat and lower power tariffs** - As energy consumption of DCs mostly remains flat, stakeholders have requested that flat and lower power tariff rate should be defined under separate category in tariff order for DCs. The flat power rate tariff is defined as a flat, unchanging charge that allows the user to consume up to a maximum amount of power. These rates are also sometimes called fixed rates. These rates demand that a user's consumption never exceeds a set wattage at any given time.

(e) **Co-generation of power** -Data centres are high electric energy consumers, resulting in very high electric power costs. They require high-quality energy in terms of reliability to ensure continuous operation. Around 40% - 50% of this power is used for continuous cooling. In addition to environmental concerns, the need for power and cooling 24/7 makes data centres an excellent potential market for combined heat and power (CHP) applications. Despite advances in resilient technologies, data centres remain vulnerable to grid outages. Co-generation and combined heat and power (CHP) have enormous promise in the data centre sector. A captive gas engine power plant's electricity and heat can be used for practical onsite purposes. Combining power and cooling (CCP) is a step in the *tri-generation* process that involves using absorption chillers to convert heat into

cooling. This could be used to assist in cooling data centre loads. There are several advantages to co-generating at a DC location having a natural gas-based power plant. These are :-

(i) Additional source of energy and alternative to a diesel generator.

(ii) Utilizing absorption chillers to cool the Data Centre by converting heat into cooling.

(iii) Energy Cost Savings - Using a wide range of fuels, resilient and robust power can considerably increase overall efficiency (thermal and electrical).

(iv) Environment friendly - Produces fewer carbon emissions than diesel gensets.

Since the above stated efforts are highly capital intensive, hence Stakeholders have projected the requirement of incentives and support from the Government in the form of capital subsidy, interest subsidy etc. The Authority has separately dealt new technology/methods/processes that can be adopted for promoting green DCs in subsequent sections.

(f) **Waiver of Fixed demand Charges**. Power utilities impose additional fees known as "fixed demand charges" on non-residential or commercial customers in order to maintain a steady supply of electricity. The amount of these charges that businesses must pay on their monthly electric bills is typically quite high. Therefore, the price of energy that a business pays each month is determined by both the amount of electricity used during the month and the rate at which it has been consumed. Stakeholders have requested that data centre parks and individual data centre units be classified as energy-intensive industries and that fixed demand charges for electricity obtained from the grid or a captive renewable plant be waived off.

(g) **Virtual Power Purchase Agreements (VPPAs) and Contract for Difference (CFD) For Data Centres**. At its foundation, a power purchase agreement (PPA) is a contract between two parties in which one party sells another party both electricity and renewable energy certificates (RECs). The majority of enterprises with significant, concentrated loads use physical PPAs. This is so that the consumer, who gets and acquires legal rights to the energy under a physical PPA, receives renewable electricity from the seller. A virtual PPA (VPPA) is a financial agreement as opposed to a power contract, unlike a physical PPA. In a VPPA, a consumer consents to buy the project's production and related RECs for a predetermined fixed cost. The developer then sells the energy at market rates and pays the consumer a portion of the proceeds.

A CFD is a long-term agreement between a power plant and a buyer, ideally a Low Carbon Contracts Company (LCCC). The agreement gives the power plant the ability to maintain its revenue levels for the duration of the agreement at a certain level. According to the CFDs, LCCC pays the power plant, the difference when the market price for the electricity produced by a power plant is less than the pre-agreed price as specified in the contract (strike price). The power plant does however, pay LCCC the difference when the reference price is higher than the strike price. The use of market-driven tools like Virtual PPAs and CFDs ought to be promoted to maximise the use of renewable energy in data centres and data parks.

(h) **Use of Renewable Energy Certificates (RECs)**. Renewable Energy Certificate (REC) mechanism is a market-based instrument for promoting renewable energy and facilitating renewable energy purchase commitments among diverse stakeholders including data centres. A Renewable Energy Certificate (REC) verifies that the holder owns one megawatt-hour (MWh) of electricity produced from a renewable energy

source. Once the power provider has put the energy into the system, the REC obtained can then be sold in the open market as an energy commodity to purchase power. In many nations, including Australia, Japan, the United States, the Netherlands, Denmark, and the United Kingdom, RECs have been successfully employed as a market-based policy instrument to promote renewable energy. However, the specifics of these plans differ and must be adjusted to account for regional laws and market conditions. The governance system in India and the fact that energy is on the concurrent list presents special hurdles for the creation of such a plan. As a result, the Authority acknowledges the importance of including several stakeholders in the creation and execution of the REC Mechanism, including the suggested framework of the Ministry New and Renewable Energy, State Electricity Regulatory Commissions, State Utilities, and RE developers.

2.177 Some of the above issues have already been addressed in previous sections where the Authority has recommended inclusion of following power related facilities/incentives in the national level DCRI framework to rank States as per their suitability to promote establishment of DCs:

(a) Separate lower/ Special power tariff for DCs/DC Parks

(b) Waiver of Electricity Duty for DC/ DC Park

(c) Ab-initio availability of Power supply from dual power grid networks for DC/ DC parks

(d) Permission to DC/DC Parks to consume Renewable Energy directly from power producers via open access system, with no restrictions and additional surcharge

(e) Whether fixed demand charges on electricity have been waived off

2.178 **The Authority recommends that DoT may take up with Ministry of Power to look into the submissions made by stakeholders for formulation of a DC conducive yet simplified framework for power to address the issues that have been flagged in this section.**

2.179 As far as establishment of DCs in naturally cooled regions of India is concern, the Authority has noted that to minimize power and cooling costs, some of the world's largest data Centre service providers and other organizations have constructed their data centres in naturally cooled regions. The key details are summarized as follows:

i. Google's data centre in Finland has shown to be beneficial in terms of cooling the building and reducing energy expenses.[33]

ii. Facebook selected a colder site for its new data centre in Lulea, Sweden, near the Arctic Circle. Freezing air from outside is pumped into the building acting as a natural coolant, with hot air generated by the servers circulating out using almost 40% less power than traditional data facilities.[34]

iii. Microsoft, the world's largest software business, in collaboration with Fortum has announced plans to develop a new emission-free data centre region in southern Finland, with the capacity to distribute clean heat from the server cooling process to homes, services, and commercial premises that are connected to its district heating system. Using waste heat from data centres will result in a decrease of around 400,000 tonne of CO2 emissions each year.[35]

2.180 These examples clearly show that setting up a Data Centre in a location that is both cold and supplies a large amount of low-cost energy is clearly a good idea. Naturally cooled regions have the potential to significantly cut energy and cooling costs and can pave the path for zero-emission green DCs. The Chart 2.1 shows the average annual temperature of several Indian states.

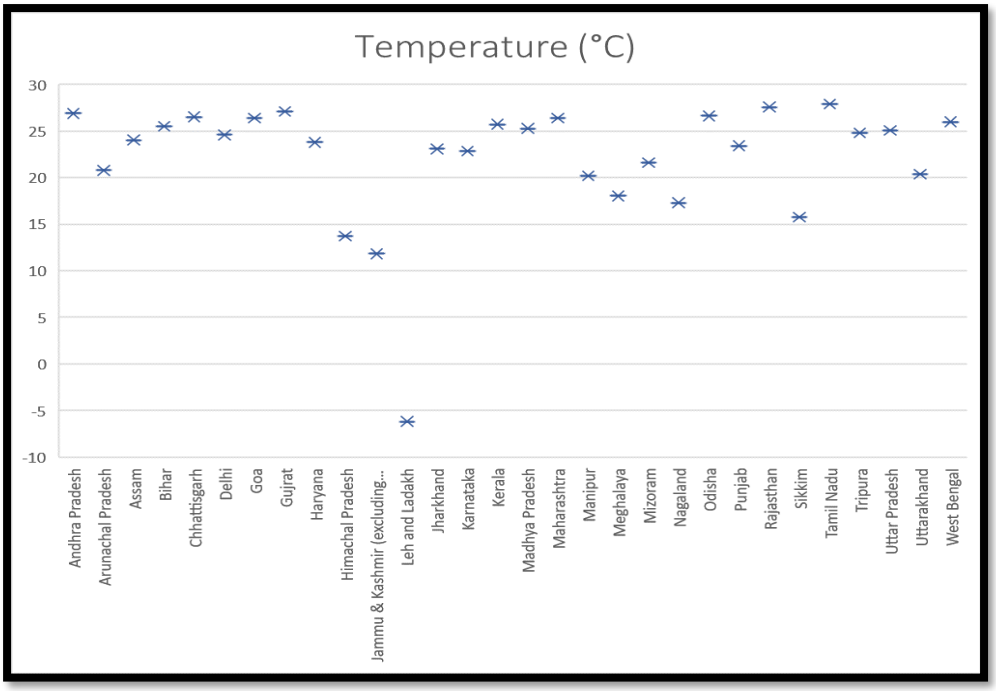
Chart 2.1 Average annual temperature for Indian States

33https://www.google.com/about/dataCentres/locations/hamina/

34https://www.theguardian.com/technology/2015/sep/25/facebook-datacentre-lulea-sweden-node-pole

https://www.dpr.com/projects/facebook-sweden-data-Centre

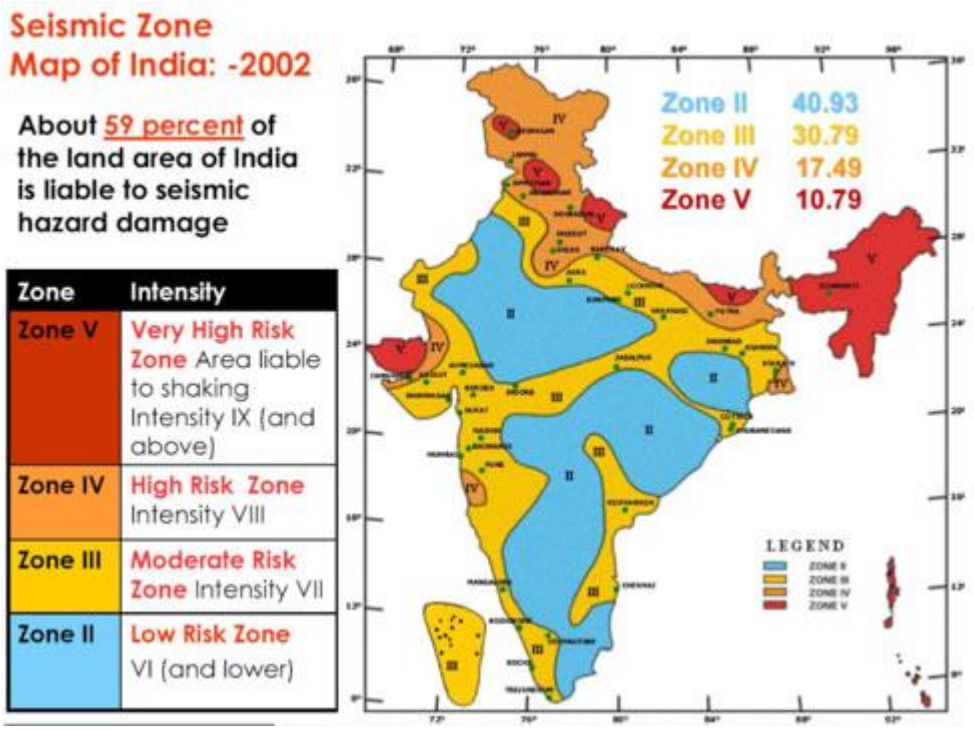
35https://news.microsoft.com/europe/2022/03/17/microsoft-announces-intent-to-build-a-new-dataCentre-region-in-finland-accelerating-sustainable-digital-transformation-and-enabling-large-scale-carbon-free-district-heating/



2.181 States like Himachal Pradesh, J&K, some of the North-Eastern States have Average annual temperature of 20^0 Celsius or below. DCs in these naturally cooled regions can reap advantages of low cooling power requirements. However, the stakeholders have opined that the major impediment in establishment of Data Centres in naturally cooled regions of India is lack of basic infrastructure, such as a power shortage and lack of skilled manpower. While Authority is of the view that these impediments can be overcome, it also understands that DCs in the naturally cooled regions in India can have disadvantages of –

- lack of low latency fiber (as they are far from CLS)
- Security issues (as they are close to international borders)
- Safety issues (as they are located in seismic zone IV and V as can be seen from the figure 2.6 below)

Figure 2.6: Map of seismic zones in India



2.182 It is therefore less likely that big data centres would come up in such parts of India. However, localized DC and edge DCs will definitely need to be encouraged in such regions. For the same the Authority has already recommended that in order to avoid the concentration of further Data Centre Parks in already developed locations, the left-out states should be supported by Centre for setting up of Data Centre Parks in each of such States.

2.183 Energy banking allows organizations to store surplus energy and withdraw it later when needed. In energy banking, a producing facility delivers power to the grid without intending to sell it. Instead, the plant can withdraw electricity from the grid within a defined time frame and for the charges specified in relevant regulations.[36] Generally, banking in India is provisioned at the point of consumption by the distribution companies (DISCOMS). Banking is exclusively permitted for intra-state transactions. A banking charge is levied by certain State Electricity Regulatory Commissions (SERCs) that varies by state. The following

36https://www.uperc.org/App_File/Draft_CRE_Regulations_2019-pdf44201991905PM.pdf

are the primary advantages of banking provisions for renewable energy generators:[37]

i. An effective mechanism to utilize excess RE generation
ii. As solar and wind power are intermittent in nature, it is not possible to forecast the generation and supply of energy with 100% accuracy. Banking can help manage intermittency and ensure a reliable power supply.
iii. The banking provision indirectly helps utilities in peak load shifting.
iv. It encourages the Commercial & Industrial (C&I) sector to raise its proportion of RE purchases, so contributing to the achievement of sustainability and RE100 objectives.

2.184 The Ministry of Power released Electricity (Promoting Renewable Energy Through Green Energy Open Access) Rules, 2022 on 06 June 2022. Few guidelines on banking as mentioned in the aforementioned rule include:

i. Banking shall be permitted at least on a monthly basis on payment of charges to compensate additional costs, if any, to the distribution licensee by the Banking and the Appropriate Commission shall fix the applicable charges.
ii. The permitted quantum of banked energy by the Green Energy Open Access consumers shall be at least thirty percent of the total monthly consumption of electricity from the distribution licensee by the consumers.

2.185 In last few months, some RE-rich states have moved from an annual to a monthly banking period, while some have completely withdrawn banking facilities for renewable energy projects which are summarized below and shown in Figure 2.7:

37https://ieefa.org/wp-content/uploads/2021/12/Banking-Restrictions-on-Renewable-Energy-Projects-in-India_December-2021.pdf

i. Gujarat and Maharashtra have moved from an annual banking period to a monthly banking facility.

ii. In Andhra Pradesh, the banking facility has been completely withdrawn. The Andhra Pradesh government amended its key renewable policies to pull back the incentives given to RE developers in November 2019. The amendment removed, banking of 100% of energy, which had been allowed throughout the year for solar, wind, and hybrid projects.

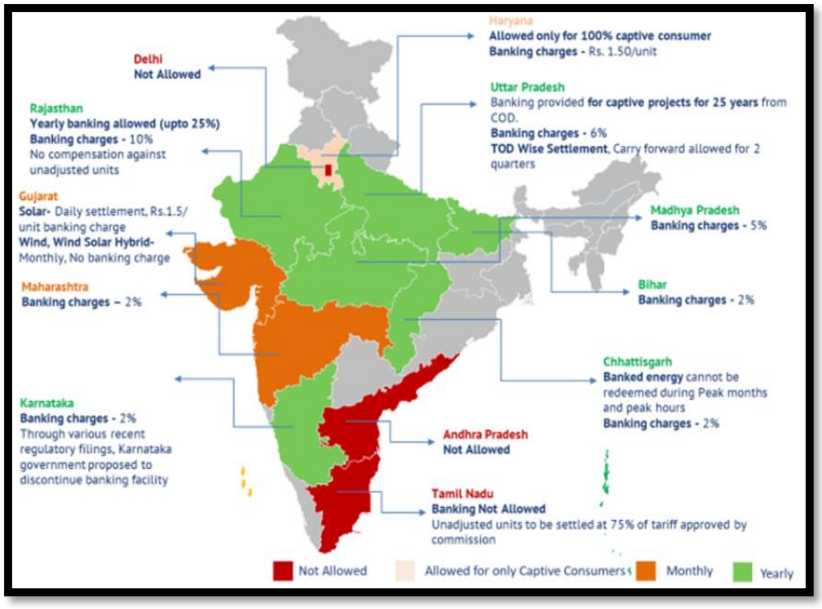
iii. Following in Andhra Pradesh's footsteps, Karnataka Electricity Regulatory Commission (KERC) in August 2020 has also proposed to discontinue the banking facility extended to renewable projects. However, in its latest issued interim order to remove regulatory uncertainty, KERC decided in September 2021 to allow a banking facility for solar projects with annual settlement periods and with banking charges of 2%.

iv. Rajasthan has restricted its banking facility for third-party transactions.

v. Madhya Pradesh does not allow a banking facility for DISCOM-registered captive projects.

Figure 2.7: Power Banking Period analysis of various states[38]

[38]Source: JMK Research



2.186 Recently Ministry of Power has notified Electricity (Promoting Renewable Energy Through Green Energy Open Access) Rules, 2022 on 06.06.2022. The rules have following provisions related to banking of surplus green energy injected in the grid and credited with the distribution licensee energy by the Green Energy Open Access consumers-

"Banking.–

(1) Banking shall be permitted at least on a monthly basis on payment of charges to compensate additional costs, if any, to the distribution licensee by the Banking and the Appropriate Commission shall fix the applicable charges.

(2) The permitted quantum of banked energy by the Green Energy Open Access consumers shall be at least thirty percent of the total monthly consumption of electricity from the distribution licensee by the consumers."

2.187 The Authority agrees with the view of stakeholders and **recommends that for the overall development of green DCs in India, energy banking provisions for DC/DC park operators who opt to produce renewal energy for consumption for DC/DC Parks should be extended on yearly basis.**

2.188 **In addition, to promote generation and consumption of renewable energy, the Authority recommends that DoT may take up the issue of providing land on priority and on concessional rates to DC/ DC park operators for establishing solar power plants.**

2.189 The Central Pollution Control Board (CPCB) of India is a statutory organization under the Ministry of Environment, Forest and Climate Change (MoEFCC). Under the Air (Prevention and Control of Pollution) Act of 1981, the CPCB is entrusted with the powers and functions of a field formation and coordinates the activities of the State Pollution Control Boards by providing technical assistance and guidance, as well as resolving disputes among them.[39] As part of the Graded Response Action Plan (GRAP), electrical generators (running on diesel, petrol, or kerosene) have been restricted in the National Capital Region, except for those required for vital or emergency services such as health care facilities, elevators, train services, the Delhi Metro, airports, inter-state bus terminals and the National Informatics Centre's data Centre etc.

2.190 It is a responsibility of the State Government, Central Government as well as the DISCOMs to provide reliable and continuous electricity supply to business establishments like DCs. A DC operator will not prefer running Diesel Generators (DG) as the per unit costs of generating power through DGs is high. However, in absence of continuous power a DC can't be shut down.

2.191 The Authority agrees with the view of the stakeholders and **recommends that DG sets at DC and DC Park sites should be allowed to operate as backup power infrastructure without any hindrance from State Pollution Control Boards (SPCB) or Central Pollution Control Board (CPCB).** Since power outages for few hours will require huge quantity of diesel to run DGs for large DCs**, the Authority recommends that the diesel storage regulation may be**

[39]https://cpcb.nic.in/Introduction/

suitably revised to cater for the requirement of DCs to operate for a minimum back-up period for up to 48 hours.

2.192 In a country with a large and increasing energy demand, energy efficiency is key. Under the ambit of Energy Conservation Act 2001 for promotion of energy conservation and energy efficiency, Bureau of Energy Efficiency (BEE) is developing policies and strategies with a thrust on self-regulation and market principles with the primary objective of reducing energy intensity of the Indian economy. BEE has been implementing several programmes/ policy for promotion of energy efficiency in India under the provision of the EC Act, 2001. Some of the energy efficiency policy/standards/codes that currently exist in India are as follows:

A. **Energy Conservation Building Code (ECBC)** issued by BEE, (November 2019 version) is intended to provide requirements for design and construction of energy-efficient buildings in India, including data centers. ECBC follows the same structure as ASHRAE 90.1 standard and covers the areas related to Building Envelope, HVAC, Service Hot Water and Pumping, Lighting, and Electric Power. This guide covers energy efficiency opportunities under four broad categories: 1. Room Cooling, 2. Chiller Plant, 3. Electrical Systems, 4. IT Hardware & Management.

B. **Perform, Achieve & Trade (PAT)** by BEE, is a market-based scheme launched in 2011 under The National Mission for Enhanced Energy Efficiency (NMEEE). NMEE is one of the eight missions under the National Action Plan on Climate Change (NAPCC). PAT aims to improve the energy efficiency in energy-intensive large industries and facilities by setting sector-specific benchmarks and giving targets to Designated Consumers.

C. **Green Rating for Integrated Habitat Assessment (GRIHA)** - All buildings (e.g., offices, retail spaces, institutional buildings, hotels, hospital buildings, healthcare facilities, residences, multi-family high- rise buildings) more than 2,500 square meters

are eligible for certification under GRIHA. It measures and rates the building's environmental performance in the context of India's varied climate and building practices.

D. **Standards and Labeling (S&L) program** for appliances and equipment.

2.193 The Indian Green Building Council (IGBC),[40] as discussed in the CP, provides a wide range of services, including the development of new green building rating standards, certification services, and green building training programs. IGBC continuously works to provide tools that facilitate the adoption of green building practices in India. The Green Data Centre Rating System is designed to enable the building and management of data centres with increased resource efficiency, resulting in national benefits. The IGBC Green Data center rating system 2016/ 2017 is intended to enable construction and operation of data centers with enhanced resource efficiency[41]. The ranking method takes into account the following factors:

- Site Selection & Planning
- Energy Efficiency
- Operation & Maintenance
- Water Conservation
- Building Material and Resources
- Indoor Environmental Quality
- Innovation

2.194 DCs interested in registering their DCs for Green Certification under IGBC Green Data Center Rating System, have to first register on IGBC website (www.igbc.in). Different levels of Green Data Center certification are awarded based on the total credits earned. However, every Green Data Center should meet certain mandatory requirements, which are non-negotiable. The Certification is valid for

40https://igbc.in/igbc/redirectHtml.htm?redVal=showgreendataenrenosign

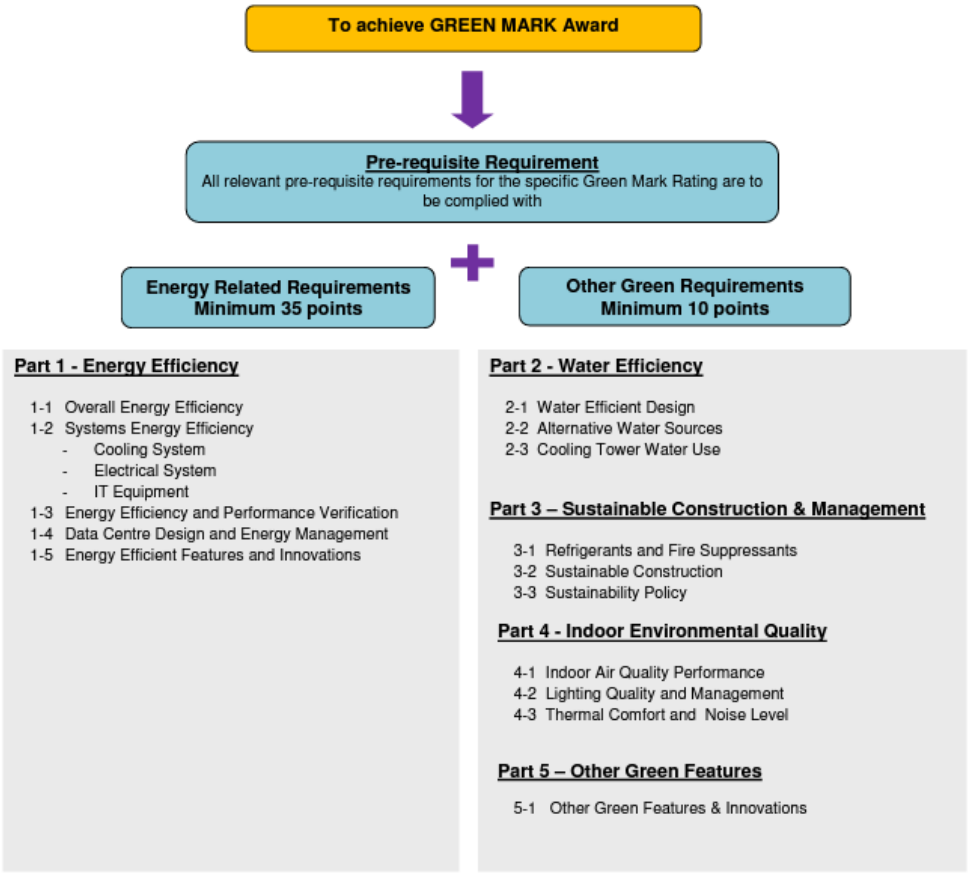
[41] https://igbc.in/igbc/redirectHtml.htm?redVal=showLNBLProjectssignin

3 years from the date of award, after which project is required to apply for the recertification.

2.195 DCs are intensive users of resources like land, water, and energy, contributing to carbon footprint. With the global trend moving towards green data centres, many countries have come out with a Data Center Energy Efficiency Policy. Singapore Government has put in place a comprehensive certification process for identifying green DCs. To provide recognition to data centre operators that have successfully deployed Green Data Centre best practices and demonstrated superior energy and environmental performance, BCA and IMDA have developed the Green Mark scheme for Data Centres in Singapore. The scheme comprises of a rating system which enables DCs to benchmark their degree of greenness with respect to their peers. Rating DCs in categories such as "Platinum", "Gold PLUS" and "Gold" provides the impetus for DC operators to track, manage and improve their energy efficiency performance to reduce operating cost and also improve the corporate branding. BCA-IMDA Green Mark for Data Centres scheme comprises of a dedicated green building rating system for Data Centres (DCs) that is designed to encourage the adoption of energy efficient design, operation and management of data centres. The scheme is jointly developed by BCA and IDA with supporting partners from Energy Research Institute @ Nanyang Technological University (ERI@N) and Lawrence Berkeley National Labs (LBNL) in the US. The Authority has gone through the ingredients of the scheme and finds it to be an effective certification mechanism. The mechanism is based on points allocated to various energy efficiency attributes as depicted below:

Figure 2.8: BCA-IMDA Green Mark for Data Centres[42]

[42]https://www.bca.gov.sg/greenmark/others/GM_New_DC_v1_1.pdf



2.196 The comparative analysis of BCA-IMDA Singapore Green Mark for New Data Centres with the IGBC Green Data Centre rating system is annexed as **Annexure-IV.** The Authority is of the view that the BCA-IMDA framework can be used for further improving the Green Data centre certification framework in India.

2.197 In direction towards greener telecom, TRAI had released its recommendations on "Approach Towards Green telecommunications" on 12 April 2011 and 'Approach towards Sustainable Telecommunications' on 23 October 2017. Based on TRAI recommendations, DoT has issued directions in the year 2019 that TSPs should voluntarily adopt the Renewable Energy Technology (RET) solutions, energy efficient equipment and high-capacity fast charging storage solutions etc. to meet the target for reduction of carbon footprint. TEC should set up the model lab facility for certification of telecom products, equipment and service on the basis of ECR ratings. TEC should also finalize the 'ECR document' delineating the test

procedure and the measurement methodologies utilized. Public/ private agencies may be accredited for conducting such certification. TEC should make necessary provisions mandating that all telecom products, equipment and service in the telecom network should be energy and performance assessed and certified 'Green Passport' utilizing the ECR rating and the energy passport determined. TEC could either appoint independent certifying agencies under its guidance or will certify the same through their Quality Assurance teams. Regarding above, TEC has recently released the standard for Energy Consumption Rating and Energy Passport for Telecommunications Products, Equipment and Network/Services. Also, TEC vide OM dated 25.02.2022 has made that the test report in respect of ECR parameter shall be made mandatory w.e.f 01st January 2023 in respect of all existing ERs.

2.198 After thoroughly analyzing the inputs from stakeholders, the Authority is of the view that the certification for green DC be introduced in India as has been supported by majority of stakeholders. The Authority noted that IGBC Green DCs rating / certification for DCs is on voluntary basis and based on credit rating, certification to DCs is being issued by IGBC. DCs are having mainly IT equipment and the recently released TEC standard for '*Energy Consumption Rating and Energy Passport for Telecommunications Products, Equipment and Network/Services'* covers Telecom equipment, telecom infrastructure equipment including servers, routers, power/ renewable power equipment, cooling equipment. Hence, the Authority is of view that TEC and IGBC should work together to further develop and improve the energy efficiency standard for Indian data centers taking into account existing policy within the country and the international best practices.

2.199 **Accordingly, the Authority recommends that the Indian Green Building Council (IGBC) along with Telecommunication Engineering Centre (TEC) should be entrusted with task of framing**

certification standards of green DCs in India. As far as linking incentives to Green DCs is concerned, the Authority feels that this should be considered in totality after the certification process is put in place. Authority has made certain recommendations in this regard in coming sections. However, the Authority will revisit the issue later, if required.

Access to Water

2.200 Uninterrupted water supply is a must for the proper functioning of Data Centres for cooling purposes. While technical advances have resulted in the use of air chillers as the standard for new data centres, water remains a key resource. Therefore, a Data Centre construction is feasible only when an adequate water supply is available nearby as there is a need for a reliable, continuous source of water for the systems to be effective. Accordingly, following issues were raised to get the opinion of stakeholders: -

21. "Availability of Water is essential for cooling of Data Centres, how the requirement can be met for continuous availability of water to the Data Centres? Are there any alternate solutions? Please elaborate."

Comments of the stakeholders

2.201 Majority of stakeholders have suggested that the Government should subsidize significant portion of capex and tax concessions on operational cost of water recycling plant to incentivize the DCs to adopt eco-friendly solutions. In addition, backup water connections are needed for smooth DC Operations. Stakeholders have pointed out that certain states as a policy do not allow secondary water line connection. As a result, all states should enable DCs to have more than one water connection. Bore well construction should also be permitted.

2.202 A few DC operators have submitted that water supply to DC should be declared as special purpose supply and not be subject to any de-prioritization/interruption. Furthermore, DC should be permitted to keep water within their premises for a period of 6 to 7 days. DCs are

required to meet the ISO14001 standard for environmental sustainability to enforce stringent conservation and optimization methods, and any incentive for managing water resources should be linked to promote the adoption.

2.203 For minimizing the usage of water and promoting sustainable Data Centre cooling strategies, a few stakeholders have suggested subsidizing and deploying liquid-based cooling technologies. Other alternate measures include adoption of complex heat transfer technologies like hot aisle containment and the exterior atmosphere cooling system by DC. One stakeholder has also proposed using Glycol based or similar liquid coolants for electrical equipment.

Analysis of the issue and views of the Authority

2.204 As computer applications become more processing-intensive, DC operators will need to weigh alternative sustainable cooling methods also. Various alternative solutions submitted by stakeholders have been noted by the Authority. The Authority has also studied some of the efforts that are being made globally by DC operators for sustainable options for promoting Green DC. Some of these efforts are summarized as follows:

i. Microsoft has successfully tested the use of hydrogen fuel cells to power its data centre servers for replacing diesel fuel in its emergency power systems with new technology.[43]
ii. Kao Data is switching their DC facilities from diesel-powered backup generator sets to those driven by hydrotreated vegetable oil (HVO) fuel, which will reduce emissions of nitrogen oxide, carbon monoxide, and particulate matter by up to 90%.[44]
iii. Large lithium-ion batteries will be used to replace diesel generators at one of Google's data centres in Belgium.[45]

43https://news.microsoft.com/innovation-stories/hydrogen-dataCentres/
44https://kaodata.com/news/kao-data-expands-harlow-campus-with-construction-of-second-high-performance-10mw-data-centre
45https://dataCentrefronTier.com/google-looks-to-batteries-as-replacement-for-diesel-generators/

iv. Working with Total's battery specialist subsidiary, Saft, Microsoft and a French energy company, Total established a partnership to investigate the long-term viability of deploying massive batteries as backup power for key infrastructure.[46]

v. Switch, a DC technology business, will increase its usage of solar energy for its massive data centre campuses in Las Vegas and Reno by using Tesla's new large-scale energy storage technology.[47]

vi. Google's data centre in Belgium uses water as an energy-efficient way to cool by running entirely without electrical refrigeration, instead using an advanced cooling system called 'free cooling'. This DC also contains an onsite water purification plant, allowing Google to recycle water from a nearby industrial canal instead of relying on the city's water supply[48].

vii. At Douglas County, Georgia, to decrease the impact of its operations on the local supply of potable water, Google utilizes municipal wastewater to cool its DC. Whereas Google's DC in Netherlands will use industrial water to cool the servers in its DC[49]. Google plans to replenish on average 120 per cent of the water it consumes at its DC by 2030.[50]

viii. Microsoft recently tested the first underwater DC, revealing that the 864 servers within were eight times more stable than those on land.[51] Microsoft operates a massive footprint of more than 200 DC around the world and is now looking to cut water usage in its DC by 95% by 2024 in order to be water positive by 2030.[52]

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46 https://totalenergies.com/media/news/press-releases/total-and-microsoft-partner-drive-digital-innovation-and-net-zero-goals

47 https://dataCentrefronTier.com/switch-will-use-tesla-megapacks-for-hyperscale-energy-storage/

48 https://www.copenhageneconomics.com/dyn/resources/Publication/publicationPDF/1/301/1435043322/the-economic-impact-of-googles-data-centre-in-belgium-2.pdf

49 https://www.dutchwatersector.com/news/google-nl-switches-to-surface-water-for-its-datacentre-cooling

50 https://blog.google/outreach-initiatives/sustainability/replenishing-water/

51 https://news.microsoft.com/innovation-stories/project-natick-underwater-dataCentre/

52 https://blogs.microsoft.com/blog/2021/10/27/supporting-our-customers-on-the-path-to-net-zero-the-microsoft-cloud-and-decarbonization/

ix. Singapore's Keppel Corporation has signed an agreement with City Gas and City-OG Gas Energy Services to examine the use of Liquefied Natural Gas (LNG) and hydrogen to power a Floating Data Centre Park (FDCP)[53]. The FDCP aims to reduce energy consumption by eliminating the need for the national grid. Furthermore, the adjacent LNG and possibly hydrogen infrastructure will potentially allow FDCPs to tap on cold energy generated from LNG regasification to supplement the cooling load. As FDCP uses saltwater for cooling rather than potable or industrial water, it is more energy efficient than traditional land-based data centres. It also frees up land for other urban uses, making it an especially appealing proposition for cities with limited land.

x. California-based start-up Nautilus Data Technologies has completed the world's first floating commercial data centre in a naval shipyard outside San Francisco, with the goal of lowering data centre energy costs. Nautilus' Stockton facility uses a zero-impact cooling system, with no water consumption, no refrigerants, no water treatment chemicals, and no wastewater[54].

2.205 When compared to traditional air-cooling systems, the liquid cooling immersion system is proven to be an evolutionary step by lowering total power usage for the server system. Immersion-cooled DC are often smaller than conventional air and liquid-cooled DC of the same performance capacity. Microsoft investigated liquid immersion as a cooling alternative for high-performance computer operations in its DC.[55] Measures can also be taken to make the best use of 7,517 km of Indian coastlines to reduce heavy dependence on grid power, implementing sustainable alternative methods for cooling electrical equipment and implementing green-energy zero emission DC Parks.

53https://www.keppeldatacentres.com/innovations/floating-data-centre-park/https://www.kepcorp.com/en/file/media/media-releases-sgx/2021/05-may/4-may-kcl-sgxnet/cs-sgx-conference-2021-slides-final.pdf

54https://nautilusdt.com/data-Centre-design/

55https://igbc.in/igbc/redirectHtml.htm?redVal=showgreendataenrenosign

However, the Authority is of the view that alternate cooling solutions are still developing, and their mass-scale deployment may take some time.

2.206 **The Authority therefore recommends that adoption of alternate cooling solutions should be left to market forces. In any case, the Authority has already prescribed certification policy for Green Data Centres. Once the Green data certification framework is in place, the Authority recommends that as part of Guidelines to State Governments, Centre should then recommend linking Capital/interest subsidy or any other fiscal incentive that the State Government is offering to DCs to the Green DC Certification they hold. Alternatively, the Authority recommends that if a DC acquires higher rated Green DC certification, their fiscal incentives can be increased. This would give the required motivation to DC operators to adopt alternate cooling technologies.**

2.207 At the same time, the Authority also feels that such innovative methods need to be encouraged by the Government. Until and unless a policy support is given to boost such new technologies and solutions, they may not take off in a big way in India.

2.208 **The Authority therefore recommends that Government should launch a scheme to incentivize (in the form of Government subsidy) implementation of innovative solutions and green initiatives by the DCs. For the same, it may invite Requests for Proposal (RFP) on an experimental basis for new technology/methods/processes that can be adopted for promoting green DCs.**

2.209 For the smooth operation of Data Centres, uninterrupted water supply is an essential requirement for cooling purposes. **The Authority**

recommends that as part of the Central Policy, for availing Centrally sponsored incentives, States should be asked to –

- Declare water supply to DC/DC parks as special purpose supply and not to subject such supply to any interruption.
- Data Centres will be allowed to store water within their premises which can last for seven days,
- Allow more than one water connection for DCs/DC Parks as a part of their respective DC policy.

2.210 The Authority agrees with stakeholders that water treatment plants shall be built to reuse treated water from within the facility, or from outside sources along with waste-water recycling plants. **The Authority recommends that in all future projects, DC parks operators should be mandated to incorporate waste-water recycling plants in their designs for DC Parks**.

Capacity Building for DC

2.211 There are human resource requirements for DC sector demanding skillset around resource controls, facilities management, and Data Centre optimization. The critically essential skills that are required for Data centres are:

a. Cloud Skills

b. Cyber and Data Security Skills

c. Data Centre Infrastructure Management (DCIM)

d. Data Analytics

e. Network LAN/WAN and Cable Design Skills

2.212 In addition, it is imperative to involve expert consultants in DC design, especially during the early project initiation stage. If the DC industry is to flourish in India, there will be need to build capacities to cater to specific requirements of this sector. Accordingly, following issues were raised in the CP to get the opinion of stakeholders: -

22. *"Whether the capacity building framework for vocational or other forms of training sufficient to upskill the young and skilled workforce in India for sustenance of data centres operations? What dovetailing measures for academia and industry are suggested to improve the existing capacity building framework, and align it with the emerging technologies to upskill the workforce in India?"*

Comments of the stakeholders

2.213 Majority of the stakeholders have suggested that DC related curriculum should get introduced into engineering disciplines along with lowering of cost of vocational training by the government. Few associations suggested for providing large-scale training on Data Centre, Digital and Cloud technologies, in collaboration with Ministry of Skills Development and Entrepreneurship (MSDE) and leading academic institutes. Suggestions on introducing vocational-vendor neutral certification courses in the field of Computing System, Data Centre Infrastructure Management, Certified Network Associate/Network professional have also been given. One of the stakeholders also suggested of forming an association between Telecom Sector Skill Council (TSSC), industry bodies and associations like DIPA & COAI, which jointly can develop content for online skill development platform like 'FutureSkills Prime' of MeitY. One of the DC operators has suggested for coordinating with "Skill India Mission" of National Skill Development Corporation (NSDC) to align programs for DC capacity building. One of the DC operators suggested not to link extension of incentives to DC with quantum of employment generated by it. Another stake holder is of the opinion that existing emerging technologies are sufficient to upskill the young and skilled workforce in India to fulfill Data Centre operations but are available at higher costs.

Analysis of the issue and views of the authority

2.214 The demand for appropriate skill sets in the Data Centre sector is high, and the availability of resources with required skillset needs to be ensured in wake of projected sectoral growth. This calls for the planned

implementation of suitable capacity building initiatives as part of vocational training along with the extant university education programs. As fostering the required technical skills for Data Centre operations is necessary, suitable investments are required in training and skill development so that India can move faster on embracing these new-age technologies.

2.215 Introduction of vocational-vendor neutral certification courses in the field of Computing System, Data Centre Infrastructure Management, Certified Network Associate/Network professional will give due impetus to the much-required capacity-building initiatives in the field of DCs in the country. New curriculum development and training of the faculty will also require focus.

2.216 According to one of the Uptime Institute's recent papers, titled "The people challenge: Global data Centre staffing forecast 2021-2025", global DC personnel requirements are expected to expand from over 2.0 million full-time employee equivalents in 2019 to nearly 2.3 million in 2025. It is clearly evident that the industry will require additional skilled workforce if it is to maintain its current high growth rate. The Draft DC policy 2020 of MeitY also advocates for collaboration with Ministry of Skill Development and Entrepreneurship and leading academic institutes to impart large scale training to DC workforce.

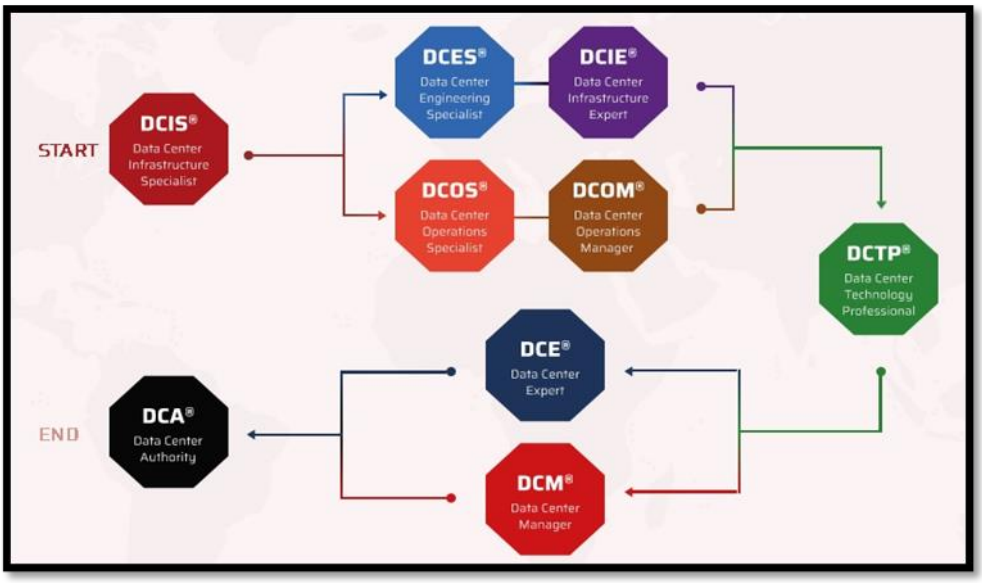
2.217 The Authority has noted that the National Skill Development Corporation (NSDC) had launched a 'Future of Work' project to help IT professionals re-skill and up-skill in new technologies. In collaboration with the IT-ITeS Sector Skill Council, NSDC has developed certification packs in areas such as AI, big data analytics, blockchain, cloud computing, cybersecurity, IoT, RPA, social and mobile applications, and virtual reality. The IT-ITeS Sector Skill Council has also created the Future Skills site, which allows learners to access free and paid information, examinations, and virtual laboratories also while being certified in their chosen skills. It covers over 155 abilities in over 70 occupational roles related to new technology.

2.218 The Authority is of the opinion that the demand for DC related skillsets is expected to skyrocket further in near future, this sector will need employees with the proper and aligned skillsets to meet the demand. Having a strong technical understanding of cloud architectural principles, abilities in software development and databases, as well as knowledge of DevOps, networking, and enterprise security are needed in today's DCs to plan, create, and construct the framework or architecture for transferring applications to the cloud. DCs also require skilled workforce who are familiar with cloud configuration management tools, databases, automation tools, and enterprise security. People with suitable abilities in cloud, load balancing, network engineering, security, and future technologies such as AI are also required. In addition, qualified people in facilities management and project management will also be required in DCs. To address this widening skill gap, DC enterprise has to collaborate closely with industry, academia and government organizations to develop academic curriculum and up-skilling programmes that will up-skill young individuals and existing DC employees with the required skill sets. In this regard, universities affiliated engineering colleges and polytechnics must also be approached and encouraged to work with industry to develop syllabus and curriculum aligned to DC functioning, which would aid in the development and training of fresh talent.

2.219 The *Pradhan Mantri Kaushal Vikas Yojana (PMKVY)* under the aegis of the *Ministry of Skill Development and Entrepreneurship* (MSDE) through the *National Skill Development Corporation* was launched with the goal of up-skilling the country's youth. The scheme was created with the goal of enabling large-scale initiatives to upskill Indian youth and encourages them to pursue industry-relevant skill training. PMKVY is an effective scheme that provides skill development training and certification in over 252 career roles to improve the employability prospects for the youth of the country. In January 2021, the MSDE started the *PMKVY 3.0*, the third phase of its flagship scheme. The

scheme's third phase has been divided into two sub phases for implementation. The first sub phase (2020-2021) was initiated on a pilot project basis. The implementation framework will be created in the second sub phase (2021-2026). NSDC in this regard has been collaborating with leading online vocational training platforms to deliver quality learning in digital skills and technologies.

2.220 The International Data Centre Authority (IDCA) was established to help the information technology sector organize, structure, educate, and direct itself including DC. IDCA is the first organization dedicated completely to the Application Ecosystem, which includes cloud, AI, blockchain, cybersecurity, IoT, big data, and data centres, among other things, to conduct research, set standards, educate, and certify the whole Application Ecosystem. IDCA is represented in over *40 countries* including Southeast Asia and collaborates with partners and affiliates all around the world to ensure that its services including education and certification are delivered locally and effectively in these countries. IDCA-certified courses as shown in diagram below, follow a dynamic ladder ascending system, giving data centre employees a well-defined educational route.



2.221 *All India Council for Technical Education* (AICTE) is the statutory body and a national-level council for technical education in the country,

whose approval is mandatory for institutes to offer engineering, PG management courses and courses that come under the ambit of ten statutory bodies of AICTE namely, UG Studies in Engineering & Technology, Post Graduate and Research in Engineering and Technology, Management Studies, Vocational Education, Technical Education, Pharmaceutical Education, Architecture, Hotel Management and Catering Technology, Information Technology, Town and Country Planning. The Authority had last year collected information from AICTE on List of all AICTE approved institutions running Telecommunication Technology and related course. There are more than 440 AICTE approved institutes that are offering Telecommunication Technology and related courses. In addition, there may be institutes that offer Information Technology and Computer related courses. However, the Authority feels that there is a need to develop DC specific courses.

2.222 The *Telecom Sector Skill Council* (TSSC) is an industry-led apex body established by the Cellular Operators Association of India (COAI), the Indian Cellular and Electronics Association (ICEA), and the National Skill Development Corporation (NSDC) to ensure adequate availability of skilled manpower to boost Telecom sector growth and productivity. For skill development, TSSC has emerged as a link between ministries, the Indian telecom industry, and country's youth. TSSC collaborates with several ministries, skilling bodies, and technical institutes with the goal of developing skills among youth in the country and closing the industry's human demand-supply gap of skilled tasked force. The draft DC Policy 2020, issued by MeitY also emphasizes upon designing programs for continuous capacity building on DC and cloud technologies, data classification, storage facilities, data security and other allied technologies. An accountable association with DC/ Cloud service providers in the country is also required to cater to capacity building in DC sector.

2.223 **The Authority recommends that National Telecom Institute for Policy Research & Training (NTIPRIT) under Department of Telecommunication (DoT), Ministry of Electronics and Information Technology (MeitY), All India Council for Technical Education (AICTE), and Telecom Sector Skill Council of India (TSSC) should closely collaborate with DC industry to develop tailor-made short and long-term courses. These courses should inter-alia cover aspects of DC functioning such as Cloud Architecture and its configuration, DC Network Engineering, Cloud Security, Edge computing, quantum computing, IoT and AI based Data Analytics for automated DC Infrastructure Management, DC facility Management etc. and can be introduced into the universities and colleges enlisted with AICTE, to up-skill the fresh talent. A suggestive list of DC related courses at diploma, undergraduate and post-graduate level is as follows:**

S. No.	**Level**	**Suggested Discipline**	**Implementation Level**
(a)	Diploma Courses	(i) Advanced Diploma in Cloud Computing and data centre operations. (ii)Diploma in Cloud support operations (iii) Diploma in Cloud Data Security. (iv) Diploma in Data Centre Infrastructure and Facility Management	Suggested to be implemented at ITI/ polytechnic level.
(b)	Undergraduate/ Post-Graduate Courses	(i) Cloud Computing Engineering with specialization in	Suggested to be implemented at Engineering Colleges, deemed universities and

		Data Centre Management. (ii) Network and Cloud Security (iii) Data Centre Engineering, Cloud computing and IoT. (iv) Data Centre Leadership and management (v) Cloud Platform and Core Infrastructure Engineering (vi) Cloud Infrastructure Engineering with specialization in Data Centre operations (vii) Masters in Data Analytics and Cloud security (viii) Data Centre Facilities Engineering (ix) Masters in Data Centre Systems Engineering. (x) Masters in Data Security and Data Security	Post Graduate Degree/ Diploma Programs.
(c)	Certification Course	(i) Certified Network Associate – Data Centre. (ii) Certified Network Professional - Data Centre. (iii) Converged Infrastructure Administration	Suggested to be implemented both via online/ Distance Education mode and on campus at Data Centres, Polytechnics, Colleges, deemed

		Engineer – Data Centre. (iv) Certified Data Centre Virtualization Professional. (v) Certified Data Centre Design Consultant. (vi) Certified Data Centre Management Professional. (vii) Certified Data Centre Technician Professional. (viii) Certified Data Centre Implementation Engineer. (ix) Certified Data Centre Cloud Architect.	universities and so on.

2.224	**The Authority also recommends that National Skill Development Corporation (NSDC) may enter into an arrangement with IDCA for DC related upskilling certification courses offered by International Data Centre Authority (IDCA) under second sub phase of Pradhan Mantri Kaushal Vikas Yojana 3.0 (PMKVY 2021-2026) so that they become available and affordable to young talents in the country.**

Centre-State Coordination

2.225 MeitY's draft National DC Policy 2020 mentions that India has around 375 MW installed power capacity for Data Centre and as per projections, this may grow to three time by 2025. This need for Data Centre infrastructure in the country opens up a potential opportunity

for investments of the order of USD 4.9 billion by 2025, which could be further increased depending upon how we progress in the direction of becoming a location of choice for global players for setting up Data Centres. However, in response to the aforementioned draft policy, industry leaders have submitted that policies should be collaboratively defined with states, as there is a lack of coordination in some states and many departments do not cooperate with one another. Most states that have DC favourable outlook have schemes in place that include tax incentives, investment assistance, loan guarantees, and other forms of business assistance aimed at attracting new business.

2.226 The DC entails huge CAPEX and OPEX and hence, this necessitates a stronger focus on Centre-State coordination, with a preference for the development of a consistent tax abatement code, equivalent labour regulations, and a shared framework to make conducting business easier. Representatives from the DC sector and potential DC investors have expressed concerns over state-level coordination and facilitation, as establishing DC requires several time-consuming permissions. If the intended policy objective to accelerate the projected Data Centre growth and investments in the sector is to be met, one of the issues that will be required to be addressed is the Centre-State Coordination. Accordingly, following issues were raised in the CP to get the opinion of stakeholders: -

23. "Is non-uniformity in state policies affecting the pan-India growth and promotion of Data Centre industry? Is there a need for promulgation of a unified Data Centre policy in India, which acts as an overarching framework for setting Data Centres across India? What institutional mechanisms can be put in place to ensure smooth coordination between Centre and States for facilitating DC business? Do support your answers with detailed justification."

24. "What practical issues merit consideration under Centre-State coordination to implement measures for pan-India single-window clearance for Data Centres?"

Comments of the stakeholders

2.227 Majority of the respondent stakeholders opined in favour of a 'Central Overarching Policy' for its consistency and pan-India uniformity in its applicability. One of the stakeholders further brought out that individual states issuing respective DC policies may result in localized concentration of DC, only within those states whereas a national DC policy, augmented with incentive framework would result in development of distributed computational infrastructure across entire country and will also attract DC investments in Tier-II & III cities, to achieve Digital India objectives.

2.228 One of the stakeholders suggested for unified/ umbrella DC policy formulation to be mapped on to a central agency (somewhat akin to GST council) for better execution, periodic updation and to provide a neutral ground for technology providers. The stakeholder further suggested for inclusion and addressing of aspects like DC building norms, power supply infrastructure, green energy policy, water supply issues, efficient approval process with provision of deemed approvals and certificates of DC etc., into the aforementioned proposed overarching policy.

2.229 Few stakeholders, in accordance with draft DC policy 2020 of MeitY opined that a nodal agency or the overarching policy would enhance coordination and have participation from both centre and states to facilitate implementation of DC initiatives. These stakeholders further suggested for constitution of an Inter-Ministerial Empowered Committee (IMEC) with participation from various Central Ministries and State Governments, for implementing 'single window clearance mechanism' to simplify the process of establishing DC.

Analysis of the issue and views of the authority

2.230 The MeitY draft DC Policy 2020, as well as the as well as the DC/ IT/ ITES policy issued by various states, have proposed a variety of policy measures, incentives, legislative, and normative data frameworks. The National Cyber Security and Artificial Intelligence (AI) Strategies, and

Frameworks for Non-Personal Data and Responsible AI are among them which will have a bearing on DC operations and its policy framework. Furthermore, platforms suggested across disciplines include data-sharing mandates, which are frequently accompanied by government engagement. In view of the above stated fact, it is imperative to mention that there is an inescapable requirement of formulating an overarching policy framework to define broader guidelines for states to align common aspects of their respective state DC policy in consonance with the overarching policy framework. Preserving country's digital sovereignty is essential in an increasingly connected world. Accordingly, data localization requirements also merit due priority. In such an environment, the Authority is of the view that an overarching central DC policy in India is imperative. . The states should subsequently align the specifics of their respective state polices thereby supplementing rather than competing with this central overarching DC policy framework.

2.231 The Authority has already deliberated that a fragmented and state centric individualistic approach can go against projecting India as a promising DC destination for international diaspora. At the same time the Authority has also acknowledged that there may be constraints in offering similar policy framework or incentives across all states. By recommending that Data Centre Incentivization Scheme (DCIS), Government should spell out two lists of incentives[56] for Data Centre and DC Park operators, the Authority has in a way paved way for an overarching policy framework under which States will have flexibility to define their own policy/incentives. The question that arises is - what institutional mechanisms should be put in place to ensure effective and smooth operationalization of the envisaged policy?

[56]One that are Centre specific and to be rolled out by the Central Government and the other in form of a guideline that the States should take a decision to implement

2.232 The Authority has noted that in the MeitY draft DC Policy 2020, several institutional mechanisms for policy governance have been suggested as follows

- **An Inter-Ministerial Empowered Committee (IMEC)** to be set up under the Chairmanship of Secretary, MeitY, with participation from various Central Ministries and State Governments. It shall be the key decision-making body to facilitate the implementation of various measures as defined under this policy framework, enabling ease of doing business in the sector. ToR and constitution of the IMEC shall be notified by MeitY.
- Institutionalizing **Data Centre Facilitation Units (DCFU)**
    - Set up a Data Centre Facilitation Unit (DCFU) within MeitY to provide harmonized services to interested Data Centre Parks/Data Centre developers on matters related to setting up of Data Centres.
    - Data Centre Facilitation Unit (DCFU) would be the nodal agency to work under the Inter-Ministerial Empowered Committee to drive and support the implementation of decisions taken.
    - DCFU would monitor the implementation of policy framework and would work with various stakeholders to facilitate timely progress of various initiatives.
    - DCFU would also be responsible for evolving Centre-State coordination mechanism(s) to ensure policy objectives are met.
- An independent **Data Centre Industry Council (DCIC)** is also proposed to be setup, which would act as an interface between the sector and the Government. The council will work to represent the sector's viewpoint and engage with MeitY regarding various matters concerning the growth of Data Centre sector in the country.

2.233 In this regard the Authority appreciates MeitY's efforts in suggesting a sound institutional mechanism for policy governance. However, these efforts must further be augmented with creation of a Data Centre specific portal on National Single Window System (NSWS) as already recommended by Authority for –

- Online registration of new DCs/DC Park operators without any obligation or registration fees. This will be purely for statistical and record purposes.
- Facility to upload all policy initiatives and benefits offered by individual states for DC sector.
- Displaying a comparative statement of such benefits and the time taken for issuing clearances on the portal.

The portal should also be used for accessing specific aspects related to Centre-state coordination including issue of notifications, announcement of schemes & benefits, frequently asked questions, facility to interact and respond to queries of potential investors, and grievance redressal of existing and prospective DC/DC Park operators.

Data Centre Infrastructure Management

2.234 DCs demand a high level of electrical dependability, and DC administrators continue to remain concerned about uninterrupted power availability. Power quality problems can lead to equipment failure, downtime, and data corruption, as well as pose hindrance to DC operations. To minimize downtime, DC administrators tend to overprovision electricity. This results in inefficient use of electricity and space in a DC. A DC Infrastructure Management System (DCIMS) is convergence of IT and building facilities operating inside a DC. A DCIM initiative's purpose is to give managers a comprehensive perspective of a DC performance so that energy, equipment, and floor space are all used as effectively as possible. DCIM technologies provide DC administrators with the capabilities allowing them to collect, store, and analyze data related to power and cooling in real time. The DCIM

software can correctly gather and evaluate power use effectiveness (PUE) and cooling system energy efficiency by installing energy-monitoring sensors and supporting hardware along all points of the power infrastructure.

2.235 Artificial intelligence (AI) is a proven way for Data Centre operators to maximize uptime, optimize energy consumption, detect potential risks quickly, and defend against cyber-attacks. AI can be applied to mechanical and electrical equipment in Data Centres to enable actionable insights and automation, saving the operator money. AI's biggest benefit for Data Centres is the considerable reduction in energy consumption. Google, with its AI-interest acquisition of DeepMind in 2014, has incorporated a machine-learning algorithm to manage Data Centre equipment that resulted in 15% reduced energy overhead and 40% reduced cooling energy.

2.236 Given that new technological developments will keep happening in the DC space, policy measures must be put in place to promote the adoption of future technologies for Data Centres. In this backdrop, following issues were raised in the CP to get the opinion of stakeholders: -

25. "Is there a need for Data Centre Infrastructure Management System (DCIMS) for Data Centres in India? What policy measures can be put in place to incentivize Data Centre players to adopt the futuristic technologies? Elaborate with justification."

Comments of the stakeholders

2.237 Majority of stakeholders are of the opinion that DCIMS is an inescapable requirement for all DC operators however at individual level, DCIMS installed by each DC operator is customized as per the customer defined requirements. They further opined that it is imprudent to manage a DC in manual, semi-automatic or automatic mode and a DCIMS is a must to correctly assess the DC requirements as it streamlines the cost and ensures sustainability by reducing the carbon footprint.

2.238 Few stakeholders also opined that indigenously developed DCIMS should be mandated, and DC should be incentivized for creating efficient DCIM. They further mentioned that DC sector needs a light touch regulatory approach wherein for smaller DC operators, the government should provide step by step assistance in preparing their infrastructure and system ready for compliance with DCIM.

2.239 One of the stakeholders opined that DCIMS is mainly used to manage IT infrastructure whereas additional systems such as Building Management System (BMS), Electrical Power Management System (EPMS) and Critical Power Management System (CPMS) are collectively essential for management of overall DC infrastructure, which also fall under the purview of overall DC certification (Uptime and TIA).

2.240 Most stakeholders were also of the opinion that once the DC sector in India attains a suitable scale, there will be utilization of large pool of power and space under this industry vertical. A large scale DCIMS (possibly integrated at DC/ State/ City/ National level) will help in providing a better visibility of DC operation to achieve desired efficiency. Till such time, the DC sector does not require a national level DCIMs and the policy measures should encourage DC operators (through incentivization) to adopt futuristic technologies such as AI/ML/IoT.

Analysis of the issue and views of the authority

2.241 Efficient management of DC infrastructure using smart futuristic technologies mandates the requirement of installing DCIMS (to include modules such as BMS, EPMS & CPMS etc.). This will help DCs to attain better visibility of DC operations and also achieve desired efficiency. DCIM system assists DC operators in monitoring, measuring, and managing DC related equipment and facility infrastructure components' utilization and energy consumption. The Authority recognizes the fact that DCIM systems are a conjoined union of IT and operations that work together to oversee and improve the functioning of a DC infrastructure. The Authority understands that

under current scenario, the DCIMS used by various DC stakeholders are non-standardized and are customized to suit their client requirements. However, the Authority also acknowledges that DCIMs are CAPEX intensive and are broadly governed by the client requirements hiring DC services. The Authority has already recommended implementation of framework for Green DCs. This, in itself, will nudge the DC operators to install state-of-the art systems for Infrastructure and power management within DCs. **In view of aforementioned, the Authority recommends that implementation of Data Centre Infrastructure Management (DCIM) System should be left at the discretion of DC business owners.**

Data Digitization and Data Monetization

2.242 Data Digitization is the process by which physical or manual records such as text, images, video, and audio are converted into digital forms. There are many methods of digitizing. Digitization of records has been a priority for Government of India as digitized data offers the long-term preservation of documents, orderly archiving of documents, easy and customized access to information, and easy information dissemination through images, text, CD-ROMs, internet, intranets, and extranets.

2.243 The act of creating measurable economic benefits from available data sources is known as data monetization. Data monetization makes use of data generated by various organizations, available exogenous data or content and data associated with particular actors, such as that acquired by IoT, electrical devices and sensors. The underlying advantages of data monetization involves improved decision-making which results in real-time crowd-sourced research, more profitability, lower expenses, lower risk, and better compliance.

2.244 Organizations that provide citizen and customer-centric services, such as registration, certificate issuance, permit issuance etc handle a large number of papers. As number of documents has increased over time,

document storage and retrieval has become a logistical concern. Converting physical records into the digital form will not only facilitate easy access of Government records and services but will also enable easy access and data analysis for informed decision making. Data digitization would further help data principals in data sharing to gain beneficial terms or conditions from businesses, information bartering, selling data outright (via consent managers or independently), etc. Digitized data offers the possibility of monetization by introducing the discovery, capture, storage, analysis, dissemination, and use of that data.

2.245 Despite prolong efforts, lot of data held by public authorities are still to be digitalized. There is need to digitize hard document within a defined timeframe. Also, there is a need to explore how the data held with public Authority can be monetized. In this backdrop, following issues were raised in the CP to get the opinion of the stakeholders: -

26. "What institutional mechanism needs to be put in place to ensure digitisation of hard document within a defined timeframe?"

27. "Would there be any security/privacy issues associated with data monetization? What further measures can be taken to boost data monetization in the country?"

Comments of the stakeholders

2.246 Mixed responses have been received from stakeholders on the above-mentioned issues and as such no concrete solutions/suggestions have been provided by the stakeholders. Few stakeholders have suggested that it may be ensured that government ministries & departments, financial institutions and statutory bodies release and accept only digitally signed documents as records instead of hard copies with periodic audits to certify on status of digitization within each organization. They further suggested implementing scorecard based incentivization to promote digitization efforts in such departments.

2.247 Another stakeholder suggested implementing digitization in a phased manner by incentivizing smaller institutions and not to mandate

timelines for digitization. Few stakeholders also suggested creating authorized centres for digitization using existing infrastructures such as AADHAR kiosks, payments bank kiosks network, etc. One of the stakeholders opined that government must pre-empt development of a secure environment for processing of data before aggressively pushing data digitization drive, which appears to be difficult at this stage.

2.248 In response to aspects of data monetization, few stakeholders have expressed strong concerns over government's policy of 'data monetization', which is likely to happen based on analysis using public data. This, in absence of a sound and strong data protection law, under current circumstances, may prompt state agencies to collect more data than necessary which is likely to conflict with the fundamental right to privacy and pose risk to citizens of India. A stakeholder mentioned that data monetization is governed by prevailing national data protection laws and any further measures in this direction should only be initiated after enactment of proposed data protection law in pipeline.

2.249 Few stakeholders are of the opinion that anonymous data should be allowed for monetization, however, unsecured digitized data remains a high-risk target for attack and its misuse can be catastrophic/lead to issues like identity theft, financial fraud, etc. Hence securing and validation of digitized data from sourcing to storing to retrieval is a very critical task. Another stakeholder opined that data acquisition, storage and processing rights/ rules should be strictly based on obtaining user content. It further opined that data privacy/ security aspects should be based on the rules and outcomes of prospective Digital Privacy Bill (DPB)-2019.

2.250 Some measures suggested by stakeholders that can be taken to boost data monetization efforts in the country are as below:

i. Owner of data should be empowered to have free, informed, clear and revocable consent towards allowing monetisation of its data or

otherwise and to also seamlessly and securely share its data with third-party institutions.

ii. An authorisation and alert mechanism (such as message alert and information of agency/ enterprise accessing information) to the data owner should be instituted against every instance of data monetisation effort by third party.

iii. Data sharing Application Programming Interface (API) standards should facilitate encrypted flow of data between providers and users and that too with active consent of the data owner. These APIs should also be free from any third-party code which anonymously collects and analyses personal information to target users without obtaining active consent of the data owner.

Analysis of the issue and views of the authority

2.251 Several initiatives have been taken by the government in respect of data sharing governance. Some of the major initiatives are as follows:

A. National Data Sharing & Accessibility Policy (NDSAP)

The Union Government through Ministry of Science and Technology has formulated the National Data Sharing and Accessibility Policy (NDSAP)[57], while Ministry of Electronics & Information Technology (MeitY) is the nodal Ministry to implement the policy. The policy was notified by the Department of Science and Technology (Govt. of India Gazette dated 17th March 2012).

B. Open Government Data (OGD) Platform

In pursuance of the NDSAP- Policy notified by Government of India in March 2012, MeitY through NIC has set up the Open Government Data (OGD) Platform India[58] to provide open access by proactive release of the data available with various ministries/ departments/ organizations of Government of India. OGD Platform is now available

[57] https://data.gov.in/sites/default/files/NDSAP.pdf
[58] https://data.gov.in/

as Software as a Service (SaaS) model. It is envisaged that Ministries/Departments would release datasets on proactive/auto consumption basis through Application Programming Interfaces (APIs)/Web Services i.e., in line with the principles of Open by Default from all e-Government Service Applications particularly from Digital India initiative of the Government. The main objectives of OGD have been defined as follows:

i) Provisioning an enabling platform to provide proactive and open access to the data generated through public funds by departments/ organizations of Government of India.

ii) To increase Transparency, Accountability, Citizen Engagement, Collaboration, Better Governance, Decision making & Innovation.

iii) Paradigm Shift in Governance – Direct Delivery of Services to Citizen, Setting up a Platform for Collaboration, Innovation in delivery of Services to Citizen.

Main features of OGD platform include Single point access to open datasets, Responsive Web Layout design, Enhanced Visualization Platform, Better User Experience and efficient discoverability of resources, Cataloguing of Similar resources, APIs, Embedding Catalogues, Widgets to share filtered set of catalogues, Catalogues Subscription, Community participation through Forums, Blogs, Infographics and Visualization and much more.

C. Ministry/State/Department Data Sharing Policies

Since notification of the NDSAP policy, various state governments, ministries and departments have published their own detailed data sharing policies and guidelines that are based on the NDSAP policy. This includes the data sharing guidelines issued by Telangana, Punjab, Geological survey of India among others.

D. Policy on Open Application Programming Interfaces[59]

[59] https://www.meity.gov.in/writereaddata/files/Open_APIs_19May2015.pdf

The policy sets out the Government's approach on the use of "Open APIs" to promote software interoperability for all e-Governance applications & systems and provide access to data & services for promoting the participation of all stakeholders including citizens.

E. API Setu

API Setu[60] was started in March 2020 and aims to bring all the APIs from Government to a single place and make them available for consumption by the Government departments and the industry.

F. Draft National Data Governance Framework Policy (NDGFP) May 2022

The Digital Government data is currently managed, stored and accessed in differing and inconsistent ways across different government entities, thus attenuating the efficacy of data-driven governance, and preventing an innovative ecosystem of data science, analytics and AI from emerging to its full potential. Realizing that the power of this data must be harnessed for more effective Digital Government, public good and innovation, MeitY floated the draft National Data Governance Framework Policy (NDGFP) for consultation in May 2022. The Policy aims to realize the full potential of Digital Government with the aim of maximising data-led governance and catalysing data-based innovation that can transform government services and their delivery to citizens, especially in areas of social importance that include agriculture, healthcare, law and justice, education, amongst others. The policy also launches non-personal data-based India Datasets program and addresses the methods and rules to ensure that non-personal data and anonymized data from both Government and Private entities are safely accessible by Research

[60] https://apisetu.gov.in/

and Innovation ecosystem. The objective of the policy has been spelt out as follows:

"To transform and modernize Governments data collection and management processes and systems through standardised guidelines, rules and standards for the collection, processing, storage, access, and use of Government data -with the objective of improving governance through a whole-of government approach towards data-led governance."

To enable and catalyze vibrant AI and Data led research and Start-up ecosystem, creating a large repository of India datasets is an inescapable requirement This will be achieved by establishing guidelines, rules and standards to build and access to anonymised non-personal data to ensure the growth of Indian datasets. This will be the catalyst for Artificial Intelligence and analytics ecosystem, which in turn would be kinetic enablers of India's digital economy. This Policy shall be applicable to all Government departments and entities and rules and standards prescribed will cover all data collected and being managed by any Government entity. This policy shall be applicable to all non-personal datasets and data and platform, rules, standards governing its access and use by researchers and Start-ups. State Governments shall be encouraged to adopt the provisions of the Policy and rules, standards, and protocols as applicable. An "India Data Management Office (IDMO)" shall be set up under the Digital India Corporation ("DIC") under MeitY and shall be responsible for framing, managing and periodically reviewing and revising the Policy. The IDMO shall be responsible for developing rules, standards, and guidelines under this Policy that shall be published periodically. State Governments also would be encouraged to designate/appoint State Officers and IDMO shall provide all assistance including training in this regard.

G. India Urban Data Exchange (IUDX)

IUDX is an open-source data exchange that facilitates secure and authenticated exchange of data amongst various data platforms, third party applications, data producers and consumers, both within a city to begin with, and scaled up across cities eventually at a national level, in a uniform & seamless way. IUDX was born out of the need to enable data exchange between various city departments, government agencies, citizens and private sector. IUDX helps the cities in using the data intelligently to address complex urban challenges, establish integrated development across various aspects of the urban sector and catapult them to the next stage of innovation. IUDX is completely open source, based on an underlying framework of open standard APIs, data models, and the security, privacy and accounting mechanisms that will facilitate its easy adoption across the digital ecosystem[61].

H. The National Data and Analytics Platform (or NDAP)

NDAP[62] is NITI Aayog's flagship initiative to improve access and use of government data. NDAP is a user-friendly web platform that aggregates and hosts datasets from across India's vast statistical infrastructure. NDAP seeks to democratize data delivery by making government datasets readily accessible, implementing rigorous data sharing standards, enabling interoperability across the Indian data landscape, and providing a seamless user interface and user-friendly tools.

2.252 From the above, it can be seen that the current data sharing policy framework in the country has following issues:

- There are multiple policies and platforms which seem to be administered by different ministries/entities and seem to overlap each other.

[61] https://iudx.org.in/about-us/

[62] https://www.niti.gov.in/sites/default/files/2020-01/Vision_Document_30_Jan.pdf

- Most policies/platforms limit their scope to Central Government data and either excludes the states, local bodies and private entities from their scope or at best require them to participate voluntarily.
- The data sharing policies/platforms presumes pre-existence of government data in digitized form and overlooks the fact that even after decades of computerization, several Central and State Government entities still have not digitized many records. Any overarching data sharing and monetization framework can work well only when data is available in digitized form not only from all government entities, but also from private entities.

2.253 The Authority is, therefore, of the view that data digitization is a pre-requisite to share and monetize data. Therefore, there is a need to holistic look at data digitization, sharing, and monetization policy framework and its operationalizing mechanisms.

2.254 Digitization has various advantages including faster access to information, improved customer experience, increased productivity, lower operational cost, improved information security, higher mobility, automation of business processes, agility, environmentally friendly and disaster recovery. Data analytics for monetization of data cannot happen without the digitization of data/ information. Authority also feels that efforts are required to monetize data that is already available in digitized form with the Government at the central, state and local authority level. Some envisaged sectoral benefits of digitization and data monetization are as follows:

a. **Benefits to the government**:
   i. Governments can improve welfare plan and subsidy targeting by decreasing both inclusion and exclusion errors by having fast access to authentic data and documentation.
   ii. Datasets that combine data from other datasets can also help improve public service delivery. Cross-verification of the income

tax return with the GST return, for example, can reveal potential tax avoidance.

iii. By charging a price for access to datasets, the government can profit from the private sector.

b. **Benefits to the Private Sector:**

i. Datasets can be sold to analytics organisations, who process the data, provide insights, and then sell the insights to the corporate sector, which can use the insights to forecast demand, uncover undiscovered markets, and develop new products.

c. **Benefits to the Citizens:**

i. Citizens are the largest group of beneficiaries of the proposed data revolution. Consider the case of 'Digi Locker' as mentioned earlier. Citizens no longer need to run from pillar to post to get "original" documents from the state such as their driving licence, Aadhaar card, PAN card, CBSE results, etc. These documents are critical in the life of every resident of India.

2.255 The Authority has noted that government has created a Digitize India Platform (DIP)[63] to provide digitization services for scanned document pictures or physical documents for any organization as part of the Digital India Programme. The goal is to digitize and make accessible all existing information in various forms, mediums, and languages, as well as to digitize and extract data for document management, IT applications, and records management. DIP offers a unique solution that combines machine intelligence with a low-cost crowd-sourcing strategy. The Authority is sanguine with the fact that DIP provides necessary digitization services for scanned document, pictures or physical documents for any organization. However, the authority also opines that necessary impetus is required to be accorded to creation

[63] https://www.digitalindia.gov.in/hi/content/digitize-india-platform

of digital documents not only at government ministries and departments but also at all such organizations and departments which are outside the purview of government. Emphasis will also be required on issue and receipt of digitally signed documents and records by different entities. Further, the Authority also opines that the use of 'Digilocker Service' created by MeitY needs to be co-opted along with digitization efforts of hard documents as the Digilocker Service accord digital documents at par status with original physical documents.

2.256 The Authority agrees with the stakeholders that security of digitized data and its consent-based validation is importance and must precede any effort of data monetization either by the government or the corporate sector. The authority has taken note of the measures suggested by the stakeholders and is also mindful of the fact that post enactment of the proposed data protection law, a framework for ensuring privacy and security of data while anonymizing and monetization will be put in place.

2.257 However, the Authority does not agree with the views of some of the stakeholders that DPB will take care of the issues raised in consultation paper regarding data digitization and monetization. These issues are outside the purview of DPB and the Data Protection Authority proposed thereof. In any case, the Government has already withdrawn the DPB in its current form. In fact, currently there is no institutional mechanism or a body that assesses whether the entire public records held with an organization/department have been digitized or not. Similarly, there is no nodal agency that can study the available digitized data with public authorities and suggest how this can be better shared and monetized. Data has tremendous commercial value, and it is duty of the Government to see to it that data available with it is monetized to generate revenues following all data privacy and security related measures. While DPA has been entrusted with the task to oversee the data privacy and security aspect, the Authority is of the opinion that for assessing the remaining data digitization work, getting the documents digitized in set timeframe and to mine, collate, share

and monetize the data available with different public agencies, there is a need to put in place a proper institutional mechanism.

2.258 **For steering the data digitization drive, the Authority recommends that a statutory body, Data Digitization and Monetization Council (DDMC), be established at the Centre by enactment of new law or by amendment of the present law. The proposed body should have suitable representation from DoT and MeitY, in addition to representatives from Central and State governments. The proposed body should be entrusted with the responsibility to review and prioritize the avenues which would require more concentrated efforts of data digitization and fix timeframes accordingly. DDMC should also assess the data digitization requirements and define the process framework for use of AI and related technology in data processing, data sharing and data monetization while ensuring the privacy and security of the data owner. The proposed body should also be entrusted with framing policies and incentivization schemes for data digitalization, data sharing, and data monetization. DDMC should be the apex body to oversee all issues related to data digitization, data sharing, and data monetization in the country.**

2.259 **The Authority is also of opinion that formation of too many statutory bodies creates confusion for the sector and organically, this work of steering the data digitization, data sharing, and data monetization can be entrusted to TRAI with suitable modifications in the TRAI Act.**

CHAPTER 3

CONTENT DELIVERY NETWORKS

3.1 Content delivery network (CDN) is a geographically distributed network of proxy servers and their Data Centres at various points of presence (PoP), working together to deliver pages and other web content to a user based on the geographic location of the user. The distributed servers are called cache or edge servers, which store a cached version of the content in Data Centres operated by IXPs and ISPs. CDNs accelerate the delivery of diverse content, especially video delivery, to the user. CDNs are important elements of digital ecosystem.

3.2 CDNs have been used to improve end users experience while at the same time limiting the need for Content Providers (CP) to own an infrastructure. By massively deploying servers in strategic locations, CDN providers assign users to a close-by server, thus reducing hop count and avoiding potential congestion occurrences, while ensuring scalability and reliability. Covid pandemic has increased the network traffic substantially and has compelled organizations for adopting CDNs to reduce content load time. Also, the use of media and entertainment platforms such as Over-the-Top (OTT) platforms requiring high-quality video content has further surged the demand for CDN solutions. Increased e-shopping, e-Learning, and online gaming have increased the demand for CDNs to reduce server load and provide uninterrupted content delivery.

3.3 Investments in CDNs are growing as new enterprises and verticals within larger tech organisation are rapidly adopting CDN services. The global content delivery network market size is expected to grow from USD 15.47 billion in 2021 to USD 95.37 billion in 2030[64] at a compound annual growth rate (CAGR) of 23.0% from 2022 to 2030. Market forecasts and trend analysis shows that by 2022, online video content constitutes more than 80% of all internet traffic (Cisco)

[64] https://www.grandviewresearch.com/industry-analysis/content-delivery-networks-cnd-market

worldwide. The global video streaming market size is expected to reach USD 330.51 billion by 2030[65], registering a CAGR of 21.3% from 2022 to 2030. This has necessitated to bring content closer to the customers on the CDNs to improve quality of service by reducing latency, improving page load speed and website performance, better handling of high traffic loads and sudden peaks, reduced bandwidth consumption etc.

3.4 India has the second largest user base and continuously growing internet users with 829.30 million[66] internet users as on Dec 2021. The country is witnessing an increased demand for online streaming of video content. Today, consumers are making a shift from conventional and cable-based video subscriptions to OTT Internet-based delivery platforms. Numerous players have emerged in the OTT market space, directly resulting in increased Internet traffic. Buffering is seen as a major reason for user dissatisfaction and low experience levels, causing more OTT & VOD-based services. The Service Providers are compelled to build and install content servers in their networks. Various mobile operators and ISPs have launched CDN initiatives during last few years.

The main drivers of CDN in the 5G era will be the digitization of everyday processes and will require very low latency delivery of content at the edge. The increased use of video data, the improved resolution of image sensors, underlying virtualization of the infrastructure, and the move towards cloud-native architectures will bring more and more focus on CDNs. The advancements in technology coupled with the smart city initiatives and impending rollout of 5G networks are also key driving factors for the growth opportunities for CDN market in the forthcoming years. Further widespread use of AI/ML will necessitate CDNs at the edge for large volume data processing for sensors, logs, image data in AI training and quick delivery of automated decisions. CDN will also impact the way

[65] https://www.grandviewresearch.com/press-release/global-video-streaming-marke
[66] https://trai.gov.in/sites/default/files/PR_No.42of2022.pdf

compute and software architecture caters to the need of new 5G use cases.

3.5 In the consultation paper (CP), the Authority has identified the increasing role of CDNs in traffic flows over the Internet and digital ecosystem. It is important that Digital Infrastructure ecosystem comprising of Datacentres, CDNs and Internet Exchanges goes beyond Tier-I cities and is present in different states to provide boost to the digital economy and success of Digital India. With proliferation of CDN industry, data traffic is set to grow and a limited number of players controlling a significant proportion of internet traffic, anti-competitive agreements between CDNs, ISPs/TSPs, and internet companies may occur.

3.6 The CP has dealt with the demand and the need for the CDNs, challenges of CDN establishment in the country, and CDN-ISP collaboration, policy and regulatory issues. The consultation issues raised on the CDNs are grouped into the below categories based on the opinions received from the industry and stakeholders for a detailed analysis to present the Authority's views:

A. Issues in the CDN-ISP interconnect and collaboration
B. Challenges for CDN establishment
C. Incentivizing the CDN industry

A. Issues in the CDN-ISP interconnect and collaboration

3.7 CDNs form a layer in the internet ecosystem, where the content owners such as media companies and e-commerce vendors pay CDN operators to deliver their content to their end users. In turn, a CDN pays ISPs, carriers, and network operators for hosting its servers in their data centres. The large deployment of the CDN-based solutions has induced blurred borders on the content delivery market and TSPs/ISPs sometimes build their own distribution networks. Deployment of a distributed Network Function Virtualization (NFV) platform at the edge of the Internet Service Provider’s network where a virtual Content Delivery Network (vCDN) is able to cater to the needs

of end user, is a model that is prominently emerging. The emerging technical architecture of edge CDNs and VCDNs suggest a global trend where Telco CDNs are likely to grow faster in coming years than traditional CDN

3.8 A possible CDN-ISP collaboration emerges where the CDN players make use of servers, storage capacities, space, power, and network site locations to host their cache servers, and ISPs in turn are benefitted from reduced bandwidth costs, security from DDoS attacks, and enhanced QoS to their customers. CDNs are changing the landscape of content delivery, providing new opportunities for ISPs to play a more significant role in the CDN ecosystem.

3.9 The relationship between CDN players and ISPs is that of a mutual facilitator. CDN providers help ISPs in terms of saving bandwidth cost and in enhancing the user experience and ISPs provide the access without which CDNs cannot deliver the content. Both the players invest in their own systems and in the process they help each other improve their commercial viability. The Competition Commission of India in their study paper[67] on 'Market study on the Telecom Sector in India' have highlighted that internet companies often utilize CDNs, to facilitate faster delivery of their content to users. CDNs and ISPs connect through transit and peering over the internet. Various issues indicating the need for regulatory oversight for CDN industry such as Revenue share between CDN-ISPs, Lack of equal access to CDN, Net-neutrality issues etc were raised in the consultation paper as mentioned below:

a) The interconnection between various players is fair and just and gives equal opportunities to each player.

b) Large ISPs, who are also in the CDN space, can create exclusive tie-ups with large content providers like OTT platform companies excluding other players from direct access on equal terms.

[67] https://www.amsshardul.com/2021/01/CCI-Report-on-Market-Study-on-the-Telecom-Sector-in-India.pdf

c) If the access to CDNs is not on equal terms, the issue of net-neutrality may arise whereby customers of preferred players may be provided with better quality CDN services.

d) Revenue share between CDN and ISPs: commercial arrangement between the players is not disclosed, market should not be misused to create dominance.

e) Maintaining Quality of service to end users as any failure at CDN will adversely impact the performance of significant internet traffic.

f) The security of DNS system used for delivering services, and the overall cyber safety of the end users.

g) Effectively implementing DNS based content filtering and URL blocking.

3.10 In this backdrop, following issues were raised in the consultation paper for the comments of the stakeholders:

1. *What long term policy measures are required to facilitate growth of CDN industry in India?*
2. *Whether the absence of regulatory framework for CDNs is affecting the growth of CDN in India and creating a non-level-playing field between CDN players and telecom service providers?*
3. *If answer to either of the above question is yes, is there a need to regulate the CDN industry? What type of Governance structure should be prescribed? Do elucidate your views with justification.*
4. *In case a registration/Licensing frameworks is to be prescribed, what should be terms and conditions for such framework?*

Comments from the Stakeholders

(a) Long term policy measures to facilitate growth of CDN industry

3.11 On the questions related to long term policy measures for CDN players, the stakeholders are of opinion that the CDNs are a collaborative framework of Content Providers and Internet Service Providers as it helps both content providers (to improve the accessibility of their content) and ISPs (to improve customer experience and saving bandwidth requirements). The collaborative and voluntary initiatives currently in place between TSPs/ISPs and content providers have helped bolster India's digital economy. CDNs

represent a constantly evolving, competitive and growing market in India. This is evident from the diversity of established players and new players alongside other content-first companies active in the market, indicating lack of significant entry barriers.

3.12 The telecom service providers on the question of long-term policy measures required to observe growth of CDN industries in India, are of the view that there is need to prescribe some quality-of-service parameters for CDNs. CDN should be given the responsibility of blocking the contents that is either originating in India or cached locally within India. Some TSPs have also pointed out that more transparency related to arrangement between TSPs/ISPs and CDNs is required to monitor net neutrality as significant amount of network traffic is handled between such players. One stakeholder is of the view that arrangements between these players should be hedged to the market force however a regulatory oversight on such arrangements is required. They also favoured mandatory development of traffic patterns and arrangements and their views are also supported by some of the Service Providers Association.

3.13 Couple of stakeholders have advocated for non-disclosure of commercial terms of a strategic partnership to keep the CDN industry profitable and competitive. The stakeholders stated that to this date, established CDN markets such as USA and EU do not mandate CDN providers to disclose commercial terms of agreements with ISPs/content providers.[68]

3.14 Some of the CDN players, have suggested for policy interventions to support CDN players as a long-term policy measure, so that they can avoid financial or business risk arising as a consequence of unfair business practices. They also favoured appropriate checks to hedge CDN players from exposure to arbitrarily high earning fees. A suitable mechanism to hedge business risks of CDN providers from peering dispute has also been suggested through a suitable dispute resolution

[68] https://berec.europa.eu/eng/netneutrality/regulation/

policy. The CDN players have also suggested incentivizing the growth of industry for easier and cheaper penetration in Tier2 and 3 cities.

(b) Non-level-playing field between CDN players and telecom service providers

On the issue of non-level playing field between CDN and TSPs, few stakeholders are of the view that larger ISPs use their market power to monetize the relationship between ISPs and CDNs. ISPs use their end-users to gain an additional revenue stream from CDNs by gate-keeping the access to their end-users via IP Transit networks. This adds an element of uncertainty for CDNs planning to invest in India and puts the Quality of Service and ability to use online content and services for end-users at risk. These anti-competitive practices need to be monitored.

3.15 Couple of stakeholders have opined that the Indian CDN players, who are also Category A ISPs, are facing challenges in terms of getting the co-location services in the points of presence (PoPs) of other Mobile Network Operators (MNOs), as the two compete with each other. While Global/foreign based dominant CDNs/Cloud Service Providers are given colocation and access by local MNOs at a preferential price or at no cost, the same treatment is not being extended to Indian CDN players thereby creating a non-level playing field and putting Indian CDN players at a disadvantageous position in the Indian CDN market against International CDN providers. Hence, the regulatory framework for CDN should be there to ensure the level playing field and non-discriminatory treatment of Indian CDN players by the MNOs.

3.16 Some of the stakeholders are of the view that the market for the interconnection of CDNs and ISPs is at a nascent stage. The big OTT players can dictate terms for interconnection with smaller ISPs or disallowing them direct peering. Further large ISP players in CDN space can create exclusive tie-ups with large content providers like OTT platform companies, excluding other players from direct access on equal terms. Therefore, regulatory interventions are needed to see

that the market is not misused for hurting business of smaller players.

3.17 Most of the service providers have an opinion that there is a non-level playing field between TSPs providing CDN services and standalone CDN players and suggested that CDNs should be subjected to telecom licensing and regulatory framework and compliances. The standalone CDN players are not subjected to telecom licensing and regulatory framework and compliances, whereas TSPs providing CDN services have to fulfill stringent licensing and regulatory framework and also cost to meet the compliances. They stated that the absence of regulatory framework for CDNs is affecting the growth of CDN in India, regulatory interventions are required for CDN industry as is applicable on TSPs for providing CDN services. Stakeholders have opined that the licensing and regulatory framework should capture the license fee structure, license tenure, Services scope, security guidelines, content hosting scope, tariff guidelines for end customer billing etc., equally applicable for standalone CDN players and TSPs providing CDN services.

3.18 The Service providers and associations have stated that there is regulatory uncertainty related to Adjusted Gross Revenue (AGR), which can lead to regulatory levies on revenue from CDNs operated by TSPs creating non-level playing field between TSP owned CDNs and CDNs operated by global players. Hence the Authority should take up the issue of amending AGR definition in line with the union cabinet decision to ensure that the definition of Gross Revenue (GR) will only include revenue actually received/receivable directly from the customer on account of provision of telecom products or services licensed under Section 4 of the Indian Telegraph Act.

3.19 Some of the service providers have stated that as far as content blocking and security is concerned, the security of DNS system used by ISPs for delivering services, also affects the overall cyber safety of the end users. DNS based content filtering and URL blocking allows or blocks access to the websites or URLs as per the Government orders under Section 69A of the IT Act which empowers Central

Government to issue directions to block public access to any information through any computer source. Service providers have opined that URL blocking is implemented effectively in DNS system maintained by ISPs, but some of the blocked websites/URLs remain accessible to subscribers of ISP networks who are using public servers or other third-party DNS servers or DNS-based CDN servers. One service provider is of the opinion that to bring an element of efficiency and effectiveness in the approach, automating the complete process of content/URL blocking will ensure better compliance and reduce manual intervention and have suggested for creation of a central portal for blocking of internet content.

(c) Need to regulate CDN industry and Governance structure

3.20 Most of the service providers and few other stakeholders have stated that CDNs should be brought under suitable licensing regime, with a light touch regulatory approach. Several reasons have been cited in favour of such suggestion. First, the contractual arrangements between internet companies, CDNs and TSPs/ISPs can be monitored for violation of any net neutrality principles and barriers to level-playing field. Secondly, such licensing regime will allow imposition of requisite conditions on CDNs for security of data processed in CDNs as well as blocking of any unlawful content being served from the CDNs. Third reason cited is that regulatory obligation will allow to maintain some minimum quality of standards by CDN players. ISPs are mandated to maintain quality of services to the customers, however CDNs operated by unlicensed entities continue to be outside the ambit of regulatory provisions even though they handle major traffic on internet. Another reason cited for a light touch regulatory regime for CDN players is to take care of matter/contents pertaining to national security, protection of minors/human dignity/privacy, intellectual property etc. Accordingly, they have suggested for an enabling and non-discriminatory regulatory environment for the growth of internet ecosystem in the country CDNs should be brought under a regulatory framework.

3.21 Few stakeholders opined that since commercial arrangements between CDNs, and ISPs/TSPs are not disclosed, mandated disclosure of arrangements and traffic patterns would help in ensuring net-neutrality principles and fair competition.

3.22 Another stakeholder suggested that there is a need for fair and equitable distribution of revenues between CDN players and TSPs/ISPs, for which a legal and regulatory framework for CDN players is the starting point.

3.23 On the other hand, few stakeholders who are against the regulation of CDN players have given various reasons for not regulating the CDN industry. Firstly, internet access service providers such as TSPs and ISPs operate last mile infrastructure that enables users to access the public internet, whereas CDNs are merely middle-mile technology architecture, CDNs have no relationship with end users, they rely on ISPs to deliver online content to end-users as they manage the complete network routing process end-to-end. Secondly CDNs should not be regulated like TSPs as CDNs require servers for computing, storage and connectivity and are either a customer of telecommunications providers (for internet access) or a private network interconnecting with telecommunications providers (through transit and peering). It has been stated that CDNs do not require a license to operate in other countries and TRAI should not set this precedent.

3.24 Few stakeholders have suggested for absolute autonomy to CDNs to establish mutual strategic partnerships with ISPs and content providers based on sound business feasibility and favourable economics, in line with the precedent practice in the USA.

3.25 Couple of stakeholders have said that as far as blocking of contents is concerned, CDN Players are covered under Section 69A of the IT Act as Intermediatory. On the issue of net neutrality, they have also pointed out the TRAI recommendations in 2017, in which the Authority has submitted that CDN should not be included within the scope of any restrictions on non-discriminatory treatment.

3.26 Another CDN provider is of the opinion that the regulatory framework for CDN would be detrimental to growth of this domain/industry and have opined that if the CDN providers are straddled with regulations compliance, they would not be in position to provide cost effective services/products quickly to the ISP. Implementation of regulatory frameworks will not be cost effective for smaller CDN providers & would also contribute to delayed service delivery timelines and significant risk of restricting the CDN market to the big players or telcos only, therefore currently there is no need to regulate the CDN industry.

(d) Terms and conditions of regulatory framework

3.27 On the issue of terms and conditions of regulatory framework, the service providers have opinion that in view of the business practices adopted by Global CDN players, a light touch regulatory framework having registration mechanism in place for CDN services should be introduced for creating level playing field for local CDN players.

3.28 Few stakeholders have suggested that Regulation must be preferably ex-post and not ex-ante as the latter tends to be stifling and anti-innovation. It should be 'light-touch' so that it permits innovation to prosper but at the same time the Regulator may be permitted to intervene whenever required to take corrective measures in case of market failure, lack of adequate competition, perceptible consumer uneasiness and potential harm so that it acts as a deterrent instead of a market barrier. It has been mentioned that since the players are at a nascent stage of digital economy, regulation should be kept to a bare minimum ensuring Digital Agility.

3.29 The CDN players have mentioned that they do not support registration/licensing in the CDN industry as licensing fees will financially burden smaller CDN service providers facing high overheads such as egress and rental expenses and thus affect profitability. Licensing will stifle innovation and restrict private investments in the CDN industry thus impacting its future growth.

Analysis of the issue and views of the Authority

3.30 India's data consumption is growing at a Compounded Annual Growth Rate (CAGR) of 53 per cent[69] over the last five years, according to Nokia's annual *Mobile Broadband Index* (MBiT) report 2022[70]. India is the second-largest user base and continuously growing internet users and consumption per user, compelling service providers to build and install content servers in their networks. The growing adoption for OTT and VOD services involves offering of latency-free data over the network and enhancing the quality of video delivery. The continuous investments in network infrastructure have improved the overall network connectivity, bandwidth and coverage, enhanced content delivery while delivering diversified data for consumption across several applications.

3.31 The value chain for video content distribution as discussed in Consultation Paper is presented below

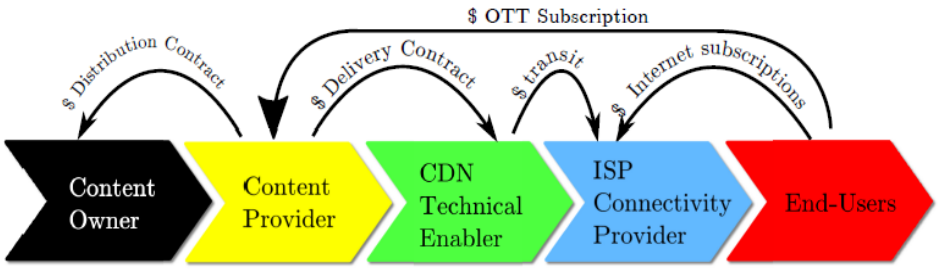


Fig: 3.1

3.32 On one hand, the Content Owner sells its content to online Content Providers (CP). On the other hand, ISPs sell plain connectivity to end-users and CPs sell them the access to OTT content. Finally, CDNs are placed between CPs and ISPs as a technology enabler. CDN is playing an important role in the value chain of content delivery ecosystem. The internet traffic, which was earlier being delivered by ISPs only, is now being delivered by ISP and CDN combined. ISPs perform load balancing, traffic engineering and offers guaranteed quality of service to end users. CDN Players also leverage various techniques like load

[69] https://advanced-television.com/2022/03/15/report-india-sees-highest-growth-in-mobile-data/
[70]https://www.nokia.com/sites/default/files/2022-03/nokia-mbit-2022.pdf

balancing, caching, optimization, use of security protocols, etc. for ensuring better delivery of content to end users in association with TSPs. CDN players are major contributors to the network traffic and can affect the overall quality of service. According to some estimates, almost half of internet traffic passes through CDNs. As more and more traffic is being handled by CDNs, CDNs role in maintaining overall QoS becomes important as any failure or malfunction at CDN is likely to adversely impact the performance of the significant traffic on Internet.

3.33 The Authority feels that imposing all obligations of QoS and net-neutrality on TSPs may not bear fruits if CDNs, with whom TSPs associate to deliver the internet traffic to end users, do not help TSPs in fulfilling such obligations. Therefore, the Authority is of the view that an appropriate legally binding and regulatory framework needs to be put in place obligating CDNs to ensure that overall QoS and Net Neutrality obligations are not compromised.

The Authority recognizes that CDN is one of the components of internet that brings content closer to the user to provide better quality of experience. CDNs perform an important function in delivery of traffic on the Internet. They add efficiency to the network by reducing latency, mitigating congestion and freeing up network capacity for various other purposes. In doing so, CDNs serve to benefit not just the faster delivery of content housed on these networks but also other content that can travel faster due to freeing up of network capacity.

The Authority agrees with the view of the stakeholders that the market for the interconnection of CDNs and ISPs is at a nascent stage. CDNs should not be regulated in a manner that disrupts content delivery services aimed to improve the quality of services provided to consumers. However, for monitoring any interconnect agreement between the Content Providers, CDN providers and ISPs some regulatory framework may be required. At this stage, given that the CDN industry in India is still developing, onerous regulatory frameworks should be avoided

3.34 **International experience:** In the Consultation Paper, Global Practices adopted in various countries were discussed. Under Table 3.1 of the CP, the regulatory framework status of various countries has been presented. It is observed that CDN practices are picking up globally and international practices in regulating CDN and regulatory frameworks are also evolving. CDNs are lightly regulated in Australia, with certain Regulatory obligations under the Telecom Act. In Germany, the services are lightly regulated and are considered as critical infrastructure. The CDN Service Provider has to perform a third-party Audit. In Brazil, CDN services are regulated and License of multimedia communication services is required from local regulator. The **UK** regulator Ofcom does not have specific licensing framework which applies to CDNs or IXPs. However, all communications providers are required to comply with the General Conditions of Entitlement[71] which are applicable to the network or service which they provide. China has several mandated licenses for the internet and telecom sector. Foreign website owners are required to obtain an Internet Content Provider (ICP) license from the Chinese Ministry of Industry and Information Technology (MIIT). An ICP license allows the licensees to legally operate, host websites on servers in mainland China and access Chinese CDNs, without which sites hosted on a Chinese server will not load on browsers located anywhere in the country. The EU regulator BEREC's (Body of European Regulators for Electronic Communications)[72] Open Internet Regulation, establishes rights in relation to the open internet for 'end-users' and the rights are available to both individual consumers and businesses using internet access services. Along with providing rights to end-users, the BEREC Regulation establishes common rules *"to safeguard equal and non-discriminatory treatment of traffic"*. The BEREC regulations allow the low barriers to entry on the open platform of the internet, providing fertile ground for new content and applications to develop, and for information to flow freely. Content

[71] https://www.ofcom.org.uk/telecoms-competition-regulation/general-conditions-of-entitlement
[72] https://berec.europa.eu/eng/netneutrality/regulation/

Application Providers (CAPs) are covered and protected by the Regulation.

3.35 Authority has analyzed the views of stakeholders for the questions relating to the potential market abuse for dominance and discriminations in the segment, and the costs and benefits of any possible regulatory interventions. Keeping in view the fast-evolving nature of the sector and the changes that have taken place in the CDN market, Authority feels that Content delivery services are to be handled with differential treatment as compared to conventional telecom network and feels the need for light touch regulation to support expansion of markets. The regulatory framework should reflect market realities and ensure that it does not stymie the growth of the data economy.

3.36 The concerns of internet service providers that similar regulatory framework to be prescribed, for all CDNs whether independent or of TSPs/ISPs, to enforce secured networks and similar license conditions to ensure level playing fields for all players planning to invest in CDNs has been noted by Authority. However, Authority is of the view that Content delivery service does not provide Internet access service to end users and CDNs often have direct interconnection points with the last mile delivery networks for delivering content to consumers with higher quality and facilitating efficient delivery of Internet traffic. The traffic within the last mile network is continued to be handled by the telecommunications service or Internet access service providers covered by licensing conditions of UL.

3.37 The Authority also agrees with the concerns raised by the service providers on the level playing field between standalone CDN players and those entities who are telecom service providers and offering services as well. Such entities are not only subject to licensing requirements but also have to pay license fee to revenues earned from CDN business as they are not exempted from the definition of AGR.

3.38 On the issue of Net-neutrality, the Authority in its 2017 recommendation itself has pointed out that there is need for more transparency relating to the arrangements between service providers and CDNs and knowledge of such arrangements would be useful for giving an appropriate understanding of the factors affecting the flow of traffic of the network and monitor violations of any discrimination, if any. Authority noted that there is a need for more transparency relating to the arrangements between TSPs and CDNs. Knowledge of such arrangements would be useful for gaining a proper understanding of the factors affecting the flow of traffic on the Internet, potential for anti-competitive practices and to monitor violations of the non-discrimination requirements by TSPs.

3.39 The Authority feels that unless and until there is some sort of regulatory framework for CDN players, it will not be possible for the regulatory entities to call for such information/agreements. Some of the stakeholders have suggested that there is no potential market failure, and, therefore, the policy should resolve to only ex-post regulation. The Authority should adopt an approach of ex-post regulation rather than ex-ante regulation. The Authority feels that it is not appropriate for any regulatory body to wait for market failure and should put in place minimum possible framework to ensure that such failures do not happen. It is imperative that certain information/data is available with the regulator so that it can analyse the market failure as and when it happens.

3.40 Therefore, the Authority recommends that there should not be any licensing framework for the CDN players. However, to address the issues that have been brought above, **Authority recommends that the CDN players should be registered with Department of Telecommunications through a simple online registration process. The suggestive draft for a Guidelines for the registration of CDN players along with the registration form and registration certificate is attached at Annexure-V.**

3.41 On the issue of providing level playing field for those telecom service providers who also provide CDN services with the standalone CDN players, the service providers have flagged the issue of amending AGR definition so as to exclude revenue of CDN services from AGR calculations. The Authority feels that entire AGR issue and exclusions thereof needs to be looked wholistically and requires specific consultation. If required, the Authority will look into the issue through separate consultation.

3.42 On various other policy initiative that are required for promoting CDN industry, recommendations have been made in the subsequent sections. **The Authority also recommends that the registration for the CDN players should be done online through a portal in a similar manner as is being done for the infrastructure providers.**

3.43 Further, the **Authority reiterates its Recommendations on Net Neutrality issued in 2017, that for monitoring and enforcement, DoT may establish a multi-stakeholder body with framework for collaborative mechanism among the stakeholders.** Authority had recommended to form a Multi Stakeholder Body comprising of TSPs and ISPs (license holders) and other stakeholders such as the content providers, researchers, academic and technical community, civil society organisations, consumers, and the government, having an advisory role and providing support to DoT in the monitoring and enforcement of net neutrality principles, to investigate complaints regarding the violation of net neutrality, to recommend suitable technical standards and methodologies on matters pertaining to best practices to be adopted for Traffic Management Practices and perform other assigned functions. The detailed composition, functions, roles and responsibilities of multi-stakeholder body were stated by authority in its Recommendations on "*Traffic Management Practices (TMPs) and Multi-Stakeholder Body for Net Neutrality*" in 2020. Authority feels that 5G growth will be impacted if such a body is not there and it will be counterproductive for the growth of the sector.

B. Challenges for CDN establishment

3.44 CDNs face multiple technical and economic challenges due to infrastructure issues. The cost of peering or IP transit for CDNs is substantial and can also be a barrier for launch or success of a CDN. These costs depend on the volume (e.g., committed, consumed etc.) of multimedia data traffic transferred or exchanged. Pricing for CDN services and charging the customers is governed by bandwidth costs, traffic distribution, content size, etc., along with the expenses incurred for peering or transit.

3.45 Further, there are cost constraints for ISPs also, especially the smaller ones, to connect to CDNs or IXs. High costs of National long-distance (NLD) charges and high costs incurred in Domestic Leased Circuits (DLC (P2P)) link charges are a major constraint for smaller ISPs to connect to CDNs or IXs at the Data Centre. Improving the connectivity, bandwidth to ISP in these locations will help in increasing the demand for CDN's and thereby contribute to the growth of the CDN industry.

3.46 CDNs form the backbone of India's digital infrastructure and are responsible for the availability of good quality internet and data services. CDNs should be established across India, including Tier-II cities and smaller towns. Location of CDNs is constrained due to connectivity issues in non-metro, rural locations. A favourable regulatory environment can thus help in attracting huge investments required to set up a large number of CDN servers in India and in eliminating various other roadblocks for CDN service providers. Keeping a view of the challenges in the CDN market, the below mentioned issues were raised in the CP -

5. *What are the challenges in terms of cost for growth of CDN? What are the suggestions for offsetting such costs to CDN providers?*
6. *Do you think CDN growth is impacted due to location constraints? What are the relevant measures required to be taken to mitigate these constraints and facilitate expansion of ecosystem of Digital communication infrastructure and services comprising various stakeholders, including CDN service providers, Data Centre operators and Interconnect Exchange providers expansion in various Tier-II cities?*

7. *What measures can be taken for improving infrastructure for connectivity between CDNs and ISPs, especially those operating on a regional basis?*

Comments from the Stakeholders

3.47 Stakeholders have stated that various costs impact long-term growth and profitability of a CDN business such as Capex and Infrastructure cost, Operation and Maintenance costs, Energy charges, etc. The Capex cost of key components like CDN routers switches, and storage servers that are imported from overseas markets, can be an entry barrier for new players. Another major cost component is the infrastructure costs such as the high initial investment for real-estate, large and uninterrupted power supply, and bandwidth connectivity. Co-location fees/expenses paid by the CDN service provider to host its servers at ISP/IXP/DC premises is also a key cost component.

3.48 Stakeholders have submitted that under the operation and maintenance cost, the Egress charges that is the fee paid for transit across the Internet backbone and to cache its CDN server network have become the major cost item for CDN service providers (contributing approx. 70 to 80% of total OpEx), driven by a continued increase in OTT driven data consumption. Energy charges paid to ensure uninterrupted and stable electricity uptime, which is critical for smooth functioning and glitch-free operation of CDN service on a 24x7 basis, accounts for 15-16% of total OpEx cost. Rentals for space to install and deploy its CDN infrastructure is another significant cost. Further repairs and maintenance costs allocated towards upkeep and maintenance of CDN infrastructure on a continuous basis are additional cost component. The stakeholders have opined that implementing and maintaining CDN servers and equipment is challenging for many small to medium-sized internet providers who have limited resources and have suggested support to smaller players in setting up the CDNs, specially in Tier II and Tier III cities.

3.49 Few stakeholders/infrastructure providers have submitted that for providing optimum user experience, it's imperative to deploy CDNs

close to users and connect to all eligible Service provider. There are certain limitations such as non–availability of Neutral facilities. CDNs are preferring to collocate at existing DC facilities rather than planning to build their PoPs as the sizing requirement for their solo use makes the later preposition economically non-viable.

3.50 The stakeholders have suggested for promoting edge Data Centres at Tier II / III cities so that it becomes the central aggregating point for all CDN operators to host their nodes and all ISPs to extend their connectivity. This will lead to a much more optimized development and deployment of network links connecting various CDNs and various ISPs.

3.51 One stakeholder has submitted that CDNs import special-purpose servers which are not sold to any third party, thus it shouldn't require testing/ certification etc. as it adds to the complexity, cost, and time. These costs become high when lesser number of units are deployed. This affects the start-ups and CDNs targeting focused regional/rural rollouts. It has been suggested that if the hardware already has Certification for the device/component from internationally recognised certification agencies like the FCC(US), CE Mark (EU), MIC (Japan) and other similar bodies worldwide, it may be allowed for import and use by captive users like CDNs where there is no commercial forward sale of the equipment involved.

3.52 One service provider has opined that the connectivity charges i.e., NLD charges and leased circuit (P2P) link charges are not a barrier or a constraint for any ISP to connect with the CDNs or IXs at the data centre. In India, the NLD services are highly competitive due to the presence of integrated service providers (having access services, ISP, NLD, ILD licenses/authorizations) and standalone NLD service providers. The existing ceiling on leased circuit tariff has already been reduced substantially. In major centres, the tariffs were offered at highly discounted rates, therefore NLD/DLC tariffs is not a constraint in the growth of CDN services in India.

3.53 Regarding limited growth of CDN in Tier II and Tier III cities, the service providers have suggested that CDNs can be mandated to set-up their infrastructure in Tier-II and Tier-III cities based on a defined criterion (viz. Traffic quantum). CDNs owing to their business objectives, have mostly concentrated their set-up to bigger cities.

3.54 Some stakeholders have highlighted the challenges in setting up CDN servers close to the users in remote and rural parts of India as dependence on wireless networks to transmit data puts a constraint on handling large data loads (video content, live-media, on-demand data, etc.). To add to this, some rural parts still have either no mobile coverage or are still being served through 2G/3G networks.

3.55 Stakeholders have suggested various measures for improving the connectivity between ISPs and CDN in Tier II and Tier III cities. The incentives in terms of RoW cost and license fee payable on the revenue from the fixed network have been suggested to improve the infrastructure connectivity and proliferation of broadband. Implementing forward-looking broadband strategies aiming at achieving affordable internet access to the public, especially in rural regions have been suggested. Further Universal service support through Government funding to subsidize efforts to build rural broadband connectivity and allowing deployment of OFC using street furniture/DISCOM assets e.g., electric poles, streetlights, bus stops, advertisement hoardings, incentivizing establishment of common ducts and posts, to be shared on non-discriminatory basis, promoting and incentivizing local cable operators /local ISPs to lay fiber over existing ducts/poles and expediting RoW permissions etc. have also been suggested.

3.56 Many stakeholders have stated that need for large and uninterrupted power supplies; availability of fiber network and necessary ecosystem are challenges in the growth of CDN business in Tier-II locations and have suggested for incentive schemes for setting up the infrastructure to facilitate the expansion of Digital ecosystem and CDN services in Tier II cities.

Analysis of the issue and views of the Authority

3.57 The Digital communication infrastructure ecosystem comprises various stakeholders, including CDN service providers, Data Centre operators, and Interconnect Exchange providers. These players can flourish and grow well together if the ecosystem for their presence exists in different parts of the countries. Currently, the ecosystem is flourishing mostly in Tier-I cities, these players must grow in different States and smaller cities so that the digital economy gets boost there.

3.58 The Authority agrees with the view of the stakeholders that initial costs associated with establishing a CDN are high, while it takes time to get the returns on investment. Private investments are required to set up many CDN servers in India.

3.59 The Authority also agrees with the view of the stakeholders that the last mile plays an important role in the CDN value chain and can deliver content efficiently only when internet access networks are fully developed in all parts of the country. Further CDNs require multiple integration with ISP's far and near for low latency and improving the CDN performance and accessibility. The Authority also recognizes that fibre penetration is the backbone for high-speed broadband and hence utility of CDNs for enhancing the experience of users. Additionally, for players to invest in CDNs, they need fiber connectivity.

3.60 In its recommendation on *Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed*, dated 31/08/2021 Authority stated various recommendations for ensuring growth of fixed-line broadband services across the country and suggested arrangements for streamlining RoW permissions framework, optical fiber connectivity incentivization for proliferation of fixed line broadband, sharing of passive infrastructure and cross sector infrastructure development, broadband proliferation and enhancement of mobile broadband speed in rural and remote areas, using BharatNet network, etc.

3.61 To make the RoW rules more effective Authority has recommended number of measures in its 2021 recommendation on *Roadmap to*

Promote Broadband Connectivity and Enhanced Broadband Speed, dated 31/08/2021. Issues related to Right of way in laying of OFC such as grant of ROW permissions, RoW policy, institutional mechanism, single window clearance mechanism, RoW charges etc have been discussed in detail.

3.62 On the issue of challenges in terms of cost for growth and CDN and the possible suggestions for offsetting such cost, the Authority has dealt the issue of incentives for CDN players in the following sections. On the issue of meeting infrastructure for connectivity between CDNs and ISPs and further penetration of the digital infrastructure services in Tier-II cities, the Authority has given various recommendations in August 2021 on "Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed".

3.63 **The Authority reiterates that its recommendations on "Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed" dated 31st August 2021, may immediately be implemented in totality as this will not only help in proliferation of broadband services but also in establishment of supporting digital communication infrastructure as Data Centres, CDN Services and Interconnect Exchange.**

C. Incentivizing the CDN industry

3.64 Incentives are crucial for any industry to strengthen its presence in the market at initial stages. The incentive schemes implemented for catering to the needs for setting up of CDN infrastructure will improve the strategic position and fuel market growth for the industry. Following issues were raised in the consultation paper:

8. *Is there a need to incentivize the CDN industry to redirect private investments into the sector? What incentives are suggested to promote the development of the CDN industry in India?*
9. *How can TSPs/ISPs be incentivized to provide CDN services? Please elucidate your views.*
10. *Are there any other issues that are hampering the development of CDN industry in India? If there are suggestions for the growth of CDNs in India, the same may be brought out with complete details.*

Comments from the Stakeholders

a) Incentivizing the CDN industry

3.65 Stakeholders have stated several reasons for incentivizing CDN industry for encouraging private investments. They have opined that the high upfront CapEx acts as a barrier to market entry for small-scale CDN service providers. Allowing private investments would benefit creation of well-capitalized CDN provider base equipped with necessary resources to cater to the enormous scale of Indian market. CDNs require specialized equipment and knowhow and are exposed to rapid swings in external infrastructure related costs (egress costs, access costs) which are outside its operational control; CDNs need strategic partnerships with ISPs / content providers that is difficult to establish for smaller players with limited financial backing. The stakeholders have suggested for incentivization to CDN players to improve internet access in the country. The incentive schemes should be directed towards improving the internet penetration.

3.66 Another stakeholder/ CDN provider is of the opinion that CDNs are a popular choice to relieve internet traffic and they immensely benefit end users (both consumers & enterprises). The CDN players need support/incentive in bringing the content closer to the users beyond Tier-1 cities.

3.67 It has also been suggested that as CDN players are not the only player in the digital ecosystem, the incentive could be shared among all participants of the ecosystem (IXP, CDN, connectivity provider, OTT, ISP).

b) Incentivizing TSP/ISPs to provide CDN services

3.68 The service providers and associations have opined that to facilitate the expansion of Digital services in Tier-II and Tier-III towns, TSPs should be incentivized, and RoW related issues be resolved to create a viable model for TSPs to provide connectivity. Incentivizing the TSPs/ISPs in terms of License fee on the revenue earned through their

fixed network, subsidized electricity price and exemption of 100 percent electricity duty from state electricity board, making available the land, water etc. at subsidized rates to the investors would create necessary infrastructure to facilitate the CDN services in India's Tier-II cities.

3.69 Various reasons have been cited by stakeholders to incentivize TSPs/ ISPs to provide CDN services. The Service providers are of the view that TSPs/ISPs should be encouraged to provide CDN service as they are well placed to offer the users higher quality internet experience and they can store content on servers located at decentralized points in the network and potentially offer service that is superior to classic CDNs. Such investment by domestic players should be incentivized through fiscal and non-fiscal initiatives, in line with the incentives for DCs. Consumption of OTT content has risen worldwide (especially post pandemic) resulting in downstream flow of very high volumes of audio/ video data. Localized caching of data intensive content over a CDN enables the ISP to serve redundant user requests at lower cost while offering enhanced customer experience. Another reason is that CDN allows an ISP to offload large volumes of data to localized CDN servers located closer to the end-user. This leads to improved internet usage experience and lowers customer dissatisfaction and thus deters customer churn of ISP/TSPs. Further building a CDN infrastructure enables an ISP to de-localize its data Centre infrastructure across multiple endpoints. This results in significant cost savings in establishment and maintenance of DC infrastructure.

3.70 One stakeholder suggested for incentivizing TSPs/ISPs through adequate availability of unlicensed spectrum and encouraging broadband deployment across India, particularly in rural regions, through policies such as promoting the sharing of passive infrastructure, as well as the costs of deploying and maintaining broadband infrastructure.

3.71 A Service provider has opined that TSP/ISP owned CDN service inherently has a disadvantage as the IP network of each operator works only within its own country and it is difficult for the operator

to compete with global CDN service providers, which have network across multiple countries. Hence there is a need to incentivize TSP owned CDNs, to enable them to compete efficiently with global CDNs in the country. The vast Indian internet market will encourage the internet companies to engage with operators directly and execute CDN service agreements with them if the TSPs/ISPs are incentivized through an enabling regulatory environment to invest in the CDNs.

3.72 Contrarily one stakeholder who is into data Centre business has opined that CDN providers need to be completely carrier neutral like Data Centres. The TSP/ISPs owned CDN may create a conflict of interest and may result into CDN provider not being carrier neutral and hence not being very attractive to the content/cloud/enterprise /government customers to whom the CDN operator serves. It has been suggested that TSPs/ISPs should not be CDN providers, rather they should be incentivized to promote and deliver seamless services to the CDN operators.

c) *Measures to incentivize CDNs*

3.73 The stakeholders have suggested various measures for incentivizing CDN players for promoting establishment of CDNs in India. Various fiscal incentive measures such as tax breaks, TAX holidays, complete tax relief on capital investments, tariff relief on power and associated investments and licence fee exemptions to CDN operators, Govt. subsidies to create dedicated CDN nodes for educational, manufacturing, and agricultural, institutes/hubs have been suggested. The licence fee imposed on ISPs/TSPs, who are a major contributor to the CDN sector may be reduced so that the same do not trickle down to content providers and end consumers.

3.74 Stakeholders have also suggested measures to encourage market entry of new players and ensure a level playing field for smaller operators in the CDN services industry. The measures/incentives such as Infrastructure Access support, Taxation support such as Tax holiday/Tax concessions/benefits, Guaranteed consumption support

etc. have been suggested for promoting long-term business sustainability of the CDN services industry.

Analysis of the issue and views of the Authority

3.75 Authority agrees with the views of the stakeholders that suitable fiscal incentives through policies can support the companies during initial investment. A favourable policy and regulatory environment can help in attracting investments for setting up large number of CDN servers in India, especially in smaller cities and towns. Authority also noted that looking at the geography of India and different licensed telecom service areas, there is need of CDN deployment and availability near to users with multiple CDN POPs. This will reduce the bandwidth cost for operators and improve user experience. Availability of space and power on competitive rates, availability of skilled resources and technology provider at competitive rates, made in India equipment and technical solutions under *Atmanirbhar Bharat* policy initiatives will facilitate growth of CDN industry in India.

3.76 The Authority recognizes that TSPs/ISPs generally have network and connectivity infrastructure in place, as well as existing relationships with end-consumers and content providers to help deliver content across their network. They have an inherent advantage in providing CDN services.

3.77 The Authority observes that content delivery networks are nothing but extension of data centres as they require similar software and hardware stacks and power as data centres. CDNs need DCs for hosting the contents and applications and their proliferation depends closely on the uptake of DC and edge DC market. The Authority therefore feels that incentives recommended herein for DCs should also help in proliferation of CDNs in the country and this would in turn provide the boost to digital infrastructure ecosystem, including CDNs and IXPs. The Authority therefore does not find a need to spell out any separate incentive scheme for CDNs presently.

CHAPTER 4

INTERCONNECT EXCHANGES

4.1 India is a vast country with many internet service providers serving a huge internet users base of about 830 million as of September 2021[73]. According to the new Cisco Annual Internet Report, India will have over 907 million internet users by 2023, accounting for 64% of the total population[74]. The boom in internet usage and content consumption in this post-pandemic era has necessitated the expansion of internet exchanges. Further, the presence of Internet Exchange Points (IXPs) benefits the entire Internet ecosystem and encourages broadband penetration in India.

4.2 An IXP acts as a framework for ISPs/TSPs to peer and exchange IP traffic with each other and the main purpose of IXP is to facilitate exchange of internet traffic originated and destined within the country among the service providers without using international bandwidth. The key objectives of IXP are –

(i) To enable domestic bandwidth utilization for routing of the domestic traffic resulting in reduction in cost for bandwidth utilization.

(ii) Improvement in Quality of Services in terms of lower latency and number of hops. This will also help to effectively utilize International Internet Bandwidth (IIB) for routing international internet traffic only.

4.3 India has a unique geographical advantage, as it is located conveniently between the submarine cables that cross Europe and Asia. India's impending data protection legislation and its expected data localization requirements are expected to drive further demand for local interconnectivity solutions. India has been ranked second in the IPv6 adoption with 62.92% availability of IPv6 connectivity[75] and is the largest subscriber of IPv6 contributing to more than 50% of the total worldwide[76] base. Moreover, the country aims to become *Atmanirbhar*

[73] https://trai.gov.in/sites/default/files/QPIR_10012022_0.pdf

[74] https://www.cisco.com/vni-forecast-highlights/India_Internet_Users.pdf

[75] Google IPv6 Country Rank - https://www.aelius.com/njh/google-ipv6/

[76] https://www.google.com/intl/en/ipv6/statistics.html#tab=per-country-ipv6-adoption

in internet connectivity and is mulling to set up the IPv6-based root server locally to safeguard critical digital infrastructure. To truly take advantage of its geography, become self-reliant in internet market and evolve as an emerging data hub, an enabling regulatory framework for IXPs is much necessary. The IXP framework also supports the IPv6 initiative aiming to boost a trusted and fully secure digital infrastructure.

4.4 As has been discussed earlier, under its Propel India Mission, the NDCP–2018 policy aims to establish India as a global hub for cloud computing, content hosting and delivery, and data communication systems and services. One of the strategies enlisted to achieve this goal is by 'promoting data economy through the establishment of DCs, CDNs and IXPs'. In a need for pronouncing concrete action points to achieve NDCP goal in making India a global Data Centre hub, the Authority has initiated consultation process to seek the inputs of the stakeholders for promoting IXPs. The CP has dealt with the current IXP scenario, demand and the need for more localized/independent interconnect exchanges, challenges of IXP establishment, and past regulatory initiatives undertaken in the country. The consultation issues raised on the IXPs are classified into the below key categories based on the opinions received from the industry and stakeholders for a detailed analysis to present the Authority's views:

A. Policy and Regulatory Intervention
B. Promoting new Interconnect Exchanges
C. IXP Cost/Revenue Analysis
D. Incentivization

A. Policy and Regulatory Intervention

4.5 Considering the challenges in the establishment of new internet exchanges in India, the Authority deliberated the need to create a suitable environment for the growth of the internet ecosystem in the country. By developing an enabling non-discriminatory regulatory framework and enhancing the ease of doing business. Citing a few global experiences of Singapore, Bahamas, Kenya, etc., on how the

regulatory measures encourage the operators to connect to IXPs and in turn increase demands for the setting up of IXPs, the Authority consulted on the issues of the need for policy and regulatory intervention for supporting interconnect exchanges.

4.6 **Authority's past initiatives —**

There are several instances in the past where the Authority has been involved in dealing with various issues relating to IXPs, which are summarized below with timeline –

- **2002 -** The requirement of creating an IXP for peering of the ISPs was felt in India as early as 2002 and TRAI has recommended the establishment of an IXP for the exchange of internet traffic within the country. Accordingly, NIXI was set up in the country under the umbrella of an industry representative not-for-profit, neutral body.
- **2007 -** Authority submitted recommendations to the Government on improving interconnections between NIXI and ISPs, which were accepted by DoT in 2009.
- **2011 -** In view of the growing importance of telecom infrastructure in development of the country, the Authority issued recommendations on 'Issues related to Telecommunications Infrastructure Policy' in April 2011. While addressing the IP infrastructural issues, the recommendations also covered IXP issues like the efficient routing of domestic IP traffic, licensing framework of the entities for setting up IXPs in India, for which the following recommendations are provided —

a. *IXPs may be brought under Class license. Once this recommendation is accepted, detailed terms and conditions of the Class license for IXP services will be provided by TRAI.*
b. *Data Centres may be permitted to connect directly to the IXPs.*
c. *National level ISPs and International Internet bandwidth (IIB) providers may be mandated to connect to all IXPs.*

- **2021 –** In its consultation paper[77] on "Roadmap to Promote Broadband Connectivity and enhanced Broadband speed" dated 20th August 2020, the Authority has deliberated on reasons for slower broadband speeds

[77] https://trai.gov.in/sites/default/files/Broadband_CP_20082020.pdf

and subsequently the recommendations were given on 31st August 2021. During the consultation process, the stakeholders stated that the performance of core networks is affecting the performance of the fixed and mobile broadband together and expressed concerns regarding frequent congestion of NIXI ports for some TSPs. Stakeholders suggested that NIXI capacity should be increased at the peering sites to avoid latency. It was further mentioned that stepping up investment in NIXI is a must to increase capacity at the peering sites to avoid latency and give a boost to domestic traffic. In this regard, the Authority in its recommendations[78]*(para no 4.48)* has stated that 'A separate consultation on the issue of IXP along with content delivery networks and data Centres will be done with the industry and recommendations will be issued.'

4.7 Due to the presence of ambiguity in licensing framework of IXP in India, some IXP players are operating under ISP license, while one of the major players, i.e., NIXI does not have any license. Another IX player who was operating without a license has litigated against DoT. Lack of clarity and confusion on the IXP regulatory framework has resulted in litigation and new private investment is getting affected. Therefore, to bring clarity in respect of licensing framework for operating IXPs and for unbiased peering, interconnection, and security, a need is felt for a separate license for IXPs. This can help in promoting IXPs in the internet ecosystem.

4.8 Keeping in view the demand drivers like data localization and data explosion in the digital ecosystem, adequate policy, and regulatory measures will promote the setting up of new IXPs and encourage healthy competition in the interconnection exchange market. Accordingly, the Authority has raised following questions in its CP on policy and regulatory intervention in the IXP market:

11. Do you think that presently there is lack of clear regulatory framework/guidelines for establishing/operating Interconnect Exchanges in India?

[78] https://trai.gov.in/sites/default/files/Recommendations_31082021.pdf

12. What policy measures are required to promote setting up of more Internet Exchange Points (IXPs) in India? What measures are suggested to encourage competition in the IXP market?

13. Whether there is a need for a separate light-touch licensing framework for operating IXPs in India? If yes, what should be the terms and conditions of suggested framework? Do justify your answer.

Comments from the stakeholders

4.9 On regulatory framework/guidelines for establishing and operating IXPs, some service providers and companies are of the opinion that there is a need for a regulatory framework for IXPs that creates a level playing field. All IXPs should be bound by the same regulatory framework. On the other hand, some of stakeholders commented that the IXP market should be left unregulated. Imposing regulatory or licensing obligations on IXPs would create a restrictive operating environment for existing and future IXPs.

4.10 A service provider is of the opinion that the traffic handled by IXPs is the internet/data traffic that falls under the ambit of the telegraph. There are linked aspects of security and lawful interception of this traffic, which are to be looked at from a national security point of view. Hence there should be a clear light-touch licensing/interconnect regulatory framework, so as to provide robust, trusted, resilient, and secured interconnect exchanges.

4.11 An association submitted that some companies are operating IXPs under the Companies Act only, whereas others are operating under a Telecom License. The obligations of both these are very different. To ensure unbiased peering, interconnection, and security, there is a need to bring IXPs under the ISP license where all IXPs would be bound by the same regulatory framework as the ISPs.

4.12 The stakeholders who are IXPs suggested that the current regulatory frameworks should be expanded/changed to accommodate the requirements of operating an IXP through specified terms and conditions. One IXP submitted that TRAI recommendations on creating a separate class license for IXPs were not accepted by DoT and there is a lack of clarity in the current frameworks for accommodating IXPs. It

was further specified that operating IX under UL ISP Class license is not feasible, due to multiple reasons like –

- IXP can be considered as a Closed User Group (CUG) service - traffic exchange between users of specific AS numbers and not general transit to the Internet. There is an explicit prohibition for ISPs to provide CUG services in the Indian UL ISP Class license.
- Although it facilitates the exchange of IP traffic, an IXP is a simple Layer 2 ethernet service, this is not essentially an internet service on its own.
- A potential conflict of interest may arise between the IXP who is acting as an ISP and ISPs who are supposed to be members of the given IXP.

4.13 A service provider has submitted that there exists a clear regulatory and market structure for Internet services, which consists of two entities- a Customer and a Service Provider (ISP), which is evident in license definition as well as the business model of ISP. The role of exchange points should only be to enable the peering arrangements among ISPs at mutually agreed commercial models, and thus the internet exchanges should be limited to provide only co-location and related infrastructure. By no means, the scope of IXPs should be made to cover the services provided by the ISPs. Another service provider and an association suggested that there is no need for any separate regulatory framework and only valid Licensed Service Providers having UL-ISP/ Standalone ISP/UL-AS Licenses should establish and operate IXPs in India.

4.14 Few stakeholders opined that imposing regulatory or licensing obligations on IXPs or other entities providing peering services in the nature of IXPs (including licensed TSP/ISPs) should be strictly refrained since the core activity of such entities extends to merely providing traffic interchange points. There are no barriers to entry for creating IXPs and they do not require a license to operate as such in any country and are operating in a healthy competitive market, hence the Authority should not set this precedent in India.

Measures suggested by the Stakeholders

4.15 On the issues of measures required to promote the setting up of more IXPs and to encourage competition in the IXP market, various measures suggested by different stakeholders are enlisted below –

a. The objective of the IXP policy/ framework should be to facilitate peering between ISPs by promoting exchanges and the role of IXPs should be restricted to provide only colocation space to enable ISPs to peer with each other on mutually negotiated terms. Therefore, the requirements of such IXPs are similar to that of DCs, and once the policy initiatives are undertaken for promoting DCs, it will also encourage IXPs.

b. IXP enabling environment can be created by assuring a reliable power supply; reducing high duties and taxes on IXP equipment imports; removing barriers to entry and ensuring fiber connectivity of the site location.

c. Setting up of IXPs in rural areas should be promoted through measures such as Government funding, permitting the use of Government resources and land, providing tax breaks, etc. The Government can also promote training opportunities to increase employability in the operations of IXPs that can then be set up in rural areas.

d. Providing incentives in the form of leased line costs reimbursement or mandating the Government controlled entities like BBNL, BSNL, MTNL, RailTel, and PowerGrid to provide IXP connectivity at nominal rates or for free, they should also be mandated to share facilities like Data Centre and dark fiber with IXP. Mandate, incentivize, or encourage all relevant government-controlled entities like e-government agencies/ services, academic/educational institutions, enterprises like ticketing, banking, etc. to participate in IXP.

e. ISP licensing policy may be suitably amended to mandate ISPs/CDNs to connect with at least one IXP. Monthly reporting of the Management Information System (MIS) by the licensee to the licensor is also one of the measures to promote IXPs.

f. There should not be any AGR levy for IXP and subsidies may be given to IXP if they host IXP in State-owned DCs. Promoting edge data

Centres at Tier II / III cities so that such edge data Centres become the central aggregating point for all IXP operators to host their nodes and all ISPs to extend their connectivity. It shall lead to a much more optimized development and deployment of network links connecting various IXPs and various ISPs and content operators.

g. IXPs should be allowed to lay/procure their own fiber and create their own managed networks. Promoting deployment of redundant high-capacity fiber in Tier II/III cities which can be used by IXPs to connect to local ISPs and global CDNs and content providers.

Comments on terms of separate licensing framework

4.16 The stakeholders who are in favour of regulatory intervention in the IXP industry have proposed different ways of implementing the licensing framework for IXPs. Some are of the opinion that all the IXPs should be obligated to the license conditions that are similar to that of ISPs, generating a level playing field for all IXP players in the country. While some have argued that an IXP license cannot be the same as an ISP license in its obligations.

4.17 A service provider is of the opinion that IXP should be operated under a valid license i.e., ISP/UL-ISP to ensure a level playing field between the ISPs/UL-ISPs who are establishing and operating IXPs and other ISPs/UL-ISPs providing only internet service. Those who are providing IX Services shall be subjected to the same license obligation as other ISPs/UL-ISPs are obligated under the ISP/UL-ISP terms and conditions and all associated compliance requirements under these licenses. Another service provider submitted that the terms and conditions should include but not be limited to security requirements and license fee payments, as is applicable to other UL holders. Some key aspects that shall be complied with by the IX operators in a similar way as by other ISPs/UL-ISPs are provided as follows:

a. License Fee and Revenue Share as applicable for other ISPs/UL-ISPs.

b. All Tax-related compliances since settlement-free peering are not allowed in India.

c. National security-related compliances like URL blocking instructions from DoT and various law enforcement agencies from time to time. Compliance on cyberthreat and other requirements from CERT-IN etc.

d. Not allowing Foreign ISPs/Telcos/ global content providers to connect to the IX platform with ISPs who don't have CDOT LIM/International Gateway. Currently, only those Indian ISPs who have CDOT Lawful Intercept and Monitoring (LIM) system and/or international gateway can connect to an internet port outside India.

e. Any other regulatory and tax compliances such as peering between ISPs and non-ISP entities (ISP peering with OTTs/CDNs/enterprises is not allowed in India)

f. Current interconnection/internet peering of entities (unlicensed or licensed with no LIM or International Gateway) with non-gateway license ISPs, internet exchanges, and foreign telecom operators connecting at the IX platform has very high chances of internet traffic going unmonitored to the end-users in India thus posing a very serious national security threat as well as pilferage of revenue to the government exchequer.

4.18 An IXP stakeholder supported the EU licensing model where the license or any other form of explicit approval shall be required only in case of scarce resources (like spectrum or numbering capacity). In all other scenarios, there are no explicit approvals required - it is either free to operate or requires a simple registration via General Authorization. In their opinion, the ideal solution would be to provide an IXP framework without introducing a specific IXP license. In case a light-touch class license is to be adopted, this IXP stakeholder suggested a General Authorization model that of the EU justifying their argument by certain key principles.

4.19 Another IXP operator suggested that the licenses should be in two categories: LSA/State level and National level license. District level (Category C) is not required in IXP as the scale of operations or impact of an IX is expected to be minimum at a regional level. Further, this IXP has provided elaborative terms and conditions in line with Unified Licence for a separate light-touch licensing framework for operating

IXPs in India. Like Unified License, these suggested terms and conditions, inter-alia, includes:

- General Conditions
- Commercial Conditions
- Financial Conditions
- Technical Conditions
- Operating Conditions
- Security Conditions

4.20 An association submitted that as the private internet exchanges are mostly coupled with the ISPs (integrated model), it should be ensured through a suitably designed licensing framework that they don't discriminate between their co-hosted/co-located ISPs, when it comes to peering and transiting traffic from other ISPs other than their partner ISP. There is a need to consider any unintended consequences that may arise from the establishment of an IXP regulatory framework, light-touch, or otherwise.

4.21 A stakeholder proposed that one approach to formalizing IXPs could be similar to the PM-WANI framework where an IXP could be required to register itself. The framework could lay out the operating guidelines as well as the requirements for what qualifies as an IXP.

Analysis of the issue and views of the Authority

4.22 In India, telecommunications services are licensed under the Indian Telegraph Act, 1855. The Telegraph Act governs the licensing and operation of 'telegraphs', which have been defined broadly enough to govern all forms of telecommunications, including the internet. Under the Telegraph Act, read with the Government of India (Allocation of Business) Rules, 1961, DoT exercises powers to license and regulate the telecommunications sector in India. Through this power, DoT issues various licenses for telecom services, usually through the Unified License, which covers the vast majority of telecom services offered in India.

4.23 Unfortunately, India does not have a clear legal regime governing IXPs. None of the licenses offered by the DoT currently envisage an IXP

service. The Unified License does not even use the term, 'internet exchange' anywhere. An IXP is a framework for ISPs to peer and exchange IP traffic with each other. In such internet exchange activity, messages are switched from one licensed service provider to another service provider for which license is necessary under section 4 of the Indian Telegraph Act, 1885. In the Unified License – Internet Service Authorization, condition 4 'Network Interconnection' under Internet Service specifies the conditions for interconnectivity of ISPs for handling traffic of other ISPs. The relevant clause of the Unified License is reproduced as follows:

4.1 The Licensee may establish direct interconnectivity with the network of other Internet Service Providers/Unified Licensee having authorization of Internet Service. The Licensee may obtain leased bandwidth from any other Licensee authorized to provide such bandwidth on lease.

4.24 Based on the above clause, it can be construed that ISP license will be required for providing service of exchange internet traffic among different ISPs. The Authority is of the opinion that clarity on applicable regulatory framework for IXP operations is must to address uncertainty and doubts of stakeholders of the Indian peering ecosystem. This will help in promoting investment and entry of more players into this space.

4.25 As far as licensing framework for IXPs is concerned, while prescribing licensing framework for IXPs, the Authority in its 2011 recommendations on 'Telecommunications Infrastructure Policy' has viewed that Class license will be most appropriate for IXP services and DoT may, therefore, bring IXPs under class licence.

4.16 IXPs may be brought under Class license. Once this recommendation is accepted, detailed terms and conditions of the Class license for IXP services will be provided by TRAI.

The Authority has recommended that IXPs should be asked to obtain class license within one month of notification by DoT and all the National ISPs and International Internet Bandwidth (IIB) providers should be mandated to connect to all IXPs for peering of domestic Internet traffic. The Authority has mentioned that QoS of IXPs, interconnection provisions, port charges, and other applicable tariff will

be regulated from time to time. And a committee will be constituted by TRAI to workout national hierarchical topology for routing and managing domestic internet traffic through IXPs. However, these recommendations were not implemented by DoT.

4.26 The Authority feels that for the growth of IXPs and any new players, it is important that clarity exists on the applicable licensing and regulatory framework for IXPs. The Authority is of the view that light touch licensing framework for operating IXP is necessary. This will not only remove the ambiguity in IXP licenses, but also help in exercising effective control on QoS of IXP, ensure smooth interconnection, regulate tariff and port charges and ensure level playing field between various entities operating in IXP domain. There can be two approaches for formulating an IXP licensing framework –

I. IXPs are subjected to the same terms and conditions as applicable for ISPs, OR

II. A separate IXP authorization is introduced with less onerous terms and conditions.

4.27 To enable the functioning of the internet, IXPs offer a critical service that is unique but not same as the services offered by ISPs. ISPs provide services to retail end customers and are required to fulfill several license conditions which may not be relevant for IXPs. For example, the UL contains provisions that require the ISP to provide its service in all regions where it has authorization. If technical reasons make such provision difficult, the Licensee is required to *"endeavour to make arrangement for providing connections/Service in such cases within a reasonable time."* In the context of an ISP or a cellular services provider, this obligation helps to nudge the service providers to broaden the accessibility of their services. An IXP (through an ISP license) cannot be expected to provide internet services to prospective customers when the provision of internet services is not the IXPs core business. IXPs provide B2B service, and they should have the commercial autonomy to select the best suitable location for offering services to their customers. Further, the UL suggests that the violation of the license terms could trigger penalties under the license. These could include

cancellation of the license or financial penalties payable to the Government, which could be up to Rupees 10,000,000 (Ten Million) in case of ISPs. The Authority feels that IXPs are merely providing interconnection to various ISPs/TSPs/CDNs and subjecting them to onerous license conditions that are applicable for ISPs will impact the growth of the IXP market and will create barriers for entry of smaller players and start-ups.

4.28 **The Authority, therefore, recommends that a separate authorization in Unified License may be created for IXPs with terms and conditions that are much less onerous than ISP license authorization. The terms and conditions including minimum equity, minimum net worth, entry fee, bank guarantees, application processing fee, and maximum amount of penalty for this light touch license authorization have been provided in Annexure VI, VII & VIII.**

4.29 **The Authority also recommends that any entity that intends to provide IXP services in India can do so either under ISP license/ UL-ISP authorization or under standalone UL-IXP authorization.**

4.30 **The Authority also recommends that all existing players, including, NIXI should be brought within this licensing framework in a stipulated time not exceeding six months.**

B. Growth of Interconnect Exchanges

4.31 An IXP is an essential part of the internet ecosystem in countries having multiple ISPs and other content service providers. According to ITU, the creation of IXPs should be encouraged by advising ISPs and other service providers on the benefits of connecting to an IXP. The CP deliberated the necessity for setting up more IXPs in the country so that the ISPs can peer together, and the domestic IP traffic can be smoothly routed within the country. This section examines the issues raised in the CP for promoting the establishment of new IXPs.

B.1. IXP Business Models

4.32 The choice of business model is an important factor that impacts the management and sustainability of its operations. The CP has discussed two IXP business models: for-profit and not-for-profit with their descriptions, advantages, and examples. In general, a for-profit IXP aims to be profitable and distributes this profit as a dividend, or payment, while not-for-profit IXPs exchange traffic, without the intention of distributing profit, but to invest any surplus funds in the future development of the IXP. Some not-for-profit IXPs charge fee for their services based on a cost-recovery model, whereas others seek external support such as sponsorships, subsidies, or donations. As there are a variety of business models followed by Indian IXP operators, the Authority raised below stated question to take the stakeholders opinion.

14. What business models are suitable for IXPs in India? Please elaborate and provide detailed justifications for your answer.

Comments from the stakeholders

4.33 Majority of the stakeholders opined that the choice of the business model to be adopted by any specific IXP should be left to the IXP operators, market forces, and up to the discretion of stakeholders investing in IXP. Indian market can have both commercial exchange and community-led open exchange, and the IXPs can use any model which might be cooperative, not for profit, or commercial.

4.34 A service provider who suggested a UL-ISP licensing framework for IXPs submitted that the IXP providers can operate in any business model provided that they are within the regulatory and licensing framework. The business model permissible shall be under the ambit and subject to ISP/UL-ISP license guidelines and the Authority must ensure a level playing field between operators providing IX Service and other ISPs/UL-ISPs providing internet services in India.

4.35 An IXP operator proposed an Independent Business Model for India whose IX must be -

(i) Carrier-neutral,

(ii) Generate revenue by charging for the ports, and

(iii) Avenue to earn additional revenue by selling Value-added services.

Analysis of the issue and views of the Authority

4.36 By function, an Internet Exchange normally is a not-for-profit, neutral and independent association meaning that it has no bias as to who connects to it (provided they meet the membership criteria) and its operational decisions are not influenced by any financial motive. Normally the Government provides the initial grant for setting up of such an Exchange which should run on a self-sustained, cost recovery basis subsequently. The functioning of the IXP shall be managed through a neutral body having representation from various stakeholders. In the same manner, NIXI was set up in the country, envisaged as a central body to handle interconnection of domestic internet traffic between peering ISP as a non-profit, neutral body. It was facilitated by the Government via one-time grant for capital requirement, which resulted in the cost saving as well as decongestion on the International Connectivity by retaining the domestic Internet traffic within the country and hence provided a better Quality of Service and reduced Internet access charges for customers. NIXI is the neutral meeting point of the ISPs and CDN providers with multi-lateral peering model at the present. Members can connect to NIXI at any NIXI Node(s)[79].

4.37 Most of the Internet Exchanges in various countries are non-commercial co-operatives funded by membership fees paid by the subscribing ISPs and are operated for the benefit of the member ISPs and the Internet community at large. The membership fee is usually comparable with the amount of potential savings in the upstream connectivity costs. The actual savings will depend on the amount of traffic that can be domestically exchanged in relation to the ISPs total traffic. A deliberated discussion on IXP business models and a

[79] https://ix.nixi.in/en/joining-process

compilation of Global practices in IXP operation is provided in Annexure III of the CP.

4.38 The Authority observed that IXP model needs to be a sustainable model, both financially and trust wise to be viable in the long term, guided by local operating environments and market factors and evolving as the peering ecosystem matures. Across the world, number of successful IXPs are formed by either existing ISP associations or as cooperative organizations ranging from non-profit community based to commercial operations run by the private sector. The Indian market is also having both the commercial exchanges and community-led exchanges. International experience displays that letting a market evolve freely will encourage sharing of experiences and best practices on governance, sustainability, ownership, and scalability in the IXP market.

4.39 The Authority feels that there is lack of clarity on the regulatory regime and licensing framework for IXPs in India which may be discouraging new players from entering into the field. Placing any restriction on the business model will further act as a deterrent for the new players to come and explore the field. Globally also, there are various business models which are prevalent within the same country. The Authority, therefore, does not recommend any particular business model and leave it to the market forces to choose one. Thus, the Authority recommends that IXP providers can operate in any business model if they are operating within the regulatory and licensing framework as recommended.

Encouraging setting up new IXPs in more states/Tier-II locations

4.40 In India, majority of IXPs are located in coastal states and metropolitan cities where submarine cable infrastructure exists. Interconnect exchanges have to progressively expand from Tier-I sites, to create new nodes in Tier-II cities for a uniformly distributed IXP market. ISPs require connection to IXPs for the exchange of local IP traffic and resilience purposes. To derive the advantages of IXPs and public peering relationships, their growth, and sustainability, it is required

that the number of members peering at an IXP location are more. Following issues were raised in the Consultation paper –

15. Whether TSPs/ISPs should be mandated to interconnect at IXPs that exist in an LSA? Do justify your response.

16. Is there a need for setting up IXP in every state in India? What support Government can provide to encourage setting up new IXPs in the states/Tier-II locations where no IXPs exist presently?

Comments from the stakeholders on mandating interconnection

4.41 IXP operators and service providers have given divergent opinions on issue of mandating interconnection. While the IXP stakeholders are in agreement with the necessity of a mandatory interconnection, the service providers are against any mandatory interconnection-related regulatory intervention for IXPs.

4.42 As per an IXP stakeholder, a government mandate for interconnection especially for Government-controlled entities like BBNL, BSNL, MTNL, RailTel, and PowerGrid will definitely benefit the IXP operators. Understanding the reasons for TSPs/ISPs not joining IXPs is way more important. The stakeholder stated that the large Indian TSPs are participating in many IXPs abroad, yet the same TSPs are not joining the local IXPs in India. Most of the Content Networks are already providing caching/edge nodes and private peering to big ISPs/TSPs in India, thus making their participation in local IXP redundant.

4.43 Another IXP operator submitted that TSPs/ISPs should be mandated to interconnect with at least one IXP in an LSA. Peering with IXPs will reduce the connectivity charges and reduce the latency which ensures quality broadband to the end consumer.

4.44 Another stakeholder has submitted two major constraints for ISPs to connect to an existing or new IXP -

a. <u>Lack of a Neutral Interconnect Platform:</u> The stakeholder stated that traditional connectivity players charge high costs given their legacy network and business models. With advancements in technology, it is possible for greenfield connectivity players to democratize such interconnections to be available at every data Centre and IXP location.

Such a 'Neutral Interconnect Platform' will open access to all ISPs at an affordable cost to connect to the IXP wherever they are. A Neutral Interconnect Platform that can play a key role in bringing affordable connections from the ISP to IXPs has been suggested.

b. Lack of substantial number of Open, neutral, not-for-profit IXP: It has been stated that unless an IXP is open, neutral, and not-for-profit, it cannot function effectively in the whole ecosystem to further the reach of the internet. As such IXPs are less in number and not available beyond Tier-1 cities in the country, the regional ISPs are forced to buy either expensive IP-Transit or buy expensive leased lines from traditional connectivity providers. Open, neutral and not-for-profit IXPs promote 'free peering' amongst 'content and eyeball' players with a very little barrier in terms of cost.

4.45 The stakeholders who are against any mandate for interconnection to IXPs have given the following reasons in favour of their submissions –

a. The peering between ISPs should continue to be driven by their respective requirements and it should be left to ISPs to decide the routing of traffic between them as per their operating requirements.
b. Any mandate to connect IXPs will increase the cost for the ISPs and will increase the cost burden on the ISPs so the ISPs should be left to decide which IXPs they intend to join.
c. Mandating to interconnect at the IXPs that exist in an LSA or beyond is tantamount to providing a free ride on the network of these TSPs/ISPs (at their cost) to the enterprises/CDNs/OTTs/ISPs who also connect at the IX platform and are also a customer of TSPs/ISPs for the internet service.
d. Mandating networks would be a poor policy that will result in market distortions and inefficiencies. It may amount to an indirect subsidy of IXPs, whereas the most successful IXPs around the world are sustained by their member's or customers' fees.

Comments from the stakeholders on setting up IXPs at newer location

4.46 Stakeholders who are IXP operators have opined that there is a need for a geographically distributed ecosystem of IXPs, and they should be available in every state, close to the presence of ISPs, CDNs, and other content-generating organizations. In order to overcome the digital divide between different states and territories of India, it is necessary to have a robust local peering ecosystem through IXP in every region. There is even a need for IXPs in every state in India and the Government can play a facilitating role in fostering the establishment of IXPs in every state. It can subsidize the DC cost in case IXP is co-located with Government DCs.

4.47 The service providers and other stakeholders are not in agreement with setting up IXP in every state in the country. Majority of them opined that setting up of IXP is driven by demand-supply considerations or otherwise shall be solely based upon the market requirement and techno-commercial viability. The growth of IXPs or the opening of new IXPs, depending on traffic in the region, should be left to market forces. Although the Government should support investment for IXPs in Tier II and Tier III cities and let the market dynamics play their role in creating the necessary infrastructure and setting up of IXPs at various locations in India.

Analysis of the issue and views of the Authority

4.48 In its 2011 recommendation on 'Telecommunications Infrastructure Policy'[80], the Authority has recommended that all National ISPs and International Internet Bandwidth (IIB) providers may be mandated to connect to all IXPs for peering of domestic internet traffic. However, DoT has not taken a decision on these recommendations. The data on Number of ISPs connected at NIXI nodes given in table below indicates that most of the smaller ISPs are currently not directly interconnecting as IXP exchange.

[80] https://www.trai.gov.in/sites/default/files/Rec_Infrastructurel.pdf

Table 4.1: Number of ISPs connected at NIXI nodes over the years

Year	Total ISP operators*	ISP members of NIXI**
2003	135	27
2011	167	36
2013	143	41
2016	298	50
2019	396	60
2021	639	97
2022	660	141

(* Number of ISP operators as per TRAI Telecom Subscription Reports,
** Number of ISP members as per NIXI Annual Audit Reports)

4.49 Peering with IXPs is expected to reduce the connectivity charges and reduce the latency which ensure a quality broadband to end consumer. IXPs also develop an internet ecosystem promoting development of various internet related activities thereby increasing digital economy. From an IXP's point of view mandatory interconnection by the ISPs to at least one IXP in an LSA, would help them get more clients. This can help in further penetration of IXP market to Tier-II cities. However, this may also distort the market in favour to IXPs at the cost of the service providers.

4.50 Smaller ISP find it unviable to take a lease line up to an IXP point. Therefore, the number of ISPs that are directly exchanging their traffic at an IXP are very less. Mandating ISPs to connect with at least one IXP would be unnecessary burden on smaller ISPs as they will be forced to buy leased line capacity to the IXP node location. Currently, they hand over the traffic at the nearest convenient point to an upstream ISP who carries the traffic up to IXP.

4.51 The Authority therefore agrees with the views of the stakeholders that interconnection with IXP should be left to the commercial business model of service providers and the benefits that they perceived to derive from such an interconnection.

The Authority, therefore, does not recommend any mandate of interconnection at an IXP.

4.52 On the issue of encouraging setting up of new IXPs in more states/Tier-II locations, a number of reasons have been discussed in the CP on the need for more independent exchanges in the country. It is seen that India is having less than 1 IXP per 10 million habitants. Having around 830 million internet users by the end of 2021[81] and expected to reach 975 million by 2025, the existing number of IXPs in India may not be sufficient to meet the internet traffic demands. Establishing more IXPs not only helps in managing traffic but encourages more local content development, creates incentives for local hosting of Internet services due to the larger pool of local users, who will be able to access online content faster and cheaper.

4.53 Recently, NIXI has planned huge infrastructure investment in setting up of new Internet Exchanges on Pan India basis, for the upcoming NIXI nodes in various parts of the country under NIXI Mission 75 plan and issued several notifications/tenders[82] on 'Point-to-point connectivity of upcoming internet exchanges of NIXI'. Authority had collected information on Mission 75 project of NIXI. The details of present and upcoming NIXI Interconnect Exchanges are provided in Table 4.2 below:

Table 4.2: NIXI Nodes (existing & planned) Location details

	Node live		Node Planned
1	Noida Netmagic	1	Pune
2	Mumbai - GPX	2	Patna
3	Chennai Sify	3	Kochi
4	Hyderabad	4	Nagpur
5	Bangalore SIFY	5	Chandigarh

[81] https://trai.gov.in/sites/default/files/QPIR_05052022.pdf
[82] https://ix.nixi.in/en/events/Tender

6	Guwahati	6	Thane
7	Kolkata	7	Vizag
8	Ahmedabad	8	Thiruvananthapuram
9	GK ST Telemedia	9	Bhubaneshwar
10	Chennai ST Telemedia	10	Nashik
11	Dehradun	11	Raipur
12	Gorakhpur	12	Pimpri Chinchwad
13	Varanasi	13	Aurangabad
14	Kanpur	14	Ludhiana
15	Prayagraj	15	Amritsar
16	Agra	16	Ranchi
17	Meerut	17	Ghaziabad
18	Durgapur	18	Jabalpur
19	Mumbai Sify	19	Bareilly
20	Bardhaman	20	Kalyan
21	Lucknow	21	Vasai
22	Haldwani	22	Coimbatore
23	Rajkot	23	Vijayawada
24	Vadodara	24	Navi Mumbai
25	Surat	25	Madurai
26	Jaipur	26	Belgaum
27	Agartala	27	Cuttack
28	Srinagar	28	Puri
29	Shimla	29	Jammu
30	Gwalior	30	Salem
31	Gurgaon	31	Jalandhar
32	Bhopal	32	Siliguri
33	Indore	33	Tuticorin
34	Jodhpur	34	Hyderabad 2
35	Panjim	35	Mumbai 3
36	Pudducheri	36	Bangalore 2
37	Mangalore	37	Noida 2
38	Tirupati	38	Mumbai 4
		39	Chennai 2

4.54 The Authority has noted that NIXI has already been expanding its connectivity into the cities that are covering almost all the States/UTs like Srinagar, Puducherry, Indore, Mangalore, Visakhapatnam, Durgapur, Aurangabad, Agartala, etc. This progressive expansion of the internet exchanges to the Tier-II locations including the North-Eastern locations that do not currently have IXP presence, would benefit the digital economy in these areas. The Authority also noted that NIXI has extensive plans to commission new interconnect exchanges at major

locations across the country. The Authority thus feels that any further recommendations for IXP expansion are not necessary at this point of time. However, the Authority may keep an eye on this IXP expansion project, on its progress, and would recommend on locations or implementation effectiveness at a later stage, if required.

C. IXP Cost/Revenue Analysis

C.1. Leased Line (LL) costs

4.55 As has been discussed, the cost of connectivity to IXP is at times prohibitive for most small ISPs. They are therefore left with no other option but to transit their traffic through bigger ISPs who may interconnect at a location that suits their own traffic rather than the small ISPs. For a well-functioning IXP local IP transport capacity must be available at a reasonable price to allow stakeholders to connect to the exchange. In this backdrop, the Authority raised an issue on leased line costs and other limitations for ISPs to connect to IXPs.

17. Whether leased line costs to connect an existing or new IXP is a barrier for ISPs? If yes, what is the suggested way out? What are other limitations for ISPs to connect to IXPs? What are the suggestions to overcome them?

Comments from the stakeholders

4.56 In response to the question, some of the stakeholders agreed that Leased Line (LL) costs to connect an existing or new IXP is a barrier for ISPs and the Government can play a major role in removing the burden of LL costs. One service provider has suggested that the Government should incentivize licensed entities to roll out fiber and remove the regulatory complexities. Being a capital-intensive domain, the Government should improve the EoDB in the fiber domain to promote healthy competition. This will lead to a lowering of the cost of leased lines for the smaller ISPs.

4.57 An IXP has submitted that in big metros and Tier-I cities leased line costs are not a major concern because in such markets there is a well-developed ecosystem of local connectivity providers, including IP-1 dark fiber vendors. Leased Line (LL) costs are probably the single largest barrier to establishing a sustainable IXP in Tier 2 and Tier 3 cities,

where both cost and availability of such facilities are an issue. Incentive support in the form of either full/partial reimbursement of the connectivity fees incurred by the stakeholders or by mandate to Government controlled entities like BBNL, BSNL, MTNL, RailTel, and PowerGrid for providing free or nominally charged IXP connectivity services may be helpful.

4.58 Another IXP stakeholder responded that the Government should mandate State-owned DCs to provide subsidized fees for smaller ISPs. Bigger ISPs may be mandated to peer with smaller ISPs and also carry the traffic to IXPs.

4.59 Few service providers and associations are of the opinion that LL costs are not a barrier for ISPs to entry into the IXP market. They have commented that the leased line market is highly competitive due to the presence of multiple service providers and hence there are no impediments with respect to the cost of LL circuits. Moreover, an ISP can buy internet service from its upstream ISP/TSP and/or peer with other ISPs/TSPs without the need for an IXP. A service provider opined that LL costs are not a barrier for any segment or sector of businesses, the charges are already regulated by TRAI and ceilings have been prescribed. There should not be any further changes, which otherwise would mean cross subsidizing the cost for connecting to IXPs, through revenues of TSPs/ISPs.

Analysis of the issue and views of the Authority

4.60 As deliberated in the CP, at present for an IXP connectivity, an ISP bring their own fiber or buy point-to-point links from some telco to reach the IXP for interconnection. As providing fiber or bandwidth up to IXP is costly, most smaller ISPs are left with no other option but to transit their traffic through bigger ISPs. These bigger ISPs may interconnect at a location that suits their own traffic rather than the small ISPs. In the bargain, smaller ISPs lose the advantage of control over their network design and on reduction in latency. Further, the major ISPs can increase the cost of transit traffic for smaller ISPs. As large TSPs see independent peering to smaller ISPs as an existential threat to their

Internet leased line (ILL) wholesale business, it is likely that TSP will either refuse a circuit to a smaller ISP or provide prohibitive pricing to the smaller/regional ISPs to transit their traffic through them. Thus, the LL charges are becoming the single largest barrier for establishing a sustainable connectivity to an IXP in Tier II and Tier III cities.

4.61 One of the methods suggested by the stakeholders for mitigating the LL costs is by subsidizing the costs of leased lines for smaller ISPs in Tier II and Tier III cities. The Authority has already fixed ceiling tariffs for domestic leased lines. The actual market rates offered are much below the ceiling tariffs. To that extent, the Authority finds merit in the submissions made by some of the stakeholders' that there is no barrier as such for ISPs to connect with the IXP and this should be left to the ISPs to decide their option to interconnect with an IXP.

4.62 NIXI in its interaction with Authority has brought out that they are planning to get quotes for leased line connectivity on behalf of ISPs on bulk basis. This will reduce the costs for smaller ISPs as they will get better rates as compared to what TSPs might have offered them for one or two leased lines.

4.63 The Authority noted that the market has already devised a solution whereby the smaller ISPs are handing over traffic to the larger ISPs at a convenient location as per their needs and paying capacities. NIXI has also planned IXP nodes in a considerable number of cities and locations in 2022. This will further reduce the distance of lease line for connecting to nearby IXP.

4.64 In view of aforesaid, **the Authority is of the view that at this stage, there is no further regulatory intervention required as far as leased line costs to connecting to IXP point of presence are concerned. Further, the Authority will keep a watch on the developments, and will take a fresh view, at a later stage, if required.** As far as domestic leased line ceiling rates are concerned, the Authority may review them through a separate consultation process, if required.

C.2. Autonomous System Number (ASN)

4.65 An autonomous system number is necessary for any interconnection between two peered networks at IXPs. ASNs are important because the ASN uniquely identifies each network on the Internet. For joining an IXP in India, the member ISP must have its own ASN and use BGP for peering. The Internet Assigned Numbers Authority (IANA) is responsible for assigning ASNs to Regional Internet Registries (RIRs), which are organizations that manage Internet number resources in a particular region of the world. Asia Pacific Network Information Centre (APNIC) is the RIR for Asia-Pacific region. Considering the cost structure and fee incurred to obtain the ASN by the ISPs, the Authority raised the below question for stakeholder's opinions:

18. Is the high cost of AS number allocation an impediment for small ISPs to connect to IX? If yes, what is the suggested way out?

Comments from the stakeholders

4.66 Majority of the stakeholders have submitted that acquiring ASN is not that expensive and can be afforded by the ISPs. Indian AS Number and IP Address assignment is being handled by Indian Registry for Internet Names and Numbers (IRINN) which ultimately falls under APNIC. NIXI has submitted that AS Number allocation is free of cost by IRINN while only IPv4/IPv6 resources are charged. NiXI has stated that the cost for IPv4/IPv6 resources is one of the most reasonable across the globe and IRINN already provides a 30% discount for smaller ISPs. Another stakeholder has commented that ASN is not costly as APNIC gives members all the ASNs they want at no cost, but it's actually the cost of IP address blocks that is high.

4.67 One service provider has commented that even though the IRINN is functional, the cost structure is quite prohibitive, which could be subsidized by Government to encourage more ISPs/enterprises to get AS numbers allocated for themselves from IRINN. The Government needs to work with international agencies to bring the cost of AS number down. One of the IXP operator agreed that the high expenses for having AS allocation and independent IPv4/IPv6 space can be an

impediment for small ISPs to connect to IX and has suggested that the Government can think of different schemes for reimbursement of APNIC fees to small and new ISPs for a given time period of 3 to 5 years or, it can reduce their expense by lowering the license fees, especially the AGR for ISPs.

Analysis of the issue and views of the Authority

4.68 There are two options to obtain AS number from APNIC:

(i) As a non-member of APNIC.

(ii) As a member of APNIC –

All APNIC members are required to pay annual membership fee and by renewing every year the members are entitled to access all APNIC services including the use of IP addresses and AS numbers.

4.69 The smaller ISPs who do not have their own ASN and have substantially low to medium domestic traffic find it uneconomical for connecting to an IXP. The Authority had earlier analyzed and tried to address the issue in its recommendations[83] on "Improvement in the Effectiveness of NIXI" in 2007 and opined that smaller ISPs can use private ASN numbers from upstream connectivity provider. Private AS number is a series which can be used to run BGP version 4 (BGP4+) routes with upstream provider, where the upstream provider has to allocate unique private AS number to its downstream ISPs. Small ISPs usually depend on larger ISPs for their upstream connectivity to international internet gateways, therefore, smaller ISPs are expected to take unique private AS number from their upstream providers who have already taken resources from NIXI. This helps small ISPs to escape from high cost of AS number allocation and leased line cost. However, the present status of NIXI and the number of ISPs joining over the years *(refer to Table 4.1)* is not very encouraging and some of the stakeholders still consider high expenses for having AS and independent IPv4/IPv6 space an impediment for small ISPs to connect to IXP. The Authority agrees to

[83] https://www.trai.gov.in/sites/default/files/recomen20apr07.pdf

the stakeholders view that using private AS numbers will not resolve the problem as the global providers deny bilateral peering arrangements for members with private AS.

4.70 In India, the National Internet Registry (NIR) i.e., Indian Registry for Internet Names and Numbers (IRINN)[84], run by NIXI, is entrusted with the task of coordinating IP address allocation along with other Internet resource management function at national level in the country since 2012[85]. The IRINN is dedicated to the task of coordinating and allocating Internet Protocol addresses. Its major activities include management and fair distribution of —

1. IPv4 (32-bit) addresses
2. IPv6 (128-bit) addresses
3. AS Numbers - Autonomous System (AS) is an individual network with a unified internal routing policy. Every ASN needs to announce its prefix routes to the Internet using BGP for other networks to identify.

4.71 IRINN policies are in line with APNIC policies, and it evaluates and approves applications as per current policies and criteria. A comparison table 4.3 is provided below for the annual fee charged by the APNIC board and IRINN for various address size blocks based on information provided by NIXI. It is seen that IRINN is offering highly subsidized prices for IP addresses as compared to APNIC. IRINN is also allocating ASN free of cost.

Table 4.3: Annual fee Comparison between APNIC and IRINN

Address size	APNIC	IRINN	Savings in IRINN
/23 (512) IPv4	80,612 INR	37,125 INR	53.94%
/24 (256) IPv4	62,010 INR	27,500 INR	55.65%
/48 IPv6	62,010 INR	24,198.9 INR	60.97%
/32 IPv6	1,04,790 INR	44,102.49 INR	57.91%

[84] www.irinn.in

[85] https://web.archive.org/web/http://www.apnic.net/publications/news/2012/nir-india

4.72 Further the address space could potentially be subdivided among quite a few ISPs, reducing that cost. Hence, the Authority is in agreement with the stakeholder's opinion that acquiring ASN is not that expensive and can be afforded by the ISPs. As per the IRINN provided data and the comparison *(refer table 4.3)*, the resource fees are cheaper than the RIR (APNIC) along with localized customer support. The cost of IPv4 and IPv6 addresses are lower than that of APNIC and ASNs are allocated free of cost. The service providers are free to choose between IRINN and APNIC for IP addresses or AS numbers.

4.73 IP addresses and AS numbers are part of an ISP's business operating expenses and are usually factored into its business plan. **Therefore, in view of the Authority, AS number allocation costs and process does not seem to be an impediment for ISPs to connect to IXP and at present, the Authority would not like to intervene in this issue.**

D. Incentivization

4.74 Provision of incentives for encouraging investment to establish IXP can help in the growth of internet exchanges. Promoting local investment opportunities via tax benefits, and reduced duties on the operational equipment needed to build IXPs will encourage the new entrants to get involved in the IXP business. To explore various policy measures and incentivizing options for the growth of IXPs in the country, the Authority has sought views of the stakeholders on following:

19. What other policy measures are suggested to encourage investment for establishing more number of IXPs? Any other issue relevant with IXP growth may be mentioned.

Comments from the stakeholders

4.75 Various policy measures suggested by the stakeholders to encourage investment in establishing more IXPs are summed up below –

a. Fiscal incentives: Tax exemptions, investment benefits, credit facilities, easy accessibility to bank loans at cheaper rates, i.e., with lesser interests and collaterals. Tailored incentives for those who wish to provide IXP services would help attract interest and investment.
b. Subsidization: Subsidy in initial CapEx and OpEx investments since IXPs business needs both content operators and ISPs to come together on a common platform to exchange traffic. A subsidy in initial investments till the business starts generating profits shall be a great boost and incentive for many operators to get into this business.
c. Loan Guarantees: Loan guarantees and similar schemes for IXP for the purchase of relevant equipment can be provided. IXPs usually are small entities who are unable to provide the needed collateral in order to fund their expansion both capacity-wise as well as circle-wise, thus help from the Government in the form of a loan guarantee will be a cheap and impactful way of supporting the internet ecosystem.
d. Focus on priority regions: The priority areas need to be proactively identified. More incentives for such priority areas can be an option.
e. Data Centre incentives: Government support is required for Data Centre location, operation and maintenance. Encouraging the deployment of edge data centres in various cities creates the needful underlying infrastructure for IXPs to host their nodes. Thus, edge DC operators may extend their scope and may also deploy the infrastructure to become IXPs.
f. Increase awareness: ISPs must know that IXPs exist, how the IXP business model works and how it can help the ecosystem.

Analysis of the issue and views of the Authority

4.76 The synergy between Data Centres and IXPs can promote cost-effective strategies for an IXP establishment. Since hosting an IXP in an existing Data Centre facility can substantially reduce the operating expenses associated with leasing space, purchasing power, hiring staff, etc., most Interconnect Exchanges are hosted in DCs. Moreover, data hosting Centres already include the facilities that may be considered and used

for an IXP establishment. Presence of CDNs and IXPs at DCs, help them to connect there itself with ease.

4.77 The Authority is in agreement with the submission of some stakeholders that encouraging the deployment of edge data centres in various cities creates the needful underlying infrastructure for IXPs to host their nodes. The Authority therefore feels that incentives recommended herein for DCs should help in proliferation of edge DCs in the country and this would in turn provide the boost to digital infrastructure ecosystem, including CDNs and IXPs. NIXI is already in process of expanding its IX nodes to several Tier-II cities. The Authority therefore does not find a need to spell out any separate incentive scheme for IXPs presently.

4.78 However, the Authority is also of the opinion that at the initial stages, the availability of price competitive hi-tech domestic equipment is a prerequisite for the establishment of CDNs and IXPs. Hence, it is necessary to promote their manufacturing within the country. This would not only help nurture domestic telecom equipment manufacturing but also prevent data breaches and security threats which is a rising concern for end customers.

4.79 It has been observed by the Authority that the existing Schemes for promoting Telecom Equipment manufacturing in the country, namely Production Linked Incentive (PLI) Scheme and Public Procurement (Preferential to Make in India) [PPP-MII] Scheme either does not comprehensively include all the telecom equipment which are required for establishing CDNs and IXPs or do not explicitly specify the same. As such, TRAI undertook an independent analysis of the equipment that is currently not explicit part of the Schemes. The findings are summarized in the table attached in **Annexure-IX**.

4.80 Authority is of the opinion that the government needs to extend the existing list of telecom equipment covered under the Schemes as well as explicitly specify the telecom equipment which are required for establishing CDNs and IXPs in both PLI and PPP-PMI scheme to ensure that sufficient focus is provided to all the required equipment.

4.81	**The Authority therefore recommends that in view of expanding markets and emerging demands for newer equipment, the government should extend the existing list of products under PLI and PPP-PMI schemes and explicitly include their classifications to prevent ambiguity as far as equipment related to CDN and IXP are concerned. Given the highly dynamic nature of digital communication sector, it is also recommended that, the lists should be updated from time to time as per market requirements so that the Schemes remain relevant and help nurture the domestic manufacturing segment.**

CHAPTER 5

DATA ETHICS AND OWNERSHIP

5.1 Data ethics encompasses the moral obligations of gathering, protecting, and using personally identifiable information and how it affects individuals. Appropriate handling of data, ensuring privacy and security are of equal importance. Fast emerging technologies such as 5G, IoT, AI, etc., are poised to dramatically heighten both connectivity and the endless data wave along with the complexity of data security and privacy protection. In the era of information technology, data security has always been a serious concern. Because the data is spread across several locations in DC based cloud computing context, it becomes even more important. In DC-based storage and compute technologies, data security and privacy protection are the two primary concerns of users. Even though numerous solutions have been examined for implementation by industry, data security and privacy protection are becoming increasingly critical for the future growth of cloud environments. Both hardware and software in the data storage and processing architecture are concerned with data security and privacy protection.

5.2 Justice Sri Krishna Committee has made the first attempt to domestically legislate on the issue of data protection and laid the groundwork for a robust and responsible data usage framework. The committee was entrusted with the responsibility of identifying lapses in the present data protection regulations and for preparing more robust and comprehensive data protection laws. This committee submitted its report on 27th July 2018, which also contained a draft data protection law, later codified as the draft Personal Data Protection Bill, 2018 (Draft Bill, 2018). The report has emphasized that the interests of the citizens and the responsibilities of the state must be protected, but not at the cost of trade and industry. Later, the committee submitted a revised draft bill which is the current 'The Personal Data Protection Bill (PDP), 2019', introduced in Lok Sabha after further deliberations by the MeitY, on 11th December 2019. The Bill seeks to provide for the protection of

the personal data of individuals and establishes a Data Protection Authority for the same. India's Personal Data Protection framework is modeled after European Union's (EU's) General Data Protection Regulation (GDPR) and the PDP Bill, 2019, incorporates many elements of the GDPR.

5.3 Freedom and fairness should be the two main guiding principles while sharing the personal data of the individuals in a digital ecosystem. Here, freedom refers to enhancing the autonomy of the individuals regarding their personal data in deciding its processing, which would lead to an ease of flow of personal data. Fairness pertains to developing a regulatory framework where the rights of the individuals with respect to their personal data are respected and the existing inequality in bargaining power between individuals and entities that process such personal data is mitigated. In such a framework, the individual must be the "data owner" since he/she is the focal actor in the digital economy. The relationship between the individual and entities with whom the individuals share their personal data is one that is based on a fundamental expectation of trust. Individuals expect that their personal data will be used in fairly and transparently.

5.4 Guiding principles for sharing of user data across services after obtaining user consent have been outlined in a key policy document on "Electronic Consent Framework" developed by MeitY. Subsequently, RBI on behalf of all the financial sector regulators has issued the master direction known as the "Non-Banking Financial Company – Account Aggregator (Reserve Bank) Directions, 201692" for all the financial sector participants. It incorporates the concept of the Account aggregator, which after obtaining the consent of the customers electronically, collects the information from providers of information based on the standardized consent artefact and securely transmits the same to users of the information. This direction is for the benefit of financial sector consumers, as it empowers them to use their personal data, in the form of financial transactions history, for availing new services from any other competing service provider. The Framework establishes a new category of institution or a Non-Banking Financial

Company (NBFC), that will act as consent managers (Financial Data Fiduciary) in sharing users' personal data. Consent Managers, often referred to as Account Aggregators in the financial industry, are at the centre of DEPA's institutional architecture. The DEPA framework[86] also considers the formation of an Account Aggregator alliance. All participating institutions happen to get the procedural and best practice recommendations from this alliance. The consent manager oversees maintaining the consent records that specify how data can flow from data sources to data consumers in an authorized system. They will continue to remain data blind, will be unable to store the data because their only responsibility is to enable the transaction. Users will be given the choice to modify their consent manager operating service and to choose consent manager portability.

5.5 Recently, NITI Aayog has come out with a discussion paper on Data Empowerment and Protection Architecture (DEPA) for a secure consent-based data sharing framework to accelerate financial inclusion. DEPA empowers every Indian with control over their data. It democratizes access and enables secure portability of trusted data between service providers. It involves the creation of a standardized technology architecture implemented within the right institutional constructs. DEPA's technology architecture is an interoperable, secure, and privacy-preserving framework for data sharing through:

a. A technology standard for a machine-readable Consent Artefact;

b. Open APIs for data sharing; and

c. A standard for financial information.

5.6 TRAI's Recommendation on "Privacy, Security and Ownership of the Data in the Telecom Sector" proposed consent mechanisms with varying levels of granularity in choices to be provided to the users by the service providers. Such choices are to be explicitly presented to the user before any data is collected. It is also recommended that the users be provided with appropriate notices detailing the practices regarding personal information being collected. In the same recommendation, the

[86] https://sahamati.org.in/faq/what-is-depa/

Authority has said that there is a need to develop a consent framework for telecom sector.

5.7 In telecom sector, telecom service providers control an individual's data as custodians or fiduciaries. Creating a simple and secure mechanism to share this data with the individuals' consent would empower them to use data to improve their well-being themselves through ease of access to new financial products and services. However, this is only possible if action is taken to ensure ease of data flows between siloed data custodians housing information (e.g., different banks, NBFCs, Government departments, telecom service providers, etc.) with user consent. The end user may more often than not be fully aware as well as have lower bargaining powers when compared to the custodians of their data in the digital ecosystem. This asymmetry is exploited on many occasions by the custodians to their advantage. They may use personal data of individuals to improve their services; they may even monetize this data by sharing it with third parties. It is imperative that all user data sharing is fully consented to, in electronic form, by the user(s) whose data is shared. Collecting, managing, auditing, and tracing paper-based consents is costly, inefficient, and risky. Thus, it is necessary to create a user-friendly technology framework for electronic consent. Adopting DEPA in telecom sector and allowing TSPs to become one of the financial information providers may enable subscribers to access their data and share it with third-party institutions. A new type of private consent manager institution can ensure that subscribers can provide consent as per an innovative digital standard for every granular piece of data shared securely. This sharing of data can be helpful for individual empowerment, while minimizing privacy risks and data misuse. By giving people the power to decide how their data can be used, this framework can enable telecom subscribers to control the flow of and benefit from the value of their personal data. Devising an interoperable, secure and privacy preserving framework for consented data sharing of telecom subscribers may empower them with greater control over their data.

5.8 In view of the above, following issues were raised in CP to obtain the opinion of stakeholders :

"47. How can the TSPs empower their subscribers with enhanced control over their data and ensure secure portability of trusted data between TSPs and other institutions? Provide comments along with detailed justification."

"48. What is the degree of feasibility of implementing DEPA based consent framework structure amongst TSPs for sharing of KYC data between TSPs based on subscriber's consent?"

Comments of the stakeholders

5.9 In response to TSPs empowering subscribers with enhanced control over their data, few stakeholders are of the opinion that present data protection regulations are not well-equipped for different sectors to maintain the security of personal data in control of data fiduciaries. Hence implementation of DEPA cannot be done simultaneously for all the sectors, before creating a secure environment and suitable regulatory framework for sharing of personal data. Some of the stakeholders brought out that TSPs are bound by telecom licence terms to ensure confidentiality & privacy of subscriber data and to take explicit consent from subscribers for use of their personal data for any activity other than rendering of telecom services and is already adhered to by the TSPs. Under the proposed DP bill, there are various obligations placed on the data fiduciary which are geared towards ensuring enhanced control of personal data and data portability rights. Till such time the DP Bill is finalized (which is pending Parliamentary deliberation and enactment), there should not be any regulatory intervention however, the Authority in the interim may engage with the Government on the issues of Data localization and Hardware testing requirements. One of the stakeholders also commented that the data privacy of consumers must be protected against misuse. However, a separate data protection framework for the telecom sector may not be required to be developed as the Government is in the process of creating an umbrella data protection legislation through Data Protection Bill, that will regulate data controllers / processors across sectors.

5.10 In response to the degree of feasibility of implementing DEPA based consent framework structure amongst TSPs for sharing of KYC data between TSPs based on subscriber's consent, mixed responses have been received from stakeholders. One of the associations brought out that DEPA comprises of four different models i.e., *Consent Management Accounts or Operators, In House Model, Public Sector Model and Privacy Based Model.* However, it recommended for implementing a distributed ledger, managed by a consortium with a consistent taxonomy, which will balance privacy and control. One stakeholder also opined that sharing of KYC data between the TSPs will not address the requirement of subscriber verification mandated in the licence. However, in case of Aadhaar based KYC process, the TSPs are bound by the agreement between the TSP and UIDAI and may not be in a position to share the personal data of the subscribers.

5.11 Few stakeholders also brought out that the DEPA framework may act as consent manager and will be responsible for obtaining the subscriber consent before sharing the KYC data from existing TSP to another TSPs. For any lapse / non-compliance regarding sharing of KYC data without the consent of subscriber, existing TSP who has possession the KYC information of the subscriber should not be held responsible in any manner. Subscriber should be responsible for any updation/deletion of his/ her KYC information while it is being shared under DEPA based consent framework. They further mentioned that subscribers should have the option to update / delete the KYC information at time of intimation given to him / her before sharing of KYC data between TSPs. The very same stakeholders also brought out that in case a subscriber opts out from availing telecom services from a TSP and after receipt of confirmation from DEPA for providing KYC details of that subscriber who has given his / her consent for KYC information sharing, such TSP after transferring the KYC information of that subscriber to Consent Manager, should not be under any obligation of retaining the KYC data but should be allowed to purge such subscriber KYC data from its customer database so as to avoid any further storage cost, provided that the existing TSPs would continue keeping the KYC data if it is

under obligation of any Court Order/Direction of licensor/ Regulatory or Designated LEAs. Another stakeholder expressed caution towards adoption of DEPA or its consent stack for telecom subscriber or KYC data bringing out that DEPA framework is not anchored under a legal framework providing enforceable rights and remedies to end users and DEPA also has technical limitations. Hence there is a requirement of a mix of legal controls and technical standards that are adopted by service providers and enforced by a data protection authority that are absent under DEPA.

5.12 One of the stakeholders brought out that the Account Aggregator (AA) framework, currently being piloted by the RBI, is also still nascent and is likely to be fine-tuned after implementation based on practical learnings. In view of the nascency of the AA and DEPA frameworks, and the institutional architecture set forth under the Data Protection Bill (DPB), TRAI should visit these issues at an appropriate stage, subsequent to the enactment of the DPB, once sufficient learnings are accumulated from the implementation of the AA framework in the financial sector.

Analysis of the issues and views of the authority

5.13 TRAI in its Recommendation on "Privacy, Security and Ownership of the Data in the Telecom Sector" dated 16.07.2018 recommended that service providers should provide users with consent mechanisms with varying levels of granularity in choices. Before any data is gathered, the user should be given the opportunity to make such decisions. Users should be given suitable warnings outlining the practises involving the collection of personal information. The goal of the collection and its planned use, as well as whether the personal data obtained will be shared with a third party, are examples of such practises. Individual permission can only be acquired after the notification has been given.

5.14 The most crucial rights that data users should possess are - Notice, Choice, and Consent. Notice and choice notifications should include

information about what personal information is being collected, why it is being collected, how it will be used, whether it will be shared with third parties and notification in the event of a data breach, among other things.

5.15 The statement of objects and reasons for the erstwhile PDP bill 2019, *inter-alia*, mentioned:

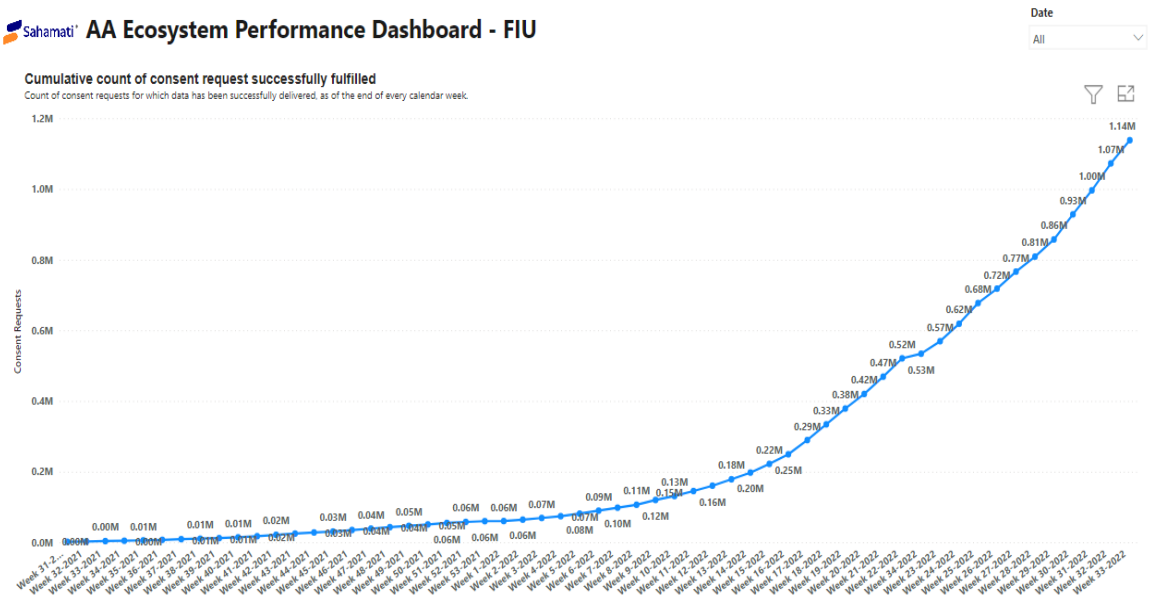
4. The salient features of the Data Protection Bill, 2019, inter alia, are as under— (i) to promote the concepts such as consent framework, purpose limitation, storage limitation and the data minimisation.

Accordingly, the provisions for right to data portability were included in the draft bill.

5.16 RBI's Non-Banking Financial Company – Account Aggregator (Reserve Bank) Directions empowers financial sector consumers to use their personal data, in the form of financial transactions history, for availing new services from any other competing service provider. The Authority has noted that the current Account Aggregator (AA) model under the RBI has created an effective starting point for cross-sectoral data sharing. It is regulated by the RBI as a representative regulator under the Financial Stability and Development Council (FSDC) which includes the SEBI, IRDA, PFRDA and other related ministries and departments. The FSDC Account Aggregator (AA) system announced in 2016 is a global-first to enable real-time, consented, secure digital data sharing between financial data providers and financial data users to overcome these challenges. Even France, the EU and other Western have now had learning sessions with India on adopting similar technical standards to complement their existing legal frameworks. The FSDC Account Aggregator (AA) network is the 'BHIM UPI for Data Sharing': a digital network that allows data sharing across financial institutions in paperless, secure, and individual-consented form. It is accessible by RBI, SEBI, IRDA, and PFRDA regulated entities to enable a fully digital loan, insurance, or MF application and disbursement experience.

5.17 AA has already started to transform the financial services landscape in India. As of June 2022, 310 million accounts AA have been enabled across 49 live financial institutions. This is expected to grow to 750 million bank accounts very soon. Transactions via AAs are growing 65% each month and as depicted in figure 5.1 below, over 1.14 million consent-based data sharing transactions have been completed over the last 50 weeks, largely to enable personal lending to individuals as well as for auto loans.

Figure 5.1 - Cumulative Count of Consent Requests Successfully Fulfilled[87]



5.18 GSTN is already joining the AA network to allow lenders secure access to GSTN invoices of 11 million registered MSMEs, to drive 18 Lakh Crore of fully digital unsecured MSME loans over 3-4 years.

5.19 As custodians or fiduciaries, telecom service providers handle an individual's data in the telecom sector. Data is maintained by each TSP in his unique format and transferring particular data from database of one TSP to another may have issues as currently there are no standards defined. These difficulties also apply to other types of data such as

[87] https://sahamati.org.in/aa-dashboard/

derived data (e.g., financial data, payment behaviour). Creating a simple and safe channel for sharing this data with the consent of the individuals will enable them to utilise data to better their own well-being by facilitating access to new financial goods and services.

5.20 There are various obligations that need to be placed on the data fiduciary which are aimed at ensuring enhanced control of an individual over personal data as well as his right to get the data ported. The Authority does not agree with the views of some of the stakeholders on the nascency of the AA as well as DEPA frameworks. Today's technical world thrives on innovations and these frameworks are already proving their effectiveness and robustness. Teething troubles, if any, will be taken care of in due course and these cannot be an excuse to avoid adopting forward-looking innovative solutions. The Authority therefore feels that there is an immediate requirement to put in place a simple data portability solution involving secure portability of telecom subscriber's KYC data using established or tested technology and frameworks. This framework can later be extended to other data (like usage, tariff plans opted, payment behaviour etc), that is held by TSPs in fiduciary capacity.

5.21 Telecom data is often the first digital footprint generated by a low-income household, and a steady history of on-time recharges could contribute to building a credit history. Collecting and sharing user data in digital form is a key requirement for ensuring that the interaction between a user and the service provider can be consummated seamlessly in a paperless, fully electronic, and high trust way. Efforts to share digital data about users must overcome the challenge of easy access across various systems in a secure and traceable manner. It is imperative that all user data sharing is fully consented to, in electronic form, by the user(s) whose data is shared. Collecting, managing, auditing, and tracing paper-based consents is costly, inefficient, and risky. Thus, it is necessary to create a user-friendly technology framework for electronic consent.

5.22 TSPs are now demonstrating increased confidence in areas where they can collaborate amongst themselves to improve operational efficiency,

cost savings, and customer experience. Tarang Sanchar is an example where the industry collaborated with the Government leading to reduction in huge amount of paperwork and costs. There are a variety of scenarios in which TSPs can work together to solve problems they are now facing with regards number portability while ensuring secure portability of subscriber's KYC data with consent of data owner. Such a mechanism will reduce huge amount of paperwork that is done again and again in name of KYC re-verification by the recipient network. The donor TSPs already have the relevant KYC records stored digitally with them and a simple consent of customer to port the number to another TSP can also be tantamount to a consent to port the KYC records. In this model the donor TSP would have to pass on the KYC data in digital form to the recipient TSP.

5.23 Another model is in which the digital KYC data is stored with a central agency or Digi Locker and based on the consent of customer the same can be made accessible to the recipient TSP by the centralised agency. However, these models will limit themselves to consent based transfer of KYC documents. The Authority would rather like to envision a more inclusive framework which can be used in future for consent-based transfer of not only KYC data of telecom subscribers, but other data like credit history, tariff choices, UCC preferences etc. with other entities from telecom as well as other sectors like banking and finance.

5.24 The guiding principles of such a user-friendly framework are:

1) **User Centricity**: Users should be at the centre of any data sharing and should be given adequate control and decision-making power on how data associated with them is shared.

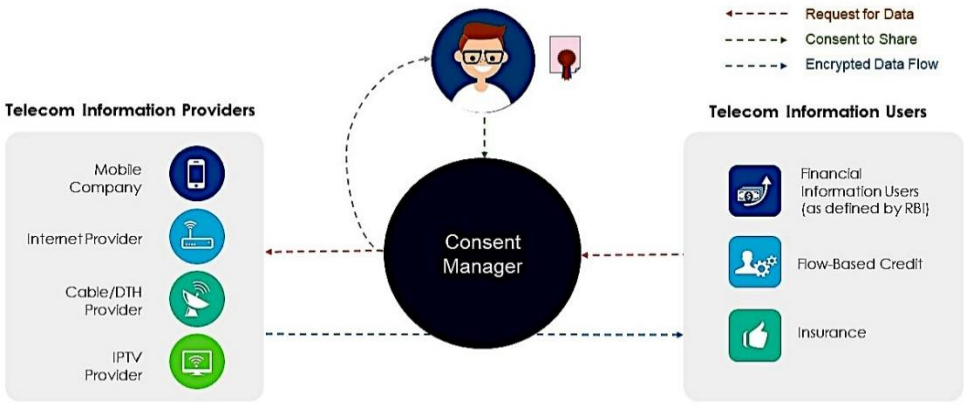
2) **Trustable and Compliant**: Use of digital signatures to guarantee integrity of access permissions given by users in consent flows. This avoids security issues faced by existing approaches and makes the framework fully legal under the DEPA and IT Act.

3) **Universal Identity**: The technical framework should leverage universal, authenticable, non-repudiable, and digital identities to *allow interoperability and usability* across telecom service providers.

4) **Granular Control**: The framework should allow users to set permissions and rights for data access at a granular level.
5) **Open Standards Based**: The framework should use open technology and legal standards available in the country. It should be agnostic to applications, programming languages, and platforms.

5.25 Adopting DEPA in telecom sector and allowing TSPs to become one of the information providers may enable subscribers to access their data and share it with third-party institutions. DEPA roll-out has already begun in the financial sector, with a closed user group (CUG) launched by major banks in July 2019, further may be followed by launches in other sectors also. Figure 5.2 depicts the Account Aggregator model[88] which has been in forefront of developing DEPA Consent Framework, that could be implemented for telecom data sharing and consent management framework.

Figure 5.2: Implementation of Consented Sharing of Telecom Data



(Source: iSPIRIT developers)

5.26 The Authority is of the opinion that Connectivity of TSPs as information providers with the data sharing and consent management framework proposed in DEPA via open APIs can provide telecom subscribers with the practical means to access, control, and selectively share their personal data. This sharing of data can be helpful for individual empowerment, while minimising privacy risks and data misuse. By

[88]https://pn.ispirt.in/tag/account-aggregator/

giving people the power to decide how their data can be used, this framework can enable telecom subscribers to control the flow of and benefit from the value of their personal data. Devising an interoperable, secure and privacy preserving framework for consented data sharing of telecom subscribers may empower them with greater control over their data. It is important that such an electronic framework is created for better management of user consent in a paperless system.

5.27 Telecom usage history offers a wealth of data by which to assess the credit risk of those with no other digital footprint. East Africa offers well documented examples of this data driving access to credit for the underserved. TSPs have a vast repository of data on each subscriber's payment history, consumption, movement, handset and online activity. A well-developed shadow economy and infrastructure already exists in form of the FSDC Account Aggregator (AA) system for the private benefit of financial service providers to access this data via intermediaries. This framework has made a good progress within the financial services sphere with numerous banks going live and IRDA, SEBI and PFRDA in the process of bringing in industry actors within their ambit. To truly drive widespread inclusion, data providers need to extend well beyond banks, insurance providers, pension funds, and asset management companies. The Authority has already discussed the data monetization aspects in previous Chapter. The Authority has always advocated cross-sectoral collaboration to drive the fruits of development. The Authority feels that facilitating consumer consent-based sharing of telecom data also via AAs can be a step where cross-sectoral collaboration can help in data monetization. Reaping the benefits of already tested existing platforms can also give confidence to consumers that tested security standards are in place and no misappropriation of data takes place.

5.28 **The Authority therefore recommends that the Government should put in place a data sharing and consent management framework on lines of Data Empowerment and Protection Architecture (DEPA) framework to provide telecom subscribers consent based option to**

share their KYC data with recipient TSP when they port their numbers.

5.29 **This framework can later be merged with Financial Stability and Development Council (FSDC) Account Aggregator (AA) system facilitating onboarding of entities from other sectors and in process allowing telecom subscribers to access, control, and consent-based sharing of their other data with any onboarded entity.**

Data Ethics

5.30 Growing capabilities of digital networks, technology systems, algorithms, and computational methods have enabled easy collection, combination, and manipulation of data. Government and enterprises use data to solve problems, develop and deliver services to citizens. Decisions made on the basis of data, touch every aspect of citizens' life. While this has benefitted the citizens, it has also enhanced the risk of unethical use and decision making based on data. It is therefore important for Government to have a framework that ensures that data fiduciaries use the data and make decisions ethically. The presence of any ethical biases in the data model may lead to fear of risks emerging from reputational loss and operational risks. Data processing entities thus need to derive a robust framework for data ethics. They must ensure that current unbiased ethical practices and policies are also applied to the data ethics framework, to ensure a holistic view of ethics governing their data processing initiatives.

5.31 Data ethics work both ways from humans to machines and from machines to humans[89]. There is a possibility that the erstwhile human biases involved in the decision-making process may get transferred to the machines, which is one of the biggest concern areas in data ethics, today.

[89] https://www2.deloitte.com/content/dam/Deloitte/in/Documents/risk/in-ra-digital-ethics-noexp.pdf

5.32 In the backdrop of possible threats to the data privacy of the telecommunication consumers, the Authority held a consultation process in 2017 on the issue of 'Privacy, Security and ownership of the Data in the Telecom Sector' and submitted its recommendations[90] to the Government on 16th July 2018. However, the issues related to Data ethics were not explicitly dealt in these recommendations. Accordingly, following issue was raised in the CP to obtain the opinion of stakeholders:

"*49. Are there any other issues related to data ethics that require policy/regulatory intervention apart from the issues that have already been dealt with in TRAI's recommendations on the issue of 'Privacy, Security and ownership of the Data in the Telecom Sector' dated 16th July 2018 and the draft PDP Bill? Provide full details.*"

Comments of the stakeholders

5.33 Mixed set of responses were received in response to the above question. Some stakeholders suggested that telecom is already a heavily regulated sector with numerous compliance requirements under various laws entailing significant costs towards compliance. This is further compounded by the pan India scope of the business and its status as critical infrastructure of national importance, which in turn requires deployment of large number of resources.

5.34 Another stakeholder stated that the concerns raised in this consultation paper are another form of OTT licensing and beyond the regulatory ambit of the authority. A comprehensive data protection law enforced by an independent data protection authority that has investigatory and enforcement powers is the best mechanism to protect data pertaining to the collection and use of data.

5.35 Another stakeholder stated that TRAI should refrain from issuing guidance or policy measures on data privacy and protection until the proposed Data Protection Bill is enacted into law. This will help avoid

[90] https://www.trai.gov.in/sites/default/files/RecommendationDataPrivacy16072018_0.pdf

any regulatory ambiguity or complexity that may inevitably arise due to a plethora of disparate measures relating to data privacy.

5.36 One of the stakeholders also opined that all personal data including general, sensitive, critical and all anonymized non-personal data of Indian citizens to be mandatorily stored and processed in India. Further explicit permission must be obtained from data owners to use their data. The stakeholder further stated that making individuals a stakeholder in ownership and usage of their data and transferring a proportionate part of the benefit to them shall result in better acceptability and usage of personal of citizens by TSPs.

5.37 Another stakeholder suggested that review and inclusion of GDPR guidelines/norms /framework has to be undertaken to augment it in the parlance of Indian context with view to adopt global best practices.

Analysis of the issue and views of the authority

5.38 The Authority has studied various aspects of 'The Personal Data Protection Bill (PDP), 2019' which was earlier placed in Parliament. The key provisions of the PDP, bill 2019 were:

- Processing and Collection of Personal Data
- Individual Consent
- Data Localization
- Data Protection Authority
- Right to be Forgotten
- Obligations of data fiduciary
- Rights of the individual
- Grounds for processing personal data
- Cross-border data transfer
- Social media intermediaries
- Sharing of non-personal data with the Government

5.39 The Authority has noted that the PDP 2019 focused on privacy and security of individual data but did not have provisions to handle the data ethics issues. In any case, the draft bill has been withdrawn.

5.40 Several countries have spelt out framework to ensure ethical use of data. For example, USA as part of its Federal Data Strategy has come out with Data Ethics Framework[91]. The Data Ethics Framework guides the data activities of agencies, providing the foundation for the ethical acquisition, management, and use of data for any federal purpose. The Framework does not include requirements or mandates of its own, but rather provides guidance in the form of Tenets to encourage ethical decision making at all levels of the Federal Government. The framework defines, "*Data Ethics as the norms of behaviour that promote appropriate judgments and accountability when acquiring, managing, or using data, with the goals of protecting civil liberties, minimizing risks to individuals and society, and maximizing the public good*".

5.41 OECD has come out with a paper on the Good Practice Principles for Data Ethics in the Public Sector to shed light on the value and practical implications of data ethics in the public sector[92].The paper emphasizes that governments need to be prepared to take action to address issues and concerns associated with data corruption; biases affecting the generation of data or its extraction (e.g. selection of data sources); and the quality of data inputs used to train Artificial Intelligence (AI) models. Other hazards include data misuse and abuse by individuals and organisations and the delivery of negative outcomes through data use, including in the context of AI systems.

5.42 EU has come out with a document for scientific community on ethical use of data[93]. On 01 January 2021, new legislation came into force for large and listed companies in Denmark to report on data ethics. The purpose of the legislation is to provide transparency in how companies

[91]https://resources.data.gov/assets/documents/fds-data-ethics-framework.pdf

[92]https://www.oecd.org/gov/digital-government/good-practice-principles-for-data-ethics-in-the-public-sector.pdf

[93]https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/ethics-and-data-protection_he_en.pdf

work with data and encourage companies to take responsibility for how to manage data.

5.43 The application of data ethics is particularly important when developing and deploying data processing technologies based on Artificial Intelligence (AI) systems. The dynamic nature of AI (such as machine learning or deep learning) inherently poses ethical challenges as the processing of data and the potential outcomes can be affected by the AI system itself. The Authority is of the opinion that in era of Internet of things, Machine learning and Artificial Intelligence, it is imperative for government to ensure that there is an overarching framework for ethical use of data. The Authority has noted that Government has withdrawn the PDP Bill and it intends to reintroduce the bill again.

5.44 **As part of these recommendations, the Authority has recommended for formation of Data Digitization and Monetization Council (DDMC), an apex body to oversee all issues related to data digitization, data sharing, and data monetization in country (Refer to para 2.258). The Authority further recommends that DDMC should also be entrusted with responsibility of putting in place an overarching framework for ethical use of data both by the Government as well as by the corporates in India. The framework should address the generic as well as vertical sector specific requirements. DDMC should also study the possible impact of upcoming technologies on data ethics and come out with relevant rules/guidelines on the subject.**

5.45 In addition, the Authority's recommendations on 'Privacy, Security and ownership of the Data in the Telecom Sector' dated 16th July 2018 were specific to Telecom sector and are yet to be implemented by the Government. These recommendations, inter-alia, included the following:

- Each user owns his/ her personal information/ data collected by/ stored with the entities in the digital ecosystem. The entities, controlling and processing such data, are mere custodians and do not have primary rights over this data.

- All entities in the digital ecosystem, which control or process the data, should be restrained from using metadata to identify the individual users.
- Privacy by design principle should be made applicable to all the entities in the digital ecosystem viz, Service providers, Devices, Browsers, Operating Systems, Applications, etc. The concept of "Data Minimisation" should be inherent to the Privacy by Design principle implementation. Here “Data Minimisation” denotes the concept of collection of bare minimum data which is essential for providing that particular service to the consumers.
- The Right to Choose, Notice, Consent, Data Portability, and Right to be Forgotten should be conferred upon the telecommunication consumers.
- In order to ensure sufficient choices to the users of digital services, granularities in the consent mechanism should be built-in by the service providers.
- Multilingual, easy to understand, unbiased, short templates of agreements/ terms and conditions be made mandatory for all the entities in the digital eco-system for the benefit of consumers.
- Data Controllers should be prohibited from using “pre-ticked boxes” to gain user’s consent. Clauses for data collection and purpose limitation should be incorporated in the agreements.
- Devices should disclose the terms and conditions of use in advance, before sale of the device.
- It should be made mandatory for the devices to incorporate provisions so that user can delete such pre-installed applications, which are not part of the basic functionality of the device, if he/she so decides. Also, the user should be able to download the certified applications at his/ her own will and the devices should in no manner restrict such actions by the users.
- Consumer awareness programs be undertaken to spread awareness about data protection and privacy issues so that the users can take well informed decisions about their personal data.
- The Government should put in place a mechanism for redressal of telecommunication consumers' grievances relating to data ownership, protection, and privacy.

- All entities in the digital ecosystem including Telecom Service Providers should transparently disclose the information about the privacy breaches on their websites along with the actions taken for mitigation and preventing such breaches in future.
- A common platform should be created for sharing of information relating to data security breach incidences by all entities in the digital ecosystem including Telecom service providers. It should be made mandatory for all entities in the digital ecosystem including all such service providers to be a part of this platform.

5.46 **The Authority reiterates that its recommendations on 'Privacy, Security and ownership of the Data in the Telecom Sector' dated 16th July 2018 should be accepted and implemented by the Government immediately.**

CHAPTER 6

SUMMARY OF THE RECOMMENDATIONS

A. Data Centers

6.1 The Authority recommends that as part of Data Centre Incentivization Scheme (DCIS), the Government of India should define certain fiscal and non-fiscal incentives for the sector that should be made applicable across all states while leaving the flexibility to the states to announce further fiscal and non-fiscal incentives through their policies. Accordingly, Government should spell out two lists of incentives for Data Centre and DC Park operators. The list of the Central Government will contain Centre specific incentives. The other should be in the form of guidelines for the States for adoption by them.

Para 2.28

6.2 The Authority recommends that guidelines for States DCIS should enlist inclusion of Data Centres as an essential service under respective Essential Services Maintenance Acts of the states as one of the items. For incorporating in DCIS guidelines for States, the Authority also recommends inclusion of DCs in the list of exemptions from inspections under provisions of the Factories Act, 1948, Shops and Commercial Establishment Acts, other labor laws, and laws on wages.

Para 2.30

6.3 The Authority recommends a two-prong approach – A) As part of these recommendations, the Authority recommends operationalizing a Data Centre specific portal on National Single Window System (NSWS) for various time-bound single window clearances (refer para 2.233).

The portal should also list out all policy initiatives and benefits offered by individual states for DC sector. States should be enabled

to upload and update the benefits offered as per their policies on this portal. A comparative statement of such benefits and the time taken for issuing clearances on the portal should be displayed to sensitize the states and infuse competitive spirits amongst them.

Para 2.32

The Data Centre specific portal on National Single Window System (NSWS), as recommended by Authority above, must further have provisions for –

- **Online registration of new DCs/DC Park operators without any obligation or registration fees. This will be purely for statistical and record purposes.**
- **Facility to upload all policy initiatives and benefits offered by individual states for DC sector.**
- **Displaying a comparative statement of such benefits and the time taken for issuing clearances on the portal.**

The portal should also be used for accessing specific aspects related to Centre-state coordination including issue of notifications, announcement of schemes & benefits, frequently asked questions, facility to interact and respond to queries of potential investors, and grievance redressal of existing and prospective DC/DC Park operators.

Para 2.233

6.4 The Authority recommends that a national level DCRI (Data Center Readiness Index) framework be implemented by Central Government to rank Indian states as per their policy and regulatory environment to promote the DC sector. The Data Centre Industry Council (DCIC) proposed to be formed under MeitY's draft DC policy, should be entrusted with the work of finalizing the parameters, their weightages, and methodology for giving marks against each parameter. However, an indicative list of parameters and their weightages for ranking the states is suggested below:

S. NO.	PARAMETER	SUGGESTED WEIGHTAGE (%)
STATUTORY CLEARANCE & EODB (35%)		
1	States giving separate category/ recognition to DC/DC Parks building infrastructure vis-à-vis commercial office buildings or malls within the state in the building byelaws of the state.	**8**
2	Performance of states to grant permissions for establishing DC/DC Parks on centralized online portal within specified timeline	**10**
3	States categorizing DC/DC Parks for exemption from inspections under provisions of various Acts/Laws related to factories, Shops and Commercial establishment, and Labour & Wages	**5**
4	States categorizing DC/DC Parks as 'Essential Services' in respective Acts	**5**
5	Availability of Free ROW permission for laying OFC for connecting DC/DC Parks	**5**
6	Data Centre building norms included in building norms of State policy	**2**
FISCAL INCENTIVES (25%)		
7	Various fiscal incentives offered to DC/DC Parks	**12**
8	Whether Capital and interest subsidy offered to DCs and DC Parks	**10**
9	Whether Capital and interest subsidy or any other fiscal incentive linked to Green Data Certification	**3**
INFRASTRUCTURE RELATED (15%)		
10	Pre-provisioned availability of DC parks with the requisite infrastructure supply to host multiple DC **OR** Availability / identification of land for DCs/ DC Parks	**10**
11	Whether available Land in DC Parks or otherwise is being offered at special rate	**5**
POWER RELATED (17%)		
12	Separate lower/ Special power tariff for DCs/DC Parks	**5**
13	Waiver of Electricity Duty for DC/ DC Park	**3**
14	Ab-initio availability of Power supply from dual power grid networks for DC/ DC parks	**4**
15	Permission to DC/DC Parks to consume Renewable Energy directly from power producers via open access system, with no restrictions and additional surcharge	**3**

16	Whether fixed demand charges on electricity have been waived off	**2**
WATER RELATED (8%)		
17	Policy for making available redundant/alternate water supply to DC/DC Parks	**3**
18	Declare water supply to DCs and DC Parks as special purpose supply and not subject to any interruption	**3**
19	Separate lower water charges for DC/DC Parks	**2**
TOTAL		**100**

Para 2.34

6.5 The Authority recommends that all the permissions/clearances required by Centre/States/UTs to build and operationalize a Data Centre should be listed on National Single Window System (NSWS) and such permissions/clearances should be given through this portal within prescribed timelines. The various permissions should be categorized as most critical, critical, and non-critical categories. It is recommended that all such permissions that fall under the non-critical category be deemed to have been granted after the prescribed timelines elapse. The Authority further recommends that NSWS portal should be interactive in nature, with provision to use new technologies like Artificial Intelligence, Machine learning etc. to facilitate active interaction (including FAQs) between stakeholders and states with provisions to raise queries/grievances and seek responses/resolutions etc.

Para 2.38

6.6 The Authority recommends that the Central Government should prepare guidelines listing out the incentives for the Data Centres and DC Parks for the states that have scanty DC footprints, in line with other advanced states. The scheme should, inter-alia, offer incentives in form of land, capital subsidy and Interest subsidy. In such a scheme, while the land may be offered by respective states, the expenses on other offered incentives including capital and interest should have at least 75% contribution from central

government. The proliferation of digital infrastructure in such states will not only help in boosting economy but will also promote other linked industries in these States.

Para 2.45

6.7 The Authority recommends that it should be mandatory for all existing and new DCs to register themselves online on the NSWS centralized portal. The data in respect of ownership, capacities and the benefits availed from the Government to establish the DC should be captured on the portal. The registration of DCs should be without any fee or any other obligation. The States should be asked to ensure that all existing DCs availing any benefits from States or even otherwise should register with NSWS centralized portal. Any recurring or new permissions to existing DCs must be processed only after verifying such a registration.

Para 2.46

6.8 The Authority recommends that the number of Data Centre Economic Zones (DCEZ) that have been envisaged in MeitY's draft Data Centre Policy, needs to go beyond four.

The Authority recommends that out of the list of 33 SEZs, one SEZ each from State of Andhra Pradesh, Kerala, Karnataka, Maharashtra, Haryana, UP, MP, Gujarat, Rajasthan, and Odisha, can be identified for either converting them into DCEZs or for carving out zones out of these SEZs for establishing DCs/DC parks. Further, in order to avoid the concentration of further Data Centre Parks in already developed locations, those States that are lagging in DCs, should be supported by the Centre for setting up of a Data Centre Parks in such states. For such States, the Center should prepare a scheme for setting up DC Parks, either in line with other states who have come up with Data Park Schemes or independently. The scheme should, inter-alia, offer incentives in

form of land, capital subsidy and interest subsidy. While the land is to be offered by respective states, the expenses on other offered incentives including capital and interest subsidy should have at least 75% contribution from central government.

Para 2.63 & 2.67

6.9 The Authority recommends that following incentives should be provided by Central Government for establishing DC Parks (DCEZs)

(i) **Time-bound single window clearance for Central and State level approvals.**

(ii) **Waiver of import restrictions on essential Data Centre operational equipment**.

In addition to incentives rolled out by the Centre, the Authority recommends that guidelines should be issued for the States for rolling out incentives for DC Parks (similar to DCIS guidelines for DCs). The decision on implementing these guidelines for rolling out incentives for DC Parks should be left to the States.

The following incentives can be included in the guidelines for DC Parks:

(i) **Deemed distribution licensee status for electricity for DC Park developers**

(ii) **Provision of Power and water at reduced rates**

(iii) **Waiver of Electricity Duty**

(iv) **Capital subsidy in buildings and infrastructure**

(v) **Reimbursement of stamp duty, conversion fee, transfer duty and registration fee**

(vi) **Providing free Right of Way for Telecom Service/Infrastructure Providers for building telecom networks to and within DC Parks**

(vii) **Time-bound single window clearance for central and state level approvals**.

Para 2.69 & 2.70

6.10 The Authority is of the view that there is a need for different India-specific building standards for construction of DCs and recommends that Bureau of Indian Standards (BIS) may be entrusted with developing the standards in a fixed timeframe. For this, BIS should carry out a detailed consultation with the industry, inter-alia, covering following aspects of building norms –

A. **For DCs**

i. **Floor to Ceiling height**

ii. **Load Bearing capacity**

iii. **Floor Space Index Norms**

iv. **Norms for housing generators, Chillers / Heating, ventilation, and air conditioning (HVAC) system, and other associated utilities like batteries to support DC load.**

v. **Parking requirements**

vi. **Window requirement**

vii. **Boundary walls**

viii. **Mandatory rainwater harvesting and recycling arrangements to be included in DC building.**

ix. **Water and diesel storage**

x. **Entry routes for Information & Communication Technology (ICT) connectivity and High Tension (HT) power lines with redundancies**

xi. **seismic standards**

B. **For DC Parks - In addition to some of the above points that are also applicable for DCs, covering the following:**

i. **Own sub-station**

ii. **Common DGs for multiple DCs**

iii. **Integration with nearest fire, police station & hospitals**

iv. **Mandatory rainwater harvesting and recycling arrangements to be included in DC parks.**

Para 2.84

6.11 The Authority also recommends that till necessary changes are done in National Building Code of India by BIS, as an interim measure, MeitY should collaborate with approved Central Government organizations to create broad criteria for Data Centre structures, easing specialized construction and safety permits.

Para 2.85

6.12 The Authority recommends that there is a requirement of India specific standard-based certification framework for the DCs and for the same, BIS be entrusted with the task. In the meantime, till BIS comes up with India-specific standards, the Authority recommends that BIS may ask DCs to follow any one or more of the international standards like EN 50600.

Para 2.90

6.13 The Authority recommends that trusted source procurement applicable for licensees under section 4 of India Telegraph Act 1885, should also be made applicable for DCs for security sensitive equipment.

Para 2.115

6.14 The Authority recommends that Telecommunication Engineering Centre (TEC) and Standardisation Testing and Quality Certification (STQC) Directorate should jointly work to develop DC security certification framework based on third party Audits.

Para 2.118

6.15 The Authority recommends that if DCs have to establish captive fibre network, they should be allowed to do so under existing licensing framework.

Para 2.136

6.16 The Authority reiterates that Government should implement its recommendations on "Roadmap to Promote Broadband Connectivity and Enhanced Broadband speed" dated 31st August 2021 in totality and on priority.

Para 2.138

6.17 The Authority recommends that other coastal states intending to promote setting up of Cable Landing Stations (CLS) may consider incentives and facilitations as has been done by State of Gujarat in its IT/ITeS Policy 2022-27.

Para 2.155

6.18 The Authority recommends that Right of Way (RoW) charges for laying and maintaining Optical fibre cables (OFC) infrastructure to CLS may be waived off for encouraging and supporting the new CLS establishment for submarine cables.

Para 2.156

6.19 The Authority recommends that DoT may take up with Ministry of Power to look into the submissions made by stakeholders for formulation of a DC conducive ~~yet~~ simplified framework for power to address the issues that have been flagged in this section.

Para 2.178

6.20 The Authority recommends that for the overall development of green DCs in India, energy banking provisions for DC/DC park operators who opt to produce renewal energy for consumption for DC/DC Parks should be extended on yearly basis.

In addition, to promote generation and consumption of renewable energy, the Authority recommends that DoT may take up the issue of providing land on priority and on concessional rates to DC/ DC park operators for establishing solar power plants.

Para 2.187 & 2.188

6.21 The Authority recommends that DG sets at DC and DC Park sites should be allowed to operate as backup power infrastructure without any hindrance from State Pollution Control Boards (SPCB) or Central Pollution Control Board (CPCB). Since power outages for few hours will require huge quantity of diesel to run DGs for large DCs, the Authority recommends that the diesel storage regulation may be suitably revised to cater for the requirement of DCs to operate for a minimum back-up period for up to 48 hours.

Para 2.191

6.22 The Authority recommends that the Indian Green Building Council (IGBC) along with Telecommunication Engineering Centre (TEC) should be entrusted with task of framing certification standards of green DCs in India. As far as linking incentives to Green DCs is concerned, the Authority feels that this should be considered in totality after the certification process is put in place. Authority has made certain recommendations in this regard in coming sections. However, the Authority will revisit the issue later, if required.

Para 2.199

6.23 The Authority recommends that adoption of alternate cooling solutions should be left to market forces. In any case, the Authority has already prescribed certification policy for Green Data Centres. Once the Green data certification framework is in place, the Authority recommends that as part of Guidelines to State Governments, Centre should then recommend linking

Capital/interest subsidy or any other fiscal incentive that the State Government is offering to DCs to the Green DC Certification they hold. Alternatively, the Authority recommends that if a DC acquires higher rated Green DC certification, their fiscal incentives can be increased. This would give the required motivation to DC operators to adopt alternate cooling technologies.

Para 2.206

6.24 The Authority recommends that Government should launch a scheme to incentivize (in the form of Government subsidy) implementation of innovative solutions and green initiatives by the DCs. For the same, it may invite Requests for Proposal (RFP) on an experimental basis for new technology/methods/processes that can be adopted for promoting green DCs.

Para 2.208

6.25 For availing Centrally sponsored incentives, the Authority recommends that, as part of the Central Policy, States should be asked to–

- **Declare water supply to DC/DC parks as special purpose supply and not to subject such supply to any interruption.**
- **Data Centres will be allowed to store water within their premises which can last for seven days.**
- **Allow more than one water connections for DCs/DC Parks as a part of their respective DC policy.**

Para 2.209

6.26 The Authority recommends that in all future projects, DC parks operators should be mandated to incorporate waste-water recycling plants in their designs for DC Parks.

Para 2.210

6.27 The Authority recommends that National Telecom Institute for Policy Research & Training (NTIPRIT) under Department of Telecommunication (DoT), Ministry of Electronics and Information Technology (MeitY), All India Council for Technical Education (AICTE), and Telecom Sector Skill Council of India (TSSC) should closely collaborate with DC industry to develop tailor-made short and long-term courses. These courses should inter-alia cover aspects of DC functioning such as Cloud Architecture and its configuration, DC Network Engineering, Cloud Security, Edge computing, quantum computing, IoT and AI based Data Analytics for automated DC Infrastructure Management, DC facility Management etc. and can be introduced into the universities and colleges enlisted with AICTE, to up-skill the fresh talent. A suggestive list of *DC related* courses at diploma, undergraduate and post-graduate level is as follows:

S. No.	**Level**	**Suggested Discipline**	**Implementation Level**
(a)	Diploma Courses	(i) Advanced Diploma in Cloud Computing and data centre operations. (ii)Diploma in Cloud support operations (iii) Diploma in Cloud Data Security. (iv) Diploma in Data Centre Infrastructure and Facility Management	Suggested to be implemented at ITI/ polytechnic level.
(b)	Undergraduate/ Post-Graduate Courses	(i) Cloud Computing Engineering with specialization in Data Centre Management.	Suggested to be implemented at Engineering Colleges, deemed universities and

		(ii) Network and Cloud Security (iii) Data Centre Engineering, Cloud computing and IoT. (iv) Data Centre Leadership and management (v) Cloud Platform and Core Infrastructure Engineering (vi) Cloud Infrastructure Engineering with specialization in Data Centre operations (vii) Masters Data Analytics and Cloud security (viii) Data Centre Facilities Engineering (ix) Masters in Data Centre Systems Engineering. (x) Masters in Data Security and Data Security	Post Graduate Degree/ Diploma Programs.
(c)	Certification Course	(i) Certified Network Associate – Data Centre. (ii) Certified Network Professional - Data Centre. (iii) Converged Infrastructure Administration Engineer – Data Centre. (iv) Certified Data Centre	Suggested to be implemented both via online/ Distance Education mode and on campus at Data Centres, Polytechnics, Colleges, deemed universities and so on.

		Virtualization Professional. (v) Certified Data Centre Design Consultant. (vi) Certified Data Centre Management Professional. (vii) Certified Data Centre Technician Professional. (viii) Certified Data Centre Implementation Engineer. (ix) Certified Data Centre Cloud Architect.	

The Authority also recommends that National Skill Development Corporation (NSDC) may enter into an arrangement with IDCA for DC related upskilling certification courses offered by International Data Centre Authority (IDCA) under second sub phase of Pradhan Mantri Kaushal Vikas Yojana 3.0 (PMKVY 2021-2026) so that they become available and affordable to young talents in the country.

Para 2.223 & 2.224

6.28 The Authority recommends that implementation of Data Centre Infrastructure Management (DCIM) System should be left at the discretion of DC business owners.

Para 2.241

6.29 For steering the data digitization drive, the Authority recommends that a statutory body, Data Digitization and Monetization Council (DDMC), be established at the Centre by enactment of new law or

by amendment of the present law. The proposed body should have suitable representation from DoT and MeitY, in addition to representatives from Central and State governments. The proposed body should be entrusted with the responsibility to review and prioritize the avenues which would require more concentrated efforts of data digitization and fix timeframes accordingly. DDMC should also assess the data digitization requirements and define the process framework for use of AI and related technology in data processing, data sharing and data monetization while ensuring the privacy and security of the data owner. The proposed body should also be entrusted with framing policies and incentivization schemes for data digitalization, data sharing, and data monetization. DDMC should be the apex body to oversee all issues related to data digitization, data sharing, and data monetization in the country.

The Authority is also of opinion that formation of too many statutory bodies creates confusion for the sector and organically, this work of steering the data digitization, data sharing, and data monetization can be entrusted to TRAI with suitable modifications in the TRAI Act.

Para 2.258 & 2.259

B. <u>Content Delivery Networks (CDN)</u>

6.30 The Authority recommends that CDN players should be registered with Department of Telecommunications through a simple online registration process. The suggestive draft for a Guidelines for the registration of CDN players along with the registration form and registration certificate is attached at Annexure-V.

[Para 3.40]

6.31 The Authority also recommends that the registration for the CDN players should be done online through a portal in a similar manner as is being done for the infrastructure providers.

[Para 3.42]

6.32 The Authority reiterates its Recommendations on Net Neutrality issued in 2017, that for monitoring and enforcement, DoT may establish a multi-stakeholder body with framework for collaborative mechanism among the stakeholders.

[Para 3.43]

6.33 The Authority reiterates that its recommendations on "Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed" dated 31st August 2021, may immediately be implemented in totality as this will not only help in proliferation of broadband services but also in establishment of supporting digital communication infrastructure as Data Centres, CDN Services and Interconnect Exchange.

[Para 3.63]

C. <u>Interconnect Exchanges</u>

6.34 The Authority recommends that a separate authorization in Unified License may be created for IXPs with terms and conditions that are much less onerous than ISP license authorization. The terms and conditions including minimum equity, minimum net worth, entry fee, bank guarantees, application processing fee, and maximum amount of penalty for this light touch license authorization have been provided in Annexure VI, VII & VIII.

[Para 4.28]

6.35 The Authority also recommends that any entity that intends to provide IXP services in India can do so either under ISP license/ UL-ISP authorization or under standalone UL-IXP authorization.

[Para 4.29]

6.36 The Authority also recommends that all existing players, including, NIXI should be brought within this licensing framework in a stipulated time not exceeding six months.

[Para 4.30]

6.37 The Authority does not recommend any mandate of interconnection at an IXP.

[Para 4.51]

6.38 The Authority recommends that in view of expanding markets and emerging demands for newer equipment, the government should extend the existing list of products under PLI and PPP-PMI schemes and explicitly include their classifications to prevent ambiguity as far as equipment related to CDN and IXP are concerned. Given the highly dynamic nature of digital communication sector, it is also recommended that, the lists should be updated from time to time as per market requirements so that the Schemes remain relevant and help nurture the domestic manufacturing segment.

[Para 4.81]

D. Data Ethics and Ownership

6.39 The Authority recommends that the Government should put in place a data sharing and consent management framework on lines of Data Empowerment and Protection Architecture (DEPA) framework to provide telecom subscribers consent based option

to share their KYC data with recipient TSP when they port their numbers.

[Para 5.28]

6.40 This framework can later be merged with Financial Stability and Development Council (FSDC) Account Aggregator (AA) system facilitating onboarding of entities from other sectors and in process allowing telecom subscribers to access, control, and consent-based sharing of their other data with any onboarded entity.

[Para 5.29]

6.41 As part of these recommendations, the Authority has recommended for formation of Data Digitization and Monetization Council (DDMC), an apex body to oversee all issues related to data digitization, data sharing, and data monetization in country (Refer to para 2.258). The Authority further recommends that DDMC should also be entrusted with responsibility of putting in place an overarching framework for ethical use of data both by the Government as well as by the corporates in India. The framework should address the generic as well as vertical sector specific requirements. DDMC should also study the possible impact of upcoming technologies on data ethics and come out with relevant rules/guidelines on the subject.

[Para 5.44]

6.42 The Authority reiterates that its recommendations on 'Privacy, Security and ownership of the Data in the Telecom Sector' dated 16th July 2018 should be accepted and implemented by the Government immediately.

[Para 5.46]

Annexure-I

Table: Fiscal and non-fiscal incentives offered in Data Centre policies of various states

S. no.	State and DC Policy	Key Provisions
1	**Maharashtra**[94] (IT/ITES Policy – 2015)	a. DCs will be covered under Essential Services and Maintenance (ESMA) Act b. DCs are eligible for the below fiscal incentives that are provided for IT/ITES units: c. 100% stamp duty exemption to new IT/ITeS units d. Electricity duty exemptions for 10 years e. Electricity tariff – power supply at industrial rates f. Property tax is levied at par with residential rates g. Registered IT/ITES units shall be exempt from octroi/Local Body Tax (LBT)/entry tax/escort tax or any other cess h. Allowing setting-up of IT/ITES units in any zone
2	**Telangana**[95] (Telangana Data Centre Policy – 2016)	**Fiscal Incentives:** 1) Incentives for expansion of IT/ITeS shall be applicable for Data Centre firms a. Allotment of Govt. land based on eligibility criteria b. IT is classified as industrial units for levying industrial power tariff category c. Green initiative: promote energy efficient equipment usage d. 100% reimbursement of stamp duty, transfer duty and registration fee e. Reimburse the cost of filing patents/copy rights to companies having R&D units in Telangana 2) Establish dual power grid networks, renewable energy under open access system, provide power at the cost of generation 3) Up to 50% rebate on building fees 4) Land shall be provided at a subsidized cost **Promoting Start-ups/SMEs:** 5) Additional preference to Start-ups/SMEs for procurement of DC services by the Government 6) 25% subsidy on lease rentals for 3 years 7) Specific R&D grants 8) Patent filing costs will be reimbursed up to INR 2 lakhs **Non-Fiscal Incentives:** 9) DC Firms are classified under 'Essential Services' 10) Exemption from power cuts, exemption from inspections under factories act; wages act; Shops and Commercial Establishment Act, etc.
3	**Gujarat**[96] (Establishment of Data Centre – 2017)	All the incentives under IT/ITeS policy (2016) for promoting IT/ITES parks and units are applicable for DCs also a. Allotment of Govt. lands to the IT/ITeS Industry b. Capital subsidy @ 25% of CapEx in buildings and infrastructure, excluding the cost of land. c. 100% reimbursement of stamp duty/registration fee/conversion fee d. Power tariff subsidy at the rate of Re. 1 per unit for 5 years e. 100% reimbursement for electricity duty paid for 5 years f. Lease rental subsidy for eligible IT/ITeS units, at the scale of 50 sq. ft. per employee, for 5 years g. Interest subsidy @ 5% for micro and @7% for SME enterprises for 5 years

[94] http://di.maharashtra.gov.in/IT_ITES_Policy_2015_final_English.pdf
[95] https://it.telangana.gov.in/telangana-data-centre-policy-2016/
[96] http://vibrantgujarat.com/writereaddata/images/pdf/project-profiles/Data-Centre.pdf

		h. Reimburse tax paid under Section-13 of Gujarat VAT Act i. 100% reimbursement of Central Sales Tax (CST) j. VAT/CST/GST reimbursement for a period of 8 years k. Patent assistance at the rate of 50% reimbursement
4	**Odisha**[97] (Odisha State Data Centre Policy – 2020)	Incentives in the ICT Policy for IT/ITES industries shall be applicable for DC firms **Fiscal Incentives:** 1) Allotment of govt. land 2) Building fees subsidy: up to 50% reimbursement 3) Electricity subsidy – industrial tariff is applicable, electricity duty and inspection fee exemption for 5 years 4) Internet bandwidth subsidy: 50% reimbursement of internet bandwidth/leased line charges per year per unit for 5 years 5) 75% Reimbursement of patent filing costs for R&D IT units
		Non-Fiscal Incentives: 6) DC industries/units are classified as 'Essential Services' under ESMA act and as 'Public Utility' services 7) Exempt from provisions of factories act; Shops and Commercial Establishment Act; labor act, etc.
5	**Uttar Pradesh**[98] (Uttar Pradesh Data Centre Policy – 2021)	**Fiscal Incentives:** 1) Interest subsidy up to INR 50 crore per park 2) Capital subsidy of 7% per DC unit 3) 25%, 50% land subsidies in specified regions 4) 100% stamp duty exemption for purchase/lease of land 5) 100% electricity duty exemptions for 10 years 6) Dual grid lines power supply and exemption from wheeling/transmission charges
		Non-Fiscal Incentives: 7) DC industries are classified under ESMA act 8) 24x7 water supply, special provisions in building norms 9) Open access system to purchase power, deemed distribution license, deemed franchisee status, 24x7 power supply, etc. 10) Exempt from inspections under factories, wages acts, etc. 11) Non disturbance provision, preference in public procurement.
6	**West Bengal**[99] (West Bengal Data Centre Policy – 2021)	**Fiscal Incentives:** 1) 100% exemption of stamp duty and registration fees 2) Electricity duty waiver for 5 years
		Non-Fiscal Incentives: 1) Dual power grid networks, 'industrial status' to electricity supplied to DCs, power and internet facilities to Edge DCs 2) 24x7 uninterrupted power supply and internet connectivity 3) 24x7 water supply 4) Single-window approvals and permits for companies willing to establish captive firms 5) Special provisions in building norms 6) RoW provisions as per 'West Bengal Broadband Policy 2020' for laying OFC to and from DCs

[97] https://startupodisha.gov.in/wp-content/uploads/2021/07/AIA-3.pdf
[98] http://invest.up.gov.in/wp-content/uploads/2021/02/Data-Centre-Policy-english.pdf
[99] https://www.eqmagpro.com/2021/09/West_Bengal_Data_Centre_Policy_2021.pdf

Annexure- II

ILLUSTRATIVE LIST OF APPROVAL/CLEARANCES REQUIRED BEFORE COMMENCEMENT OF A DATA CENTRE OPERATION

The approvals required to establish a Data Centre facility may have some variations indifferent states. As an illustration, the clearances required to build a Data Centre in Chennai is provided in the below table.

S. no.	Clearance	Authority	Under single window
Statutory Approvals: Pre-Construction Stage			
1	Environment Clearance	Ministry of Environment, Forest and Climate Change (MoEFCC)	No
2	Consent to Establishment	Metropolitan Development Authority and Central Pollution Control Board (CPCB)	Yes
3	Provisional Fire No Objection Certificate (NOC)	State Fire and Rescue Services/ National Fire Protection Association (NFPA)	Yes
4	Storm Water Permits	State Pollution Control Board	Yes
5	Sewage Discharge Approval		Yes
6	Tree Cutting NOC	Central Pollution Control Board (CPCB): Forest Department	No
7	Drainage/Garden NOC	Metro Water Supply and Sewage Board	Yes
8	Building Permit/ Approvals	Metropolitan Development Authority	Yes
9	Commencement Certificate		Yes
10	Telecom	Service provider/Controller of Communication Accounts of State	No
11	Water Supply	Metro Water Supply and Sewage Board	Yes

12	Power Connection Feasibility, Design and Sanction	State Electricity Board	Yes
13	Traffic Approval NOC	Commissioner of Traffic	No
14	NOC for High-Rise Structure	Airport Authority of India (AAI)	No
Pre-Construction Stage Compliance			
15	Registration with DIC	Director of Industry (DIC)	No
16	Registration IEM	Ministry of Commerce	No
Statutory Approvals: During Construction Stage			
17	220kV Power connection cable laying from substation to project premises	State Electricity Board	Yes
18	220kV Power Connection Substation Testing and Charging	State Electricity Board	Yes
19	Form V Approval - Labor	Labor Department: State Government	Yes
20	Plinth Checking Certificate	Metropolitan Development Authority	Yes
21	Electricity Safety License	Central Electricity Authority (CEA) / Chief Electrical Inspector to Government (CEIG)/ Public Works Department (PWD): Electrical Inspector	No
22	Elevator Permits and Certification: Safety License	Central Electricity Authority (CEA)/Public Works Department (PWD) Electrical Inspector	No
23	Diesel Generator System approval	CEIG/State PCB/PWD-Electrical Inspector	No
24	High Speed Diesel License	Petroleum and Explosives Safety Organization (PESO)/Chief Controller of Explosives Department (CCOE)/PWD: Electrical Inspector	No
Statutory Approvals: Post-Construction Stage			
25	Lift Operating Licenses	Public Welfare Department: State Government: Lift Inspector	Yes
26	Occupancy Certificate	Metropolitan Development Authority:	Yes

		Fire Department	
27	Completion Certificate	Metropolitan Development Authority	Yes
28	Consent to Operate Certification	Central Pollution Control Board (CPCB)	No
Statutory Approvals: Fire and Explosive			
29	Preliminary Explosive License for HSD	Petroleum and Explosives Safety Organization (PESO)/ Chief Controller of Explosives Department (CCOE)	No
30	Final Explosive License for HSD		No

Annexure-III

Table: Pan India details of Special Economic (SEZs) suitable for establishment of Data Centres

S. No.	State	Name of the SEZ & Location	Availability of Surplus Power and DISCOM infrastructure	Availability of water to undertake cooling requirements in a DC	Ab-intio availability of subsidized land within SEZ	Remarks, if any
1	Andhra Pradesh	APIIC Limited, ITSEZ/Sarpavaram, Kakinada, EG District, AP	Yes	Yes	Yes 2.517 Hectare of land available. No Subsidy is given by APIIC.	
2	Kerala	Kerala Industrial Infrastructure Development Corporation. (KINFRA), Ayiroopara and Kazhakoottam Villages, Trivandrum District, Kerala (IT/ITES)	Yes	Yes	Yes, 2.2988 Hectare available	
3		Kerala State Information Technology Infrastructure Limited, Pallipuram Village, Chertala Taluk, Alappuzha District Kerala (IT/ ITES)	Yes	Yes	Yes, 19.8913 Hectare available	
4		Kerala State Information Technology Infrastructure Limited, Village Mulavana, District Kollam, Kerala	Yes	Yes	Yes, 7.29 Hectare available	
5		Uralungal Labour Contract Co-operative Society Limited (ULCCS LTD) Nellikode Village, Kozhikode District, Kerala	Yes	Yes	Yes, 4.002 Hectare available	
6		Sutherland Global Services Private Limited Village Thrikkakara North, Taluka Kanayannur, District Ernakulam, Kerala.	Yes	Yes	Yes, 9.0618 Hectare available	

7		Smart City (Kochi) Infrastructure Limited Village Kakkanad, Taluka Kanayannur, District Ernakulam, Kerala	Yes	Yes	Yes, 43.0565 Hectare available	
8		Electronics Technology Parks- Kerala Village Andoorkonam, Taluk & District Thiruvananthapuram, Kerala	Yes	Yes	Yes, 13.662 Hectare available	
9		Kerala State IT Infrastructure Limited (KSITIL) Village Muringur – Thekkumuri, Mukundapuram Taluk, Koratty Panchayath, Thrissur District, Kerala	Yes	Yes	Yes, 5.0609 Hectare available	
10	Karnataka	Vikas Telecom Private Limited (formerly Vikas Telecom Limited) Outer Ring Road, Devarabeesanhalli Village, Varthur Hobli, Bangalore East Taluk, Karnataka	Yes	Yes	Yes, 1.11 Hectare available	
11		RMZ Ecoworld Infrastructure Pvt. Ltd. (formerly Adarsh Prime Projects Private Limited) Devarabeesanahalli, Bhoganahalli and Doddakanahalli, Bangalore, Karnataka	Yes	Yes	Yes, 1.4 Hectare available	
12		Shyamaraju and Company (India) Pvt. Ltd. (formerly Divyasree Technopark) Kundalahalli Village, Krishnarajapuram Hobli, Bangalore East Taluk, District Bangalore, Karnataka	Yes	Yes	Yes, 12.05 Hectare available	
13		Manyata Embassy Business Park Rachenhalli & Nagavara Vill., Bangalore Distt., Karnataka	Yes	Yes	Yes, 0.55 Hectare available	
14		Infosys Limited (Formerly Infosys Technologies Limited) Hebbal Industrial area,	Yes	Yes	Yes, 5.36 Hectare available	

		District Mysore, Karnataka				
15		Infosys Technologies Limited Hebbal Industrial area, District Mysore, Karnataka	Yes	Yes	Yes, 53.94 Hectare available	
16		Larsen & Toubro Limited KIADB Industrial Area, Taluka Hebbel-Hootagally, District Mysore, Karnataka	Yes	Yes	Yes, 3.57 Hectare available	
17		Milestone Buildcon Private Limited Village Chokkanahalli, Taluka Yelahanka Hobli, Bangalore North, Karnataka	Yes	Yes	Yes, 1.444 Hectare available	
18		Gulf Oil Corporation Limited Village Kattigenahalli and Venkatala, Hobli Yelahanka, District Bangalore, Karnataka	Yes	Yes	Yes, 7.66 Hectare available	
19		Wipro Limited Village Kodathi, Varthur Hobli, Sarjapur Road, District Bangalore, Karnataka	Yes	Yes	Yes, 10.94 Hectare available	
20		Infosys Limited Gokul Village, within the limits of Hobli, Hubli Taluk, District Dharwad, Near Airport Hubli, Karnataka	Yes	Yes	Yes, 10.95 Hectare available	
		Karnataka Industrial Areas Development Board (KIADB) Gamanagatti, Hubli Taluk, Dharwad District, Karnataka	Yes	Yes	Yes, 12.15 Hectare available	
21	Maharashtra	Mindspace SEZ, Airoli, Navi Mumbai, Maharashtra	-	-	-	This SEZ may be suitable for the establishment of data

						centres with the requisite and timely support from the State and Central Government for required infrastructure.
22		Gigaplex Estate Private Limited, Gigaplex, Plot No.05, MIDC Knowledge Park, Airoli, Navi Mumbai (DC SEEPZ SEZ Mumbai)	-	-	-	This SEZ may be suitable for the establishment of data centres with the requisite and timely support from the State and Central Government for required infrastructure.
23		Maharashtra Airport Development Company Ltd. (Mihan SEZ) Mihan, District Nagpur	Yes	Yes	Yes, available	
24		Khed Economics Infrastructure Private Limited (KEIPL) Bharat Forge, Rajgurunagar (Khed), Pune District, Maharashtra	Yes	Yes	Yes, 100 Hectare can be made available	
25	Haryana	Anant Raj Industries Ltd. Sonepat, Haryana	Yes	Yes	Yes, 13.935456 Hectare available	

26		Mayar Infrastrcuture Development Pvt. Ltd. Biotechnology SEZ, Village Rahka & Nimoth, Tehsil- Sohna, Distt. Gurugram (Haryana)	Yes	Yes	Yes, 2.322576 Hectare available	
27	Uttar Pradesh	Arshiya Northern FTWZ Limited Khurja, Bulandshahr, Uttar Pradesh	Yes	Yes	Yes, available	
28	Rajasthan	Mahindra World City (Jaipur) Ltd. Multiproduct SEZ at Jaipur, Rajasthan	Yes	Yes	Yes, available.	
29	Gujarat	Aqualine Properties Pvt. Ltd. Gandhinagar. IT/ ITES Special Economic Zone Gujarat	Yes	Yes	Yes, 2.0174 Hectare available	
30		Ganesh SEZ, Ahmedabad, Gujarat	Yes	Yes	Yes, 3.2640 Hectare available	
31		Calica Group's "3rd eye voice" IT/ITES SEZ, Ahmedabad, Gujarat	Yes	Yes	Yes, 0.5087 Hectare available	
32	Madhya Pradesh	Yash Technologies Pvt. Limited, Indore SEZ, Khandwa Road, Indore, MP	Yes	Yes	Yes, 0.9290304 Hectare available	
33	Odisha	Infovalley Bhubaneswar SEZ IT/ITES	-	-	Yes, 85.65 Hectare available	

Annexure- IV

Comparative Analysis of Assessment Criteria for New Data Centres of BCA-IMDA Green Mark scheme with IGBC Green DC rating system

S. No.	Assessment Criteria of Singapore BCA-IMDA Green Mark for new Data Centres	Green Mark, Singapore	IGBC Green DC rating system	Remark
1	**Overall Energy Efficiency**- (i) Maximum Design PUE	Design PUE not more than 2.0	Design PUE shall not exceed 1.69	-
	(ii) PUE Improvements over Reference Model	Improvement in PUE at part load condition (66% and 33%) over reference DC Model at the full design capacity under Singapore Climatic Condition. Target / Aim (i) At 66% of design load, the energy saving should be not less than 75% of the percentage saving at full design load. (ii) At 33% of the Design Load, the energy savings should be not less than 50% of the percentage savings at Full Design Load.	PUE does not exceed threshold limit at 1/3 (33%) loading of the data center	Green Mark Parameters may be examined and considered for DC Green Certification in India.
	(iii) IT Equipment load	Based on UPS output. For verification purposes, if UPS output data is not available, the closest direct measured power data will be used and a fixed PDU loss will be applied based on industry norms for such equipment.	IT equipment energy need to be measured at Power Distribution Unit (PDU) output (kWh taken either at PDU display or by an energy meter on the secondary side of PDU transformer.	Green Mark Parameters may be examined and considered for DC Green Certification in India
2	**System Energy Efficiency**	Different cooling efficiency parameters for	To have a system in place for monitoring Rack Cooling	Green Mark Parameters may be examined and

	(i) Cooling System	different cooling system for DCs **(a) Water-Cooled Chilled-Water Plant** Minimum water- cooled central chilled- water plant efficiency (i) 0.90 kW/RT for Peak Cooling Load of < 500 RT (ii) 0.80 kW/RT for Peak Cooling Load of ≥ 500 RT **(b) Air Cooled Chilled-Water Plant / Unitary Air- Conditioners (DX CRAC Units):** Minimum system efficiency of air cooled chilled-water plant or unitary conditioners: - (i) 1 kW/RT for Peak Cooling Load of < 500 RT (ii) 0.9 kW/RT for Peak Cooling Load of ≥ 500 RT (c) **Using chilled water from a central facility** - For data centres using district cooling system, data from the central plant will be used for the computation of the cooling system performance. (d) **Air Management System: Computer Room Air-** Conditioning Unit (CRACs) Baseline – Fan power limitation in CRAC of 0.25W/CMH (0.9 kW/m3/s) Base design: CHW >250RT, DX below 250 RT A variable volume design to vary the airflow rate as a function of actual load	Performance Index online and predictive & corrective actions are taken to maintain the thermal conditions within the recommended range. The Real time performance monitoring system, system to monitor Rack Cooling performance index and online temperature and humidity measurements need to be conceived by design and implemented.	considered for DC Green Certification in India.

		is encouraged and should have controls and/or devices (such as two-speed or variable speed control) that will result in fan motor demand of no more than 50 per cent of design wattage at 66 per cent of design fan speed.		
	ii) Electrical System	(a) Transformer efficiency of at least 98% (b) The UPS Load Factor shall be determined as: UPS Load Factor = Total UPS Output / Total Installed UPS Capacity (N)	-	Green Mark Parameters may be examined.
	iii) IT Equipment	**Applicable where DCs have operational over the ICT equipment** (a) Energy STAR rated, where available (b) Power control of ICT equipment. Low power modes, Power capping. (Minimum 25% of the equipment enabled) (c) Software control technologies, such as virtualization and optimizing algorithms or dynamic control of equipment for minimizing energy utilisation. (d) Monitoring of ICT or Server Equipment Utilisation.	-	Green Mark Parameters may be examined and considered for DC Green Certification in India
3	**Energy Efficiency and Performance Verification**	(a) Commissioning of Energy System - The commissioning shall include verification of the PUE according to the design criteria at	Project owner to sign an agreement with third party commissioning authority (CxA), not	-

		partial and full load conditions. (b) Measurement and Verification Plan - The M&V period must cover at least 1 year of post- construction occupancy at different load. Provide a process for corrective action if the results of the M&V plan indicate that energy savings are not being achieved. (c) Energy Metering and Reporting of PUE The data centre shall, at a minimum, be equipped with energy metering to provide total facility power and energy usage and total IT equipment power and energy usage on a historical basis, to determine instantaneous and average PUE data. Besides PUE determination, the data centre shall be equipped with energy metering to provide power and energy usage for the facility's power transformation and distribution systems, cooling systems and any on-site generation and trending of these metrics on a historical basis.	involved in the design. The commissioning authority is also required to have at least 3 years prior experience in equipment & systems To show how the data center would be audited for green performance after operation. Measurement & verification plan for yearly reporting. There is a system in place for real time monitoring of equipment operating conditions and performance for CRAC units, HVAC equipment, CRAH units, Direct expansion air handlers, Generator or Power back UPS, Pumps, Cooling Tower (CT), UPS system.	
4	**Data Centre Design and Energy Management**	(a) Data Centre Planning and Design (b) Data Centre Operations and Energy Management Have policies that promote continuity of information to ensure	Owner Project Requirement (OPR) and Basis of Design (BOD) report. The Real time performance monitoring system, system to monitor Rack Cooling	-

		that energy-efficient operating strategies are maintained; and provide a foundation for training and system analysis. Management commitment towards obtaining SS 564 certification, including intent, measures and implementation strategies of energy efficiency improvement plans to achieve energy target set over the next three years.	performance index and online temperature and humidity measurements need to be conceived by design and implemented.	
5	**Energy Efficient Features and Innovations**	To qualify, the features must achieve significant, measurable improvement of energy performance in one of the following areas: (a) innovative cooling systems or features (including free air-cooling, direct liquid cooling and two-phase systems, etc.) (b) innovative power supply, back-up power or UPS systems (c) IT operations, maintenance or system upgrade strategies not covered by Section 1-2-3 above (d) radical changes in data centre design, operations or systems not covered in any section above. Encourage the application of	The project shall also meet the following criteria for achieving an Innovation point: Quantitative performance improvements (comparing a baseline and design case). Strategy must be significantly better than standard sustainable design practices. Measures must be voluntary. Measures that are mandated by the local byelaws and not addressed in the rating system are not eligible for Innovation.	-

		renewable energy sources in data centres.		
6	**Water Efficiency**	(a) Water Metering, Water Leak Detection and Use of Water Efficient Fittings (b) Alternative Water Sources – utilize alternative water source for non-potable uses (cooling tower make up water, irrigation, washing, water features, toilet flushing, etc.) Alternative sources can include rainwater, greywater (for toilet flushing only), NEWater, condensate harvesting from the cooling system and recycled water from approved sources. (c) Cooling Towers Water Use Calculate percentage savings over baseline annual consumption. The baseline consumption is calculated based on the following: Evaporation rate of 1% water flow rate for each 7K of water temperature range, Drift loss of 0.002% water flow rate for counter- flow towers and 0.005% water flow rate for cross- flow towers, and Use of cooling tower water treatment system which can achieve 7 or better cycles of concentration of acceptable water quality.	Details of water meter installations and water balance chart covering entire facility. on-site treatment system to handle 100% of waste water generated in the Data Center, to the quality standards suitable for reuse, as prescribed by Central (or) State Pollution Control Board, as applicable. Use treated waste water for at least 50% of the total water required for landscaping, flushing, and cooling tower make-up water (if the project uses water-cooled chillers). Details indicating the flow rates and flush rates of all the fixture types.	-
7	**Sustainable Construction & Management**	(a) Refrigerants and Fire Suppressants To reduce global warming and damage to the ozone layer by minimizing the release of greenhouse gases and ozone depleting substances.	Use CFC-free Refrigerants Use certified green building materials, products, and equipment, to reduce dependence on materials that have associated negative	Additional assessment parameter of Singaporean Green Mark may also be added in DC Green Certification in India

		Use Refrigerants with ozone depletion potential (ODP) of zero or with global warming potential (GWP) of less than 100. Refrigerant leak detection monitoring system at critical areas of plant rooms containing chillers and other equipment with refrigerants. In server rooms, use of Fire Suppressants with zero ODP or GWP of less than 100. In UPS and Battery rooms, use of Fire Suppressants with zero ODP or GWP of less than 100 (b) Sustainable Construction- Use of Sustainable and Recycled Materials Green Cements with approved industrial by-product (such as Ground Granulated Blast Furnace Slag (GGBS), silica fume, fly ash) to replace Ordinary Portland Cement (OPC) by at least 10% by mass for superstructural works. Recycled Concrete Aggregates (RCA) and Washed Copper Slag (WCS) from approved sources to replace coarse and fine aggregates for concrete production of main building elements. (c) Concrete Usage Index (CUI) Encourage designs with efficient use of concrete for building components. (d) Sustainability Policy, Sustainable Purchasing Establish a policy to promote the procurement and use of environmentally friendly products that	environmental impacts. Data Center uses at least five passive or active green building materials, products or equipment that are certified by 'GreenPro' – Green Product Certification programme with the support of IGBC or having any other internationally accepted Eco Label.	

		are certified by local certification bodies. (e) Waste Management Establish a policy to promote and encourage waste minimization, waste sorting, collecting, quantifying, monitoring and recycling of a large range of waste generated in-house. Provide facilities or recycling bins for collection and storage of different recyclable waste such as: (a) IT related waste such as, electronic equipment (b) Plastic waste (c) Metal waste (d) Paper waste		
8	Indoor Environment Quality	(a) Indoor Air Quality Performance To promote a healthy indoor environment. In occupied areas to provide means to monitor CO2 and particulate filtration media in accordance with SS554:2009 Code of Practice for 'Indoor air quality for air-conditioned buildings' In unoccupied space and server areas to provide means to supply treated ventilation air on demand. (b) Lighting Quality and Management To encourage good workplace lighting quality to promote productivity and occupant comfort Specify in design that in occupied space lighting level to comply with SS531. Lighting is user controllable and fluorescent lamps with	Data Center has installed filters to meet ASHRAE recommendation of achieving ISO Class 8 cleanliness. The room air be continuously filtered with MERV 8 filters (as recommended by ASHRAE standard 127). Fresh air entering the data center shall be filtered with MERV 11 to MERV 13 filters (as recommended in Particulate and Gaseous Contamination in Datacom Environments - ASHRAE 2009b). 75% of the regularly occupied spaces in the data center achieve daylight illuminance levels for a minimum of 110 Lux.	Additional assessment parameter of Singapore Green Mark may also be added in DC Green Certification in India

		electronic ballasts or LED lamps. Specify in design that in machine spaces/server rooms lighting to be in accordance with recommendations of SS564. Use of occupancy sensors, bi-level lighting, task lighting is to be promoted. (c) Thermal Comfort and Noise In occupied areas specify comfort level to comply with SS 553 (Temperature and relative humidity) In occupied areas, specify in design that internal noise level is maintained at an appropriate level and to comply with SS553 (low dbA rating)	simulation / measurement report of non-technical areas in the data center achieving daylight illuminance levels of minimum 110 Lux	
9	Other Green Features	(a) To encourage the use of other green features which are innovative or/and have positive environmental impact. Features must achieve significant, measurable environmental performance in the data centre operations, maintenance or management not covered in above	-	

Annexure -V

DRAFT GUIDELINES FOR REGISTRATION OF CONTENT DELIVERY NETWORK (CDN) PROVIDERS

A CDN (content delivery network) is a group of geographically distributed and interconnected servers used to provide cached internet content [housed either in their own network points of presence (POPs) or in third-party data centres], from a suitable network location to a user, so as to improve its performance by leveraging various techniques like load balancing, caching, optimization, use of security protocols etc.

The following are the guidelines for the registration of Content Delivery Network (CDN) Providers.

1. The applicant must be an Indian company, registered under the Indian Companies Act,2013
2. FDI up to 100% under automatic route subject to Para 3.1.1 of FDI policy 2020 (as amended vide Press Note 3(2020) series dated17.04.202) and observance of conditions of Content Delivery Network (CDN) Providers Registration by the company as well as investors as notified by the Department of Telecommunications (DoT) from time to time. Notwithstanding with the above provision, foreign investment shall be subject to following conditions:
   (i) An entity of a country, which shares land border with India or where the beneficial owner of an investment into India is situated in or is a citizen of any such country, can invest only under the Government route.
   (ii) In the event of the transfer of ownership of any existing or future FDI in an entity in India, directly

or indirectly, resulting in the beneficial ownership falling within the restriction/purview of the clause no. **(i)** above, such subsequent change in beneficial ownership will also require Government approval.

(iii) Both direct and indirect foreign investment in the applicant company shall be counted for the purpose of calculating total FDI.

(iv) The applicant company/ Indian Promoters/ Investment Companies including their holding companies shall comply relevant provisions of extant FDI policy of the Government. While approving the investment proposals, the Government may take into account security concerns.

(v) FDI shall be subject to laws of India and not the laws of the foreign country/countries. The applicant company shall comply with the relevant provisions of FDI policy of the Government and such modifications to the policy as may be issued from time to time.

(vi) The words, mentioned hereinabove, such as FDI, foreign equity, investment companies, FIPB, etc., shall have the same meaning as defined by Department for Promotion of Industry and Internal Trade (DPIIT) in its FDI Policy.

3. The company shall submit the application for registration in the prescribed form (Appendix-A). The documents may be submitted as per check list at Appendix-B.

4. Change in the name of the applicant company or the registered Content Delivery Network (CDN) Provider, as the case may be, shall be permitted in terms of the provisions under the CompaniesAct,1956/2013.

5. The applicant company shall be informed of the approval or rejection of the application as far as practicable within 15 days of submission of the application.
6. The registration for Content Delivery Network (CDN) Providers shall be on non-exclusive basis without any restriction on the number of entrants.
7. The Content Delivery Network (CDN) Provider registered company shall provide cached internet content [housed either in their own network points of presence (POPs) or in third-party data centres] to a user, from a suitable network location on a group of geographically distributed and interconnected servers, so as to improve its performance by leveraging various techniques like load balancing, caching, optimization, use of security protocols etc. Such content will be carried to a user through networks of licensees of telecom services on mutually agreed terms and conditions. Provided that for establishing and operating Data Centres, the CDN provider shall follow the rules/guidelines issued by Central/State Government from time to time.
8. The Content Delivery Network (CDN) Provider registered company shall submit a copy of an agreement entered into with the telecom service providers to the DOT and TRAI within 15 days of signing of such agreement.
9. Content Delivery Network (CDN) Provider registered company shall offer delivery of content to Service Providers and users in a non-discriminatory manner.
10. The applicant company will be issued a Registration Certificate for Content Delivery Network (CDN) Provider, a draft copy of which is attached herewith as Appendix-C. The terms & conditions of these guidelines as well as that of the Registration Certificate will be binding on the Content Delivery Network (CDN) Provider registered companies.

11. The applicant company shall pay a processing fee of Rs.10,000/-(non-refundable) through digital payments like e-transfers/NEFT/RTGS/Debit Card/Credit Card, as per the process given in the user guide for NTRP at_____

12. The application to be submitted to the__(designated officer___, Department of Telecommunications, __(Address)_____.

******

Appendix-A

APPLICATION FOR REGISTRATION OF CONTENT DELIVERY NETWORK (CDN) PROVIDERS

1. Name of Applicant Company: ____

2. Complete postal address with Telephone/FAX Nos./E-Mail

   i) Corporate Office _____

   ii) Registered Office _____

3. Address for correspondence with_____
   Telephone/FAX Nos./ E-mail

4. Name of Authorised contact person,
   his_____designation, address
   and Telephone/FAX Nos./E-mail

5. Details of payment of processing fee (Refer para12 of Guideline)

6. Certified copy of Certificate of Registration along with Articles of Association and Memorandum of Association to be attached.

(To be certified by the Company Secretary/Statutory Auditor and countersigned by Authorized Signatory duly authorized by the company)

7. Details of Promoters/Partners/Shareholder in the Company: The Promoters to be indicated.

S. No. Name of Indian/Foreign Promoter/Partner Equity %age.

_____ _____ _____

_____ _____ _____

(Complete break-up of 100% of equity must be given. Equity holding up to 5% of the total equity shared among various shareholder can be clubbed but Indian and Foreign equity must be separate.)

8. Equity details

Indian:.....

Foreign:

(i) Land Border sharing country.....

(ii) Others.....

Total..... ..

(Certificate from Company Secretary/Statutory Auditor and countersigned by Authorized Signatory duly authorized by the company to be attached)

9. Resolution of Board of Directors *I*/other proof that the person signing the application is authorized signatory, to be attached. Such resolution should be signed with stamp by a Director but not by authorized signatory himself clearly mentioning the name of the Director signing the document.

Certificate/ Undertaking:

(I) I hereby certify that I have carefully read the guidelines, for the registration as Content Delivery Network (CDN) Provider and I undertake to comply with the terms and conditions therein.

(II) I hereby certify that the norms of extant FDI policy including norms related to investment from entity/ beneficial owners of the country which shares land border with India are complied with.

(III) I understand that this application if found incomplete in any respect and/or if found with conditional compliance shall be summarily rejected.

(IV) I understand that all matters relating to the application will be subject to jurisdiction of courts in Delhi/ New Delhi only.

(V) I understand that if at any time any averments made, or

information furnished for obtaining the registration is found incorrect then my application and the registration if granted there to on the basis of such application shall be cancelled.

(VI) I understand that in case it is decided to grant license under section 4 of Indian Telegraph Act,1885 to Content Delivery Network (CDN) Provider instead of registration, at a later date, the said registration shall stand cancelled after the prescribed period as decided by the competent authority and the Content Delivery Network (CDN) Provider shall have to apply for grant of specified license/authorisation at that point of time as per terms and conditions applicable for such license/authorisation.

Date:

Place:

Signature and Name of the Authorized Signatory
(Company's seal)

Appendix-B

CHECK-LIST

The following documents should be submitted along with the application for Content Delivery Network (CDN) Provider Registration:

S. No	Particulars	Parameters to be checked	Status (YIN)
1.	Application form in prescribed format with Date, sign and Stamp	Signed by authorized Signatory with stamp	
		Date & place mentioned	
2.	Processing fee as prescribed.	Presently Rs. 10000/- to be Submitted under the Content Delivery Network (CDN) Provider Registration head	
3.	Resolution of Board of Director that the person signing the application is authorized signatory. Such resolution should be signed with stamp by a Director but not by authorized signatory himself clearly mentioning the name of the Director signing the document.	Contains name of Authorized signatory	
		Signed. With stamp by a Director but not by authorized signatory himself	
		Mentions name of the Director signing the document.	
4.	Signature of the authorized signatory should be attested by any of the other Director of the company or Company Secretary as the case may be.	Suitable Document attached	
5.	Certified copy of Certificate of Registration' duly certified by Company Secretary/Statutory Auditor and countersigned by authorized signatory with stamp.	Certified by Company Secretary/Statutory Auditor	
		Countersigned by authorized signatory with stamp	

6.	Certified copy of MOA along with the required clause duly certified by Company Secretary/ Statutory Auditor and countersigned by authorized signatory with stamp.	Contains the required clause*	
		Certified by Company Secretary/Statutory Auditor	
		Countersigned by authorized signatory with stamp	
7.	Certified copy of AOA duly certified by Company Secretary/ Statutory Auditor and countersigned by authorized signatory with stamp	Certified by Company Secretary/Statutory Auditor	
		Countersigned by authorized signatory with stamp	
8.	Equity details of Indian & Foreign (Certified by Company Secretary/ Statutory auditor and countersigned by authorized signatory with stamp)	Certified by Company Secretary/Statutory Auditor	
		Countersigned by authorized signatory with stamp	
9.	Certified copy of approval of Government of India for Foreign Equity {**To be applicable if FDI is from an entity of a country, which shares land border with India or beneficial owner of an investment into India is situated in or is a citizen of any such country)** (Certificate from Company Secretary/Statutory Auditor and countersigned by authorized signatory with stamp to be attached)	Approval attached, if applicable	
		Certified by Company Secretary/Statutory Auditor	
		Countersigned by authorized signatory with stamp	
10.	List of Board of Directors along with their nationality (It should be clearly indicated that whether they are Resident Indian Citizen/NRI/Foreign Nationals).	Nationality Status i.e., Resident Indian Citizen/Non-Resident Indian/Foreign Nationals mentioned against Each director	

		Countersigned by authorized signatory with stamp	

*MoA shall contain clause which allows the company to do business related to provisioning of Content delivery service. In case the required clause has been inserted after incorporation of the company, the revised MoA along with certificate issued by ROC regarding alteration of MoA is to be submitted. Both the documents (MoA & certificate issued by RoC) are to be duly certified by Company Secretary/Statutory Auditor and countersigned by authorized signatory with stamp.

Appendix-C

Registration Certificate No.:xxx/2xxx

Dated: xx.xx.xxxx

Registration Certificate For Content Delivery Network (CDN) Provider

This is to certify that *M/s*----------with registered office at ----------

----------is registered as Content Delivery Network (CDN) Provider to provide cached internet content [housed either in their own network points of presence (POPs) or in third-party data centres] to a user, from a suitable network location on a group of geographically distributed and interconnected servers, so as to improve its performance by leveraging various techniques like load balancing, caching, optimization, use of security protocols etc. Such content will be carried to a user through networks of licensees of Telecom Services licensed under Section 4 of Indian Telegraph Act, 1885 on mutually agreed terms and conditions.

2. The company shall provide the said services in a non-discriminatory manner.
3. The company shall provide service only through networks of licensees of Telecom Services licensed under Section 4 of Indian Telegraph Act,1885.
4. The registered company will comply with guidelines or regulations issued by DOT/TRAI on net neutrality, inter-connection, content blocking, Quality of Service and security from time to time
5. The registered company shall ensure that interconnectivity between CDN registered company and the licensed service providers do not compromise the overall QoS of the networks.
6. The registered company shall ensure that terms of agreements

between CDN registered company and licensees of Telecom Services should have provisions to ensure that net neutrality principles, inter-connection, Quality of Service and security related guidelines/regulations are upheld.

7. The company shall submit a copy of an Agreement entered into with the telecom service providers, if any,within15 days of signing of such Agreement.
8. In the event of any question, dispute or difference arising under this Registration, or in connection thereof, except as to the matter, the decision of which is specifically provided elsewhere under this Registration, the same shall be referred to the sole Arbitrator appointed and nominated by the Director General Telecommunications or by whatever designation Director General Telecom may be called, herein after called the "ARBITRAL TRIBUNAL".
   8.1. This Registration Certificate and any dispute there of shall be governed by the substantive provisions of Indian law.
   8.2. The venue of Arbitration shall be New Delhi or as may be fixed by the ARBITRAL TRIBUNAL anywhere in India.
   8.3. The arbitration proceedings shall be conducted in accordance with the provisions of the Indian Arbitration and Conciliation Act,1996 and rules framed there under or any modifications or re-enactment thereof made from time to time.
9. The Registered company shall facilitate and provide necessary facilities depending upon the specific situation at the relevant time to the Government to counteract espionage, subversive act, sabotage or any other unlawful activity.
10. The Registered company shall make available on demand to the agencies authorized by the Government of India, full access to the network for technical scrutiny and for inspection which can be visual inspection or any operational inspection.
11. All foreign personnel likely to be deployed by the Registered company for installation, operation and maintenance of the Registered company network shall be security cleared by the

Government of India prior to their deployment. The security clearance will be obtained from the Ministry of Home Affairs, Government of India, who will follow standard norms in the matter.

12. The Government shall have the right to take over the equipment and networks of the Registered company or revoke/terminate/suspend the Registration of the company either in part or in whole as per directions if any, issued in the public interest by the Government in case of emergency or war or low intensity conflict or any other eventuality. Provided any specific orders or direction from the Government issued under such conditions shall be applicable to the Registered company and shall be strictly complied with.

13. Government reserves the right to modify these conditions or incorporate new conditions considered necessary in the interest of national security and public interest.

14. The Registered company will ensure that the CDN network and services delivered by it should not be in contravention of any statute

15. Any breach of the above terms will lead to cancellation of the registration without any further notice

Annexure- VI

Draft UL- CHAPTER-XX

INTERNET EXCHANGE POINTS (IXP)

1. Service Area: The License/Authorization for IXP is granted to provide Service(s) on a non-exclusive basis in the Service Area applicable at National level.

2. Scope of IXP Service: Scope of this authorization covers the following:

2(i) The Licensee shall own the underlying network element(s) to provide connectivity and related services for IXP users/ peers.

2(ii) The Licensee can perform functions such as:

Peering and exchanging IP traffic originated and destined within the country, among the Telecom Service Providers who are so authorized in scope of their licenses and CDN registered entities without using international bandwidth.

2(iii) Except those services permitted under the scope of this authorization, the Licensee shall not provide any service / services which require a separate service authorization / license.

Provided that the Licensees is authorized to provide such services in accordance with the provisions contained in this license, as modified from time to time.

3. Financial Conditions

i. Entry fee: The total amount of Entry fee shall be as specified in Annexure-II.

ii. No License Fee

4. Provision of Services:

4.1 For the purpose of providing the Service, the Licensee shall install its own suitable equipment so as to be compatible with the other eligible licensed service providers' equipment and connect the same through any of the authorized licensed service provider to Internet Gateway for routing International Internet Traffic.

4.2 It will be the responsibility of the Licensee to obtain IP addresses, domain name etc. from competent authority.

4.3 The licensee shall adhere to the prevailing directions/instructions and shall also abide by further directions / instructions as may be issued by Licensor/TRAI from time to time in this regard.

4.4 The Licensee may establish, operate and maintain IXP Networks and services using any technology as per prescribed standards in the service area as per scope of services authorized under this License

5. Network Interconnection:

5.1 The Licensee may establish direct interconnectivity with the network of Unified Licensee having authorization of IXP Service. The Licensee may obtain leased bandwidth from any other Licensee authorized to provide such bandwidth on lease.

5.2 Resources required for interconnecting as well as time frame for provision of the same, will be mutually agreed between the parties concerned and shall conform to TRAI's regulations and orders.

5.3 Licensees shall use IP (Internet Protocol) and shall meet the interface requirements as prescribed by TEC/ Licensor to connect with other Telecom Service Providers' network.

5.4 While interconnecting, the Licensee will ensure that the overall network Quality of service is not compromised. Licensee will follow regulations/orders/guidelines issued by TRAI regarding QoS and interconnection.

6. Operating Conditions

6.1 The LICENSEE shall not in any manner discriminate between peers and provide service on the same commercial principle and shall be required to maintain a transparent, open to inspection, waiting list. The LICENSEE shall clearly define the scope of Service to the peer(s) at the time of entering into contract with such peer(s).

6.2 The LICENSEE shall widely publicize provision of service and shall not refuse demand for inter-connection by any eligible licensed service provider or registered CDN entity

6.3 All complaints of peers in this regard will be addressed / handled as per the orders or regulations or directions issued by the Licensor or TRAI from time to time.

6.4 Any dispute, with regard to the provision of Service shall be a matter only between the aggrieved party and the Licensee, who shall duly notify this to all before providing the Service. And in no case, the Licensor/TRAI shall bear any liability or responsibility in the matter. The LICENSEE shall keep the Licensor/TRAI indemnified for all claims, cost, charges or damages in the matter

6.5 Principle of non-discriminatory treatment, definition of specialised services and reasonable traffic management and other exceptions:

(i) A Licensee providing Internet Exchange Service shall not engage in any discriminatory treatment of

content, including based on the sender or receiver, the protocols being used or the user equipment.

(ii) The Licensee is prohibited from entering into any arrangement, agreement or contact, by whatever name called, with any person, natural or legal, that has the effect of discriminatory treatment of content.

iii) Nothing contained in this provision shall restrict:

a) The provision of any Specialized Service by a Licensee, provided that:

- The provision of the Specialised Services is not detrimental to the availability and overall quality of Internet Access Service

b) Any measure adopted by the Licensee that are proportionate, transient and transparent in nature and fall under any of the following categories:

- Reasonable traffic management practices as may be specified from time to time;
- Provision of emergency services or any services provided during time of grave public emergency, as per the process laid down by the Licensor/TRAI;
- Implementation of any order of a court or direction issued by the Government, in accordance with law;
- Measures taken in pursuance of preserving the integrity and security of the network and equipment; and
- Measures taken in pursuance of an international treaty, as may be specified by the Government.

(iv) For the purpose of this provision:

a) “Content” shall include all content, applications, services and any other data, including its end-point information, which can be accessed or transmitted over the Internet.

b) “Discriminatory treatment” shall include any form of discrimination, restriction or interference in the treatment of content, including practices like blocking, degrading, slowing down or granting preferential speeds or treatment to any content.

c) “Specialized services” shall mean services other than Internet Access Services that are optimized for specific content, protocols or user equipment, where the optimization is necessary in order to meet specific quality of service requirements.

7. Security Conditions:

7.1 The Licensee shall maintain details of all users for services provided. These details shall be maintained for a minimum period of two year.

7.2 A record of complete network diagram of set up for each of the peer/user along with details of connectivity shall be available at the site.

7.3 An agreement shall be executed with each peer/user which clearly mentions the activities that are prohibited.

7.4 Periodic surprise checks may be carried out by the Licensor or its authorized representative(s)/Army and/or security agencies in order to ensure compliance of the conditions by Licensee(s). In case, any violation is detected, stern action shall be taken according to the terms and conditions of the License Agreement, including imposition of financial penalty.

7.5 In the interest of national security or public interest, the Licensee shall block Internet sites/Uniform Resource Locators (URLs)/Uniform Resource Identifiers (URIs) and / or individual subscribers, as identified and directed by the Licensor from time to time.

7.6 The traffic of Internet nodes on places of security importance would be routed as per directions issued from time to time by Licensor. Interconnection of these nodes to other nodes within the country directly is not permitted.

8. Requirement to furnish information:

8.1 The licensee shall provide to the licensor/TRAI, a quarterly report indicating the details of IXP Nodes or Points of Presence with their locations and number connected members. In case new nodes are to be installed, one-month prior notice is required to be given to the licensor.

8.2 The licensee shall provide to the licensor/TRAI on regular basis the volume of internet traffic flowing through its network

9. Part I of UL Conditions that will not be applicable for Licensees having only IXP Authorization

Chapter	Part I of UL Condition that will not be applicable for Licensees having only IXP Authorization
Chapter I : General Conditions	2.3, 7, 8,
Chapter II : Commercial Conditions	

Chapter III : Financial Conditions	18.2, 18.3, 18.4, 19,20, 21.1, 22,
Chapter IV : Technical Conditions	24.1, 29,
Chapter V : Operating Conditions	30.1, 30.2, 30.3(b), 30.4, 30.5, 30.6, 30.7, 30.11, 31, 32.2, 34, 35, 37.2, 37.3, 37.4, 38.1,38.2,38.3
Chapter VI : Security Conditions	39.2, 39.11(ii), 39.13, 39.15, 39.17, 39.18, 39.19, 39.20, 39.21, 39.22, 39.23(ii), 39.23(iii), 39.23(iv), 39.23(v), 39.23(viii), 39.23(xi), 39.23(x), 39.23(xvi), 39.23(xvii), 39.23(xix), 39.23(xx)
Chapter VII : Spectrum Allotment and use	41,42

Annexure- VII

Details of Minimum Equity, Minimum Net worth, Entry Fee, PBG, FBG and Application Processing Fee for various service authorizations

S. No.	Service	Minimum Equity (Rs. Cr.)	Minimum Net worth (Rs. Cr.)	Entry Fee (Rs. Cr.)	PBG (Rs. Cr.)	FBG (Rs. Cr.)	Application Processing Fee (Rs. Cr.)
1	UL (All services)	25.000	25.000	15.000	44.000	8.800	0.010
Service Authorization wise requirements							
I	ISP "A" (National Area)	Nil	Nil	0.300	0.400	0.020	0.005
II	ISP "B" (Telecom circle/Metro Area)	Nil	Nil	0.020	0.020	0.002	0.0015
III	ISP "C" (SSA)	Nil	Nil	0.002	0.001	0.0002	0.001
IV	**IXP**	**Nil**	**Nil**	**0.002**	**0.001**	**0.0002**	**0.001**

Annexure -VIII

Details of Maximum amount of Penalty under each Service Authorization

S. No.	Service Authorization	Maximum Amount of Penalty per violation for each occasion in Service Area
1	Access	50 Crore
2	NLD	50 Crore
3	ILD	50 Crore
4	ISP Cat A	1 Crore
5	ISP Cat B	20 Lakh
6	ISP Cat C	10 Lakh
7	GMPCS	50 Crore
8	PMRTS	10 Lakh
9	VSAT CUG	1 Crore
10	Audio Conferencing/ Audiotex/ Voicemail services	20 Lakh
11	M2M Cat A	1 Crore
12	M2M Cat B	20 Lakh
13	M2MCat C	10 Lakh
14	**IXP**	**10 Lakh**

Annexure-IX

CDN & IXP related equipment that is currently not explicitly covered as part of the PLI & PMA Schemes

Equipment in CDN & IXP	Covered under PLI	Covered under PMA
A. Switching & Routing Equipment for traffic exchange operations at the IXPs and between CDN servers –		
i. Switches - LAN switches, Carrier Ethernet switches (L2 and L3), Local and Transit switches, Fixed Line Switches, Photonic Switches	Switches, IP, and Packing Switching Apparatus	Ethernet Switches (L2 and L3), Hubs
ii. Advanced switches - LAN switches with static and dynamic routing with OSPF, OSPFv3, ISIS (v4 and v6), BGP, IP based Soft Switches, IP multimedia subsystems, Ethernet/IP Aggregation, IMS, Unified Communication Systems	Soft Switches, Unified Communications Platforms, IP multimedia subsystems	IP based Soft Switches, IMS, Unified Communication Systems
Layer 4-7 Multilayer switches (MLS) for servers, MPLS virtual private networks (VPNs)	Not covered	Not covered
iii. Routers - P/PE/CE routers, Edge/Aggregation/Enterprise/Core routers, IP/MPLS Routing apparatus	Routers, IP and Packet Routing Apparatus	IP/MPLS Core routers/ Edge/ Enterprise Router
B. Broadband Equipment for CDN and IXPs –		
iv. xDSL - Copper access systems (DSL/DSLAM), high-speed xDSL (G.fast), DSL Modems, Leased-line Modems, xDSL CPEs, MSAN	Not covered	Copper access systems (DSL/DSLAM), high-speed xDSL (G.fast)
v. FTTx- Optical fiber, Optical fiber cable, Optical Network Units (ONU), GPON (ONT and OLT terminals), XGPON, Next-Generation Passive Optical Network (NG-PON/NG-PON2) equipment, Mobile Front haul BBU and RRH, Short Range Devices and Associated Electronics in FTTx	Short range devices and associated electronics in FTTH, GPON (ONT)	Optical Fibre (single and multimode), OFC

vi. Wireless Broadband - WiMAX RAN, WiMAX CPE, Wi-Fi Access points and Controllers, Wi-Fi based broadband wireless access systems indoor & outdoor, Repeaters (RF/RF-over-Optical), Wireless Broadband Equipment in Access, FWA	Wireless equipment in Access and backhaul	Wi-Fi based broadband wireless access systems (Including Access Point, Aggregation Block, Core Block), Integrated Broadband system, Repeaters (RF/RF-over-Optical)
C. Backhaul and Transmission Equipment for CDN PoPs and IXPs –		
vii. Fiber/Optical - Synchronous Digital Hierarchy (SDH), Optical/SDH/ PDH Cross Connects, Dense Wavelength Division Multiplexing DWDM/CWDM systems, POTP, DXC, Optical Transport Network (OTN), OTN Cross-connects, OADM, Optical distribution frames, Add-drop Mux, OFC accessories like Fiber amplifiers (EDFA), Splitters, Attenuators; Multi Service Provisioning Platform (MSPP), Packet Transport Network (PTN)/ Multi-Protocol Label Switching (MPLS), Fiber Monitoring System, Gigabit Passive Optical Networks (GPON)/ Next Generation-Passive Optical Network (NG-PON) Optical Line Terminal (OLT), Fiber repeaters, other wireline/wireless equipment used for backhaul	Dense Wavelength Division Multiplexing (DWDM), Optical Transport Network (OTN), Multi Service Provisioning Platform (MSPP), PTN/MPLS, GPON/NGPON-OLT, GPON (ONT)	SDH/Carrier-Ethernet/MPLS-TP/ Packet Optical Transport equipment/ PTN/ OTN systems DWDM/CWDM systems, GPON / XGS-PON, NG-PON2 equipment (including ONT and OLT), Optical/SDH/PDH Cross Connects/ OTN Cross-connects and optical MUX, OADM, Optical Fiber Repeaters
viii. Microwave Radio - PDH/SDH Microwave, Ethernet Microwave, Digital Microwave Radio, Radio systems (IP/ Hybrid)	SDH, Digital Microwave Radio	Microwave Radio systems (IP/Hybrid)
ix. Submarine systems - including repeaters	Not covered	Not covered

LIST OF ACRONYMS

No.	Acronym	Description
1	5G	5th generation cellular wireless system
2	AA	Account Aggregator
3	AFC	Access Facilitation Charges
4	AGR	Adjusted Gross Revenue
5	AI	Artificial intelligence
6	AICPA SOC	American Institute of Certified Public Accountants, System and Organization Controls
7	AICTE	All India Council for Technical Education
8	ANSI	American National Standards Institute
9	APAC	Asia-Pacific
10	API	Application Programming Interface
11	APNIC	Asia Pacific Network Information Centre
12	AS	Autonomous Systems
13	ASN	Autonomous System Numbers
14	BBNL	Bharat Broadband Network Limited
15	BEE	Bureau of Energy Efficiency
16	BEREC	Body of European Regulators for Electronic Communications
17	BGP	Border Gateway Protocol
18	BIS	Bureau of Indian Standards
19	BMS	Building Management System
20	BSNL	Bharat Sanchar Nigam Limited
21	C3S	Common Criteria Certification Scheme
22	CAGR	Compound Annual Growth Rate
23	CapEx	Capital expenditure
24	CAPs	Content Application Providers
25	CCP	Combined Power and Cooling
26	CDN	Content Delivery Networks
27	CDPDA	Common Ducts and Posts Development Agency
28	C-DOT	Centre for Development of Telematics
29	CFD	Contract for Difference
30	CHP	Combined Heat and Power
31	C&I	Commercial and Industrial
32	CII	Confederation of Indian Industry
33	CLS	Cable Landing Station
34	CNC	Carrier Neutral Colocation
35	CNPN	Captive Non-Public Network

36	CP	Consultation Paper
37	CPCB	Central Pollution Control Board
38	CPMS	Critical Power Management System
39	CPSU	Central Public Sector Undertaking
40	CPUs	Central Power Supply Undertakings
41	CSR	Corporate Social Responsibility Data Portal
42	CST	Central Sales Tax
43	CUG	Closed User Group
44	DC	Data Centre
45	DCC	Digital Communication Commission
46	DCEZ	Data Centre Economic Zones
47	DCFU	Data Centre Facilitation Unit
48	DCP	Data Center Park
49	DCIC	Data Centre Industry Council
50	DCIMS	Data Centre Infrastructure Management System
51	DCIS	Data Centre Incentivization Scheme
52	DCRI	Data Center Readiness Index
53	DDMC	Data Digitization and Monetization Council
54	DDoS	Distributed Denial of Service attack
55	DEPA	Data Empowerment and Protection Architecture
56	DG	Diesel Generators
57	DIP	Digitize India Platform
58	DISCOM	Distribution Company
59	DLC	Domestic Leased Circuits
60	DNS	Domain Name System
61	DOBO	Dig-Once Build-Once
62	DoT	Department of Telecommunications
63	DPA	Data Protection Authority
64	DPB	Data Protection Bill
65	DR	Disaster Recovery
66	DPIIT	Department for promotion of Industry and Internal Trade
67	ECBC	Energy Conservation Building Code
68	EHV	Extra High Voltage
69	eMBB	Enhanced Mobile Broadband
70	EoDB	Ease of Doing Business
71	EPMS	Electrical Power Management System
72	ESMA	Essential Services Maintenance Act
73	EU	European Union
74	FCC	Federal Communications Commission
75	FDCP	Floating Data Centre Park

76	FDI	Foreign direct investment
77	FSDC	Financial Stability and Development Council
78	FSI	Floor Space Index
79	G2C	Government-to-Citizen
80	GDPR	General Data Protection Regulation
81	GIS	Geographic Information System
82	GMPCS	Global Mobile Personal Communication by Satellite
83	GoI	Government of India
84	GRIHA	Green Rating for Integrated Habitat Assessment
85	GSR	Global Status Report
86	GST	Goods and Services Tax
87	GSTN	Goods and Services Tax Network
88	HIPAA	Health Insurance Portability and Accountability Act
89	HT	High Tension
90	HVAC	High-Voltage Alternating Current
91	IANA	Internet Assigned Numbers Authority
92	ICP	Internet Content Provider
93	ICT	Information and Communication Technology
94	IDCA	International Data Centre Authority
95	IEC	International Electronic Commission
96	IEM	Industrial Entrepreneurs Memorandum
97	IGBC	Indian Green Building Council
98	IIB	International Internet bandwidth
99	ILD	International Long-Distance
100	ILDO	International Long-Distance Operator
101	ILL	Internet leased line
102	IMEC	Inter-Ministerial Empowered Committee
103	IMT	International Mobile Telecommunications
104	INR	Indian rupee
105	IoT	Internet of Things
106	IP	Internet Protocol
107	IP-I	Infrastructure Provider Category-I
108	IPR	Intellectual Property Rights
109	IPv4	Internet Protocol Version 4
110	IPv6	Internet Protocol Version 6
111	IRDA	Insurance Regulatory and Development Authority
112	IRINN	Indian Registry for Internet Names and Numbers
113	ISO	International Standards Organization
114	ISP	Internet Service Provider
115	IT	Information Technology

116	ITES	Information Technology Enabled Services
117	ITU	International Telecommunication Union
118	IX	Internet Exchange
119	IXP	Internet Exchange Point
120	KDCC	Korea Data Centre Council
121	kW	Kilowatts
122	KYC	Know Your Customer
123	LAN	Local Area Network
124	LBT	Local Body Tax
125	LCCC	Low Carbon Contracts Company
126	LEED	Leadership in Energy and Environmental Design
127	LIM	Lawful Intercept and Monitoring
128	LL	Leased Line
129	LNG	Liquefied Natural Gas
130	M2M	Machine-to-machine
131	MeitY	Ministry of Electronics and Information Technology
132	MIIT	Ministry of Industry and Information Technology
133	MIS	Management Information System
134	ML	Machine Learning
135	mMTC	Massive Machine Type Communications
136	MNO	Mobile Network Operators
137	MNRE	Ministry of New and Renewable Energy
138	MoU	Memorandum of Understanding
139	MSDE	Ministry of Skill Development and Entrepreneurship
140	MSME	Micro, Small & Medium Enterprises
141	MTNL	Mahanagar Telephone Nigam Limited
142	MW	Megawatts
143	MWh	Megawatt-hour
144	NAPCC	National Action Plan on Climate Change
145	NBC	National Building Code
146	NBFC	Non-Banking Financial Company
147	NCR	National Capital Region
148	NCSC	National Cyber Security Coordinator
149	NDCP	National Digital Communications Policy
150	NDP	National Data Platform
151	NDRC	National Development and Reform Commission
152	NeGP	National e-Governance Plan
153	NFV	Network functions virtualization
154	NIA	Notice Inviting Applications
155	NIR	National Internet Registry

156	NITI	National Institution for Transforming India
157	NMEEE	National Mission for Enhanced Energy Efficiency
158	NIXI	National Internet Exchange of India
159	NLD	National Long Distance
160	NOC	No Objection Certificate
161	NSCT	National Security Committee on Telecom
162	NSDC	National Skill Development Corporation
163	NSDTS	National Security Directive on Telecommunication Sector
164	NSWS	National Single Window System
165	OA	Open Access
166	OCLS	Owner of Cable Landing Station
167	OECD	Organisation for Economic Co-operation and Development
168	OEM	Original equipment manufacturer
169	OFC	Optical Fibre Cable
170	OGD	Open Government Data
171	OHD	Open House Discussion
172	OHSAS	Occupational Health and Safety Assessment Series
173	OpEx	Operating expenditure
174	OSP	Other Service Provider
175	OTT	Over-the-top
176	P2P	Peer-to-Peer
177	PAT	Perform, Achieve & Trade
178	PCI DSS	Payment Card Industry Data Security Standard
179	PRFDA	Pension Fund Regulatory and Development Authority
180	PLI	Production Linked Incentive Scheme
181	PLMN	Public Land Mobile Network
182	PMKVY	Pradhan Mantri Kaushal Vikas Yojana
183	PM-WANI	Prime Minister Wi-Fi Access Network Interface
184	PoP	Point of Presence
185	PPA	Power Purchase Agreement
186	PPP	Public-Private Partnership
187	PPP-PMI	Public Procurement (Preferential to Make in India)
189	PSTN	Public Switched Telephone Network
190	PUE	Power Usage Effectiveness
191	QoS	Quality of service
192	R&D	Research and Development
193	RBI	Reserve Bank of India
194	REC	Renewable Energy Certificate
195	RFP	Requests for Proposal
196	RIR	Regional Internet Registries

197	ROI	Return on investment
198	RoW	Right of Way
199	RPA	Robotic Process Automation
200	SEBI	Securities and Exchange Board of India
201	SERC	State Electricity Regulatory Commission
202	SEZ	Special Economic Zones
203	SGST	State Goods and Services Tax
204	SHP	Small Hydro Plants
205	SME	Small and Medium Enterprise
206	SPCB	State Pollution Control Board
207	STQC	Standardization Testing and Quality Certification
208	TEC	Telecommunication Engineering Centre
209	TIA	Telecommunications Industry Association
210	TOD	Time of Day slots
211	TRAI	Telecom Regulatory Authority of India
212	TSP	Telecommunications service provider
213	TSSC	Telecom Sector Skill Council
214	TWh	Terawatt-hour
215	UIDAI	Unique Identification Authority of India
216	UL	Unified License
217	UL-AS	Unified License for Access Service
218	UL-ISP	Unified License for Internet Service
219	UPI	Unified Payments Interface
220	URL	Uniform Resource Locator
221	URLLC	Ultra-Reliable Low Latency Communications
222	USD	United States Dollar
223	VAS	Value-added services
224	VAT	Value-added tax
225	vCDN	Virtual Content Delivery Network
226	VGF	Viability Gap Funding
227	VNO	Virtual Network Operator
228	VoD	Video-on-demand
229	VPPAs	Virtual Power Purchase Agreements
230	WAN	Wide Area Network