



Telecom Regulatory Authority of India



Recommendations

on

Implementation Strategy for BharatNet

01.02.2016

Mahanagar Doorsanchar Bhawan, JawaharLal Nehru Marg
New Delhi-110002

CONTENTS

CHAPTER I: INTRODUCTION.....	1
CHAPTER II: NEED FOR PRIVATE SECTOR INVOLVEMENT.....	12
CHAPTER III: BHARATNET IMPLEMENTATION	31
CHAPTER IV: SUMMARY OF RECOMMENDATIONS.....	59

CHAPTER-I

Introduction

A. Background

- 1.0 As India gears up to reap the benefits of rapid technological change and digitization, there is renewed and urgent focus on universal Internet provision. The expansion of Internet access has the potential to revolutionize lives by substantially reducing the cost of accessing information, enhancing productivity and reducing transaction costs. A recent study by ICRIER¹ shows that a 10% increase in growth of Internet subscribers leads to an increase of as much as 1.08% in the rate of growth of GDP. Recognizing the significant value generation and spillover effects associated with Internet access, the Government of India, in its flagship initiative "Digital India", explicitly targets universal broadband access in both rural and urban areas.
- 1.1 The telecommunications sector in India has been one of the most progressive sectors in terms of both regulatory framework as well as outcomes. Riding on increasing mobile penetration, declining prices, increasing competition, and the evolution of wireless technologies, telecom has surged ahead of other infrastructure heavy sectors (like electricity and roads). This success can be attributed to a large addressable market coupled with substantial private sector participation, technological innovations and an enabling institutional and regulatory environment. However, despite vast potential, Internet provision (and especially broadband) has not fully lived up to expectations.

¹ ICRIER, "*India: Impact of the Internet*", 2012; A similar analysis done by ICRIER using more recent data indicates that a 10% increase in growth of Internet subscribers can lead to an increase of 2.6% in the rate of growth of GDP.

- 1.2 The National Telecom Policy of 2012 (NTP 2012) envisaged broadband on demand by 2015, and 175 million broadband subscribers by 2017 with a minimum speed of 2 Mbps and up to 100 Mbps on demand. As of September 2015, the total number of broadband (defined as download speeds ≥ 512 Kbps) subscribers stood at 120.88 million (largely concentrated in Andhra Pradesh, Delhi, Karnataka, Kerala, Maharashtra and Tamil Nadu), with only 27.20 million rural subscribers. This "internet divide" between rural and urban India has become more relevant as the scope of activities carried out on the Internet has expanded beyond what was previously imagined.
- 1.3 The Internet is commonly thought of as a "general purpose technology" or GPT- "*a single generic technology, recognizable as such over its whole lifetime that initially has much scope for improvement and eventually comes to be widely used, to have many uses, and to have many spillover effects*".² It acts as an input across different sectors of the economy and leads to several intricate complementarities. Associated with these complementarities are extensive spillover benefits which manifest in productivity gains, knowledge creation and virtuous cycles of innovation. Evidence of the resultant value creation has been widespread, in both developing and developed economies. The range of uses of the Internet is diverse and its impact ubiquitous.
- 1.4 Another characteristic externality of the Internet is "network effects" - its value increases as more people are connected. This happens in two ways. First, consumers get direct benefits from connecting with each other on the Internet (by accessing messaging services, email, social media). Second, more content and services are provided over the Internet as an increasing number of users create larger market opportunities. Both these characteristics enhance the total value of the network.

² Lipsey, R., Carlaw, K., and Bekar, C. Economic Transformations: General Purpose Technologies and Long-term Economic Growth (2005)

- 1.5 The benefits of broadband have been noted and are profound. As stated by the Broadband Commission, “[...] *in opening up young minds to new horizons through educational technologies; in empowering women to expand their opportunities through genuine choices; in improving awareness of hygiene and healthcare; and in helping family breadwinners find work, a better salary or return on their goods. Through broadband, the provision of public services is transformed to make them global public goods for the global good. Greater access to the Internet and broadband applications and services help accelerate achievement of internationally-agreed development goals, including the Millennium Development Goals (MDGs).*”³
- 1.6 Rural broadband access can be the force that drives integration of the unconnected and the underserved in economy, thereby helping to enhance the overall value of the network. Greater broadband access has the power to augment productivity of the agricultural sector as well as small enterprises, facilitate easier and more efficient participation of the rural population in governance, generate new employment opportunities, and enable a host of services like e-commerce, e-learning, e-banking etc. As an increasing number of Government services are also being electronically delivered, expanding rural Internet access has become a matter of urgency and is essential in fulfilling the vision of Digital India. Moreover, rural broadband access will help address multiple service deficits that arise due to other infrastructure related constraints widespread among the rural population. The potential gains from increasing such access are tremendous – the Report of the Committee on NOFN in its projections of the economic benefit from BharatNet estimated that an additional 2.5 crore Internet users by 2018-19 would result in economic benefits of Rs. 66,465 crore due to the direct, indirect and spillover benefits of Internet access. It follows that the slow rate of growth in Internet penetration has had

³ “The Broadband Challenge”, Broadband Commission for Digital Development, ITU & UNESCO, 2011

significant opportunity costs in terms of potential benefits foregone. The urgency of increasing the speed of deployment cannot be overemphasized.

B. Market & Government Failure in Rural Broadband

- 1.7 Left to itself however, the private market finds it unattractive to invest in rural broadband infrastructure - a condition that economists describe as 'market failure'. Ubiquitous broadband access is associated with extensive positive externalities and spillover benefits. However, that is not factored by private actors in their decision making due to absence of direct financial benefits, leading to underinvestment in its provision. Therefore, these significant positive externalities are a critical underlying reason for Government intervention to support roll out. The form and manner of that intervention however needs careful and considered examination, especially in the light of past performance in this regard.
- 1.8 In most countries, reaching ubiquitous or near-ubiquitous coverage of high-speed broadband is likely to require public funding, as the high costs of rolling out broadband infrastructure reduce the economic viability of high-speed broadband in areas of low population density.
- 1.9 Broadband is best viewed as an ecosystem of several interdependent components that function efficiently together and sub-optimally in isolation. Policies to promote digital literacy, development of locally relevant content and applications, and creating threshold demand remain critical to ecosystem design. When these components are in place, availability of broadband is likely to be much more effective, akin to a force multiplier. Thinking of broadband as an ecosystem also helps define the likely roles that different actors (including the Central as well as the State Governments) will need to play to exploit the interdependencies among the components of the broadband ecosystem.

Accordingly, the policy and engagement canvas is wider for the Government and deployment of broadband is one critical (but not only) objective. As noted by the Authority in its recommendations dated 17th April 2015, the idea that ‘production is the source of demand’ i.e. that supply creates its own demand may not be applicable to broadband services. The benefits of technological progress (which are not limited to production efficiency but can extend to revolutionary and disruptive innovations that can radically alter markets and create entirely new ones) require embedding through the involvement of stakeholders across the demand and supply sides.

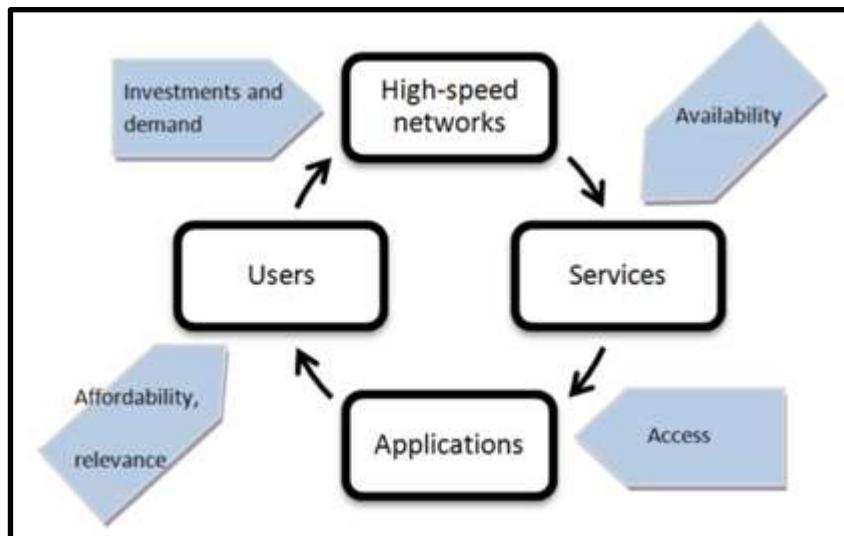


Figure 1: The Broadband Ecosystem

- 1.10 Conventional wisdom suggests that in the event of underinvestment by the private market in public goods with strong positive externalities (such as rural broadband), the Government step in to fill this gap. In this case, Government responsibility for provision of infrastructure is synonymous with ownership. Since economic liberalisation in the 1990s, there has been a rethink on the State-led model of infrastructure deployment in India. The reasons for this are several and apply in varying degrees to varying circumstances. In general these include quality of service, misalignment of incentives, speed of implementation and fiscal constraints.

- 1.11 While the Government may be vested with the responsibility to provide goods and services that are socially desirable, its ability to deliver has to contend with several issues. These include poor information regarding the scope of demand for the good or service in question, lack of marketing skills, and misalignment of incentives. Public funding dulls the incentive to respond to customers, while Government mandates to provide services may simply be infeasible if they are not accompanied by sufficient financial, technological and human resources to deliver these outcomes.
- 1.12 Public institutions also often face a different set of constraints that inhibit the achievement of service delivery goals. For example, if the decision making framework disproportionately incentivizes caution and accountability by punishing even honest mistakes and at the same time neglecting to reward speedy decision making, it could result in inordinate delays. The chances of cost and time overruns are palpable in such cases.
- 1.13 It is generally accepted that the private sector's technical capacity and ability to efficiently deliver is superior. As a result, Governments often seek to leverage the private sector's capacity to deliver socially desirable goods/services when it is possible to do so. However, there are risks with private provision that must be guarded against as well. In addition to the previously mentioned tendency to underinvest, the private sector's profit motive might not align with the larger social objectives of the State. Profit-driven private operators may establish monopolies to maximize profits, only provide services at extremely high prices to well-off customers capable of bearing them, or restrict themselves to areas where the costs of provision are low - all of which could undermine the national goal of universal access.
- 1.14 The discussion on the apparent dichotomy between the role of the State and the role of the market is more than two centuries old. While there is no blueprint on how to combine public and private sector strengths

in infrastructure provision, some broad principles for motivating infrastructure provision are well known. It is now widely recognised that some (if not all) infrastructure operations can be undertaken by the private sector in some form to motivate public performance as well as supplement gaps in public provision. But it is worth reiterating that both public and private sectors have important roles to play.

C. The Role of Public-Private-Partnerships

- 1.15 Given the problems associated with both purely market-based as well as purely governmental methods of delivery for goods and/or services with social benefits, organizational innovations have led to a reclassification of the Government and private sector's relative roles. A fairly new model of regulatory governance that seeks to combine the respective strengths of public and private sectors is the so-called "Public-Private-Partnership" (PPP) model. PPPs seek to combine the private sector's capacity for delivery with the Government's role as an enabler and regulator to overcome market failures.
- 1.16 PPPs are contractual arrangements between the Government and private players to facilitate the delivery of goods and services that are traditionally provided by the Government or are insufficiently supplied by the market. The provision of a good or service can be roughly divided into four tasks⁴ -
 - a) defining and designing the project,
 - b) financing the capital costs of the project,
 - c) building the physical assets required, and
 - d) operating and maintaining the asset in order to deliver the good/service.

⁴ Bettignies, J., Ross, T. 2004. "*The Economics of Public-Private Partnerships*", Canadian Public Policy-Analyse de Politiques, Vol. XXX, No. 2.

- 1.17 Under the PPP arrangement, any combination of these may be allocated to the private sector (while ownership of the asset may remain with the Government, which also provides regulatory oversight). PPPs generally seek to align incentives and allocate risks based on the parties' ability to manage them and private players equipped with superior technical expertise and experience are often better equipped to absorb many of the risks associated with infrastructure deployment, using efficient and high-quality technologies to reduce maintenance costs over the lifetime of the project. Increasing the private party's role across financing, operations and management also ensures its interest in timely completion and quality while reducing the Government's coordination burden.
- 1.18 PPPs must be viewed as not just an instrument for easing finance and capacity constraints, but as an effective tool towards ensuring competition in service delivery and improvement in quality of service. While access to finance is one commonly cited rationale, it has been noted elsewhere that this is one of the “weaker reasons to enter into such arrangements for project or service delivery.”⁵ Ensuring the wider financial sustainability of such projects and value-for-money to the public purse is thus essential. It is vital to thus enable competition and due diligence as well as bring in the necessary capacity to manage complicated financial structures and monitoring requirements (including appropriate commercial and professional skills to realize the benefits of PPP contracts).⁶
- 1.19 PPPs can be attractive to Governments as an off-budget mechanism for infrastructure development as in addition they⁷ -

⁵ National Transport Development Policy Committee, *India Transport Report* (2014), “Regulatory Issues: An Overall Approach”, p. 247

⁶ “Financing Sustainable Public-Private Partnerships”, International Institute for Sustainable Development, 2013

⁷ Shukla, N. et al, “Built-Own-Lease-Transfer (BOLT): A Public Private Partnership Model that Bridges Gap of Infrastructure in Urban Areas”, International Journal of Civil Engineering Research, Volume 5, Number 2 (2014), pp. 135-144

- *Can enhance the supply of much-needed infrastructure services.*
 - *Reduce the need for immediate cash spending.*
 - *Reduce the burden of costs of design and construction.*
 - *Allow the private sector party to assume substantial financial, technical and operational risks.*
 - *Enable better project design, choice of technology, construction, operation and service delivery.*
- 1.20 Owing to these advantages, PPP has been widely used to build roads, hospitals, airports, and provide other utilities in countries across the world. PPP is also a popular feature in broadband plans across countries (*see Figure 2: Some Selected Examples of National Broadband Plans*). In the current context, as rural broadband provision is prone to market failures as well as Government failures (as evident by the lags in the implementation of NOFN), employing a PPP based model to expand broadband coverage is the only other viable option. However, PPP models are not devoid of risks and adequate care must be taken to address these. In India, unsuccessful PPPs have suffered from weak feasibility studies, over aggressive bidding, lengthy conflict resolution mechanisms, ambiguous risk allocation, and ambiguous tariff adjustment guidelines.⁸
- 1.21 Nevertheless, evaluations of the outcomes and impacts of PPP transport projects in the last 20 years have shown that “on the average such projects have brought significant benefits, in themselves and when compared with the public works alternative, though variance has been high.”⁹ The primary benefits recorded have been the acceleration of infrastructure deployment, short term release of fiscal pressure, and better value for money. For the success of PPP in infrastructure

⁸ National Transport Development Policy Committee, *India Transport Report* (2014), “Regulatory Issues: An Overall Approach”, p. 248

⁹ *Ibid*, p. 247

deployment, it is thus imperative to bear these risks in mind while examining the capacity and management expertise of private players in order to design optimal frameworks that provide adequate safeguards to encourage private participation.

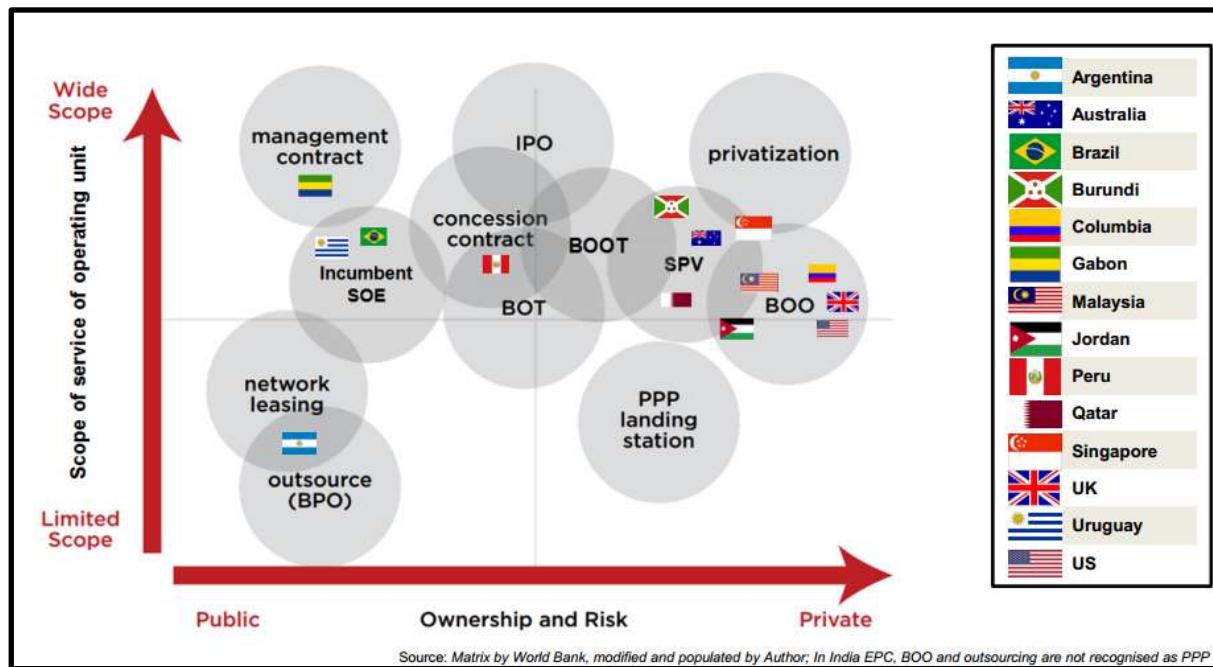


Figure 2: Some Selected Examples of National Broadband Plans

D. Public-Private-Partnerships in India

1.22 Considering that infrastructure development require huge upfront investments, the Government has embarked on a policy of promoting Public Private Partnership (PPP) as a means of augmenting investment in infrastructure. Besides supplementing public resources, PPPs provide an opportunity to exploit the private sector efficiencies in project implementation. While measures have been taken since the mid-1990s to induct private participation in different infrastructure sectors, the PPPs gained momentum during the Tenth and Eleventh Plan periods when initiatives taken included -

- Setting up a robust institutional structure for appraising and approving PPP projects;*

- b) *Increasing the availability of finance by creating dedicated institutions and providing viability gap funding; and*
- c) *Developing standardised documents such as model concession agreement across infrastructure sectors.*¹⁰

1.23 Chapter II of this report discusses the issues with the models suggested by NOFN review Committee and need for private sector involvement. Chapter III covers implementation aspects related to BharatNet. Chapter IV contains the summary of recommendations.

¹⁰ Twelfth Five-Year Plan, 2012–2017. Volume I. p. 84

CHAPTER-II

Need for Private Sector Involvement

A. Introduction

- 2.0 It has been observed that Governments (“Governments” is used for the remainder of this document as referring to both the Central as well as the State Governments) in many developing countries face the challenge of meeting growing demand for infrastructure services. At the same time, available funding from traditional sources as well as the public sector’s capacity for implementing many projects simultaneously are both limited. Partnership with the private sector is thus one attractive alternative to further an increase to improve the supply of infrastructure services.¹¹
- 2.1 As elaborated earlier, digital access and Internet penetration in particular can realize several benefits in terms of economic growth, enhanced access to markets and improved outcomes in education, healthcare and governance. At present, the scope for alternative means of rural Internet access (such as satellite connectivity) remain limited due to a combination of unaffordability as well as regulatory bottlenecks (e.g. India lacks an “Open Sky” policy). Optical fibre is thus crucial for augmenting backhaul infrastructure as well as for supporting wireless Internet connectivity.
- 2.2 The Government’s National Optical Fibre Network (NOFN) plan was conceived when India’s low broadband penetration (0.74% at the time) and high tele-density afforded an untapped growth opportunity through broadband deployment. The estimated cost for connecting the 2,50,000 Gram Panchayats using the fibre was Rs.13,288 crores (including

¹¹ Amponsah, R., Gatete, B., “*Private Sector Involvement In Infrastructure Development Projects Through Public-Private Partnerships: A Case Study Of Road Infrastructure In Ghana*”, PM World Journal, Vol. III, Issue IV, April 2014

development of new fibre links, GPON and customer premises equipment to be maintained for three years) with a deployment timeline of 24-30 months¹².

- 2.3 The NOFN project was formally approved by the Union Cabinet in December 2011 with the vision of increasing affordable and high-quality access to a number of digital services (including Internet access, cable television and e-governance services). The project aimed at connecting 2,50,000 Gram Panchayats (GPs) by laying 6,00,000 km of incremental optical fibre in three phases: Phase 1 sought to connect 1,00,000 GPs and was to be completed by March 2015, while Phases 2 (1,00,000 GPs) and 3 (an additional 50,000 GPs) were to be completed by March 2016 and March 2017 respectively. The initial design for the NOFN consisted of a uniform 24-core fibre that was projected to deliver speeds of 100 Mbps for all GPs in India. These estimates have been subsequently revised to account for varied estimations for bandwidth demand at various GPs. An exponential increase in bandwidth demand is expected in the future, and certain components of the network necessitate significantly high costs for replacement or upgradation, such as the trenches, ducts and optical fibre in the ground. As a result, plans for these components incorporated high targets to ensure that the installed infrastructure could serve in the long term. At the same time components such as electronics and transmission equipment that were considered more dynamic allowed for the possibility of upgradation as and when necessary. The project was to be funded from the Universal Service Obligation Fund (USOF).
- 2.4 The NOFN design considered that centralized allocation of responsibility would facilitate the coordination of activities of several entities at various levels of network architecture and stages of project execution. The Central Government created a special purpose vehicle (SPV), Bharat Broadband Network Limited (BBNL), to act as the executing agency

¹² White Paper on Broadband to Panchayats, August 2010

responsible for overseeing the project, determining reference prices for each activity, and procuring optical fibre. A Project Implementation Team consisting of incumbent CPSUs was instated to undertake preparatory activities related to deployment including granular aspects of network design and drafting the bid package. BSNL, RailTel and PGCIL were responsible for trenching and ducting as well as laying the fibre. Additionally, NIC and C-DOT were to facilitate features such as GIS mapping. It was expected under the plan that private participation and interest would increase significantly after the initial work of laying physical infrastructure had been done and CPSUs were intended to then be limited in their role to maintenance services and provision of wholesale bandwidth (under an NLDO license) in a non-discriminatory manner to private and public operators for last mile operations and service delivery.

- 2.5 Quarterly progress from January 2015 and February 2015 indicated that NOFN had been falling short of its targets, though the pace of deployment has increased over time. According to BBNL, the tenders for activities of trenching, ducting and laying fibre have been signed for over 50,000 GPs, but only 3,384 GPs had been connected as of November 2015.
- 2.6 The Broadband Commission for Digital Development (launched by the International Telecommunication Union (ITU) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) in response to UN Secretary-General Ban Ki-Moon's call to step up efforts to meet the Millennium Development Goals has been publishing various reports with detailed statistics on various aspects of the broadband ecosystem.¹³ A comparison of India's rankings on various parameters for the last 2 years is shown below -

¹³ "The State of Broadband 2015", The Broadband Commission for Digital Development, ITU & UNESCO, 2015

Table 1: Ranking of India on Various Parameters as per State of Broadband Report

	2014 Ranking (Details)	2015 Ranking (Details)
Fixed Broadband Subscription	125 (1.2 subscriptions per 100)	131 (1.2 subscriptions per 100)
Mobile Broadband Subscription	113 (3.2 subscriptions per 100)	155 (5.5 subscriptions per 100)
Percentage of Households with Internet, Developing Countries	75 (13.0 %)	80 (15.3 %)
Percentage of individuals using the Internet	142 (15.1 %)	136 (18 %)

Table 2: Ranking of India on Various Parameters as per Measuring the Information Society Report

	2014 Ranking (Details)	2015 Ranking (Details)
ICT Development Index	129 (IDI Value of 2.53) (IDI Value World Average 4.77)	131 (IDI Value of 2.69) (IDI Value World Average 5.03)
Access Sub Index	132	135
Use Sub Index	133	135
Skill Sub Index	121	120

2.7 It can be safely concluded that the NOFN has failed in achieving its original objectives. Focusing on the design of the finance and investment model for future roll-out of broadband is critical. With the objective of reducing the opportunity cost of poor Internet penetration and catalyzing the benefits of Internet access across the country, the Authority released a consultation paper on 24th September 2014 that

inter alia sought suggestions on successfully implementing the NOFN. Entitled “Delivering Broadband Quickly: What do we need to do?”, the issues on which comments were sought included whether PSUs were ideally suited to implementing the NOFN, the possibility of using Engineering, Procurement and Construction (EPC, also known as “turnkey”) contracts as a means of infrastructural deployment, and methods to reduce the costs of deployment (including incorporating existing private access networks).

- 2.8 Following the consultation process, the Authority issued its recommendations on 17th April 2015. Specific recommendations included an institutional overhaul that did away with the multi-layered decision making structure of the NOFN, setting delivery dates for clearly defined milestones to enable rapid course correction, reassessing bandwidth equipment in relation to GP population, overhauling BBNL with professional management (with the Delhi Metro Rail Corporation as a guiding example), reassessing the optical fibre specifications, and checking for areas where the unusable condition of pre-existing OFC rendered incremental deployment futile. The Authority stressed on the need to involve the State Governments and private sector stakeholders by way of “Centre-State-Public-Private-Partnership” and recommended that EPC (turnkey) contracts be awarded by BBNL to private parties with requirements for interconnection and infrastructure sharing.
- 2.9 DoT, realizing the slow pace of implementation and marred by day to day issues, vide its notification dated January 14, 2015 constituted a Committee to review the strategy and approach towards speedy implementation of National Optical Fibre Network (“the Committee”), which submitted its Report on 31 March, 2015. The Committee identified accountability fears and misaligned incentives for the implementation agency as major issues responsible for massive delays in project delivery.

- 2.10 Many of the implementation problems identified by the Committee are reflective of the discussion in Chapter I on factors that can result in coordination failure between different decision making layers in public sector. An illustrative example of the conflicts in this implementation framework highlighted by the Committee relates to issues of pricing and cost. Under the NOFN plan, Central Public Sector Undertakings (CPSUs) were given the responsibility of trenching, PLB ducting and laying the fibre, however they possessed limited autonomy to make decisions in matters of price discovery. With the primary objective of controlling costs and minimising unnecessary expenditure, BBNL established reference prices for each activity to be undertaken by the CPSU. As a result however, any time the price discovered by the CPSU for contracting exceeded this reference price by over 10%, the CPSU was required to obtain additional approvals from BBNL. Such constant back and forth mired the project in time overruns while also triggering institutional friction between BBNL and the CPSUs (eventually necessitating the involvement of the Telecom Commission in 2013 to affect a resolution). Thus, within the allocation of responsibilities in the NOFN plan, attempts by BBNL to control costs inadvertently had the effect of creating time and cost overruns. The Committee also noted that in the absence of autonomy to make financial decisions, the CPSUs lacked ownership of the project. This was furthered by the fact that accountability rested primarily with BBNL. Moreover, such disputes revealed the underlying need for accountability structures between the executing agencies, a limitation that disrupted BBNL's ability to enforce prescribed timelines for the project.
- 2.11 A misalignment of incentive structures with the executing agencies also proved costly. The design of the NOFN programme assumed that the final leg of last mile access and service provision to end-users would be covered by the private sector. However, this resulted in the executing agencies lacking inherent incentives to ensure that the network be built

to high quality standards. Even though long-term maintenance was a part of the engagement, periodic checks were still necessary to ensure quality and required granular coordination amongst several local bodies, which proved extremely onerous for the centralized BBNL and stretched its capacity. The Committee's report also identified a lack of long term planning in other network elements (such as service provisioning, bandwidth utilization, operations and maintenance, and allocation of responsibilities for individual project components), which it attributed to BBNL's shortage of a large professional staff with specific management proficiency. The Committee identified the need to impart flexibility and autonomy to BBNL and the need to enhance its human resource base as the single most important factor for the success of BharatNet.

- 2.12 Even in areas where the infrastructure was deployed, executing agencies were unable to successfully market the networks to private companies that could provide connectivity and service delivery at the user level. Due to the lack of private participation, pilot projects were initiated in Vishakhapatnam, North Tripura and Ajmer where the three CPSUs (PGCIL, RailTel and BSNL respectively) were tasked with providing connectivity through the established infrastructure in a ratio of 15:15:70. However, PGCIL and RailTel lacked the flexibility and efficiency to act as feasible operators, thus requiring BSNL to undertake a large-scale connectivity initiative that proved beyond its operational capacity.

B. Expanding the NOFN Programme: “BharatNet”

- 2.13 As part of its core recommendations, the Committee recommended increasing the scope of the NOFN programme and migrating it to becoming “BharatNet”, in line with the centrality of citizen-level Internet access to the Government’s Digital India initiative –

“BharatNet shall be a project of national importance to establish, by 2017, a highly scalable network infrastructure accessible on a non-discriminatory basis, to provide on demand, affordable broadband connectivity of 2 Mbps to 20 Mbps for all households and on demand capacity to all institutions, to realise the vision of Digital India, in partnership with States and the private sector.”

- 2.14 The Committee estimated that this increase in scope and scale would raise the total cost of the project under the BharatNet from the previous estimate to Rs. 72,778 crores (with the potential to reduce this cost by Rs. 6,900 crores if existing BSNL infrastructure is utilized), and increase penetration by 1.9% of the estimated population in 2018-19. Given this increase in cost as well as scope, the need to involve the private sector as well as obtain additional sources of financing became imperative. The Committee in its report identified three models for deployment - the appropriateness of each model for the implementation area was determined on the basis of private sector price quotes, underlying security context, nature of terrain etc. The three models so outlined are (i) the CPSU-led model, (ii) the State Government-led model, and (iii) the Private sector-led (EPC/Consortia) model.

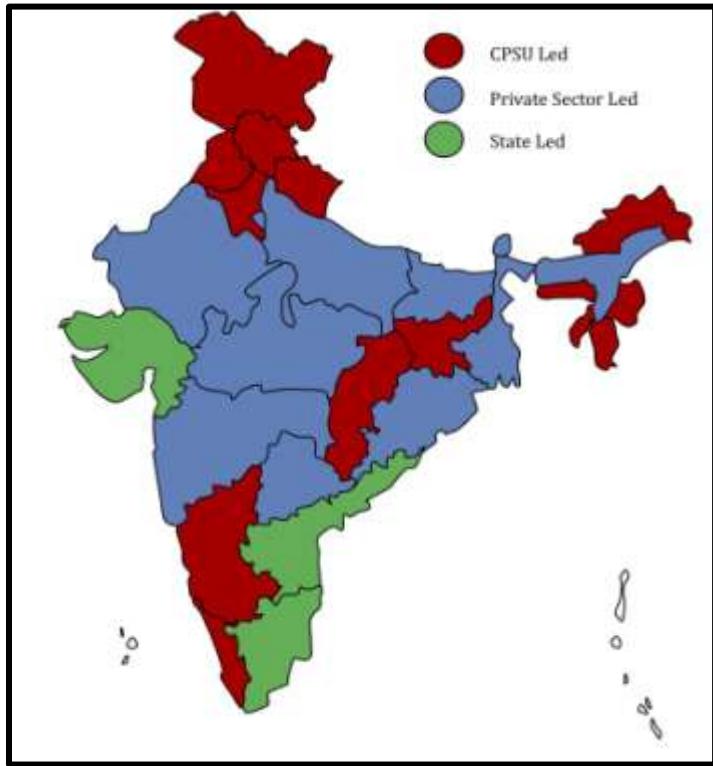


Figure 3: Areas categorised by Implementation Model (DoT Committee Report on NOFN)

C. The CPSU-led Model

- 2.15 In the CPSU model, monitoring operations would be carried out through a centralized Network Operation Centre (NOC) facility under the Central SPV (BBNL). Incumbent CPSUs (BSNL, Railtel, PGCIL) will carry out competitive bids for dynamic price discovery across project components.
- 2.16 The CPSU model has been recommended for specific regions only, depending upon the viability of private and State-led models. In specific, this includes areas that face political or social instability (Chhattisgarh, Jharkhand, Jammu & Kashmir, Nagaland, Manipur) and areas characterized by challenging topographical terrain, necessitating alternative means of deployment (such as laying of aerial optical fibre). Additionally, CPSUs could lead in certain areas where they have already completed a significant portion of Phase 1 (Kerala, Karnataka, Haryana)

and Punjab). The CPSUs were identified as having the advantage of being able to accommodate the risks in areas where deviations from the buried optical fibre prototype (in the form of aerial optical fibre or other techniques) could be required. Incentives are to be incorporated into the project structure, while performance indicators could further instil a sense of ownership in key public officials (particularly the CMD, director-in-charge and the project head in-charge). The challenges identified include insufficiently robust accountability mechanisms, and limited capacity to enforce incentive structures by the agencies.

D. The State-led Model

- 2.17 The second deployment model envisions State Governments designing, customizing, implementing, commissioning, managing and operating the network. State Governments shall create or assign a State Special Purpose Vehicle that owns the network. State Governments are considered the principal carriers of Government services and so incentivizing States to contribute and lead sections of the project was identified as essential. The complex realities and challenges of each State were also seen as demanding a decentralized system of project implementation.
- 2.18 Leveraging the State governance systems could allow for parallel implementation of the project along different regions. However, some State Governments may not possess the management and technical capacity required to successfully implement a project of such complexity.

E. Private Sector-led Model(EPC/Consortia)

- 2.19 Under this model, bids for a 'Build and Maintain' contract would be invited from a consortium. The bid-winner is to establish, operate and maintain the network, while the assets shall be owned by the Central

Government. The capital expenditure for each bid-package will be benchmarked to completion of certain milestones, with an incentive of revenue sharing if bandwidth utilisation exceeds a threshold.

- 2.20 For such a model, the bidding consortium design could include private players experienced in Engineering Procurement and Construction (EPC), network Original Equipment Manufacturers (OEM), system integrators, and managed services providers in order to attract a diverse group of serious bidders with sufficient professional capacity. This model also incorporates a single window clearance facility for the lead bidder in the consortium.
- 2.21 Such an approach was seen to potentially optimize network rollout by ensuring parallel execution across multiple regions through a number of implementation partners. Since the bid would be structured on a turnkey basis, the complexities of managing dependencies across different agencies are handled by the partner. This would enable BBNL to concentrate on other aspects such as project monitoring, ensuring deliverables and enforcing SLAs. Further, the bundling of Managed Services Portion (MSP) as part of the bid could overcome any resource deficit on part of BBNL.
- 2.22 The Committee recognizes that this would require enormous capacity building for BBNL to manage, monitor and enforce several activities and the high variations in inventory-supply across different regions simultaneously. The number of such contracts could easily exceed a few thousands. Another risk in this model is the uncertainty of the willingness of multiple companies to participate in the bids to ensure optimum competition in the process. As multiple private entities will be leveraged in this model, external variables such as risks in the provisioning of RoW will be an important factor to take into account.

F. Catalysing Additional Private Sector Involvement

- 2.23 It appears that the CPSU and State-led models outlined in the Committee Report share many of the same characteristics of the NOFN implementation model that have been previously outlined as increasing the risk of failure due to misaligned incentives. For example, monitoring implementation to ensure quality of work is an integral part of broadband strategy and can help ensure that targets, costs, benefits and outcomes of projects are measured to ensure efficient management. Under the suggestions of the Committee, this role has been assigned to BBNL/State SPVs (which may engage other State Government or third-party inspection and monitoring agencies to oversee implementation) adding to the bureaucratic layers that can hinder Government decision making. Such a “*thick*” governance model risks slowing down decision making and can lead to programme delay, cost over-run and damage to all parties.¹⁴ The adoption of a ‘*thin*’ oversight model that contractually assigns responsibility for managing delivery to ‘Delivery Integration Partners (DIPs)’ however requires the DIPs to take on significant risk on behalf of the State without sufficient leverage over the wider group of delivery partners. Moreover, in addition to the coordination concerns that emerge with the “state-as-middleman” approach, the number of private entities involved and probability of Service-Level-Agreement disputes, the processes for resolving which can add to the State’s burden.
- 2.24 While the committee’s suggested model for private participation i.e. the EPC model is a step in the right direction and may result in the private sector filling in the role of infrastructure deployment, the alignment of incentives continues to be mismatched. Under the EPC model, the private sector’s engagement is limited entirely to infrastructural

¹⁴ Deloitte National Broadband Plans – Realising the benefits through better governance - 2014

deployment, thus restricting its interest away from the long-term success of the BharatNet programme i.e. service delivery. With the private contractor having no long-term stake post-deployment and the weak monitoring capacity of the public monitoring agency (especially given the highly technical nature of the project and the sheer volume of work that must be monitored), there exist perverse incentives for private contractors to increase profit margins by reducing costs through the deployment of poor quality infrastructure and there exist no incentives for speedy implementation (since the executing agency's source of revenue is independent of how quickly the network is made operational).

- 2.25 Even where this problem is sought to be solved by enhancing the monitoring agency's capacity and including contractual safeguards that condition payments on clearly defined outcomes and/or provide for staggered payment over time contingent on the maintenance of infrastructure, the State may still suffer from its inability to efficiently and effectively market its services to end users and catalyse demand. As discussed previously, even where fibre has been successfully laid under the NOFN model, PSUs fared poorly when marketing their services to end users.
- 2.26 The various risks in the three models suggested by the NOFN committee can be summarised as below:

G. Analysis of risks in various models

- 2.27 The three models suggested by the NOFN Committee have varying degree of details relating to implementation. However, one common theme running through these models is that the selected agency(ies) are given the responsibility of building the network. Thereafter the network is maintained by the same agency(ies) for a period of 10 years. However, the bulk marketing of the network is proposed to be done by the BBNL

and/or the State SPV (hereinafter described as Contracting Agency). Though these models differ in their details, these can be jointly referred to as 'EPC' models. Broadly various implementation risks associated with the project can be separated in two distinct phases: construction phase and maintenance phase. During construction phase of the network, the risks are: (a) risk relating to timely completion of the project i.e. execution speed risk and (b) risk relating to quality of implementation. Similarly major risks in the post-construction/maintenance phase are: (a) marketing risk (b) technology up-gradation risk (c) contract management and related issues of dispute resolution and (d) risk of monopoly.

- 2.28 In this background, it is important to analyse the models recommended by the NOFN committee and compare the critical aspects, which will result in the success or failure in implementation. Such a comparative analysis is necessary to identify the model that will best meet the stated objectives of BharatNet.
- 2.29 The NOFN Committee, other than identifying the implementing agency(ies), is fairly sketchy in providing details about implementation. It only provides that the selected agency(ies) will be given the responsibility of building the network, and thereafter maintain the network for a period of 10 years. The bulk marketing of the network is proposed to be handled by the BBNL and/or the State SPV (hereinafter described as "Contracting Agency").
- 2.30 **Timely completion of the network:** In the EPC model, the contractor is paid as per the milestones of construction that are specified. If there are delays due to factors beyond the control of the EPC contractor, he cannot be penalized. The contractor has little incentive in completing the project in time. Typically in an EPC scenario, a variety of situations (such as RoW permissions) are offered as *force majeure* alibi for delay. It is difficult to penalize and impossible to recoup the loss of time when delays do take place. A case in point is the various projects in the road

sector where non-availability of land is taken as a major reason (many times as an excuse/alibi) for construction delays. Given the stakes in such high value projects, not only does the EPC contractor not pay any penalty for delay, often it is the EPC contractor who gets damages from the Government, if it is actually held that it is not responsible for the delays. In sharp contrast a BOOT operator having significant incentive to complete the project in time, as his revenue stream from the project starts only on its completion, is more likely to anticipate problems and make all the efforts to resolve them early so as to complete the project well in time. The risk of delay in completion of the project is relatively less in such model than in EPC model.

- 2.31 **Quality of Network:** Under the EPC model, the EPC contractor gets paid on completion of the network and for maintenance thereafter. However, the contractor will not be selling the final product/services. It will be done by the Contracting Agency. Such a system does not build in an inherent requirement for adherence to or ensure quality of output. In such a scenario, ensuring quality becomes the prime function of the Contracting Agency, requiring close supervision by them. In addition to the administrative cost involved in such supervision, for a project such as BharatNet this will be a humungous task considering that the length of the fiber is of the order of 1.7 million kms. The EPC contractor not having any long-term post deployment stake in the project coupled with the limited monitoring capacity of the public Contracting Agency, (especially given the highly technical nature of the project and the sheer volume of work that must be monitored), there actually exists perverse incentive for private contractors to increase their profit margins by cutting corners in quality of the network deployed. To give a specific example of such perverse incentive relating to the BharatNet, it may be noted that a very important element of cost is digging of the trenches for laying optical fibre. Significant cost saving is possible for the EPC contractor by reducing the depth of the trench. It will be very difficult to

supervise such large tract (1.7 Million Kms.) for ensuring proper depth. While the adverse impact on quality of the network may not be immediately discernable, this compromise will result in long-term maintenance problems which will have to be additionally paid for in the future. On the other hand if the proposed models has provision for aligning long-term interest of the contractor and of the public Contracting Agency to ensure high quality of construction (including proper depth of fibre laying), the model will be successful.

- 2.32 **Marketing:** As per the current proposal, the dark fibres are proposed to be auctioned in a reverse auction at the district level. It is quite possible that there is no demand and the reverse auction does not succeed. Hence the network could remain unutilised post-construction, in some parts at least. While the risk of under-utilisation of the network may also exist in other models, if the executing agency is also given the right to earn revenue by selling the final product, the need to maximise the return on investment will ensure that there is a constant attempt by the executing agency to increase the network utilisation through price and content based innovation.
- 2.33 **Technology up-gradation:** In the telecom sector, technology advancement and the associated risk of technological obsolescence is real. Some unforeseen technological advancement in the future could constitute a major risk for the Government if it gets involved in deployment, maintenance and marketing of bandwidth as per the recommendations of the NOFN Committee. Once the Government has chosen a particular technology, for any upgradation it will be dependent on that very vendor who can exploit the situation and increase the cost of whole project. On the other hand if the selected agency is required to deliver the desired outcome in a given time frame, it will make sure the technological upgradation in order to reduce cost and better QoS.
- 2.34 **Contract Management:** The current proposal envisages the network to be auctioned at the district level. This concept is fraught with the

danger of creating an administrative nightmare. Implementation of this proposal will result in a complex and unmanageable web of contracts. Assuming that one entity is auctioned one pair of fibre, there will be a minimum of a dozen contracts at each district. This will put the total contracts pan-India at 6000 at the minimum. Management of these contracts, their SLAs, payments, disputes etc. will require huge resource and work by the BBNL and/or State SPVs. Besides, the contracts of these users will be with the Contracting Agency and the responsibility of maintaining the network will be with the EPC contractor. In case of complaints relating to non-maintenance of the network/SLAs, the users will complain to the Contracting Agency and then the Contracting Agency will pass on this complain to the maintenance contractor. There are bound to be disputes relating to many issues. These operational issues will put lot of burden on the Contracting Agencies.

- 2.35 **Monopoly:** In the three models suggested by the committee with the Government; obviously, there appears no fear of monopoly. However, in view of the fact that there is a very little demand; the Authority does not perceive monopoly as a major risk in any alternate model. The Authority has also taken note of the fact in near future, availability of bandwidth through alternate technologies such as microwave and satellites communication (in Ka band) will offer sufficient competition to curb monopolistic behaviour, if any. Moreover, an institutional framework is already in place to manage abuse of monopoly in the form of TRAI and Competition Commission of India (CCI). The recommendations of the Authority seek to address monopolistic outcomes and protect consumer interests by (1) requiring a mandated maximum wholesale price for the bandwidth; (2) ensuring arms-length arrangements between the agencies in the consortium and the service provider to whom bandwidth is sold; and (3) requiring all bandwidth provided to be subject to the oversight of the Authority as well as the CCI.

- 2.36 In light of these constraints, it thus becomes desirable to structure the private sector's involvement in a manner that aligns long-term private sector incentives with the State's social and public service delivery objectives. Such alignment of incentives is possible in a PPP model and can go a long way in reducing the need for extensive and granular public sector monitoring, reducing the State/monitoring agency's role to simply ensuring outcomes in special circumstances. Bundling construction and operation is efficient as it requires private parties to internalise operation and maintenance costs, generating incentives to design the project in a manner that minimises life-cycle costs. Moreover, as builders become responsible for enforceable service standards, the incentive to consider such standards when designing the project are high. This can go a long way in reducing maintenance risks.
- 2.37 The Authority thus perceives the Build-Own-Operate-Transfer (BOOT) model as having the potential to ensure such long-term incentive alignment and going some way in reducing many of the varied sources of risks. The model was defined in the CP as "*a form of concession in which a public authority makes an agreement with a private company (concessionaire) to Design, Build, Own and Operate a specific piece of an infrastructure such as a power plant, road, a bridge, a telecom network etc. along with the right to earn income from the facility for a pre-decided period of time (concession period approximately 15-25 years), and later transferring it back into public ownership.*" Given the varied specialities and experience required over the course of the concession (enterprises that are most adept at construction may not necessarily be the best at operation and maintenance), it would be advisable that any optimal pairing be in the form of a consortium of firms with specializations across the necessary work requirements.
- 2.38 With these issues and alternative framework in mind, the Authority issued a Consultation Paper on 17th November 2015 ("CP"), briefly

outlining the possibility of mobilising Public Private Partnership under the BOOT model, and solicited comments from stakeholders on implementing BharatNet. The spirit of the CP recognised that the challenge in financing and deploying broadband to reach low-income communities and remote areas made these markets less attractive for private investment. As a result, Governments often have to step in as the source of funding, or take steps to attract investment to expand access to the less advantaged.¹⁵ Thus, co-operation and buy-in of a range of agents in the ICT ecosystem becomes imperative and in cohesion can provide an optimum implementation solution.

- 2.39 In response to the CP, TRAI received comments and counter comments from stakeholders. These were placed on the TRAI website www.trai.gov.in. Separate meetings were held with Infrastructure Providers, Construction Companies, Financial Institutions, Multi-Service Operators (MSOs) and Broadcasters on 02nd December, 2015. A separate meeting with Telecom Service Providers (TSPs), Internet Service Providers (ISPs), Industry Associations, Multiple System Operators (MSOs) and Broadcasters was also held on 11th December, 2015. An Open House Discussion (OHD) with stakeholders was organized on 18th December, 2015. After analyzing the various issues involved and considering the comments received from stakeholders in their written responses and during the OHD, the Authority has finalized these recommendations.

¹⁵ Special Session of the Broadband Commission in Davos, 2015
<https://itunews.itu.int/en/5656-Special-Session-of-the-Broadband-Commission-in-Davos.note.aspx>

CHAPTER-III

BharatNet Implementation

- 3.0 Understanding the potential of the digital economy as an ecosystem is critical - it boosts sustainable economic growth (by creating companies, business opportunities, and more and better jobs); facilitates social inclusion (by connecting and digitizing citizens, businesses and public offices); and fosters international competitiveness and integration.
- 3.1 Broadband infrastructure is a key piece in this ecosystem and the foundation of the Digital Economy. As such, the decisions regarding broadband infrastructure need to consider coverage (defined as the required bandwidth) as well as quality of service. The exponential increase in consumers' demand requires wider, more robust, and higher capacity networks. The impact on necessary investment poses a financing challenge to all stakeholders, these challenges becoming more pronounced when considering the demand elements of the ecosystem (such as devices, affordability or capacity building).
- 3.2 The consultation paper contained 18 questions covering issues on which the Authority sought comments. This chapter summarizes the responses received as well as the opinion of the Authority on each of these issues.

A. Comments on the Models Suggested by the Committee on NOFN

- 3.3 In the context of the risks and advantages associated with the implementation models suggested in the Committee report (as identified by the Authority), stakeholder comments were solicited on whether these models would be able to deliver the project within the costs and timelines envisaged. The CP also requested comments on any other

risks and/or advantages with regards to the three suggested implementation models.

- 3.4 On whether the three models suggested in the Committee Report are by themselves sufficient to ensure timely delivery within the predicted costs, the majority of stakeholders across TSPs, industry, consultancies and individual respondents seemed doubtful. While a small number suggested that turnkey projects could still be successfully deployed, most were of the opinion that the three models are compromised by a lack of interest alignment between the implementing, monitoring and (last-mile) service entities. In addition, a number of stakeholders expressed skepticism over the coordinating agency's capacity, specifically with regard to project management, given the highly technical nature and spread of the project. These factors were identified as potentially having strongly negative impacts on the efficiency of delivery and the quality of execution. Many stakeholders suggested deploying multiple models, paired with implementation areas on the basis of local context, emphasising that a 'one size fit all' approach is likely to be counterproductive.
- 3.5 Stakeholders identified a variety of risks associated with the three models, with questionable implementation and project management capacity, potential for procedural delays due to bureaucratic structuring, and lack of accountability due to a multi-point and diffused responsibility framework as the most oft cited. In addition, some stakeholders stressed financial burden and last mile connectivity as additional challenges, although these are not entirely limited to only the three models specified in the Committee Report. It was a recurrent theme in stakeholder discussions that assigning of responsibility without an explicit accountability mechanism is unlikely to produce the desired outcomes. Indeed good regulatory design (including enforcement) helps to reduce risk while poorly designed regulatory and enforcement mechanisms can become a source of performance

problems. It was also generally agreed during the consultations that no model or regulatory design is risk free. But it was simultaneously stressed that several conditions that reduce the likelihood of ‘moral hazard’ can and do need to be instituted to minimise agency costs and implementation failures.

- 3.6 Access to low-cost finance is probably the most crucial of issues that limit the deployment of broadband networks in underserved areas. This applies to all projects, but in particular to those with a weaker commercial case, the very implementation of which may hinge on a low cost of finance. Public capital can be deployed to help finance such projects, but it is in short supply generally due to competing priorities.

B. BOOT Model

- 3.7 Against the background of performance delays in implementation of NOFN and the need for giving urgency to the Digital India initiative, the CP also sought stakeholder comments on whether the BOOT model as described would be more suitable as a composite (in terms of cost, execution, quality of construction and marketing) to meeting the envisaged timelines for execution in comparison with the models suggested by the Committee. Responses were divided on whether such a model on its own would be successful across the heterogeneous demand and deployment conditions within the country. With this caveat however, a number of comments stressed on how an outcome based structure could help achieve timely and successful deployment and assign risks appropriately. While under the generic Build-Operate-Transfer (BOT) model it is possible to extend PPP further through a service or operation and maintenance (O&M) contract awarded to a private company, the BOOT model adds to BOT by also including ownership as part of the concession arrangement.¹⁶

¹⁶ Toolkit for Public-Private-Partnerships in Roads and Highways, PPIAF (Available at <<https://www.ppiaf.org/sites/ppiaf.org/files/documents/toolkits/highwaystoolkit/6/pdf-version/5-36.pdf>>)

- 3.8 While it must be decided whether the PPP model must include transfer of ownership or be limited to BOT, in considering BOOT against BOT the greater functional flexibility granted to the private concessionaire under the BOOT ought to be borne in mind (desirable given the focus on quality and speed of execution). Retaining public ownership can ensure at least some control and discretion over managerial decisions, but at the cost of weakening the private party's ownership rights and introducing rigidity in its choices¹⁷ (including implications on the ability to access and costs of private capital). As has been noted elsewhere, bundling, ownership and service standards are all necessary to ensure the effective transfer of risks to the private concessionaire best suited to bear them. It is harder to make a firm accountable for service quality "*if it [is] not responsible for designing and building the facility (hence, the importance of bundling) or if the firm has no control rights over investment and operational decisions (hence, the importance of ownership rights)*". A PPP arrangement that mimics the incentives wrought by asset ownership can thus "substitute private management practices, strong incentives and focus for public sector rigidities, weak incentives and excessive scale."¹⁸ Engaging the concessionaire's interest in service delivery over the long term also transfers maintenance risks such as technological upgradation of the network, maintenance of fibre connectivity and power supply to the private party. Such an approach can also reduce execution risks due to both delay and coordination as the private concessionaire's own interests are aligned with rapid deployment (to quicken monetisation) and the need for coordination by the public agency is minimised.
- 3.9 The proposed scheme under the CP for the BOOT model was that executing agencies would be selected based on competitive bidding for licensed service areas or States or combinations of both on the basis of

¹⁷ Engel, Fischer and Galetovic, "Finance and Public-Private Partnership", Reserve Bank of Australia, 2014

¹⁸ *Ibid*

minimum Viability Gap Funding (VGF) sought. The agencies would be responsible for building and operating the network, own it for the entirety of the concession period and be entitled to proceeds of revenue from sale of dark fibre/bandwidth. The infrastructure deployed by agencies would stand transferred to the Government at the end of the concession period.

- 3.10 Stakeholders were asked to list the various challenges as well as possible advantages of the BOOT model. Among the advantages identified by stakeholders, the most commonly recorded were the private sector's efficiency and ability for speedy execution, strong implementing and technical capacity, and ownership in ensuring quality of execution due to alignment of long term incentives with network operations. Other advantages mentioned included capacity for innovation and experience in deploying a variety of last mile technologies. A simple outcome-based contract also helps reduce the burden on the coordinating agency while appropriately sharing and allocating risk. The private sector's experience with marketing and delivering end-user services was also recognised.
- 3.11 Stakeholder responses also outlined a number of foreseeable challenges to deployment under the BOOT model. By far the two most frequently emphasized challenges were risks related with the uncertainty of demand/return on investment and interruptions/delays due to non-grant of Right-of-Way. The former is a business risk that can be attenuated with appropriate Government intervention while the latter is an authorisation to be given solely by the Governments (both Central and State).
- 3.12 The BharatNet project is very large and thus the private sector will be unable to pool the risk effectively on its own. In a public-private collaboration, risks are assigned to the party that is able to handle it best i.e. based on comparative advantage. Thus, the design should be such that the public sector would take care of the financially unviable

portion (through VGF) and part of the regulatory/policy (RoW) risk while leaving the financially viable portion for the private sector with transparent and efficient competition. Business and demand risk is best borne by the private party. In this sense, we can create a market for private sector engagement.

- 3.13 Naturally, these critical challenges will need to be addressed to enable successful private participation and implementation. The possibility of technological obsolescence with fibre optic technology becoming outdated by some as yet unforeseen technological advancement was also mentioned, however this would constitute a business risk that will be identified and incorporated into the concessionaires' business plans and VGF bids. Additional notable challenges include risks of monopolization by the BOOT concessionaire and high costs of obtaining private financing that could result in reduced affordability.
- 3.14 The BOOT model helps resolve the incentive problems inherent in other models with success dependent on catalyzing private sector interest (uncertainty in demand) and the credibility of the State in fulfilling its part of the arrangement, for example granting of RoW. With regards to ownership of assets, while the models recommended by the Committee on NOFN called for Government/SPV ownership of all assets, under the BOOT model ownership would rest with the concessionaire for the concession period, following which it would stand transferred to the Government. The distribution and analysis of risk in various models is already explained in para 2.27 to 2.35 of chapter II.
- 3.15 To recapitulate the distribution of risks, while under the models recommended by the Committee, execution risk was concentrated with the Government and included limited resources as well as lack of experience and capacity for deployment. However, under the proposed framework (BOOT model), the involvement of private concessionaires has the potential to reduce execution risk considerably. At the same time, maintenance risks (such as poor quality implementation and

inability to monitor volume of work centrally) are mitigated through the alignment of long term incentives towards high-quality implementation. In addition to the coordination concerns that emerge with the “state-as-middleman” approach, the large number of private entities involved will increase the probability of Service-Level-Agreement disputes, further adding to the State’s burden. Finally, while demand risks continue to exist in all cases, the private sector’s ability to market services and generate consumer awareness towards spurring demand is widely-regarded as significantly greater than the State.

- 3.16 The BOOT model enables leveraging private sector efficiency, capacity, and technical know-how for the delivery of public services. Under an appropriately designed BOOT framework, risks can be allocated amongst parties based on their capacity to manage, and private financing can be deployed. This can add an additional layer of external monitoring in the form of financing institutions, whose interests also require timely execution. The comparison of various models is annexed as Annexure to the Recommendation.
- 3.17 Most importantly, the BOOT model results in the private concessionaire having a significant stake minimizing time to deployment of high-quality network infrastructure in order to begin monetizing the deployed broadband infrastructure assets. Moreover, the inability of BBNL/State SPVs to market services effectively has already been identified as adding to demand risk under the Committee’s suggested models and can have negative implications for the project’s funding. The private sector is well recognised as being far more skilled at marketing services to end-users and catalysing demand. The generation of end-user interest and service delivery is critical since the success of BharatNet is dependent on the creation of a strong ecosystem characterized by both strong supply as well as demand conditions.
- 3.18 Finally, the scale of deployment and heterogeneity of conditions (the BharatNet project involves the laying of over 17,11,000 km of OFC

across 2,50,000 panchayats) necessitates that the State's limited monitoring and coordination resources be rationally deployed. Under the various models suggested by the Committee there exists serious risk to execution due to the possibility of the coordinating agency's (BBNL's) capacity being overwhelmed by the sheer amplitude of contractual management necessary (executed between BBNL and State SPVs, TSPs, LCOs, MSOs, ISPs etc. which with 676 districts and assuming a dozen entities per district would already exceed 6000 in number). Building appropriate incentives into the implementation process itself can safeguard against unnecessary depletion of these resources while streamlining the service delivery process. The implementation process under the BOOT model thus seeks to reduce the role of the "state as middleman" where the State (or in this case BBNL/State SPV) operates as the intermediary between the various parties involved across the project, which given the sheer number of private entities involved and probability of SLA disputes, adds significantly to the State's risk. In this regard, the bundling of service delivery and marketing with implementation can reduce perverse incentives for parties to reduce their own deliverables on quality of service by exploiting the possibility of coordination gridlock on the part of the State. The suggested BOOT implementation model along with recommendations on method of implementation seeks to mitigate some of these risks.

- 3.19 It is thus recommended that a PPP deployment model that creates long-term private engagement in the vein of a BOOT/BOT be the preferred means of deployment
- 3.20 The concessionaire should be responsible for deployment as well as operating and marketing the network. Given the desirability of leveraging private sector efficiency and technical capacity but recognising that many rural areas may not be perceived by it as lucrative enough, Viability Gap Funding should be offered to encourage private infrastructure deployment and operations in such areas.

3.21 The Authority recommends that

- a) A PPP model that aligns private incentives with long term service delivery in the vein of the Build-Own-Operate-Transfer/Build-Operate-Transfer models of implementation be the preferred means of implementation.**
- b) The scope of the concessionaire's work should include both the deployment and implementation of the OFC and other network infrastructure as well as operating the network for the concession period. Concessionaires shall be entitled to proceeds of revenue from dark fibre and/or bandwidth.**

C. Funding Private Participation

3.22 As has been previously noted, a predominant risk identified by stakeholders as preventing rural deployment has been that of demand/ROI risk, which makes many of the areas that must be covered under BharatNet non-lucrative for the private sector. The CP thus discussed the possibility of the Government providing VGF, the amount for and recipient of which may be determined by way of a Reverse Auction process where the lowest amount sought for VGF shall be granted the right to deploy infrastructure in the LSA. As a result, unlike in the three models outlined by the Committee on NOFN under which financing is to be sourced from the Government, under the BOOT model financing would be a combination of private finance sourced by the concessionaire and Viability Gap Funding.

3.23 In India, the Viability Gap Funding (VGF) Scheme was notified in 2006 to enhance the financial viability of competitively bid infrastructure projects. Under the scheme, grant assistance up to 20 per cent of project cost is provided by the Central Government to PPP projects undertaken by the Central Ministry, State Government, statutory entity

or local body, thus leveraging budgetary resources to access a large pool of private capital. The sponsoring Ministry, State Government or the project authority, if it so decides, can provide additional grant up to 20 per cent of the project cost from its own budget.

- 3.24 Recommendations from stakeholders across TSPs, industry and infrastructure providers recommended *inter alia* that the VGF could be sourced from the Universal Service Obligation Fund (USOF, which was also previously earmarked to fund the NOFN programme) and be paid incrementally based on the achievement of predefined outcomes/milestones instead of as a lump sum in order to additionally incentivise efficient and timely deployment of infrastructure. Some stakeholders also suggested that a detailed economic analysis that considers revenue potential against CAPEX requirements across various types of deployment areas be conducted to obtain an estimate of the amount of VGF that may be required. The setting of a minimum VGF as a means of checking against over optimistic bidding was also recommended by some stakeholders.
- 3.25 Historically, the Central Government has maintained a limit on the amount of VGF that may be provided for provision of infrastructure projects under PPP models. It must be noted that these infrastructure projects have been characteristically different from the deployment of fibre in rural and underserved areas in terms of demand uncertainty. Unlike roads that may be immediately monetized, a significant amount of additional work post-deployment will be required by the concessionaire in the form of marketing and generating consumer awareness if the goals of BharatNet are to be fully realised. The Authority recommends that these peculiarities be borne in mind and the Central and State Governments consider providing the necessary amount of VGF without being overly constrained by existing caps of VGF provision.

- 3.26 Under the proposed BOOT/BOT model, long term incentive alignment can ensure quality as well as compensate for the State's monitoring and marketing incapacity. The concession periods should be long term and the implementation areas should be at the LSA level (suitable given the relative homogeneity of size as well as reduced overall volume of granular monitoring required of the central monitoring agency/BBNL). The proposed Viability Gap Funding may be determined by way of a reverse auction with liberal eligibility criteria to ensure wide participation. The provision of VGF and the selection of the concessionaire must be conditional on the provision of non-discriminatory access to fibre/provision of bandwidth to other service providers/the registration and fulfilment of all demand.
- 3.27 It is important at this time to remember that enthusiasm for market/private efficiency and capacity must not subvert the cause of public service delivery. It must thus be stated that these recommendations in no way imply a "one-size-fits-all" approach, and the Authority recognises the need for multiple options and multiple models of deployment. There may still well remain a number of areas where incentives will be insufficient for private delivery and in such cases the State must still perform the role of service delivery. Such cases should be well identified, following an analysis of the initial private sector response in the concessionaire selection process. While we make the transition from exclusive provision by the public sector to a situation where there will be many entities, public and private and combinations of both, the rules of engagement must be better defined for the benefit of investors, service providers and consumers.
- 3.28 Implementation phasing: Given the comparative advantage of BOOT over other models, the Contracting Agency may, in the first phase, explore the appetite and response of the potential BOOT participants through bidding process. This can either be done in one go for the entire country (by having States/LSA or packages as 'Schedules'). Or it can be

done beginning with certain States with larger potential of bidders' response. In the second phase (after excluding those area where BOOT model can be implemented) EPC model with the following changes may be resorted to:

3.29 EPC contractor should be responsible for building the network and will have defect liability period of two years after completing the network. When the network is about to be completed, the Contracting Agency should engage a third party (through bidding process) who should be responsible for managing and marketing the network as per the broad principles laid down by the Government. The overlapping defect liability period of two years should be used to ensure smooth transition from construction to maintenance phase.

3.30 **The Authority recommends that**

- a) **Concessionaires should be selected by way of a reverse bidding process to determine minimum Viability Gap Funding sought for concession. The area of implementation may be analogous with the Licensed Service Areas (LSAs)/or the State/UT. The use of a reverse bid process to determine lowest VGF sought can ensure that the amount of support from public funds is rational.**
- b) **The Contracting Agency may, in the first phase, explore the appetite and response of the potential BOOT participants through bidding process. This can either be done in one go for the entire country (by having States/LSA or packages as 'Schedules') or it can be done beginning with certain States with larger potential of bidders' response.**
- c) **In the second phase (after excluding those area where BOOT model can be implemented), EPC contractor may be selected. Such EPC contractor should be responsible for building the network and will have defect liability period of two years after**

completing the network. When the network is about to be completed, the Contracting Agency should engage a third party (through bidding process) who should be responsible for managing and marketing the network as per the broad principles laid down by the Government. The overlapping defect liability period of two years should be used to ensure smooth transition from construction to maintenance phase.

- d) The VGF payments should be divided into two components- an initial capital expenditure amount to allow the concessionaire adequate funds to meet initial capital costs and to be able to raise complementary finance from financial institutions at reasonable rates, and the rest should be annualised over the concession period and be paid out on the achievement of predefined milestones. Early achievement of the milestones would merit early payments incentivizing speedy delivery. The two components must be carefully balanced over the concession period – while excess payment at the initiation stage can result in the risk of poor quality delivery, not providing concessionaires with sufficient funding in the beginning will necessitate the deployment of more expensive private finance (the additional costs of which will end up being reflected in the VGF bidding process and thus come from public funds).

D. Period of Concession

- 3.31 Given that the BOOT model seeks to align the long term incentives of the private sector with the national goals of infrastructure provision, the period of concession under this model (such as in the case of the Bangalore Airport) is generally long-term in order to provide concessionaires with sufficient time to make a reasonable profit. Current industry estimates of the expected lifetime of fibre optic cable

are approximately 20 to 25 years. The question of how long the period of private ownership prior to transfer should be was also posed in the CP, with the majority of responses clustered between 20 and 30 years.

3.32 The Authority recommends that

The period of concession should be coterminous with the technical life of the fibre at present the consensus on this is 25 years. Such a period should be sufficient time to align the concessionaire's incentives with high quality installation for service delivery, while also providing a large enough window to make a reasonable profit. The period may be further extended in blocks of 10/20/30 years after concession period at the mutual agreement of the Government and the concessionaire.

3.33 The long-term nature of the concession agreement is perceived as necessary given the uncertainty of demand and the amount of time it may take to market services and generate sufficient user awareness to spur demand. However this uncertainty also means that while the possibility of a boom in demand and resultant windfall profits accruing to the concessionaire may currently seem extremely low, it cannot be discounted entirely. Given the involvement of public funds and the national importance of the programme, it is thus essential to include certain minimal measures to be taken in such an event. Stakeholder responses on the subject of possible windfall profits were divided between no measures being taken and concessionaires being allowed to retain the entirety of such a benefit, and such additional windfalls becoming part of public funds.

3.34 The Authority recommends that

Exceptionally high windfall profits may be dealt with by way of a one-time “windfall tax” and the suspension of further VGF support. However, such measures must be clearly outlined at the outset prior to the bidding stage, in order to ensure the necessary

stability and predictability to encourage private sector involvement in this manner of long term infrastructure project. A clear definition of what shall be considered a windfall profit must thus be provided a priori to bidders, in order to allow this to be factored into their financial and outlay plans.

E. Preventing Anti-competitive and monopolistic Behaviour

- 3.35 It was recognised in the CP that one apprehension in case of the BOOT model is the potential for anti-competitive/monopolistic behaviour by the executing agency, which could vertically integrate its services and thus defeat the basic purpose of affordable broadband in rural areas. The CP sought comments on suitable eligibility criteria, possible caps on Executing Agency (EA) participation and any other suggestions for measures to prevent monopolistic behaviour.
- 3.36 Apart from safeguarding against anticompetitive vertical integration, care must be taken to ensure that the concessionaire provides access to all service providers in a non-discriminatory and transparent manner. Such competition is essential given that all manner of content (including entertainment, entitlements and Government services) will be delivered on the network. The defence against monopolistic conduct suggested by stakeholders during the consultation process and in their comments included mandating that concessionaires be required to provide access to all users on a non-discriminatory basis (with regular oversight to ensure compliance), placing limits on the number of fibre cores that concessionaires may set aside for retail service delivery, and setting limits on wholesale prices that may be charged by the concessionaire. To ensure transparency, some stakeholders suggested a publicly accessible online inventory of available fibre that be updated in real time.

- 3.37 Conditions requiring concessionaires to adhere to a maximum set price can ensure service provision at an affordable level and prevent anti-competitive conduct. Such a requirement can be included within the terms of the concession agreement as well as be a prerequisite for the provision of Viability Gap Funding. The maximum price ceiling for wholesale of bandwidth and its evolution over time can be set by the Authority and revised from time to time (or left under forbearance), while retail pricing can be left to market forces subject to the usual competitive safeguards. The institutional mechanism for this is already in place in India. A clause requiring registration and servicing of all bandwidth demand requests in a non-discriminatory basis should also be included in the concession agreement.¹⁹ This can be augmented by requiring all concessionaires to regularly provide information about fibre availability to the Authority/coordinating agency, which can be made available on an online “dashboard” that is available for public access.
- 3.38 In addition the relationship between the concessionaire and the service provider should be at arm’s length. This can be ensured by mandating a legal separation of the businesses of infrastructure provision and service provision in case of overlapping interests to preclude the possibility of a vertically integrated entity abusing its position.
- 3.39 **The Authority recommends that**
- a) **Care must be taken to ensure that the concessionaire provides access to all service providers in a non-discriminatory and transparent manner. Such competition is essential given that all manner of content (including entertainment, entitlements and Government services) will be delivered on the network.**
 - b) **In addition the relationship between the concessionaire and the service provider should be at arm’s length. This can be**

¹⁹ The License Agreement for Provision of Unified Access Service contains similar provisions.

ensured by mandating a legal separation of the businesses of infrastructure provision and service provision in case of overlapping interests to preclude the possibility of a vertically integrated entity abusing its position.

- c) **Conditions requiring concessionaires to adhere to a maximum set price can ensure service provision at an affordable level and prevent anti-competitive conduct. Such a requirement can be included within the terms of the concession agreement as well as be a prerequisite for the provision of Viability Gap Funding. The maximum price ceiling for wholesale of bandwidth and its evolution over time can be set by the Authority and revised from time to time (or left under forbearance), while retail pricing can be left to market forces subject to the usual competitive safeguards.**

F. Eligibility criteria for EA/participation in bidding

- 3.40 During the consultation process, stakeholders were asked to comment on the manner of eligibility criteria (if any) for the EA in order to prevent conflicts of interest. Most of the comments highlighted the need to ensure that the EA possess strong financial credentials when selected on the basis of minimum VGF sought. Responses from TSPs and Industry associations stressed the need for experience in deploying infrastructure in order to ensure project implementation capabilities. Some TSPs also recommended optical fibre specialisation as additional criteria for qualification. It was also recommended that sharing/swapping of fibre be made mandatory.
- 3.41 While a minimum criteria on financial and infrastructure execution capacity will be necessary to ex-ante ensure the seriousness of participating bidding agencies, it is important that these conditions do not become a barrier to participation in the bidding process. Wide

participation in the auction will also act as a safeguard against anti-competitive activity within the auction process and reduce the risk of auction cartelisation.

3.42 The Authority recommends that

Liberal eligibility criteria that allows for broad participation is necessary to ensure the participation of a large number of bidders and guarantee a strong and competitive auction process to enable optimal price discovery.

G. Limits on allocation of number of implementation areas.

3.43 Responses across stakeholders were divided on the subject of limiting participation at the bidding stage to a set number of implementation areas. Responses in support of a cap on bidding participation clustered around limiting participation to 3 or 4 implementation areas in order to avoid the possibility of monopolisation. Emphasis was also placed on the need to ensure that capacity and capital resources of the executing agency are not spread too thin.

3.44 As previously discussed, allowing for liberal eligibility criteria at the auction stage will allow broad participation and increase the probability of competitive outcomes.

3.45 The Authority recommends that

- a) **There is no need to place a cap on participation in the bidding process – however a cap should be set on the number of implementation areas that are allocated. This can ensure that the bidders' capacity and resources are not stretched thin due to winning bids for too many areas.**
- b) **Any bidding agency/consortium with winning bids in more than the maximum number of implementation areas permitted**

for allocation can be allowed to choose the areas it wishes to be allocated.

- c) **As winning bidders maximize allocations slots available to them they will be removed from consideration. In the remaining areas the agency/consortium with the second best bid may be offered the implementation contract on the same terms as under the winning bid. However where areas remain but the winning L1 bidders no longer have allocations slots available, the L2 bidder may be engaged.**
- 3.46 The limit on the number of implementation areas is recommended in major part to aid speed of deployment. In minor part, it also safeguards against the risk of monopolisation by ensuring that if all LSAs are successfully bid, there will be at least 4-5 distinct entities deploying the infrastructure across the country.
- ## **H. Flexibility of Implementation**
- 3.47 The BOOT model is outcome oriented and the selected agency is required to deliver desired outcome in a given time frame. The executing agency may require flexibility to survey the route plan for laying optical fibre to minimize its cost. The existing agency may also like to use technology of its own choice and like to upgrade the technology with time. The topology of BharatNet has been explained in detail in the report of the Committee on NOFN. However, the selected executing agency may not consider it as a most appropriate and efficient way for completing the project in a time bound manner. There may be a need to give flexibility to the executing agency in terms of selection of route of laying optical fibre, construction, topology and deployment of technology.
- 3.48 The Authority also requested stakeholders to comment on the manner of flexibility that must be provided in terms of selection of route of

laying optical fibre, construction, topology and deployment of technology.

- 3.49 Almost all comments submitted were in support of allowing executing agencies flexibility in choice of technology, architecture, efficient routes and topology in so far as the choices made were interoperable and met required standards of Quality of Service. The Authority also recommends that concessionaires be provided with flexibility in terms of route for laying optical fibre, choice of construction, topology and technology in order to ensure technical as well as economic efficiency. This flexibility is subject to the same standards of redundancy and quality as outlined for BharatNet by the Committee on NOFN.
- 3.50 Given that the costs of fibre optic cable constitute only a small minority of the total costs of installation, it has been standard practice to install surplus “dark” fibre as an efficient means of satisfying future increase in demand. In addition to allowing expansion commensurate with future demand, additional unlit fibre also enables network redundancy in case of cable faults. It is thus recommended that concessionaires be encouraged to and have the flexibility to deploy large amounts of dark fibre in order to ensure that the network remains future proof and easy to upgrade.
- 3.51 A variety of national broadband plans include specific measures for the use of existing infrastructure and facilities to enable efficient rollout. While the possibility of using existing private sector access networks to minimize costs in reaching remote locations is potential that may be worth exploring, the risk of duplicating infrastructure is not overpowering. Unlike other forms of infrastructure (such as roads), augmented capacity due to duplicate deployment can be useful as high bandwidth applications for the fibre become more ubiquitous.
- 3.52 Private concessionaires must be given freedom and flexibility in choice of technology, topology and route, and provision of last mile access (post

the Gram Panchayat level) may be carried out by other technological means (such as wireless access, cable networks etc.) However, till the GP level the provision of access must be by way of OFC in order to allow for the high bandwidth necessary for the variety of applications envisioned under Digital India and to ensure a future proof network.

3.53 The Authority also recommends that

- a) Concessionaires be provided with flexibility in terms of route for laying optical fibre, choice of construction, topology and technology in order to ensure technical as well as economic efficiency. This flexibility is subject to the same standards of redundancy and quality as outlined for BharatNet by the Committee on NOFN.**
- b) Concessionaires be encouraged to and have the flexibility to deploy large amounts of dark fibre in order to ensure that the network remains future proof and easy to upgrade.**

I. Setting aside Dark Fibre for other Service Providers

3.54 The Report of the Committee on NOFN additionally recommended that a minimum amount of dark fibre (not less than 50% of the total pairs) be required to be “set aside for allocation to telecom service providers, multisystem operators, local cable operators, Internet service providers and other service providers through forward-cum-reverse auction process”. The details of this process as applicable to the three recommended implementation models are outlined in the Committee Report. The CP recognised the importance of quantifiable deliverables in terms of dark fibre and bandwidth for proper implementation under the BOOT model, and requested comments on whether there should be a mandate requiring a minimum number of fibres to be made available as dark fibre for other operators to ensure choice in the provision of bandwidth at the GP level.

- 3.55 Network operation and roll-out costs can be reduced by allowing operators to share inputs; either only ‘passive’ assets such as a mobile tower or dark fibre, or ‘active’ elements as well including electronic assets or even spectrum. Costs come down as a result of sharing, and these cost savings should be passed to customers. Also, in some cases site sharing can increase competition by giving operators access to key sites, which otherwise they may have not had access to, allowing them to compete on quality of service and coverage. However, operators sharing inputs may be tempted to co-ordinate their retail pricing strategies or an operator excluded from a sharing arrangement may be weakened or eliminated.
- 3.56 The consultations echoed the principle in the Committee Report in that a number of TSPs supported the idea that a certain percentage of dark fibres be offered to other operators. At the GP level, many TSPs suggest that a minimum of 48 pairs of fibre should be laid with 50-60% reserved for use by other service providers. A small number of stakeholders suggested that only a minimum of 8-16 fibres be allocated as dark fibre to other operators, while others recommended allocating as much as 80%. As a parallel suggestion, some TSPs and industry associations have advised that a cap be placed on the maximum number of fibres that a single operator may own (suggestions pegged this number in the range of 4 pairs) - however stakeholders are divided on this suggestion with others recommending that the process of fibre allocation be market driven since the deployment and allocation of network capacity must be efficient.
- 3.57 The presence of other service providers (eg. other TSPs, LCOs, MSOs, ISPs) can also attenuate demand risk by increasing the number of parties involved in generating demand as well as the variety of services delivered and packages available on the network, in turn spurring demand for the infrastructure itself.
- 3.58 The Central and State Government may also consider guaranteeing the purchase of a minimum amount of bandwidth for the provision of

Government services. Such purchase should be market based and at the price set by the concessionaire (in line with the terms of the concession agreement).

3.59 The Authority recommends that

The Central and State Governments act as anchor clients to purchase a minimum amount of bandwidth (100 Mbps) to be purchased at market prices for the provision of services. Additionally, the mandating of a minimum amount of fibre (eg. 50%) be set aside for use by other service providers in order to encourage competition may be considered.

J. Right of Way Safeguards and active involvement of States/UT

- 3.60 As noted previously, a major identified risk that can delay project implementation has been the possibility of Right of Way (RoW) approvals not being granted. Despite tripartite agreements signed between the Department of Telecommunications, State Governments and BBNL to facilitate ‘free’ RoW for laying optical fibre under the NOFN programme, a number of issues came up in the implementation stage that must necessarily be addressed to curtail implementation delays. The CP noted how given that RoW approvals are not limited to State Governments but must also on occasion be obtained from Central Government bodies (such as the National Highway Authority of India (NHAI), Indian Railways, Oil and Natural Gas Corporation (ONGC), Gas Authority of India Limited (GAIL) etc. BBNL and the implementing CPSUs often faced a variety of problems. The success of the private sector under the BOOT model also necessarily hinges on the grant of RoW, the grant of which at no cost has been considered a form of monetary/in-kind fiscal support offered for PPP.²⁰ The CP thus outlined

²⁰ González, E., Garvin, M. “Fiscal Support Mechanisms For Public- Private Partnerships”, Engineering Project Organization Conference, 2013

as an issue for consultation suggestions for safeguards that could be incorporated in the agreement between Central and State Governments and executing agencies for problems attributable to the non-grant of RoW in a timely manner.

- 3.61 On this subject, stakeholders unanimously were of the view that RoW is a major issue in implementing such project. Many stressed how the limited potential for private sector entities to tackle RoW challenges meant that the role of the Government in this matter is paramount. Stakeholders suggested a variety of possibilities, referencing provisions under Section 7 of the Telegraph Act 1885 as a guideline for resolving RoW issues, recommending a centrally coordinated blanket RoW approval mechanism (possibly by way of a Presidential Ordinance to expedite the sanction process), and asserting the need for a Tripartite Agreement (TPA) that included local bodies to ensure time-bound RoW clearance. Some TSPs in particular also recommended a robust escalation mechanism to expediently resolve potential conflict. A few stakeholders from industry also expressed the possible necessity of using disincentives while negotiating with uncooperative bodies. In the consultations on Right of Way, it was also made clear that while RoW is important, waiving of these charges does not extend to service providers being exempt from the responsibility of reinstating the infrastructure that must be disturbed for laying such fibre.
- 3.62 Risks must be assigned to parties clearly, and based on their capacity to bear them. Allocating responsibility to private parties for delays or problems that are attributable to RoW is neither fair nor efficient. It is thus quite clear that the importance of State Government cooperation cannot be overemphasized. State Governments must cooperate to ensure the provision of RoW to executing agencies. While a framework for speedy and reliable grant of RoW to executing agencies is a necessary precondition for successful implementation, the possibility of some occasionally uncooperative agencies or other unforeseen problems are real. Given that RoW is perceived as a major risk factor by the

private sector, safeguards recognising such a possibility and outlining the steps to be taken must be put in place under the agreement to attenuate such risk and encourage participation. Guaranteed provision of free RoW is a necessary and non-negotiable precondition to successful deployment of BharatNet, subject to the reinstatement of public property to its original condition. An optimal combination of a ‘carrot and stick’ approach for Executing Agency is recommended. For example, expediting VGF disbursements on meeting milestones ahead of time and deterrent penalties for non-compliance could be instituted for Executing Agency. A coordination committee may be established that can be tasked with determining when the cause of implementation delays qualifies as attributable to problems in obtaining RoW Clear guidelines to help such an identification should be designed in consultation with stakeholders and made available *a priori*.

- 3.63 Guaranteed provision of free RoW is a necessary and non-negotiable precondition to successful deployment of BharatNet. The concession terms must assuage private risks by also providing in some way to compensate and/or indemnify the private sector for delays and problems attributable to non-grant of RoW. Incentives/Disincentives must be set up for States to ensure the provision of RoW. RoW is a valuable resource and while the State will guarantee its provision, the private sector entities that are given the RoW would need to ensure that fibre/bandwidth be available for Central and State Government use. It should also be ensured that in so far as possible deployment takes place only once and is able to cater to all Government initiatives that will ride on the network. The responsibility of reinstating the infrastructure that must be disturbed for laying such fibre back to its original state remains with the Concessionaire and is a necessary precondition to grant of free RoW.

3.64 The Authority recommends that

RoW is perceived as a major risk factor by the private sector, safeguards recognising such a possibility and outlining the steps to be taken must be put in place under the agreement to attenuate such risk and encourage participation. Guaranteed provision of free RoW is a necessary and non-negotiable precondition to successful deployment of BharatNet, subject to the reinstatement of public property to its original condition.

- 3.65 Irrespective of implementation model chosen for the BharatNet, there will be large number of ground-level, operational issues which will require quick resolution. A few examples of such issues, besides RoW are : law and order, reinstatement after laying optical fibre, availability of power and day to day administrative issues faced by the executing agency. These will obviously require the active support of State/UT authorities. Hence it is absolutely essential to get the support and participation of the concerned States/UTs.
- 3.66 Active involvement and participation of States would lead to timely completion and better project outcome by leveraging resources available with the State Government. Coordination with other State Government agencies can also be best managed by the States/UTs. Moreover, State Governments deliver large number of e-Governance services in many areas. BharatNet will play a very important role in providing a robust, reliable and fast connectivity for these services. Hence States are very important stakeholders in this project and their participation will ensure smooth implementation of BharatNet.

3.67 The Authority, therefore, recommends that

Involvement of State Governments is essential for success of the project irrespective of the strategy chosen for implementing it. States/UTs should be made an integral part of the project implementation and an institutional mechanism both at the State

and District level should be created to effectively coordinate and sort out the implementation issues

K. Other measures to ensure Affordability and mitigate Risks

- 3.68 The importance of affordable broadband services is well recognised and has already been discussed in Chapter I. Given how in some countries around the world affordable broadband access is viewed as having public good characteristics and Governments have thus directly intervened (including by way of purchasing bandwidth for online service provision), the CP also sought comments on any other measures that could help ensure the affordability of broadband at large.
- 3.69 There appeared to be a general consensus among stakeholders that affordable access is impossible unless the costs of network deployment are minimized. Some industry associations and TSPs thus suggested rationalizing various levies and charges, including the USO levy on operators (with some suggesting that such incentives could be linked to the achievement of rural penetration targets), and reducing licensing fees paid by operators, indicating the intention of using these cost reductions to make access more affordable to end users. Other suggestions to reduce deployment costs included leveraging the existing infrastructure owned by operators and allowing multiple operators to use optical fibre deployed for Bharat Net. Measures to enhance competition on quality, price and innovation by removing barriers to entry were also suggested. Certain stakeholders have also suggested making low speed connections (~256 kbps) free of cost for a certain period of time to promote broadband penetration. One suggestion was to link VGF payments to the number of users that an operator is able to service, creating incentive milestones with rewards to further operator incentives to increase affordability.
- 3.70 During the consultation process a view was also expressed that the Central and State Governments should additionally consider becoming

involved with the concessionaire by becoming minority equity partners (~26%) in the selected consortium - this can reduce the perceived risks and thus lower the costs of obtaining private finance while also automatically solving the risks associated with windfall profits. In addition, this can help check monopolistic behaviour on the part of the concessionaire. Such equity may be equally divided between the Central Government and State Governments to ensure ownership of the project (the support and co-option of States being essential to implementation, not least to ensure the resolution of issues involving right of way). Such an arrangement must also allow for the possibility of the Government's shares eventually being purchased by the private concessionaire at a fair market price agreeable to all parties. Clearly providing for the option of eventual disinvestment by the Government will positively impact the capacity of the private party to raise money as well as provide the Government with revenue at a fair market price if and when such disinvestment occurs.

3.71 The Authority recommends that

The Central and State Government should additionally consider becoming involved with the concessionaire by becoming a minority equity partner (~26%) in the selected consortium - this can reduce the perceived risks and thus lower the costs of obtaining private finance while also automatically solving the risks associated with windfall profits. In addition, this can help the Government check monopolistic behaviour on the part of the concessionaire.

3.72 Last but not the least, capacity enhancement at BBNL is essential. A structural rehaul to bring in professional management (perhaps by way of secondment of experts from the private sector) as well as to restructure the organization along the lines of the Delhi Metro Rail Corporation may be considered.

CHAPTER-IV

Summary of Recommendations

- 1. A PPP model that aligns private incentives with long term service delivery in the vein of the Build-Own-Operate-Transfer/Build-Operate-Transfer models of implementation be the preferred means of implementation. (Para 3.21)**
- 2. The scope of the concessionaire's work should include both the deployment and implementation of the OFC and other network infrastructure as well as operating the network for the concession period. Concessionaires shall be entitled to proceeds of revenue from dark fibre and/or bandwidth. (Para 3.21)**
- 3. Concessionaires should be selected by way of a reverse bidding process to determine minimum Viability Gap Funding sought for concession. The area of implementation may be analogous with the Licensed Service Areas (LSAs)/or the State/UT. The use of a reverse bid process to determine lowest VGF sought can ensure that the amount of support from public funds is rational. (Para 3.30)**
- 4. The Contracting Agency may, in the first phase, explore the appetite and response of the potential BOOT participants through bidding process. This can either be done in one go for the entire country (by having States/LSA or packages as 'Schedules') or it can be done beginning with certain States with larger potential of bidders' response. (Para 3.30)**
- 5. In the second phase (after excluding those areas where BOOT model can be implemented), EPC contractor may be selected. Such EPC contractor should be responsible for building the network and will have defect liability period of two years after completing the network. When the network is about to be completed, the Contracting Agency should engage a third party (through bidding process) who should be responsible for managing and marketing the**

- network as per the broad principles laid down by the Government. The overlapping defect liability period of two years should be used to ensure smooth transition from construction to maintenance phase. (Para 3.30)**
6. The VGF payments should be divided into two components- an initial capital expenditure amount to allow the concessionaire adequate funds to meet initial capital costs and to be able to raise complementary finance from financial institutions at reasonable rates, and the rest should be annualised over the concession period and be paid out on the achievement of predefined milestones. Early achievement of the milestones would merit early payments incentivizing speedy delivery. The two components must be carefully balanced over the concession period – while excess payment at the initiation stage can result in the risk of poor quality delivery, not providing concessionaires with sufficient funding in the beginning will necessitate the deployment of more expensive private finance (the additional costs of which will end up being reflected in the VGF bidding process and thus come from public funds). (Para 3.30)
7. The period of concession should be coterminous with the technical life of the fibre at present the consensus on this is 25 years. Such a period should be sufficient time to align the concessionaire's incentives with high quality installation for service delivery, while also providing a large enough window to make a reasonable profit. The period may be further extended in blocks of 10/20/30 years after concession period at the mutual agreement of the Government and the concessionaire. (Para 3.32)
8. Exceptionally high windfall profits may be dealt with by way of a one-time “windfall tax” and the suspension of further VGF support. However, such measures must be clearly outlined at the outset prior to the bidding stage, in order to ensure the necessary stability and predictability to encourage private sector involvement in this

manner of long term infrastructure project. A clear definition of what shall be considered a windfall profit must thus be provided a priori to bidders, in order to allow this to be factored into their financial and outlay plans. (Para 3.34)

9. Care must be taken to ensure that the concessionaire provides access to all service providers in a non-discriminatory and transparent manner. Such competition is essential given that all manner of content (including entertainment, entitlements and Government services) will be delivered on the network. (Para 3.39)
10. In addition the relationship between the concessionaire and the service provider should be at arm's length. This can be ensured by mandating a legal separation of the businesses of infrastructure provision and service provision in case of overlapping interests to preclude the possibility of a vertically integrated entity abusing its position. (Para 3.39)
11. Conditions requiring concessionaires to adhere to a maximum set price can ensure service provision at an affordable level and prevent anti-competitive conduct. Such a requirement can be included within the terms of the concession agreement as well as be a prerequisite for the provision of Viability Gap Funding. The maximum price ceiling for wholesale of bandwidth and its evolution over time can be set by the Authority and revised from time to time (or left under forbearance), while retail pricing can be left to market forces subject to the usual competitive safeguards. (Para 3.39)
12. Liberal eligibility criteria that allows for broad participation is necessary to ensure the participation of a large number of bidders and guarantee a strong and competitive auction process to enable optimal price discovery. (Para 3.42)
13. There is no need to place a cap on participation in the bidding process – however a cap should be set on the number of implementation areas that are allocated. This can ensure that the

bidders' capacity and resources are not stretched thin due to winning bids for too many areas. (Para 3.45)

14. **Any bidding agency/consortium with winning bids in more than the maximum number of implementation areas permitted for allocation can be allowed to choose the areas it wishes to be allocated. (Para 3.45)**
15. **As winning bidders maximize allocations slots available to them they will be removed from consideration. In the remaining areas the agency/consortium with the second best bid may be offered the implementation contract on the same terms as under the winning bid. However where areas remain but the winning L1 bidders no longer have allocations slots available, the L2 bidder may be engaged. (Para 3.45)**
16. **Concessionaires be provided with flexibility in terms of route for laying optical fibre, choice of construction, topology and technology in order to ensure technical as well as economic efficiency. This flexibility is subject to the same standards of redundancy and quality as outlined for BharatNet by the Committee on NOFN. (Para 3.53)**
17. **Concessionaires be encouraged to and have the flexibility to deploy large amounts of dark fibre in order to ensure that the network remains future proof and easy to upgrade. (Para 3.53)**
18. **The Central and State Governments act as anchor clients to purchase a minimum amount of bandwidth (100 Mbps) to be purchased at market prices for the provision of services. Additionally, the mandating of a minimum amount of fibre (eg. 50%) be set aside for use by other service providers in order to encourage competition may be considered. (Para 3.54)**
19. **RoW is perceived as a major risk factor by the private sector, safeguards recognising such a possibility and outlining the steps to**

be taken must be put in place under the agreement to attenuate such risk and encourage participation. Guaranteed provision of free RoW is a necessary and non-negotiable precondition to successful deployment of BharatNet, subject to the reinstatement of public property to its original condition. (Para 3.64)

20. Involvement of State Governments is essential for success of the project irrespective of the strategy chosen for implementing it. States/UTs should be made an integral part of the project implementation and an institutional mechanism both at the State and District level should be created to effectively coordinate and sort out the implementation issues. (Para 3.67)
21. The Central and State Government should additionally consider becoming involved with the concessionaire by becoming a minority equity partner (~26%) in the selected consortium - this can reduce the perceived risks and thus lower the costs of obtaining private finance while also automatically solving the risks associated with windfall profits. In addition, this can help the Government check monopolistic behaviour on the part of the concessionaire. (Para 3.71)
22. Last but not the least, capacity enhancement at BBNL is essential. A structural rehaul to bring in professional management (perhaps by way of secondment of experts from the private sector) as well as to restructure the organization along the lines of the Delhi Metro Rail Corporation may be considered. (Para 3.72)

ANNEXURE

Comparison of the Four Models

	CPSU Led	State Government Led	Private Sector Led (EPC/Consortium)	PPP Model with Long Term Incentive Alignment (BOOT/BOT)
Summary	Existing PSUs (BSNL, Railtel etc.) are awarded contracts for infrastructure implementation	States establish SPVs (with Central Government equity) to design, customise, implement, commission, manage and operate the network	Consortia of manufacturers (OEM/SI/MSP) & EPC companies are awarded "Build and Maintain" contracts	Private concessionaire builds, maintains, operates and markets the network for the period of the concession. Ownership may also be transferred for the concession period following which infrastructure stands transferred back to Government (BOOT).
Asset Ownership	Central Government	SPV	Central Government	Concessionaire for period of concession/Government following transfer upon end of concession term (BOOT)
Financing	Central Government	Central Government to provide CAPEX, fund viability gap in case of loss to SPV (which may retain any profit)	Unspecified but effectively Central Government	Combination of private finance mobilised by the Concessionaire and Viability Gap Funding provided by the Government
Method of Implementation	Competitive bidding to enable price discovery and outlined incentives/disincentives linked to timelines	Same as CPSU-led model	Tendering for GPs in single or group of States with CAPEX linked to milestones	Tendering to be carried out at the LSA level
Role of Government	Execution and implementation, financing, coordination, ensure quality of infrastructure, operationalise and market services	Execution by SPV, Financing by Central Government, Coordination and quality checks by BBNL	Coordination and monitoring by BBNL	Provision of Viability Gap Funding with BBNL providing objective-based monitoring
Role of Private Sector	Extent of Involvement	N/A	Can be awarded specific contracts by the SPV	Build and maintain infrastructure and manage interdependencies
	Selection Criteria	N/A	N/A	Minimum annual equity payments linked to SLA
				Minimum VGF

	Enabling Participation	N/A	N/A	Revenue sharing if bandwidth utilisation surpasses threshold	Viability Gap Funding with Private Concessionaire revenue from sale of dark fibre/bandwidth; Government to be anchor client for minimum bandwidth to provide Government services
Risks	Execution	Limited resources, insufficient experience with scale deployment of network infrastructure of this nature, minimal coordination resources and monitoring capacity	Lack of technical and managerial expertise	Significant coordination and monitoring burden on public agency with minimal capacity	Minimal due to long-term alignment of interest coupled with strong technical expertise and implementation experience; risks include RoW; readiness and availability of resources, long gestation period
	Maintenance	Technological obsolescence, damage to fibre, power supply concerns	Providing and maintaining common facilities, law and order	Increased complexity for network integration	Incentives aligned due to concessionaire interest in using state-of-the-art technology to minimise maintenance costs to be borne/ensure QoS
	Quality of Construction	Inability to monitor execution quality due to scale and scope of implementation	Inability to monitor execution quality due to scale and scope of implementation; variable across regional needs and terrain etc.	Perverse incentives on the part of EPC contractor to minimise costs and deliver poor quality due to lack of long-term involvement; aggravated by monitoring constraints on part of BBNL	High quality with scalable network
	Marketing	Minimal to no experience; public provisioning dulls incentives for responding to customer demands	Minimal to no experience; public provisioning dulls incentives for responding to customer demands	Discriminatory behaviour, monopolisation of regional markets	Business risk exists but private sector widely accepted as better at marketing services, generating consumer awareness and demand and developing products
	Demand	Commercialisation of middle-mile network	Low utilisation of network post completion	Lack of incentives	Strong incentives to market and respond to consumer demand; Government as anchor client for services can initiate process of developing ecosystem for broadband delivery

List of Acronyms

S. No.	Acronym	Description
1	BB	Broadband
2	BBNL	Bharat Broadband Network Limited
3	BOOT	Build-Own-Operate-Transfer
4	BOT	Build-Operate-Transfer
5	CCI	Competition Commission of India
6	CPSU	Central Public Sector Undertaking
7	DIP	Delivery Integration Partners
8	EA	Executing Agency
9	EPC	Engineering, Procurement and Construction
10	GAIL	Gas Authority of India Limited
11	GDP	Gross Domestic Product
12	GIS	Geographic Information System
13	GP	Gram Panchayats
14	GPON	Gigabit Passive Optical Network
15	GPT	General Purpose Technology
16	ICRIER	Indian Council for Research on International Economic Relations
17	IDI	ICT Development Index
18	ISP	Internet Service Providers
19	ITU	International Telecommunication Union
20	LSA	Licensed Service Area
21	MDG	Millennium Development Goal
22	MSO	Multi-Service Operator
23	MSP	Managed Services Portion
24	NHAI	National Highway Authority of India

25	NLDO	National Long Distance Operator
26	NOC	Network Operation Centre
27	NOFN	National Optical Fibre Network
28	NTP	National Telecom Policy
29	OEM	Original Equipment Manufacturers
30	OFC	Optical Fibre Cable
31	ONGC	Oil and Natural Gas Corporation
32	PGCIL	Power Grid Corporation of India Limited
33	PLB	Permanently Lubricated High Density Polyethylene Pipes
34	PPP	Public-Private-Partnership
35	QoS	Quality of Service
36	ROI	Return-on-Investment
37	RoW	Right of Way
38	SLA	Service Level Agreement
39	SPV	Special Purpose Vehicle
40	TPA	Tripartite Agreement
41	TSP	Telecom Service Provider
42	UNESCO	United Nations Educational, Scientific and Cultural Organization
43	USOF	Universal Service Obligation Funds
44	VGF	Viability Gap Funding