

Sir, before answering the queries, I have some key points for consideration. I have been in Optical network planning, execution, O&M, training for more than 26 years and have served Government and Telecom Operators in this field to train, design, plan, execute, operate the optical networks nationwide all across the country with very fast ROI. Based on my field level experience and business viability experience and study of global successes and failures inputs are hereby given with expectation that that judiciously and objectively they will be considered.

The submissions are as under:

General: Issues for Consultation as per my understanding:

Problem Statements

- 1 GP pilot was done and no operator came forward to use the finer based services for backhaul from BBNL.**
- 2 The issue was not reviewed seriously and BBNL continued to create the network through BSNL, RAILTEL and PGCIL which was policy decision. More GPs were connected and still no operator is willing to take backbone on finer from BBNL.**
- 3 No SLAs are assured to customer as no SLAs are agreed with BSNL.**
- 4 TRAI does not have backhaul performance monitoring parameters and operators use MW backhaul due to easier and cheaper solution.**
- 5 License related issues continue in different solutions being searched to expedite the project and increase utility of the created assets.**

Submissions to expedite the project and increase the usage with viability of business based on analysis and success cases globally

- 1 The USO funding is done basically to create the network in areas where business case is not there for operators and Government wants socio economic development of society.**
- 2 This objective has been taken up Governments and successfully spreader the ICT to even each house of the country.**
- 3 Taking this as encouraging statement the solution is searched.**
- 4 First and foremost let us divide network in broad building blocks:**

Telecom infrastructure and services involve three different kinds of investments:

1. Long-term passive infrastructure, as sites, ducts, masts, poles and cables
2. Mid-term active equipment involving access, transport and control platforms
3. Application and content-related investments as cloud, CDN and SDP platforms

Now Point by Point inputs to TRAI questions:

Q.1 The “Report of the Committee on NOFN” has recommended three models and risks/advantages associated with these models. In your opinion what are the other challenges with these models?

Answer 1:

A. General: The report has not considered the case studies of success in other countries and only deliberated on present issues. Accordingly they have given recommendations. The success cases have mostly been divided the network in three parts — **fibre infra, technology and content**. They have not considered the collaboration method of existing fibre in the country as available resources (**unbundling method**). Also countries have used existing copper for broadband. **copper and fibre unbundling** has not been considered. Social and commercial requirement has not been worked out separately. No regulatory change has been proposed while countries made regulatory reforms. Different methodologies have been proposed for different states for implementation. The sample data used is too small for generalising the decisions. country is diverse and recommendations are generalised based on small/vague information. How the integration will take place is not covered. High level technology is proposed at GP level and skill set is not considered.

The regulatory reform like declaring fibre network as infrastructure, making building norms as **MEPO** (Mechanical, Electrical, Plumbing and **add Optical**), setting **fibre, duct lease rates** to utilise existing resources etc are mandatory to make the vision a success at reasonable tariff with **reasonable QoS**.

B. Comments on Report of DoT:

a. in forward — **i-ways are new highways is mentioned**, but not recommended as national infrastructure. **broadband connection target (year 2017)** is mentioned, but TRAI need to define the broadband. Example — other countries have defined broadband like Finland has said — right of broadband — 100 Mb. Similarly TRAI to define — for different media situations as mentioned in the report — OF, MW and Satellite till OF reaches everywhere with targets. **For each GP 100 Mb is mentioned** — Need to segment based on population. Also Accessibility and cost per HH (house hold) to be defined. The E-Govt services should be mandatory and that should be taken as social requirement. The BW requirement for social aspect should be declared as mandatory and must not be related to commercial aspect. **Committee to re-examine the original architecture, capacity, reliability and design** — The QoS part of existing operators backhaul not considered. It is QoS part and TRAI to set parameters for backhaul QoS. The present MW backhaul spectrum rates to be rationalised after making fibre availability and set the reasonable rate of fibre lease with better QoS than existing method of backhaul. All existing available fibre and duct should be considered to finalise the network design and declared as national asset. Define the rate of fibre as BW rates are defined. **Enhancing the human resource base** — how to do it is not covered. To ensure usage and get benefit of created resources the manpower skill set improvement plan to be drawn. We tried at Indore and got success. When fibre reached village exchange, one STD PCO was made mandatory target for SDO. the local person opened PCO. He earned and ensured that the Fibre system and exchange remained live. In case of break down he used to run around and ensured early restoration by BSNL team as he was losing his earning. Similar simple concepts are to be part of policy to ensure success. How O&M will be done and wherefrom OPEX will come is not touched.

b. Chapter 1 — **page 22 clause 1.02 — only 5000 GPS are done** — only comment is there and no detailed analysis is done by asking 5 times WHY BBNL failed and then how to plug the failure in future is not covered. **Clause 1.05 — primarily for the benefit of local communities, panchayats and state Govts** — If so then clearly define how much cost is apportioned for this as subsidy and balance for commercial purpose to make business viable. This subsidy should not be limited to CAPEX in that case. It should cover OPEX. However, if free is given then it will be failure like MARR. The fund for such subsidy should come from other development projects like rural development, education, health,

security etc and they should be charged (define tariff for them). **clause 1.09 — lack of skilled manpower** — Paper has not covered how this issue will be tackled? Please recall you had taken up ALTTTC as university. The skill development plan upto village level for this purpose should be part of recommendation or TRAI can cover in regulatory reform. Without manpower how success will be there? **Clause 1.14** — Need to be addressed in detail. All vague statements are there. District can be made as business unit and all the available resources can be mapped as this is possible (being small geography and states also have district level administration). where fibre is not available, they can draw cable. District authorities can help in this as social programs belong to them. The fibre infra part and space to provide social services should be their responsibility to ensure. Hence fibre can be state subject as they can add value and this way geo penetration of fibre will increase. Since they own RoW all operators and fibre owners will be lined up easily which our DoT is not able to get in years. This data can then centrally be mapped on GIS owned by BBNL to design the integrated network. Fibre infra therefore has to be separate. **Clause 1.15 (iv) — non contiguous coverage** — If BW is made available to particular GP, the services can start and we should not wait till whole network is ready. We always head in wireline non feasible cases. let it be on similar line. At least benefit will be extended to that pocket. **(v) — Excessive control** — I will say illogical control of cost — BBNL defined benchmark rates for execution — Rs 2000/cum for PCC. It needs more than 7 bags of cement. What will you call this? They have messed it up. They need to define the budget and let agency manage. They need to ensure quality. With such illogical rates how will they ensure quality and the network will be on paper. Now location based (GPS) videography is possible and thus quality can be ensured easily. This should be part of guidelines while funding the project from public money. **page 31 (ii) — High Internet bandwidth cost** — Clear guidelines are not defined how to have server hosting in India, Indian content? In parallel Indian content and hosting plan is to be implemented. there can be two tariffs — for information from Indian servers and for international servers. The Govt related social services will be on Indian servers. This is not covered. **Page 32 — Principles for BW estimation** — They are based on very vague information. Perhaps TRAI can collect the data in consultation paper and survey. Existing ARPU of mobile at Block level can be a good data to work out. Social services (e-Govt) bandwidth can be worked out easily. Accordingly the estimates can be prepared. **page 33 clause 2.18** — AP is not representing Indian demography and can't be taken as guiding factor. This exercise is to be done at district level with contiguous integration of districts and just can't assume like this that 66% in ring or so on. Each meter of laying OFC costs. The life of Aerial to be considered. **Page 39/40 — Guiding Principles** — All English and no objective numbers. Need define in numbers — example QoS? **Page 50 — Duct size 50 mm — all are using 40/33 mm as per GR** — why 50 mm? **Similarly defining number of fibres — generalised** — should depend on HH in GPs and blocks taking ultimate objective of FTTH. I gave all calculations. **Page 52-58 — Technology selection criteria** — Not considered Indian environment, cost, available skill set etc. As on date MPLS TP at GP level will not be practical. It has not matured globally yet. The bulk deployment as set top box will be risky. MPLS TP is being developed as MPLS IP was costlier and so many features are not required at edge level. Though GPON is recommended for linear and has been rejected for ring architecture. The technology has been developed in India and ring also is possible and CDOT can take up. Where is MAKE IN INDIA if we go for such recommendations. I had discussions with ITI, BEL etc who have product and moreover, people can use it and much cheaper. Yes ultimately MPLS TP may reach end user, but let it not be at this stage till it matures. Also I gave comparison of Ethernet switches Vs MPLS TP comparisons. Still need time to get maturity on MPLS including technology, price and skill set. Where numbers are less and power is available even ethernet based switches can be used in place of GPON depending on commercial viability. Technology keeps on changing and therefore, the network has to be technology agnostic.

At this point let me mention if they give to states to be ISP then integration at national level will be an issue. **Page 65-72 — Framework for Alternative Implementation Models** — All stories, no clear recommendations. AP, TN and GJ — will have independent network. Some states CPSU led and some are Private player led (page 68). How is it possible? CPSUs have already messed up the whole network because of policy gaps. BSNL and RAILTEL were given works of OFC network upto block level through tendering process by USO and years have passed. they have not done. TRAI has taken very seriously for RAILTEL failure in NE. Still recommendations continue with CPSU. It is not that CPSUs can't do it. They need to analyse why they are failing? very first thing is that they did not create organisation to take up such task. TRAI can get RAILTEL works of OFC till block level (in USO tender) audited and will know the quality. They don't have manpower to supervise. Why the location based video system is implemented to ensure quality of works. This will ultimately be a national waste if quality work is not done. Govts and TRAI may perhaps to think on this point seriously to ensure consistent QoS to indian citizens in remotest places. There has to be strong mechanism to take contractual actions gor defaulting contractors. BSNL and RAITEL have defaulted and with excuses they continue and public money is wasted and social cause is not taken care. Page 110 — Organisation — the decisions are pending. When we talk of organisation it should be till user including consistent operation and service to customer. That part is not covered. Perhaps ALTTC type of setup as Apex and then franchisee at block/district level will ensure availability of manpower. If Fibre infra goes to state then complete organisation at that level and coordination team from BBNL (Apex body) need to be clearly defined. So far BBNL is not having regular chairman or directors????

I have given my observations as per my experience in this field covering whole country in optical network planning, execution and operation management of around 150000 Kms of network. I started working on Optical fibre in 1989 and since than created number of networks in Metros, NLD and rural. Perhaps my experience sharing will help society to grow.

Q.2 Do you think that these three models along with implementation strategy as indicated in the report would be able to deliver the project within the costs and time-line as envisaged in the report? If not, please elucidate.

No. The 3 models in report are State Led, CPSU Led and Private Sector Led. Before discussing the expected reasons why these models will not be able to meet the cost and time targets, we need to discuss some success stories globally. Going through the present status CPSU model was implemented and all know the status — the report clearly mentions that they have failed. State Led model needs analysis of pros and cons. Private Led model also needs analysis — why private players have not come forward so far. In this regard we may have to refer here USO funded tenders for block to district fibre based network was to created in Assam and NE. The bids were invited and no private player quoted, even though they attended all probed meetings. The projects were awarded to BSNL and RAIL-

TEL. they are still not completed. That means there is something wrong in designing USO funded projects because of which private players are not attracted to quote. CPSUs perhaps did not do the detailed analysis and quoted to win. They won and they are not able to deliver. **The failure analysis needs to be done in detail (asking 5 times WHY at least to find root cause and then take decision) before arriving on these models.** The state led models — states will need all types of licenses. They are not in this business. How will they make the project viable? Will they be able to sale bandwidth on competitive rates and with defined quality of service? There will be interconnect issues. the national integration will be an issue for seamless working. No single operator who took license of single circle could survive as business case will not be there. Recently AP has come out with proposal on Aerial. **The life of Aerial network is question mark.** Also quality of service on Aerial will be an issue. Therefore, strength of all — State, CPSU, Private players are to be synergised before taking the decision and rather than assigning state by state, the responsibility by responsibility assignment can be done.

Points for State SPV:

1. They should only be IP1 registered Infrastructure Provider. They will own the fibre. Since the funding is from USO, they will first lay where there is no fibre. Once they lay, all have to use these fibres by leasing from them and will not be allowed to lay on same route i.e., RoW will not be given. Example: Mumbai Pune highway, all have to take duct from Maharashtra Govt. In Nagpur city similar case. I can explain. This way national asset will not be duplicated as has happened so far. Multiple Optical cables are there on same route.
2. By TRAI quality policy, the operators will be forced to take fibres. The rate can be fixed low as basic objective is to create infrastructure for social obligation.
3. To have defined plan, quality execution and defined QoS in O&M, all state SPVs will have standard process as per BBNL. Just think of franchise system of Subway — you will find same standard. For that BBNL will have presence at high level in State SPV and PMC and OMC teams (small) and state SPVs will have detailed PMC and OMC teams as per BBNL guidelines.

3. If state SPV becomes ISP, NLD or any other operator then it will be too complex. How will you integrate NOC? How will they cross state boundaries? Why do you want them to become operator? Let BBNL take ownership of Bharatnet. The services on Fibre provided by state SPV will be organised by BBNL i.e., technology and equipment. The content will be by others on franchise system/revenue sharing system.
4. If you make state SPVs please do SWOT analysis — what value will they add and how will they operate. The operators who were having just one circle license only have disappeared in this country itself as they could not survive.
5. The points can be further deliberated.

Success Stories of Different countries with key policy details (extract from reports/papers downloaded from Internet):

1. Korea, Japan, Hong Kong, and Singapore are high fiber countries, thanks in large part to government subsidies and incentives for fiber to home that are quite large in relation to GDP. **The details of many of these initiatives are found in our 2008 report, *Explaining International Broadband Leadership*.** For example, the Japanese government allowed providers to depreciate during the first year about one-third of the cost of the broadband capital investments, as opposed to the usual depreciation schedule of up to 22 years for telecommunications equipment. And, as part of their own “stimulus package,” the Japanese government provided funds to help the incumbent providers NTT East and West deploy more fiber.
2. In Korea, the government established the Korean Information Infrastructure initiative (KII) in 1994 to construct a nationwide optical fiber network. The government followed KII with a string of 5-year programs that combined government funding with private sector contributions—including Cyber Korea 21 in 1999, e-Korea Vision 2006 in 2002, IT Korea Vision 2007 in 2003, and finally the Broadband Convergence Network (BcN) and IT 839 initiatives in 2004. Through these programs, Korea invested a substantial amount of money and provided incentives to private companies to build fiber networks.
3. Moreover, the governments in both Korea and Japan either own or recently owned significant shares of the incumbent telecommunications companies. Consequently, these governments have been able to pressure the incumbent telecommunications companies to roll out broadband, particularly high-speed broadband, faster than would otherwise be the case.

4. THESE INPUTS AS POLICY WILL HELP IN PREPARING THE NOTE FOR STATE SPV. SEE BOLD POINTS.

As revealed in OECD and Alliance for Affordable Internet (A4AI) surveys, some policy initiatives have been well identified to promote broadband investments, including these objectives:

- Establish a healthy market competition and an open environment.
- **Encourage lower cost structure for industry by streamlining processes for infrastructure deployment and sharing.**
- **Improve access to passive infrastructure (conduit, poles, ducts and masts) and coordinate civil works as an effective means to encourage investment.**
- **Encourage and promote the installation of open access to passive infrastructure when public works are undertaken.**
- Telecom infrastructure and services involve three different kinds of investments:
 1. Long-term passive infrastructure, as sites, ducts, masts, poles and cables
 2. Mid-term active equipment involving access, transport and control platforms
 3. Application and content-related investments as cloud, CDN and SDP platforms

.All of these types of infrastructures have different investment requirements and could be shared differently. As an example, sharing civil passive infrastructure makes sense cost-wise and does not materially impact service differentiation.

Building out a national fiber backbone is a capital-intensive project, requiring the acquisition of rights of way and the construction of ducts, poles, data centers, nodes, the fiber itself and other physical assets for the network. Once it is in place, it can provide a transformative open platform for ultra-broadband access

TAKING ABOVE OECD INPUTS, STATE SPV CAN BE ASSIGNED ITEM 1 TO ENSURE VALUE ADDITION AND SIMPLE TO OPERATE.

5. Sweden success in rural — a large number of rural municipalities have deployed open access fiber networks, because the open access model is sufficient to meet their specific demands. Unlike the traditional telecommunications business model, the open access model maximizes the consumer's benefits in terms of freedom of choice and presents the highest degree of competition on equal terms in order to avoid monopoly behaviours, by separating the roles of service provider and the infrastructure & network provider. Due to different nature (both technical and economic) of the different parts of the network, the open access model also optimizes resource allocation for a passive infrastructure and active equipment by further separating the roles of physical infrastructure provider (PIP) and network provider (NP). The PIP (e.g. municipalities or utilities) typically owns a passive infrastructure and takes care of its physical maintenance, as the PIP is normally highly local. A passive infrastructure requires high initial CAPEX, low OPEX, and is hard to duplicate and inherently subject to regulation[65]. The NP (e.g. incumbent operators and broadband companies), on the other hand, usually operates nationally with large economies of scale; hence they can afford the high OPEX of running the active equipment.

6. PERHAPS THIS POINT IS IMPORTANT TO JUSTIFY THE POINTS. Much more important, Noam continued, “is the other side of the ecosystem—how to

help the private sector generate applications and content that will capture the hearts, minds and pocketbooks of the world. That's much harder, yet it is hardly getting discussed on the policy level. But when we look at the whole ecosystem, we really ought to focus here." Private-sector apps and content could benefit from appropriate tax policies and angel and venture capital, he said. He also cited the need for real competition: "One of the myths of the Internet is that it's incredibly competitive. But once you look at sub-markets, it's actually not. It's highly concentrated. And while it might start out competitive, it soon shakes out — and then the large-market-share players dominate." Charles Firestone added that this should not be surprising since, in most ecosystems, "there is a major species that controls." From his experience assessing broadband development in countries around the world, Robert Pepper of Cisco Systems proposed that broadband's evolution be seen as a four-stage drama. The first stage is a supply issue: Is it available? The second stage is adoption: Are people subscribing to the service? The third stage is speed and speed-for-price: How many megabits of broadband transmission can one buy per dollar (or euro or yen)? And finally, the fourth stage is about quality: What applications can one use, with what benefits?

7. US — Policy Recommendations in the Low Demand, Low Supply Scenario. EXTRACTS WHICH MAY HELP: A. Use universal service to subsidize high-end broadband in rural areas (despite the costs and inefficiencies). B. To stimulate broadband demand generally (and not just to rural areas), the *Batman Returns* group recommended promoting alternative venues for broadband use, such as schools and government centers for service delivery, which would then stimulate home demand. It also suggested training programs, including free personal computers, to make broadband "sticky." C. Government could make it easier and cheaper for citizens to access government services online, and provide economic incentives for doing so.

8. ITU report also will be helpful to support your points. The related extract:

- "Infrastructure policy should take account of rapid technical advances and be focused on larger goals, not directed towards a specific technology mix. Legacy infrastructure (or lack thereof) constitutes both a constraint and an opportunity.
- Infrastructure goals are separate from questions of public ownership of facilities and the role of competition in spurring private investment.
- Pricing or other barriers that restrict access to networks or infrastructure must be removed as far as possible. Interconnection among networks must be robust, cheap and efficient.
- The physical network is distinct from the services and functions that travel across it, and, in the interest of competition and technical progress, too close an association between infrastructure and a particular service should be avoided.

- **The sharing of infrastructure should be facilitated and encouraged, and policy-makers should consider how best to ensure synergies among applications and services. This means adopting an integrated, trans-sectoral approach.**
- **Build an adaptive regulatory framework by adopting a technology neutral approach, and an administratively simplified and flexible licensing regime providing for easy market entry of new players, such as through general authorizations and multiservice/unified licences.**
- **Create a regulatory framework that encourages a full range of potential broadband providers. Moving beyond large-scale national network operators, regulators can empower, for example, universities and government offices, local communities and smaller entrepreneurs to deploy broadband access networks. This may include tailoring regulatory frameworks to each group of potential broadband providers:**
 - **A regulatory framework tailored to small broadband providers will enable and encourage local community providers to harness the potential of broadband technologies and enable greater broadband access in rural areas;**
 - **Competitive large-scale operators can be encouraged to extend their networks to rural areas through infrastructure-sharing arrangements that guarantee open access to all competitive operators;**
 - **Competitive large-scale operators can be given incentives to deploy networks in return for appropriate rewards;**
 - **Regulators could seek to encourage the deployment of broadband access networks by providing direct, targeted subsidies from universal access funds or indirect financial benefits (such as tax exemptions) to a full range of broadband providers.**
 - Shift regulatory attention from retail to wholesale markets; i.e. by ensuring that alternative operators have access to dominant players' infrastructure (through passive sharing such as duct sharing, local loop and sub-loop unbundling, bitstream access, network and facility sharing, etc.) to offer competitive converged services, therefore avoiding unnecessary duplication of infrastructure and reducing costs.
 - Create an asymmetric regulatory regime to prevent the dominant operator from constraining the development of competition in the broadband access market.
 - Work with other government agencies or ministries to develop initiatives stimulating demand for services and applications within the framework of broader strategic goals, such as connecting public institu-

tions (especially public administrations, schools, libraries and hospitals), businesses and residential users with broadband, promoting economic development, digital inclusion, social cohesion and equality of opportunity.

- Encourage the deployment of wireless broadband access networks by freeing up the requisite spectrum, while taking account of the range of demand. This strategy can be augmented by a technology-neutral approach to spectrum assignments.

- Encourage the build-out of fibre backbone networks to boost the capability of both wire-line and wireless broadband technologies. These steps include forging synergies with transport and energy infrastructure projects and providing incentives for 2G mobile operators to replace their microwave links with fibre networks. It also means making it possible for all owners of such communication resources to lease unused capacity to others for commercial deployment.

- Link broadband access development strategies to efforts to help people have access to personal computers or other devices. Build government-sponsored Internet kiosks and access terminals, especially in areas where broadband networks are to be deployed.

As regulators consider and implement new strategies, they will have to remain flexible.

9. From Estonia —

Build-out of retail broadband network will be supported in regions of market failure. This will be done by:

- reducing administrative burden related to the construction of the communications network by simplifying the relevant legal framework. A principle will be introduced according to which “last mile” connections will have to be built into any new government-funded construction objects;
- promoting community initiatives aimed at the development of “last mile” connections;
- supporting the development of “last mile” connections as needed in areas of market failure, including in rural areas.

10. Cases of Success in Rural area — EXTRACT FROM UNCTAD PAPER Year 2015. This will be very useful support.

In Australia, the national administration and regulatory authority have sponsored an extensive series of programmes to support rural broadband access, including the Universal Service Obligation and Fund, which has generated over \$200 million, the Connect Australia programme, which has allocated over \$1 billion for extending broadband fixed and mobile networks to rural areas, and a new national broadband network initiative to create a new national wholesale fibre backbone.

The Korean broadband success story has also been aided by strategic public investments and partnerships. The Informatization Promotion Fund was used to finance projects, with contributions from the Government (39 per cent) and the private sector, through spectrum-licensing fees, operators lev-

ees and earnings from Fund loans. The Fund was jointly managed and administered by the then Ministry of Information and Communication and Institute of Information Technology Advancement. A \$900 million project, Korea Information Infrastructure, invested in the national high-speed public backbone, the development of ICT applications, and the promotion of research and development and information technology pilot projects. Private sector carriers, both Korea Telecom (now KT Corporation) and others, were contracted by the Broadband Planning Division of the aforementioned Ministry of Information and Communication, with Government funds leveraging private investment (World Bank, 2009).

In Malaysia, the Government established a national broadband initiative to promote the expansion of broadband services throughout the country and achieve 50 per cent household penetration of fixed or mobile broadband by 2010. Some \$4.2 billion were allocated from the Universal Service Provision Fund to finance ICT access for hundreds of rural schools, libraries and clinics. Public access community broadband centres and other telecentre projects have also become a successful component of the Malaysian strategy. Over 220 community broadband centres provide broadband access, ICT training, and online business or website development. The Government has also allocated \$305 million from the Fund to provide free personal computers to qualified students and

17

households, and discounted broadband subscription prices of \$6 per month for rural subscribers. Chile was a pioneer in promoting rural telecommunications access through its Telecommunications Development Fund, which used open, competitive tenders and achieved rapid expansion of rural networks and establishment of infocentros (information centres). In 2008, the Chilean Government announced a new programme to provide mobile broadband in underserved rural areas by using a hybrid method that established minimum service conditions for broadband access and a ceiling on prices. The Government offered subsidies amounting to more than \$100 million through a reverse auction to develop about 1,500 municipalities in rural areas. As a result of the programme, broadband coverage is expected to increase to 90 per cent of Chile's population (World Bank, 2012).

Policy support for greater access. Market incentives are often insufficient to ensure the availability of goods and services to those that need it most but do not have the ability to pay. Express governmental support to promote access to broadband to the poor, particularly in rural areas, is required. This can take the form of additional financial incentives for greater penetration into rural areas, direct governmental provision of broadband infrastructure to rural areas and network access partnerships that facilitate broadband access to the poor at lower rates, among others.

Promoting relevant ICT content. Policies that promote the development of relevant ICT content, especially with a focus on the interests of less advantaged users, can help reinforce broadband demand. They can also contribute to the creation of ICT-based businesses and jobs, including software companies, business process outsourcing and online services. Such policies encourage the growth of domestic content that is of value to diverse groups of citizens and communities, while emphasizing awareness, training and economic opportunity.

Support for programmes focusing on local content and application development can be provided through various government initiatives that include partnerships with educational institutions, private corporations, non-governmental organizations, other public funding programmes and activities within local com-

munities. ICT content in developing countries that addresses the interests of non-traditional users, from farmers and rural residents to indigenous peoples, and reflects local community values and social conditions can include the following components:

- (a) Content that is available in local languages and addresses indigenous cultures and traditions;
- (b) Applications focusing on ICT use in agricultural, fishing, forestry, tourism and other country-specific economic sectors;
- (c) Customized social networking services and programmes that encourage user-generated local content;
- (d) Mobile applications adapted to the devices and capacity levels of typical local users;
- (e) Applications and services aimed at specific disadvantaged or special groups, such as women, the elderly, disabled persons and non-literate users;
- (f) Business management and support software for local SMEs;
- (g) Entertainment content, including music and television programming, reflective of national values and interests.

Promoting use of ICTs and broadband technologies in local production. The high cost of relevant software, applications and hardware, such as computers, servers and parts, can be unaffordable for enterprises, particularly SMEs in developing countries. High tariffs or inconsistent tariff regimes can lead to high prices of ICT products (WTO, 2013) and may discourage SMEs to take up e-commerce and thus hinder their development and expansion into new markets. Broadband also allows enterprises to connect internally as well as with other national and international producers. A firm can participate in global value chains when it has access to well-developed ICT infrastructure involving broadband networks that provide integrated and uninterrupted information flow across companies and countries (OECD, 2013).

Local government roles and responsibilities. Local and regional policies and rules can be at least as influential as national standards on broadband growth opportunities. Local government can bring valuable perspectives to ICT planning and implementation, whereas their opposition or exclusion can often lead to unforeseen impediments. Some key roles and functions played by local governments in the process of promoting rural ICT development include issuing permits and fees for infrastructure rights of way, local taxes, providing e-government services and facilities, direct participation in community access projects and contributions to local ICT educational and awareness campaigns.

Bridging the gender gap in broadband divide. Policymakers need to address another problem: gender digital divide. Inclusive broadband ICT policies

should consider the accessibility, affordability and digital literacy of discriminated groups in society. Therefore, policies need to promote content catering to the interests and needs of women, including content focusing on education, health, jobs, economic empowerment, and family and community life. Moreover, policies should encourage women and girls to embrace technology for their own empowerment, study and choose careers in this sector and engage passionately in the future of broadband (ITU and UNESCO, 2012).

Promoting open educational resources. Open educational resources also hold significant potential to accelerate free access to knowledge and facilitate the adaptation of content to local needs and languages (ITU and UNESCO, 2013a). Therefore, online educational materials, applications and services can be provided with local content and in local languages free of charge by governments and public organizations. Collaboration between developed and developing countries, as well as among the latter, would facilitate closing the broadband ICT divide. Individual institutions also play an important role in this initiative. In 2001, the Massachusetts Institute of Technology announced the release of nearly all its courses on the Internet for free access. In April 2012, the World Bank launched the Open Knowledge Repository, an online collection of World Bank publications released under Creative Commons licensing, which includes more than 9,200 research works. The content of the open resource materials is crucial in maximizing its benefits. Another open educational resource, launched by the Delft University of Technology in the Netherlands, is particularly important for developing countries, as it offers courses on clean water technology for developing countries and updated information on water treatment processes from various regions.

11. **US paper of yr 2008** is very exhaustive and will be helpful. On similar logical concept State SPV recommendations can be worked out. Regulatory reforms are also equally important as per the paper. The network builder will own the local network, but will be required, as a condition of receiving the federal/state funds, to ensure that the network is open to all lawful content and applications and that its prices are affordable. In addition, government policymakers will determine whether or not the network owner should be required to make a certain amount of capacity available on a wholesale basis to competitive retail service providers. In addition, the United States should undertake an inquiry to determine whether owners and operators of broadband networks should make their facilities available for interconnection and resale by competitors on an unbundled basis. The European experience demonstrates that unbundling and interconnection creates a competitive dynamic that provides lower prices for consumers and can enhance broadband deployment and penetration. On the other hand, network owners allege that network sharing inhibits their incentive to invest. If these private network operators receive two-thirds of the funding they need to cover deployment costs, however, that would appear to address the investment incentive. Competitors often offer innovative services by adding their own electronics to the network that benefit consumers. At the same time, network owners must be assured that they are not

subsidizing their competitors by being required to offer below-cost rates. Sweden and other countries in Europe are also deploying fiber. Given the shortage of available broadband capacity in the United States, it seems unwise for states to thwart the efforts of municipalities to deploy greater broadband.

12. **Inputs from Denmark experience** may be useful to add. Just as railroads and highways, broadband networks are the technological means which enable people/machines to meet and interact virtually with other people/machines. Development of content and infrastructure may stimulate each other. But for our purpose it is important to distinguish between the factors stimulating content development and those stimulating the infrastructure development.

12. **We must write similar paper as of Copenhagen** — (infrastructure_-_assessment_-_auriol_fanfalone). Concluding remarks — The aim of this study was to suggest possible ICT infrastructure targets to be included in the Sustainable Development Goals agenda, accompanied of a Cost Benefit Analysis of these targets. The suggested targets focused on broadband availability measured in terms of penetration. Existing literature has already generated considerable amount of evidence of the positive spillovers that broadband has on the economy (ITU, 2012), and policy makers in both the developed and developing regions of the world are taking into account ICT when their development strategies as well as stimulus packages.

The Cost Benefit Analysis conducted in this paper should be interpreted with much caution as it is based in a series of over-simplifying assumptions regarding they cost per line per type of technology to achieve network coverage. The intention was to provide some sort of reference when comparing ICT infrastructure targets with other development targets in the Post-20145 Agenda. In addition the broadband deployment targets are formulated according to the existing indicators in this domain.

With these caveats in mind, in general the targets related to the expansion of mobile broadband penetration by three-fold at a global level or in developing regions exhibit the largest Benefit-Cost Ratio (Targets 3-4). In particular, the highest B/C ratio that is robust to different methodologies of assessing the benefits are related to expanding mobile broadband in developing regions by three-fold (i.e. Target 4, with a B/C ratio of 14.41 and 21.74, depending on the way the benefits are assessed). Secondly, expanding world mobile broadband penetration threefold (from 32% to 90% as expressed in Target 3) also exhibits a large B/C ratio of 13 and 29.42 (according to both methodologies to assess the benefits).

Additionally, if policy makers wish to insist upon universal broadband penetration goals, a discussion on how to measure this target should be undertaken (i.e. if the targets should be measured with indicators according fixed or mobile broadband, and if indicators should be measured at a household or individual level). If we consider universal broadband penetration to be reached by either fixed or mobile networks, some takeaways can be drawn from the analysis: it seems that given the cost advantages that wireless technologies have over fixed networks, targets aimed to achieve the universal availability of broadband seemed to be better off if they are reached through wireless technology, (at least in the developing regions of the world). In fact, the B/C ratio of achieving universal mobile broadband penetration by the year 2030, Target 8, is quite high (i.e. 11.43 and 28.79 depending on the methodology used to assess the benefits). Finally, there are some actions governments can take in order to drive the cost of deployment down as well as fostering incentives for network deployment. In this vein, governments should seek policies and regulations aiming to improve the market competition, as well fostering incentives to invest in network deployment by the private sector in order to achieve ICT infrastructure objectives by the year 2030. In this sense, institutional and regulatory framework conditions provide fertile ground for ICT infrastructure deployment.

13. Physical Infrastructure Access (PIA) lets communications providers use BT ducts and poles when laying their own fibres between exchanges, cabinets and premises. BT is required to share detailed information with other communications providers about, for example, the available capacity and quality of ducts and poles. The prices for PIA must reflect the costs of providing it (with a recognition of investment risk where new ducts or poles are needed for superfast broadband).

14. Universal_Broadband_Blair_Levin — 2010 US — most important for success.

Q.3 Do you think that alternate implementation strategy of BOOT model as discussed in the paper will be more suitable (in terms of cost, execution and quality of construction) for completing the project in time? If yes, please justify.

Answer 3: Please see comments and inputs in reply of Q1 & Q2. Before discussing BOOT, we need to have detailed network design by APEX body. Transfer in case of road etc is possible. In case of fibre, there is no precedence in the world perhaps. It can be BOO on re-

verse auction basis for Fibre Infra part (Passive under IP1). Once the USO fund is used for viability gap in reverse auction, then no other laying should be allowed as i-way is created for use of all. The rates can be fixed by TRAI for leasing. ROW should be free in terms of document. The social service requirement of fibres should be defined. Geo penetration should be the target for i-way. Existing fibres should be taken into account by going for EOI/reverse bidding basis. The existing owners can bid for providing fibres. The number of fibres can be decided similar to road network — Express way, NH, SH, Others etc as i-way is analogous to road network.

The electronics part should be open to all based on the requirement. For social service BBNL should create the network with States and extra capacity can be used for commercial use in competitive environment.

There are two models possible in fibre sharing — lease or revenue share.

The content part should be developed as separate building block to be collaborated by service providers.

Q.4 What are the advantages and challenges associated with the BOOT model?

Answer 4: BOOT has no precedence in fibre network. The points are covered in Q3 reply.

Q.5 What should be the eligibility criteria for the executing agency so that conflict of interest can be avoided?

Answer 5: The eligibility criteria is to be designed for 3 building blocks — fibre infra, electronics and content. The main item is fibre infra. For that IP1 registration is required. To have local interest and involvement of locals, the financial strength, local employment and previous experience in OFC works as contractor for execution and O&M should be taken into account. Since the contractors do not have financial strength for such massive works, consortiums/JVs should be allowed. To ensure Quality of work (as public funds/USOF) are involved, BBNL should have Project Management Agency (PMA) to certify. Since this is long term association, the viability should be worked out on State level for smaller states and group of districts for

larger states by fixing some figure of total KMs of network, say 20000 Kms or so. Man/machine/money resources are to be part of eligibility criteria.

Q.6 Should there be a cap on number of States/ licensed service area to be bid by the executing agency?

Answer: Yes. To avoid monopolistic approach by bidders, number should be restricted to 2 to 3. The consortium should be with contractors who have work experience in that geography.

Q.7 What measures are required to be taken to avoid monopolistic behaviour of executing agency?

Answer: Covered in Answer of Q6.

Q.8 What terms and conditions should be imposed on the executing agency so that it provides bandwidth/fibre in fair, transparent and non-discriminatory manner?

Rates are to be fixed by TRAI like for BW. Since USO fund is used and only one agency will be there to deliver fibre, this rate will be mentioned in the document of reverse bidding. This is like setting toll tax on roads in BOT model.

Q.9 What flexibility should be given to the agency in terms of selection of route of laying optical fibre, construction, topology and deployment of technology?

The design should be finalised by BBNL centrally where USO fund is used. The inputs may be obtained from prospective bidders (first go for EOI and pre qualification) and then declare the final routes taking social obligation of services as mandatory requirements. Later on the allotted bidder in that geography can extend the fibres based on business viability to increase geo penetration. Against USO fund provision for viability gap, BBNL can mention revenue share of fix amount in the bid. The detailed document can be prepared.

Q.10 What should be the methodology of funding the project? In case of VGF, what should be the method to determine the maximum value of

VGF for each State/ service area and what should be the terms and conditions for making payments?

Answer: The present revenue (ARPU) at block level can be one of the criteria. The distance to cover (the cost to provide fibre for social service) to GP. The income index of district. Population at GP level. In hilly terrain, the cost of digging is very high and social obligation with underground provision will cost very. These exceptions can be assigned to electricity boards of the states as they are already doing the social service and their poles can be used and they can take up IP1. this will help them to modernise the monitoring and control system of electricity boards. The policy decision or regulatory guidelines will help. This will easily ensure FTTH in hilly area as electricity is reaching the house and there will be very small incremental cost.

Q.11 What kind of fiscal incentive and disincentive be imposed on the agency for completing the project in time/early and delaying the project?

Answer: Incentive on early completion and quality (No NON COMPLIANCE) may be defined in bid so that social services can be started early. On disincentive part double the penalty will be imposed of whatever incentive is defined and USO fund will not be disbursed. The fund dispersion may be linked with connectivity.

Q.12 What should be the tenure/period after which the ownership of the project should be transferred to the Government?

Answer: Why should Government take back? No precedence exists. Let it be owned and operated. Taking over will not be easy task. In case not providing services as per SLA, then heavy penalties and taking over should be the only option. This can be only in that condition. Again it should be outsourced. What benefits will you get in taking over? Who will take over? when? wherefrom organisation will come? what will happen to the organisation of agency whois maintaining? Perhaps these questions justify that taking over is not a solution and not required.

Q 13 Do you think that some measures are to be put in place in case the executing agency earns windfall profits? How should windfall profits be defined?

Answer: When demand increases windfall profits come. In this case since rates are defined by TRAI to avoid monopolistic approach, the possibility of leasing fibres by more operators is only possibility to get more revenue. Since revenue sharing is proposed in terms and conditions, BBNL will also gain more.

Q.14 Whether there is a need to mandate the number of fibres to be offered as a dark fibre to other operators to ensure more than one operator is available for providing bandwidth at GP level?

Answer: There should not be any restriction for leasing fibres except that operator who is leasing can't sublease to others. Discount on leasing more fibres can be avoided to stop this practice.

Q.15 What measures are required so that broadband services remain affordable to the public at large?

Answer: Since sharing is done and TRAI is fixing the rates, the CAPEX and OPEX will be low to service provider. hence rates will be affordable. In license condition of serving in rural is there and therefore, fair competition will also be there.

Q.16 What safeguards are to be incorporated in the agreement entered between Government and executing agencies if RoW is not being granted to the executing agency in time?

Answer: SLAs are to be signed off with RoW agencies and tracked centrally as social service provision will be impacted. Provision of auto RoW approval beyond SLA can be defined so that RoW authorities are forced to meet SLAs. Blanket RoW permission should be responsibility of central agency and to be committed in RMA(Responsibility Matrix Assignment).

Q.17 The success of BOOT Model depends on participation of private entities which will encourage competition. What measures should be adopted to ensure large scale participation by them?

Answer: BOO is proposed. In this private as well as State SPVs, PSUs etc should be allowed to participate. The qualification criteria should be simple and to be worked out based on local geographical factors to have locals associated in the project. Since fibre infra is not a very specialised job, the experience criteria can be relaxed to all agencies (water/gas/sewer pipe laying, electric cable laying/underground utility laying agencies) may be considered for experience. Before start of work for such agencies skill development can be encouraged for fibre specific works like laying precaution, DIT, Blowing, Pulling, splicing, testing etc. ITIs/ Diploma/ Engineering colleges are there all across the country. This will create work force also. For machine purchase special loans may be encouraged to unemployed youth in local geography (district level say). These steps will bring local involvement with belongingness and development of respective area from the very beginning. People try to form cartel in such big jobs. The cartels can be avoided by encouraging participation of all underground utility contractors. On financial strengths method of loan on project may be worked out with financial institutions. This way reasonable rates with local participation will be possible.

Q.18 Please give your comments on any other related matter not covered above.

Answer: a. Single agency for integrated network with long term vision. b. Don't allot works to CPSUs on nomination basis. treat them as competitor. they keep on failing and no action. the responsible owners should be penalised with clear RMAs at all levels. USO funded block to district works were allowed to CPSUs in Assam and NE against bidding. They have not done and no action taken. Till you treat them like contractor they will not be serious. Start taking action like black listing, allowing works at risk and cost etc., they will deliver. In NOFN also review failures and stop allotment by nomination basis.