



Development of a National Broadband Strategy Project

**Addendum No. 1 to
Phase 2 report**

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1 Introduction

This addendum to the Phase 2 Report on the Development of a National ICT Broadband Strategy deals with the development of Fibre-To-The-X. This aspect was left out of the main report because the process of validating the cartographical data necessary for the model was taking longer than had been anticipated. Thus it was decided to release the rest of the report while addressing this issue.

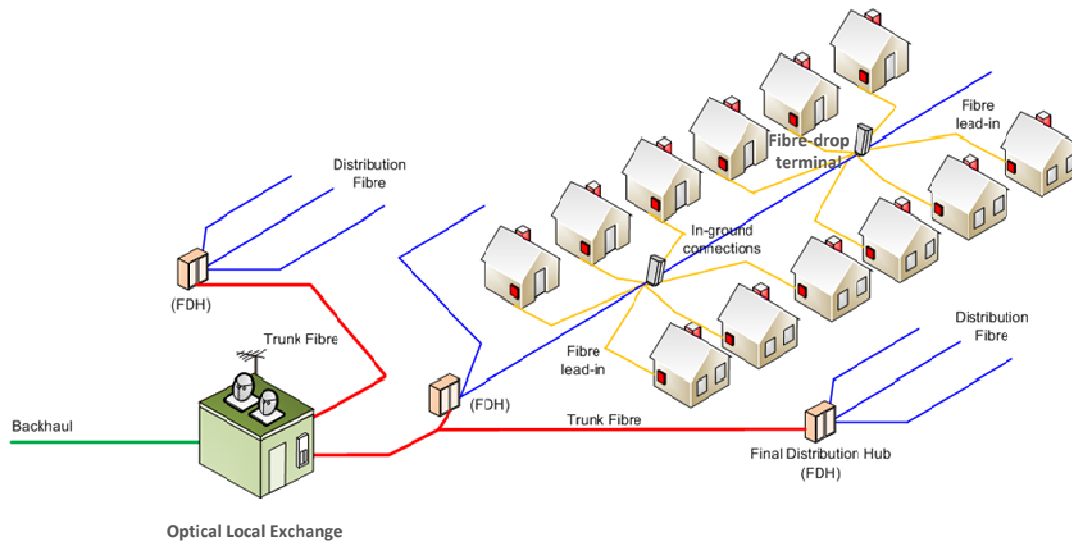
This material will be incorporated in the main report when it is revised.

2 FTTx Modelling

The use of Fibre-to-the-X (FTTx) was discussed together with other broadband technologies in Phase 1 of this project. The cost of rolling-out an FTTx network has been calculated over Gaborone and Francistown based on the following model and assumptions:

- The optical exchanges could be collocated with the existing telephone exchanges, or when necessary built from scratch. A cost for rearrangement of rooms and/or construction, splicing, active equipment has been defined.
- It has been assumed that the backhaul from the optical exchanges will be done using existing Metropolitan Area Networks (MAN).
- The other flexibility points in the network are the Final Distribution Hub (FDH - street cabinet), with an average of 1,000 connections, and the fibre-drop terminal grouping 6 connections. The cost for the provision of these elements takes into account the installation and the splicing.
- The horizontal network follows the roads and streets, and it is considered that the complete roll-out should be performed by digging trenches (no re-use of existing ducts). The average cost includes civil works, ducts, manholes, labour and cable.
- All identified developed parcels (plots) should be connected. Therefore the access network includes all sections from the local exchange to the lead-in segment (the connecting point being considered in the middle of the parcel). The average cost for completing this section of the network also takes into account the time the private area (appointments, unsuccessful on-site visits, etc.).
- The vertical part of the network (connection within the building) is not included as this cost should be borne by the owner.
- The specific distribution architecture (PON network or Point-to-Point) that will be chosen by the operator does not impact the global cost evaluation.

Figure 2-1: FTTH network segments



Two options have been considered:

Case 1: Connects all parcels identified in the cities: residential, industrial, commercial, civic & community, etc.

Case 2: Limits the roll-out to the industrial areas, commercial areas and parcels as well as civic & community (i.e. excludes residential parcels).

Figure 2-2: Overview of an FTTx network over Gaborone

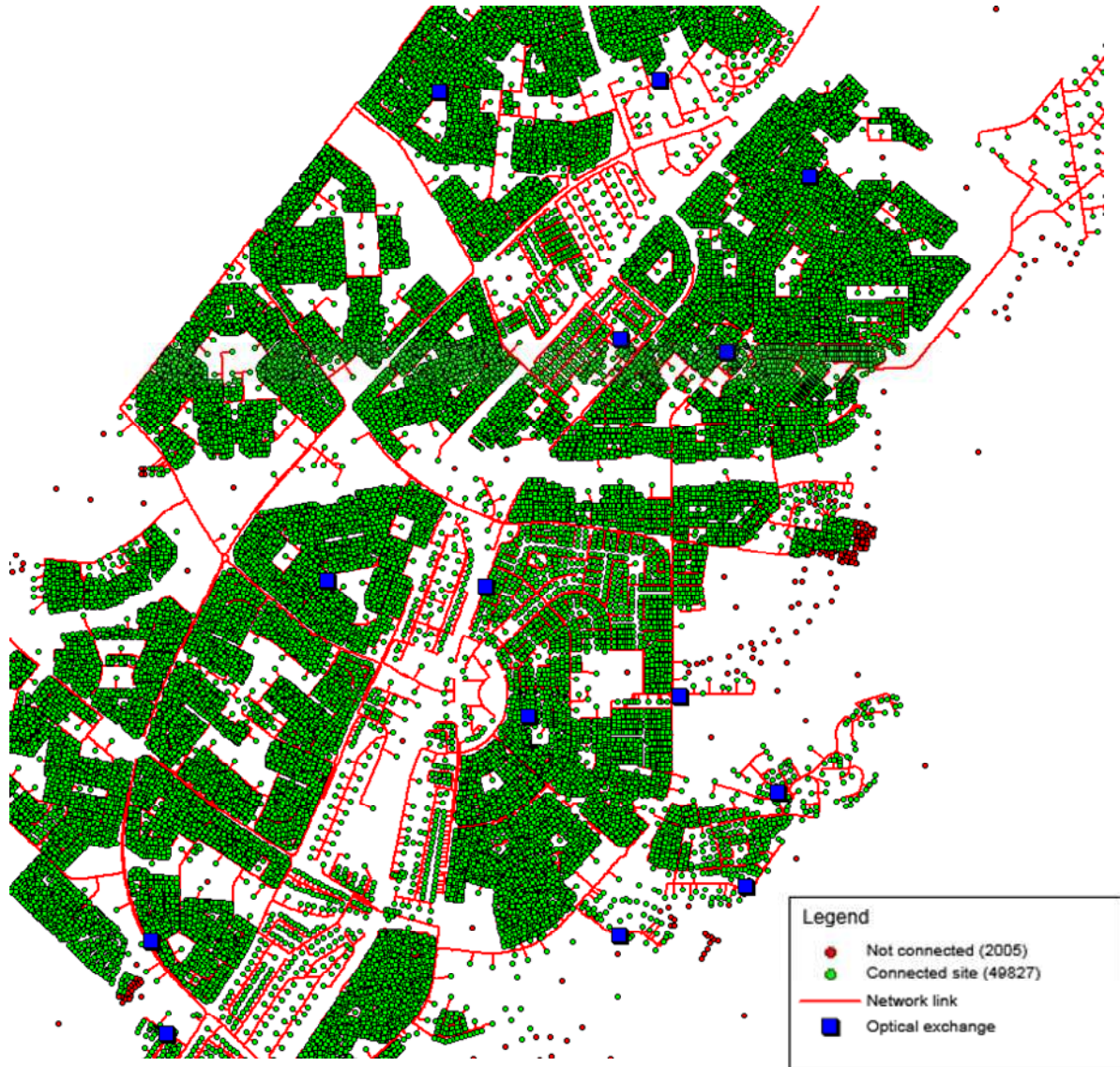


Figure 2-3: Detail of an FTTx network over Gaborone

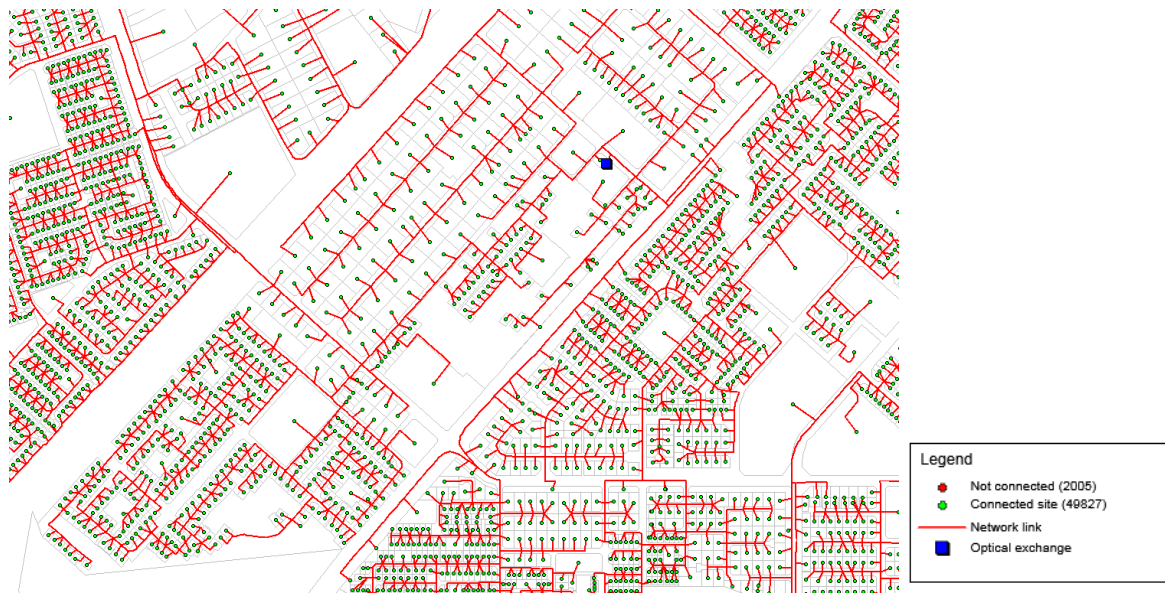


Figure 2-4: FTTx network over selected areas: industrial, commercial, civic & community

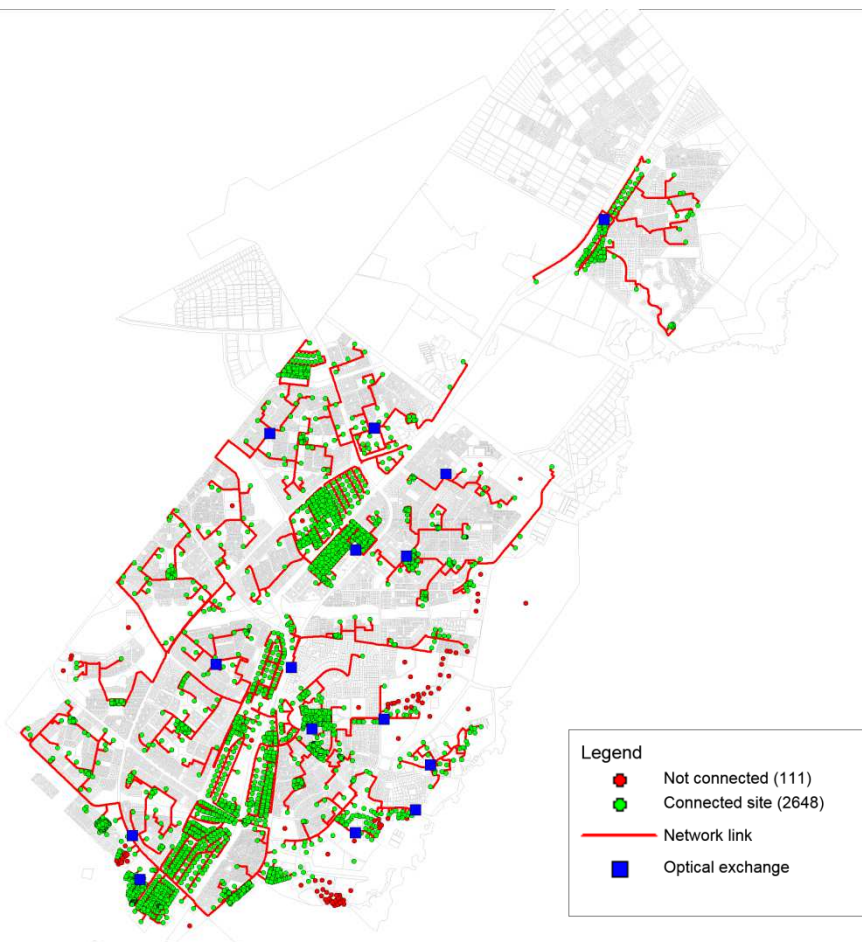
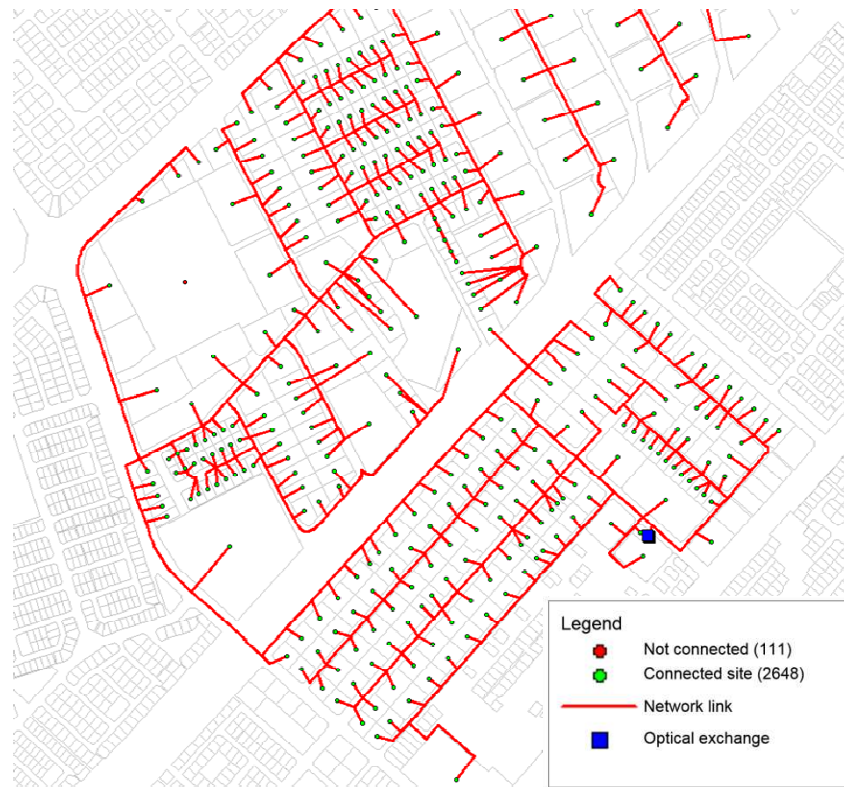


Figure 2-5: FTTx network over an industrial area (detail)



It should be noted that out of the cartographic data obtained, an average of 96% of the households are passed (the other ones being too far from the reach of any street). This gap with the comprehensive connection of the city is not significant; real on-field conditions would most probably show the existence of roads that could be used and that some of the parcels do not actually require connection. Furthermore, there might be some discrepancies between the cartographic data obtained and the on-field situation.

The global costs are the following:

Table 2-1: FTTx Network investments

FTTH roll-out CAPEX	All sites	Industrial, Commercial, Civic & Community
Gaborone	1,400 million Pula	222 million Pula
Francistown	900 million Pula	165 million Pula

3 Development of Fibre-To-The-X (FTTx)

3.1 Strategy

The National ICT Policy (Maitlamo) provides the following as regards the ICT Vision and Goals for Botswana:

National ICT Vision:

“Botswana will be a globally competitive, knowledge and information society where lasting improvement in social, economic and cultural development is achieved through effective use of ICT”.

Goals:

1. *Creation of an enabling environment for the growth of an ICT industry in the country;*
2. *Provision of universal service and access to information and communication facilities in the country; and*
3. *Making Botswana a Regional ICT Hub so as to make the country’s service sector globally competitive.*

In 2008, the Government adopted the Excellence Strategy whose main objective is to address challenges that hinder economic diversification. The strategy identifies a number of key issues that are critical to creating an Enabling Framework for Foreign Direct Investment (FDI). To that end, the strategy states that:

“Economic diversification and sustainable growth cannot succeed unless an appropriate supportive enabling framework is put in place. At its base, this framework requires, amongst others, the following elements:

-
• *Ensuring that Botswana has a state of the art ICT infrastructure that is competitively priced to facilitate private sector growth and transform service delivery through efficient and effective e-Services in government and the private sector*
•”

Thus both the National ICT Policy and the Excellence Botswana identify a state of the art telecommunications infrastructure as being key to the development of the country. From the results of Phase 1 of this study, it goes without saying that the current state of broadband infrastructure in the access network cannot be said to be state of the art.

The Excellence Strategy identifies the establishment of “Free Zones” as a key feature for attracting FDI and local investment in high technology and high value-added services. These areas are to be provided with a number of incentives, including amongst other things, state of the art telecommunications services. While we agree with this statement as regards FDI, it is equally important to recognise that for sustainable development and to ensure that the country is globally competitive, all businesses and public institutions should have access to state of the art telecommunications infrastructure regardless of whether they happen to be in the Free Zone or not. However, this statement should be tempered with the reality that it would be prohibitively costly to provide the same type of infrastructure everywhere in the country.

No other technology can provide better broadband services than fibre optic infrastructure. Thus most countries try at least to provide fibre optic infrastructure in their major commercial centre, or in selected business areas (ICT Hubs, ICT Parks, etc.). However, as shown in Table 2-1, deployment of fibre optic infrastructure is very costly. As a result, even in developed countries (see for example the international benchmark in chapter 5 of the Interim Report), the deployment of fibre optic infrastructure in the access network is done with some form of government subsidy.

Thus as discussed, we considered two options for rolling out broadband fibre optic infrastructure in the access network, in the two main cities of Gaborone and Francistown:

- **Option 1** is based on a fibre optic infrastructure for both residential and all developed industrial, commercial, civic and community areas.

The total cost of Option 1 (Gaborone and Francistown) = **P2,300 million**.

- **Option 2** is the same as Option 1, except that residential areas are excluded.

The total cost of Option 2 (Gaborone and Francistown) = **P387 million**.

To facilitate easy expansion of FTTx infrastructure in major cities, all new infrastructure developments for commercial, industrial, civic and community areas should include ducts and manholes for FTTx infrastructure.

Recommendation 1: Development of FTTx in major cities

In view of the high cost of deploying FTTX infrastructure, it is recommended that an FTTx network connecting Commercial, Industrial, Civic and Community Areas should be deployed in Gaborone and Francistown.

Question 1: Development of FTTx in Gaborone and Francistown

- (a) Do you agree with Recommendation 1 above?
- (b) Do you agree with the recommendation to exclude residential areas from consideration? If not, please explain/justify your reasons.
- (c) If you do not agree with the Recommendation 1, how can Botswana attract FDI in high technology and high value-added services that require robust broadband infrastructure?
- (d) Should Gaborone and Francistown FTTx infrastructure be rolled out as one project or as two separate projects, potential done by different entities?
- (e) If the FTTx cannot be rolled out at once (e.g. due to financial constraints), how should the rollout be prioritised? That is, which areas should be rolled out first and why?

3.2 Options for rolling out FTTx Broadband Infrastructure

This section provides options that could be adopted for rolling out the FTTx infrastructure, if a decision is taken to.

As for the copper local loop, a fibre optic access network can be considered as a natural monopoly, due to the predominance of the capital cost (fixed cost). This means that it is more efficient to avoid duplication of the infrastructure. Hence, the network infrastructure should be rolled out by a single operator and made available to all licensed operators (PTOs and ISPs) as an Open Access Network (OAN). BOCRA's study on Passive Infrastructure Sharing which was done in 2011 provides details as regards OANs. The report can be obtained from BOCRA's website.

The basic principles of an OAN are that:

1. Consumers must be free to choose any service provider on the OAN;
2. Any authorised service provider must be free to deliver services over the OAN;
3. Any authorised service provider should be allowed to add access points to the OAN, subject to technical feasibility and the service provider paying for the cost of establishing the access point;
4. Service providers should be offered Transport Layer services at various levels depending on their requirements;
5. All service providers must be offered services on fair and non-discriminatory terms and conditions;
6. The OAN operator should not compete with its customers (service providers) by offering retail services (directly to end users).

Some of the countries that have deployed broadband networks based on Open Access Network principles include Australia, Singapore, France and New Zealand.

Condition 4 of the principles here above, requires that the OAN operator offer leased capacity at various levels to meet the requirements of the licensed service providers. Thus the operator will have to offer both dark fibres and leased bandwidth to ensure that service providers can lease whatever meets their requirement. It would not be advisable to lease dark fibres only, because that could be wasteful of fibres if each service provider is required to lease dark fibres, it would not offer the necessary flexibility and the cost could be too high for most service providers.

By having an OAN with a public and regulated wholesale offer, competition in the provision of broadband services will ensure that consumers are not deprived of diverse and innovative services that different service providers may offer.

3.2.1 Option 1: Use a reverse auction open to PTOs

This option would be similar to that proposed for rolling out Mobile Broadband Infrastructure in Clusters 1 to 3. BOCRA and the Government would issue a tender to rollout the FTTx infrastructure in Gaborone and Francistown based on the selected option in Section 6.4 of Phase 2 report. The bidder that requires the least subsidy would be granted the funding and would be required to rollout the infrastructure within a specified time frame.

3.2.1.1 Advantages of this option:

- a) Since this will be a competitive process, it will lead to the least subsidy and thus alleviate the funding burden from being borne by the Government alone.
- b) Normally a competitive process selects the best operator on the basis of their business plan, system design and innovative services that they may propose to offer.

3.2.1.2 Disadvantages of this option:

- a) Considering that PTOs will be obliged to rollout Mobile Broadband Infrastructure in Clusters 4 to 6 at their own cost and Clusters 1 to 3 through on reverse auctions, the additional financial burden of sourcing funds for the FTTx could be beyond even the most financially resourced PTOs.
- b) This option will create a monopoly operator in a segment of the market that has been identified as the main constraint to the development of broadband services and innovation in the ICT sector. Should the operator turn out to be a non-performer or provide poor service, there will be very little that can be done to take the FTTx infrastructure away from that operator and hand it to a more competent one.
- c) Condition 6 of the principles for an OAN states that the OAN operator should not compete with its customers by offering retail services. It would then be necessary to separate, at least functionally but preferably structurally, the retail operator from the wholesale operator.

3.2.2 Option 2: Let BOFINET operate the FTTx as an Open Access Network

In August 2012, the Government announced that it had decided to split the Botswana Telecommunications Corporation (BTC) into two entities: BTC Limited (BTCL) to be partially privatised and Botswana Fibre Networks (BOFINET), the wholly Government owned entity that will own and operate, amongst other things; all local and national fibre optic cable infrastructure as a wholesale only operator.

Thus it might be logical to let BOFINET rollout the FTTx infrastructure.

3.2.2.1 Advantages of this option:

- 1. BOFINET as a wholesale operator, is required, already on other network segments, to provide services in a manner consistent with Conditions 5 and 6. Condition 6 is critical to ensure that the FTTx operator does not compete with service providers. Its role is to facilitate competition in the retail market. This ensures that the OAN operator does not develop anticompetitive tendencies.
- 2. Since BOFINET already has a substantial fibre optic cable infrastructure in the metropolitan network, extending this infrastructure to build the FTTx network would reduce the cost of the FTTX network.

3. Since BOFINET is wholly Government owned, to ensure the achievement of other Government policies (e.g. Diversification of the Economy, FDI, Universal Service, Increasing Competition ICT Sector, etc.), BOCRA and the Government can, as a matter of policy, ensure that BOFINET's tariffs are as low as necessary for the achievement of these objectives, subject only to ensuring that it (BOFINET) makes sufficient returns to deliver on its mandate.

3.2.2.2 Disadvantages of this option

1. The process of separating BTC and BOFINET could affect the rollout of the FTTx network. This process needs to be expedited and BOFINET needs to complete the recruitment of key resources that will be responsible for managing the rollout of the FTTx network.
2. There is the risk that BOFINET may hold back the whole broadband market if it does not deliver on its mandate. The rollout of the FTTx network should include measureable targets and there should also be quality of service targets to be monitored by BOCRA. Similar quality of service should be included in all service provider's licences and these targets should be published periodically to ensure that customers know what is expected of operators.

<p>Question 2: Development of FTTx in Gaborone and Francistown</p> <p>(a) If it is decided to develop the FTTx infrastructure, should the development be based on Option 1 (Reverse Auction open to PTOs) or Option 2 (Development by BOFINET as an Open Access Network)?</p> <p>(b) Please provide reasons in support of your response.</p>
