

**FORM 100**

**CABLE TELEVISION LICENSE APPLICATION**

**VERIZON NEW ENGLAND INC.**

**QUESTION 23**

**EXHIBIT F**

**Technical Description of the FTTP system  
and of the Cable Television Service to be provided**

FORM 100

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EXHIBIT F

**Proposed Service Overview, Product Offers and Architecture**

- Overview of Fiber to the Premises (FTTP) Deployment
- Service Overview
  - Product Offer
  - Service Delivery/Connection Method
- FTTP System Architecture
  - End-to-End Architecture
  - Wide Area Transport

**Overview of Fiber To The Premises (FTTP) Deployment**

Fiber to the Premises (FTTP) is a key Verizon corporate initiative to provide voice, cable television and very high speed data services. FTTP uses fiber-optic cable and optical electronics to directly link homes and many businesses to the Verizon network. The fiber network being deployed can support cable television and, where appropriate, Verizon will seek to provide cable service to customers. Key objectives include, but are not limited to, the delivery of higher customer satisfaction, superior performance (network, applications & technical support), and an installation process that surpasses the Cable, DBS and DSL experience today.

- Verizon Communications companies began deploying FTTP in twelve states by the end of 2004. By the end of 2005, Verizon had passed 3 million homes.
- Cable television services deployment will be a subset that is ancillary to the voice and data FTTP services. Select FTTP-enabled wire centers will be deployed for cable service in the first instance.

## Service Overview

The FTTP Network will enable provision of a feature rich and fully competitive cable television offering. The major components of the cable television services which Verizon will offer to consumers will include:

- Analog channel tier, including local and Education and Government (EG) channels as requested by and as negotiated with the community
- Digital channel tiers
- Premium channel tiers
- Pay Per View (PPV)
- HDTV channels
- Digital music channels
- Digital Video Recorder (DVR)
- Interactive programming guide (IPG)
- Inside coax cable wire installation

## **Product Offers**

For Consumer customers, Verizon will initially offer Broadcast Television, High Definition TV (HDTV), Personal Video Recorders (PVR), Interactive Programming Guide (IPG), and Pay Per View (PPV) Movies and Events. The Broadcast Television offering will consist of both analog and digital channels. The analog tier will be carried "in the clear" (i.e. will not require the use of a set-top-box for receipt of service) and will include local, educational/government (EG) channels and select cable channels. The digital channel line-up will duplicate the analog line-up (so called "dual carry") and will include additional cable channels, premium cable channels, digital music channels, an interactive program guide (IPG), HDTV programming and PPV programming. For digital tiers, a set top box (STB) will be required for receipt of service. One STB will be provided with the initial purchase of a digital service. Monthly recurring fees will be charged for additional STBs provisioned to the customer. The customer will be offered the option to upgrade STBs to include support for HDTV, a PVR, or both for additional monthly fees. Verizon will notify the City of the final channel line-up prior to service offering.

In addition to organizing and informing the customer of the programming line-up, the IPG will support on-screen program control, parental controls, timers, search, and ordering of PPV services. Pay Per View allows subscribers to pay for and watch prescheduled programming events on an on-demand basis. PPV movies or events will be selected from the IPG. Authorization for billing will occur at the time of purchase. Events begin at pre-scheduled intervals (i.e., programming is not immediately available). Customers will purchase PPV either as discrete events or in pre-defined packages.

## **Service Delivery/Connection Method**

### Connection Method: Analog

At initial deployment, an installation and maintenance (I&M) technician will connect the Optical Network Terminal (ONT) to a central point of demarcation where a cable television I & M technician will make final connections to provide the cable television service. After the installation of the ONT, a cable television field technician will test the existing in-home coaxial cable to determine if it is technically acceptable and will connect the service. If no coaxial cable exists or the coaxial cable is unacceptable, the technician will install wiring to the first cable outlet, and will install new coaxial wiring to other locations identified by the customer at the customer's request and expense. The customer may choose to self-install such wiring, or to obtain inside wiring installation service from a third party or Verizon.

### Connection Method: Digital - New Install

Installation per the analog method will be done. In addition, the technician also will have a set top box that will need to be installed near the TV. The technician will connect a coaxial cable from the wall outlet to the set top and another coaxial cable from the set top box to the TV. The technician will also connect the customer's VCR and/or DVD device and check for proper operation. A fee may be charged for non-standard installations involving multiple components such as surround sound systems or other electronic equipment.

This process will be followed for any boxes installed.

### Connection Method: Digital - Set Top Box

When a set top box is installed the technician will call the service center at which point the digital services previously ordered by the customer will be activated. A remote command will be issued to the set top box in real time to turn the purchased service(s) on.

### Connection Method: Digital - PPV

Customers must have at least one set top box to have access to the service. The customer will use their remote control to purchase the programming they desire. Purchases will appear on the monthly bill.

### Equipment Changes and Re-Configurations

When a customer changes the in-home configuration (e.g., moving a set top box from one TV to another), the customer will be able to accomplish this change without reconfiguring the set top box.

## FTTP System Architecture

### End-to-End Architecture

Figure 1 shows the architecture topology for supporting service across multiple market areas. A brief summary of the end-to-end architecture follows. Subsequent sections provide more information on each major component within the planned Verizon FTTP overlay architecture.

Figure 2 shows full build and overlay architecture. FTTP will be built instead of copper facilities in new communities. In existing communities, the existing copper network will continue to serve those customers who have not migrated to the FTTP network. The fiber is deployed from a Central Office location within a wire center area.

Figure 1-High Level End to End Architecture

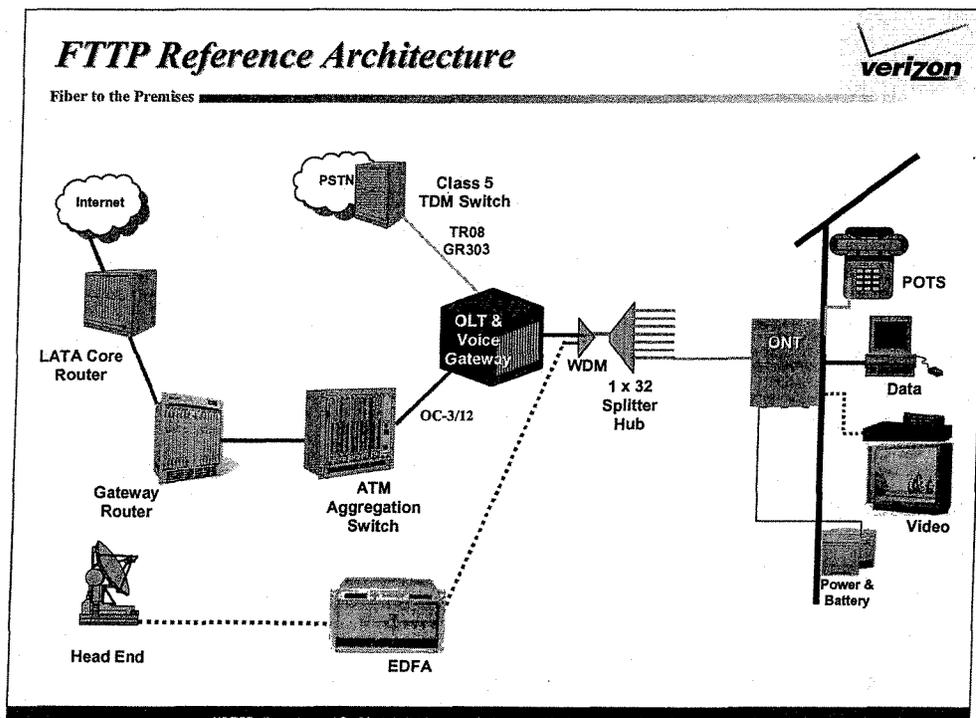
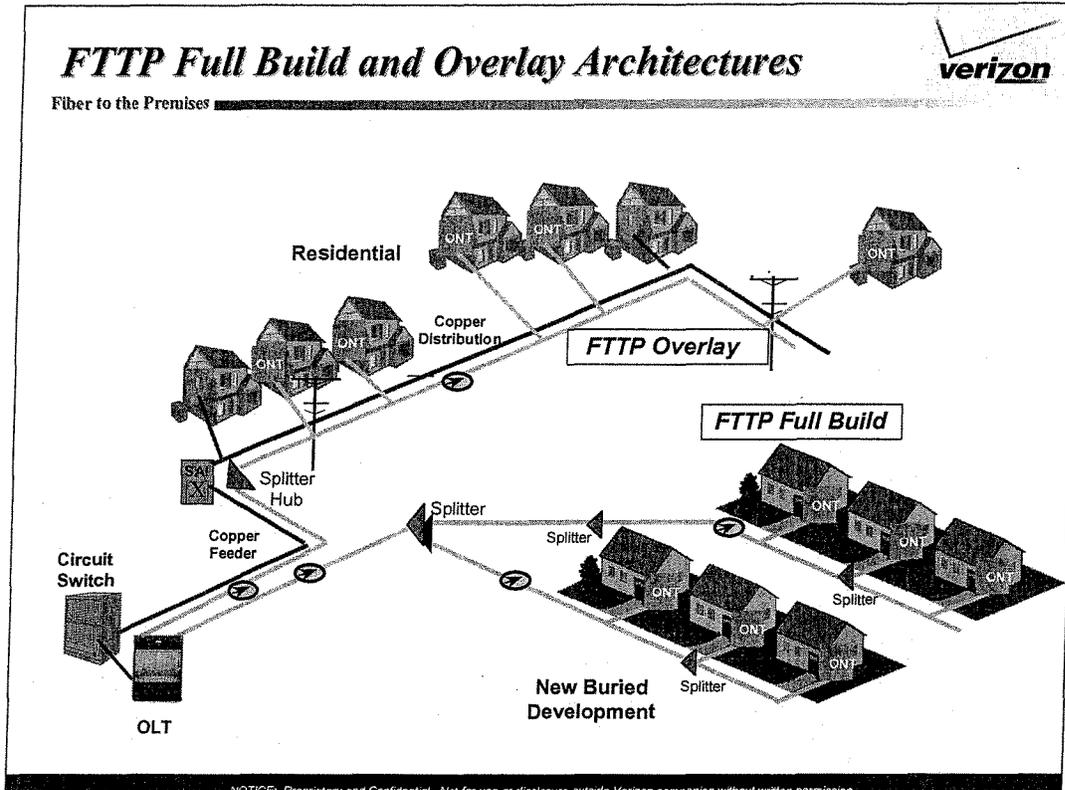


Figure 2-FTTP Full Build and Overlay Architectures



At the national or regional level, a “super” headend (SHE) shall serve as the single point of national content aggregation (see Figure 1). All content shall be encoded into MPEG2 streams and transported over nationwide SONET services. In each market where Verizon seeks to offer service, the broadcast cable television traffic is off loaded from the long haul network and terminated at a Video Hub Office (VHO). Network redundancy and route diversity shall extend from the SHE to the VHO.

The VHO serves as the metro or local point of aggregation. It is here that off-air and public, education, and government (PEG) channels (where appropriate) are combined with the broadcast cable television coming from the SHE. Interactive Program Guides (IPG) shall be controlled from this site, also. The service that exits the VHO shall look like the final product viewed by the end user subscriber.

Cable television traffic is converted to optical signals at the VHO and transported over Verizon’s metro area, inter-office facilities (IOF) to Video Serving Offices (VSOs). Voice and high-speed data signals are combined with the cable television at this location for final transport to the subscriber premises over Verizon’s FTTP Passive Optical Network (PON).

At the premise, the optical cable television signal is de-multiplexed and converted to an electrical signal, which meets cable television industry standards for cable services. Standard home wiring practices, using coaxial cables, as well as alternative media, shall distribute the signal to cable ready TVs and standard set top boxes (STB).

There will be 24x7 control and surveillance of the cable television platform from a remote location. This Network Operations Center (NOC) will be centrally located and shall be responsible for the operation and maintenance of the Conditional Access System (CAS), which directs the encryption functions performed back at the VHO.

#### Super Headend (SHE)

A "super" headend (SHE) shall serve as the single point of national content aggregation. At general service availability, Verizon shall deploy a primary SHE and an additional SHE for redundancy.

Both the primary and redundant SHEs will be strategically located to ensure technical and environmental requirements are met.

The key functions of the SHE include:

Content Reception

Signal Processing

Encoding

Network Interface

The majority of cable television sources shall be individual content provider programming. A mix of standard and high definition formats shall be supported. All content shall be encoded into MPEG2 streams, formatted for SONET, and transported via an OC48c to a local point-of-presence (POP) for wide area (national) transport.

#### **Wide Area Transport**

In support of the cable television service, Verizon will use OC48c SONET facilities in the POPs serving target cable markets. Where multiple POPs exist within a market, redundancy options shall dictate if a single or multiple POPs shall be designated for supporting the cable television traffic.

In most cases, it is expected that the cable television traffic shall traverse multiple interconnected rings between the SHE and the destination market. Once the cable traffic reaches a POP located in a target market, it will be forwarded to an OC48c SONET interface connected to metro/local SONET facilities. These facilities shall connect the POP to a Video Hub Office (VHO). VHOs are capable of serving multiple communities

within a target market. If more than one VHO is required, the metro SONET ring(s) would be deployed to cover multiple sites.

#### Video Hub Office (VHO)

The VHO serves as the metro or local point of aggregation. The VHO location is based on a combination of technical factors, metro fiber/IOF availability, local channel reception characteristics, and municipal regulations (e.g., zoning ordinances).

Under current network design plans, the anticipated functions of the VHO include:

WAN Interface for Cable television Transport

Ad Insertion

PEG Content

Signal Grooming and Multiplexing

Emergency Alert Service

Interactive Program Guide

Conditional Access

Local Content

The VHO shall aggregate three basic sources of content: national broadcast channels, local broadcast channels, and public, education, & government (PEG) channels. The national content is the traffic sent from the SHE and is delivered via an OC48c SONET interface from the SONETPOP. The local broadcast channels shall be received off-air via antennas or terrestrial fiber transport located at the VHO site. The PEG channels shall be collected via terrestrial connections from each local franchising area (LFA) served by the VHO. Finally, based on Verizon service tiering requirements to support an analog tier, a certain subset of channels shall be converted from digital to analog signals at the VHO (or kept in analog format if local or PEG).

The final collection of content is placed into the RF spectrum between 50 – 870 MHz as either an analog AM-VSB signal or, as part of a digital multiplex, into a 256-QAM modulated carrier. Digital content requiring encryption by the CAS shall also be multiplexed into QAM modulators and combined with other analog and digital carriers. In addition, an out-of-band downstream channel is generated which carries the Interactive Program Guide (IPG), provisioning, and management messages to STBs. The combined RF signal is converted to optics and fed into EDFAs at egress from the VHO. These optical cable television signals are transported on the 1550 nm wavelength of the G.983-specified Enhancement band to Verizon Video Serving Offices (VSOs).

As noted previously, it is intended that the broadcast cable television traffic/service that exits the VHO shall look like the final product viewed by the end user subscriber.

### Metro Area Transport

The optical cable television signals coming from the VHO are transported on the 1550 nm wavelength over fiber available within Verizon's inter-office facilities (IOF).

### Video Serving Office (VSO) & Passive Optical Network (PON)

The Video Serving Office (VSO) is a location within the central office containing FTTP equipment. If technically feasible or otherwise appropriate, PEG insertion may occur at this location in the network.

The key function of the VSO is to combine Broadcast Cable television into the Voice and High Speed Data FTTP Network

Once in the VSO, the optical cable television signal is sent through an EDFA and then to a Wave Division Multiplexer (WDM) combiner and splitter, which is used to add the cable signal to the voice and high-speed data signals' wavelength (1490nm) – coming from the Optical Line Terminal (OLT) – together with the cable wavelength onto a single optical source. This optical signal is then sent towards the subscriber premises via a PON. The VSO will also play a role in supporting upstream signals from the customer premises for pay-per-view services. Pay-per-view usage data uses the data service's 1310nm upstream wavelength. The upstream data communications shall be sent back to a subscriber database located in the Operations Center located in the VHO.

### Customer Premises

At the premise, an Optical Network Terminal (ONT) de-multiplexes the 1550nm optical signal and simply converts it to a voice, data and cable television electrical signal, which meets cable television industry standards for cable services.

It is expected that, in many cases, standard home wiring practices, using coaxial cables, will distribute the signal to cable ready televisions (for analog-only subscribers) and to STBs for digital subscribers.

## LEGAL AUTHORITY FOR FTTP BUILD OUT

Verizon, as a common carrier under Title II of the Communications Act, is constructing its FTTP network as an upgrade to its existing telecommunications network. Verizon has the requisite authority to upgrade its network for enhanced voice and broadband services for the reasons discussed, in part, below.

Verizon has the necessary Federal, state and local authorizations to upgrade its Title II telecommunications network, subject to customary time, place and manner permitting requirements. Specifically, Chapter 166, Section 21 of the General Laws of Massachusetts ("M.G.L.") grants Verizon the right to place its lines upon, along, under and across the public ways in the Commonwealth of Massachusetts. While a company must secure the permission of municipal officers to construct or alter a line in the public way pursuant to Chapter 166, Section 22 of the M.G.L., that section also provides that no municipal order is required for renewing, repairing or replacing wires, cables, or other facilities, or for making house connections or connections between existing conduits and poles, once erected under the provisions of the law.

The Title II services to be provided over Verizon's FTTP network are not subject to Title VI of the Communications Act, Chapter 166A of the M.G.L., or Chapter 207 of the Code of Massachusetts Regulation ("CMR"), which regulate cable service. Verizon plans to utilize FTTP to offer its customers enhanced voice and broadband data services. While FTTP may give Verizon the future capability of providing cable service, the physical FTTP network (including any construction and maintenance requirements) is, and will continue to be, regulated by Title II and Chapter 166.

Verizon's obligation to obtain a cable franchise is triggered only when cable services are provided to multiple subscribers within a community. As stated in the Communications Act, "the term 'cable system' ... does not include ... a facility of a common carrier which is subject, in whole or in part, to the provisions of Title II of this Act, except ... to the extent that such facility is used in the transmission of video programming directly to subscribers." See Nat'l Cable Television Ass'n v. FCC, 33 F.3d 66 (D.C. Cir. 1994) (concluding that the FCC "reasonably interpreted the [Communications] Act to require that an entity obtain a cable franchise only when that entity selects or provides the video programming to be offered.")