ITU-D Regional Development Forums 2010 on
NGN and Broadband (ARB, EUR & CIS Regions):
*"NGN and Broadband, Opportunities and Challenges"*

# Session 8

# Economic Impact of Broadband Implementation: Service bandwidth upgrade and Broadband access technology

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*HCTP/ITC, Bulgaria*



## Content of the presentation :

- **Economic Impact of Broadband Implementation**
- **Problem 1 – Service bandwidth upgrade**
  - **on FTTH broadband access network**
  - **on xDSL broadband access network**
- **Problem 2 – Selection of broadband access technology**
  - **xDSL vs. FTTH for urban brownfield area**
  - **FTTH vs. WiMAX for urban greenfield area**
  - **xDSL vs. WiMAX for rural area**

# Problem 1 – Service bandwidth upgrade

**There is a need to model the impact of upgrading the service bandwidth bandwidth, the service take rate and the service mix on the access network.**

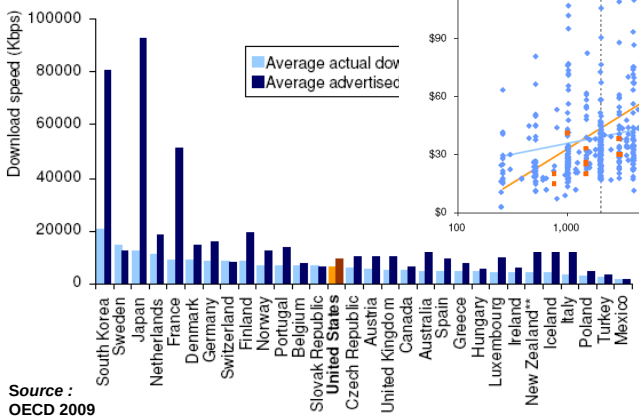
**For a given market, the access network planners want to perform Bandwidth Upgrade Scenarios, Uptake Growth Scenarios, and Service Mix Scenarios**

**The access network planners have to dimension the required capacity of the access nodes, to optimize the access network and to calculate related costs to upgrade it.**



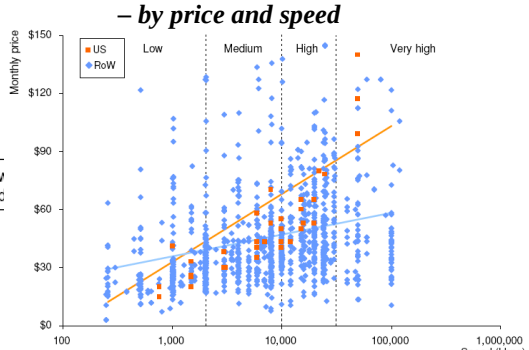
# Speed and bandwidth statistics related to service upgrade

***Average advertised vs. actual download speed***



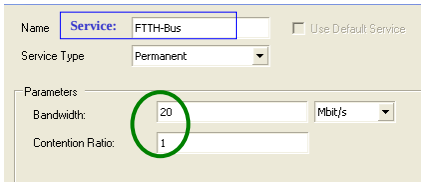

***Source :*** **OECD 2009**

***Offered broadband connection – by price and speed***



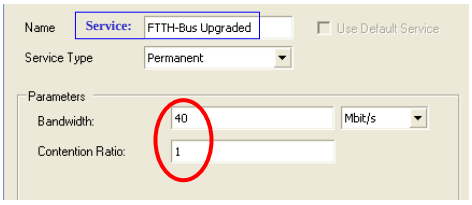

***Source :*** **OECD, TeleGeography, Point Topic**

# Service bandwidth upgrade – example I

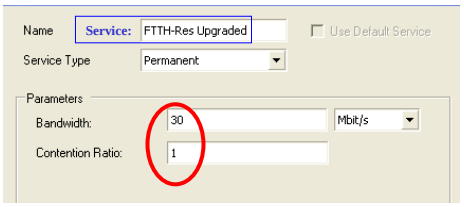



***Normal :***


**Service utilization is presented by the Contention Ratio**

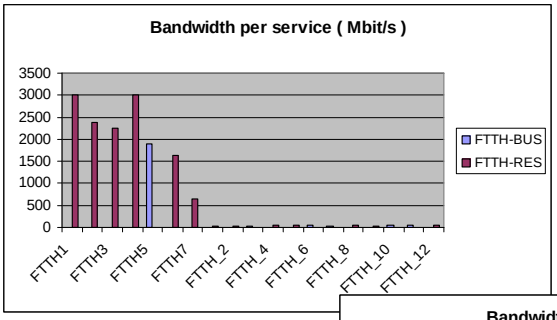



***Upgraded:***





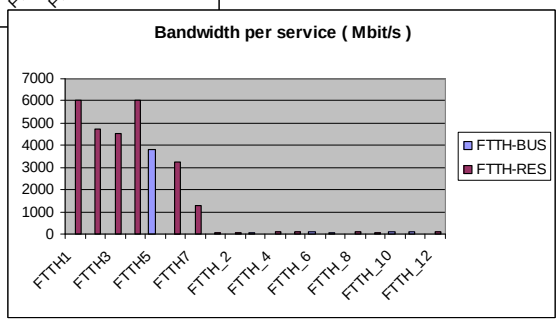

# Service bandwidth upgrade – example I




**<-** ***Normal***

**FTTH** – Home locations

***Upgraded:***



# Service bandwidth upgrade - example I

| Service Areas and Sites | Data connectivity | *FTTH-Bus* | *FTTH-Res* |
|---|---|---|---|
| FTTH1 | 0 | 0 | 3750 |
| FTTH2 | 0 | 0 | 2972 |
| FTTH3 | 0 | 0 | 2819 |
| FTTH4 | 0 | 0 | 3775 |
| FTTH5 | 0 | 1900 | 0 |
| FTTH6 | 0 | 0 | 2041 |
| FTTH7 | 0 | 0 | 805 |
| FTTH_1 | 0 | 0 | 15 |
| FTTH_2 | 0 | 0 | 30 |
| FTTH_3 | 0 | 20 | 0 |
| FTTH_4 | 0 | 0 | 45 |
| FTTH_5 | 0 | 0 | 60 |
| FTTH_6 | 0 | 40 | 0 |
| FTTH_7 | 0 | 20 | 0 |
| FTTH_8 | 0 | 0 | 60 |
| FTTH_9 | 0 | 0 | 30 |
| FTTH_10 | 0 | 40 | 0 |
| FTTH_11 | 0 | 60 | 0 |
| FTTH_12 | 0 | 0 | 60 |
| | | *2080* | *16462* |

<- *Normal*

**Bandwidth per service ( Mbit/s )**

**Bandwidth increase :**

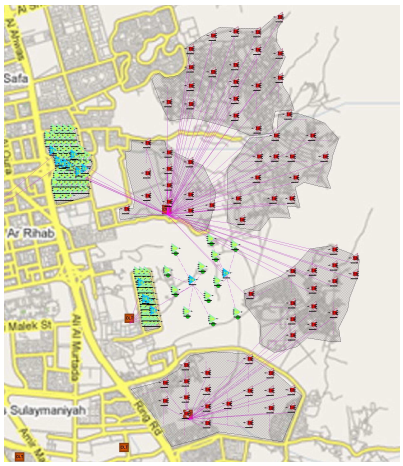
*100 %*

*Upgraded:*

| Service Areas and Sites | Data connectivity | *FTTH-Bus Upgraded* | *FTTH-Res Upgraded* |
|---|---|---|---|
| FTTH1 | 0 | 0 | 7500 |
| FTTH2 | 0 | 0 | 5944 |
| FTTH3 | 0 | 0 | 5638 |
| FTTH4 | 0 | 0 | 7551 |
| FTTH5 | 0 | 3800 | 0 |
| FTTH6 | 0 | 0 | 4081 |
| FTTH7 | 0 | 0 | 1609 |
| FTTH_1 | 0 | 0 | 30 |
| FTTH_2 | 0 | 0 | 60 |
| FTTH_3 | 0 | 40 | 0 |
| FTTH_4 | 0 | 0 | 90 |
| FTTH_5 | 0 | 0 | 120 |
| FTTH_6 | 0 | 80 | 0 |
| FTTH_7 | 0 | 40 | 0 |
| FTTH_8 | 0 | 0 | 120 |
| FTTH_9 | 0 | 0 | 60 |
| FTTH_10 | 0 | 80 | 0 |
| FTTH_11 | 0 | 120 | 0 |
| FTTH_12 | 0 | 0 | 120 |
| | | *4160* | *32923* |



# Service bandwidth upgrade - example I

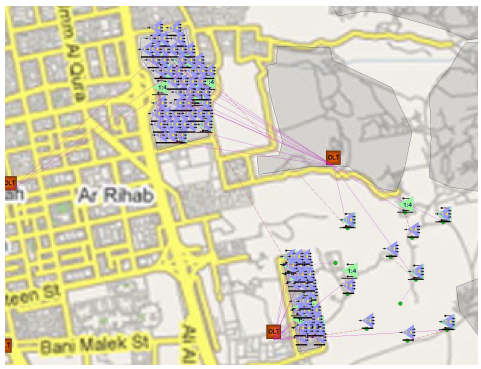



<- *Normal*

*(3 OLT, 17 Splitter 1:8, 89 Splitter 1:4)*

**Access Network Dimensioning/ Optimization**

*Upgraded:*




*(3 OLT, 28 Splitter 1:8, 93 Splitter 1:4)*

# Service bandwidth upgrade – example I

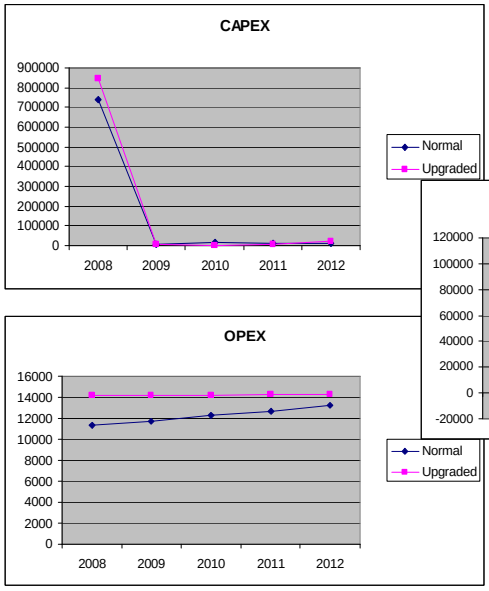
***Costs :***

| | | | | | |
|---|---|---|---|---|---|
| ***Normal services :*** | | | | | |
| | 10/1/2008 | 10/1/2009 | 10/1/2010 | 10/1/2011 | 10/1/2012 |
| Acquisition | ***714006*** | ***6851*** | ***12354*** | ***7825*** | ***10450*** |
| Installation | ***27001*** | ***685*** | ***1235*** | ***783*** | ***1045*** |
| Maintenance | ***11364*** | ***11704*** | ***12320*** | ***12709*** | ***13230*** |
| | | | | | |
| ***Upgraded services :*** | | | | | |
| | 10/1/2008 | 10/1/2009 | 10/1/2010 | 10/1/2011 | 10/1/2012 |
| Acquisition | ***814089*** | ***5072*** | ***2165*** | ***5437*** | ***23187*** |
| Installation | ***32651*** | ***56*** | ***25*** | ***100*** | ***74*** |
| Maintenance | ***14172*** | ***14198*** | ***14208*** | ***14256*** | ***14293*** |
| | | | | | |
| ***Difference :*** | | | | | |
| | 10/1/2008 | 10/1/2009 | 10/1/2010 | 10/1/2011 | 10/1/2012 |
| Acquisition | **100082** | **-1779** | **-10189** | **-2388** | **12737** |
| Installation | **5650** | **-629** | **-1210** | **-682** | **-971** |
| Maintenance | **2809** | **2494** | **1888** | **1547** | **1063** |

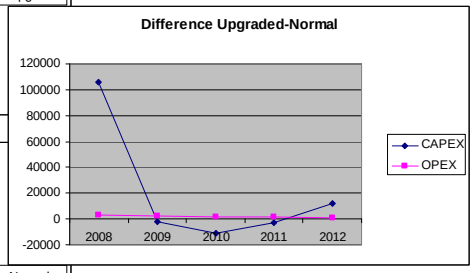
***Costs increase :***
***(relative to all costs)*** **1.16 %**



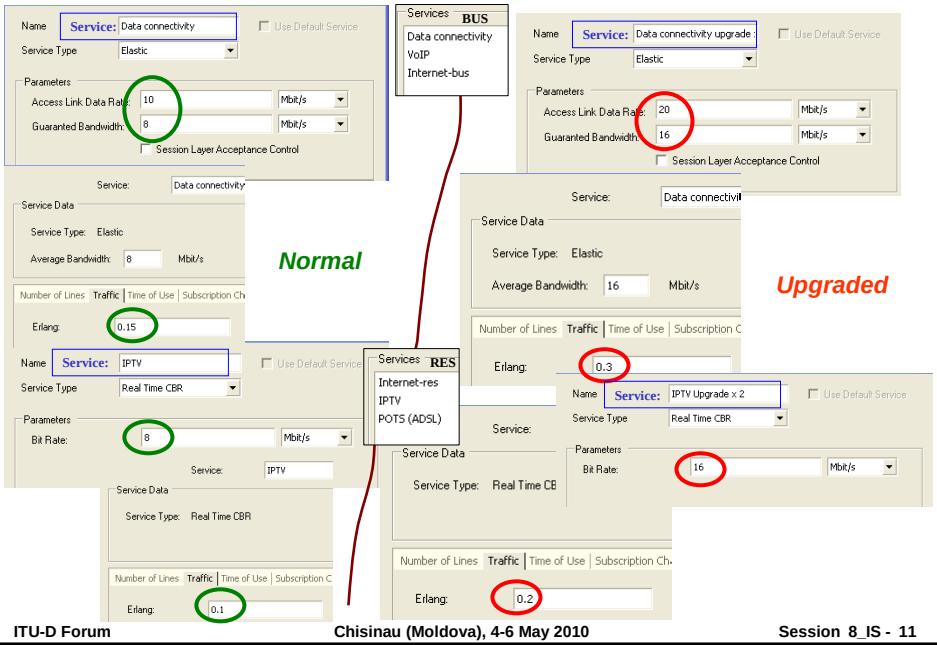
# Service bandwidth upgrade – example I




***Costs :***

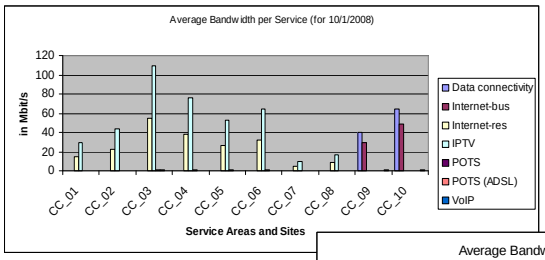


# Service bandwidth upgrade – example II



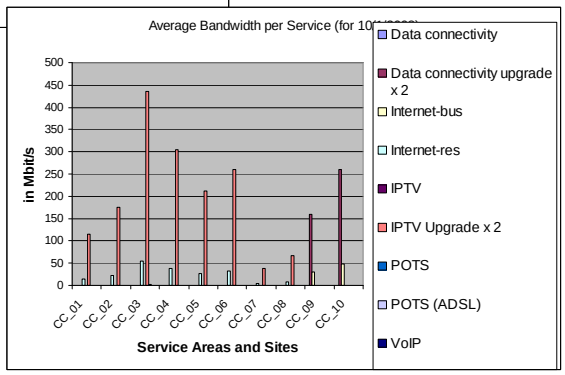



# Service bandwidth upgrade – example II




<- *Normal*

**CC** – Copper Cabinets




*Upgraded:*

# Service bandwidth upgrade - example II

| Service Areas and Sites | *Data connectivity* | Internet-bus | Internet-res | *IPTV* | POTS | POTS (ADSL) | VoIP |
|---|---|---|---|---|---|---|---|
| CC_01 | 0 | 0 | 14.4 | **28.8** | 0.306 | 0.153 | 0 |
| CC_02 | 0 | 0 | 22 | **44** | 0.4675 | 0.23375 | 0 |
| CC_03 | 0 | 0 | 54.4 | **108.8** | 1.156 | 0.578 | 0 |
| CC_04 | 0 | 0 | 38 | **76** | 0.80325 | 0.40375 | 0 |
| CC_05 | 0 | 0 | 26.4 | **52.8** | 0.561 | 0.2805 | 0 |
| CC_06 | 0 | 0 | 32.4 | **64.8** | 0.6885 | 0.34425 | 0 |
| CC_07 | 0 | 0 | 4.8 | **9.6** | 0.09775 | 0.051 | 0 |
| CC_08 | 0 | 0 | 8.4 | **16.8** | 0.1785 | 0.08925 | 0 |
| CC_09 | **39.6** | 29.7 | 0 | 0 | 0 | 0 | 0.561 |
| CC_10 | **64.8** | 48.6 | 0 | 0 | 0 | 0 | 0.918 |
| Total : | **104.4** | 78.3 | 200.8 | **401.6** | 4.2585 | 2.1335 | 1.479 |

<- *Normal*

**Bandwidth per service ( Mbit/s )**

***Upgraded:***

| Service Areas and Sites | *Data connectivity upgrade x 2* | Internet-bus | Internet-res | *IPTV Upgrade x 2* | POTS | POTS (ADSL) | VoIP |
|---|---|---|---|---|---|---|---|
| CC_01 | 0 | 0 | 14.4 | **115.2** | 0.306 | 0.153 | 0 |
| CC_02 | 0 | 0 | 22 | **176** | 0.4675 | 0.23375 | 0 |
| CC_03 | 0 | 0 | 54.4 | **435.2** | 1.156 | 0.578 | 0 |
| CC_04 | 0 | 0 | 38 | **304** | 0.80325 | 0.40375 | 0 |
| CC_05 | 0 | 0 | 26.4 | **211.2** | 0.561 | 0.2805 | 0 |
| CC_06 | 0 | 0 | 32.4 | **259.2** | 0.6885 | 0.34425 | 0 |
| CC_07 | 0 | 0 | 4.8 | **38.4** | 0.09775 | 0.051 | 0 |
| CC_08 | 0 | 0 | 8.4 | **67.2** | 0.1785 | 0.08925 | 0 |
| CC_09 | **178.2** | 29.7 | 0 | 0 | 0 | 0 | 0.561 |
| CC_10 | **291.6** | 48.6 | 0 | 0 | 0 | 0 | 0.918 |
| Total : | **469.8** | 78.3 | 200.8 | **1606.4** | 4.2585 | 2.1335 | 1.479 |

**Bandwidth increase :**

***298.0%***



# Service bandwidth upgrade - example II

<- *Normal*

*(3 MSAN)*

**Access Network Dimensioning/ Optimization**

***Upgraded:***

***(5 MSAN)***

# Service bandwidth upgrade – example II

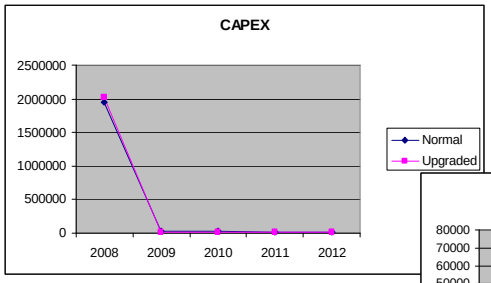
**Costs :**

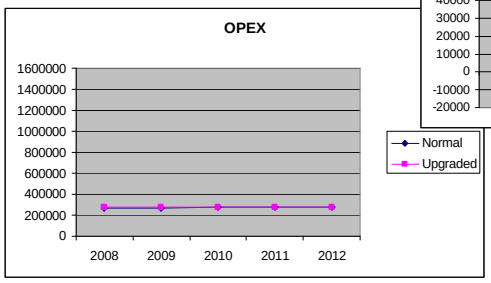
| ***Normal services :*** | | | | | | |
|---|---|---|---|---|---|---|
| | 10/1/2008 | 10/1/2009 | 10/1/2010 | 10/1/2011 | 10/1/2012 | Total: |
| Acquisition | ***1906829*** | ***21110*** | ***23120*** | ***20110*** | ***17900*** | **1989069** |
| Installation | ***39797*** | ***2090*** | ***2300*** | ***1990*** | ***1780*** | **47957** |
| Maintenance | ***270064*** | ***271124*** | ***272294*** | ***273304*** | ***274214*** | **1360998** |
| | | | | | | |
| ***Upgraded services :*** | | | | | | |
| | 10/1/2008 | 10/1/2009 | 10/1/2010 | 10/1/2011 | 10/1/2012 | Total: |
| Acquisition | ***1971873*** | ***13720*** | ***15070*** | ***16860*** | ***13070*** | **2030593** |
| Installation | ***47283*** | ***1440*** | ***1570*** | ***1760*** | ***1370*** | **53423** |
| Maintenance | ***273807*** | ***274547*** | ***275347*** | ***276247*** | ***276947*** | **1376893** |
| | | | | | | |
| ***Difference :*** | | | | | | |
| | 10/1/2008 | 10/1/2009 | 10/1/2010 | 10/1/2011 | 10/1/2012 | Total: |
| Acquisition | **65044** | **-7390** | **-8050** | **-3250** | **-4830** | **41524** |
| Installation | **7486** | **-650** | **-730** | **-230** | **-410** | **5466** |
| Maintenance | **3743** | **3423** | **3053** | **2943** | **2733** | **15895** |

***Costs increase :***
***(relative to all costs)*** **1.85 %**

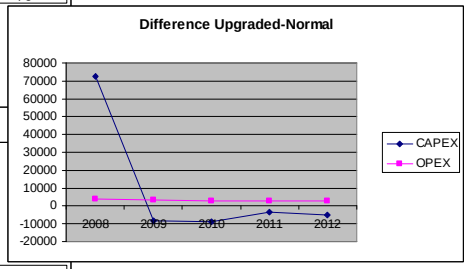


# Service bandwidth upgrade – example II




***Costs :***



## Extension of the service bandwidth upgrade studies

**There is a need also to assess the cost for services in order to price products. Such study facilitates comparison of multiple service costing scenarios for strategic decisions on product pricing.**

**Additional parameters are:**

- **price per service/bundle of services**
- **growth in customers from each service class**
- **growth in customers from each speed package**

**The planner have to dimension the access network, to calculate all related costs and based on the expected revenue to providing insight into the Return-on-Investment and the profitability.**



## Problem 2 – Selection of Access Technology

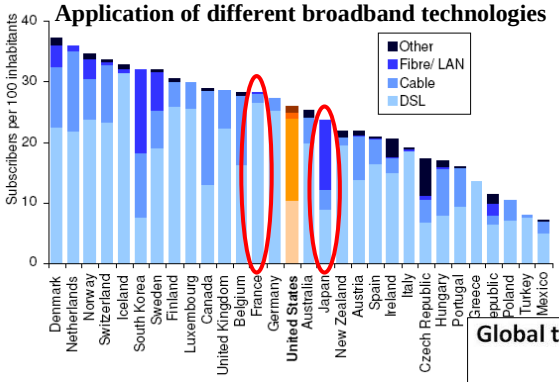
**Aim is to investigate the techno-economical impact of various access technologies on the network for a given market**

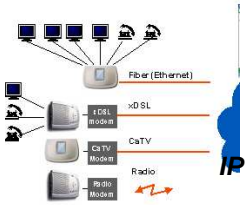
**Multiple techno-economical studies are carrier out for the purpose to determine the optimum access technology for the network**

**Selection is done by comparison of the economical parameters for each access technology**

# Broadband access technologies

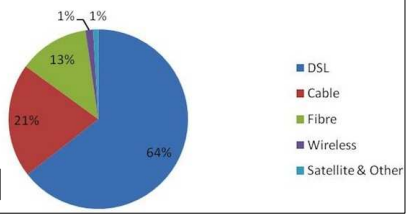
**Application of different broadband technologies**




***Source : OESD 2008***

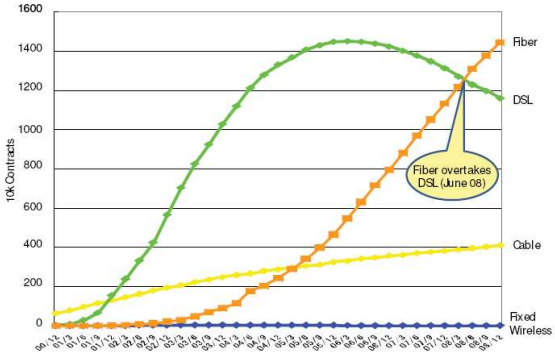
**Global technology market shares - Q209**




**Source: PointTopic**



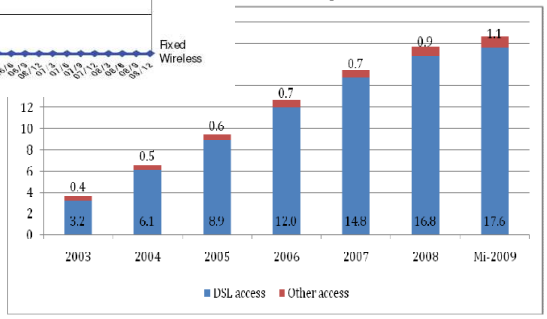
# Broadband access – market share by technology




**Broadband subscriptions in Japan**

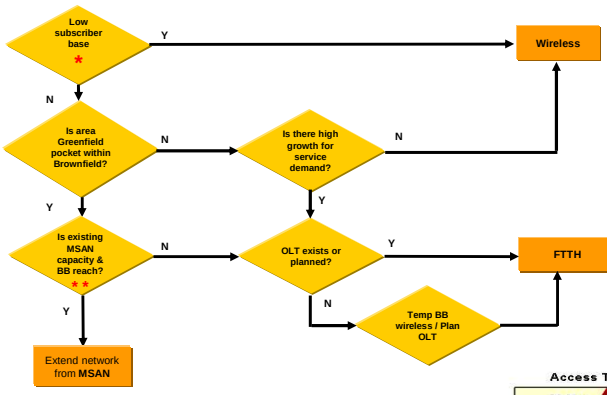
***Source :* Japan MIC**

**Broadband subscriptions in France**




***Source :* ARCEP**

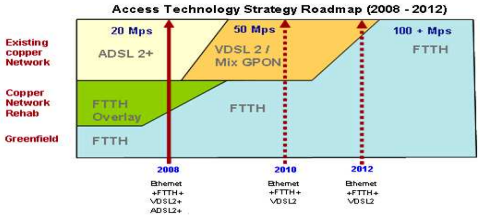
# Planning guidelines for broadband access technology




## Sample guidelines

*Access Network Planning Guidelines*

*Access Network Planning Roadmap*



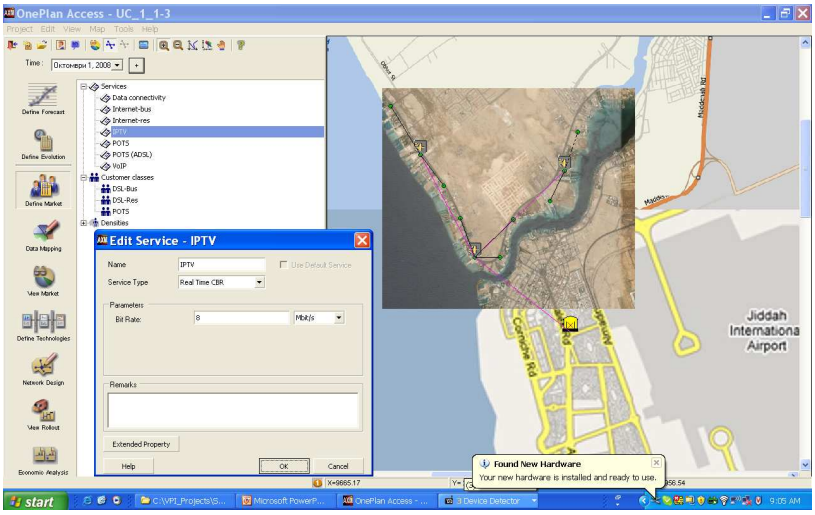

***Source :* STC**



# Example I – urban area brownfield

***xDSL vs. FTTH brownfield***

***xDSL***



# Example I – urban area brownfield

**List of material :**

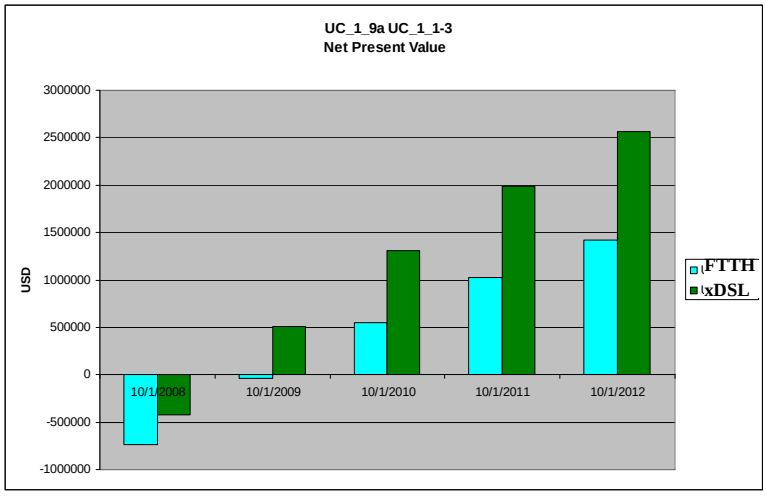
***FTTH***

| Node Name | Node Description | Part Number | Description | Total Number New | Total Number Existing | Total New Cost | Date |
|---|---|---|---|---|---|---|---|
| CO_Ubhur | | OLT | | 1 | | 1922600 | October 01,2008 |
| | | | | 0 | | 250400 | October 01,2009 |
| | | | | 0 | | 250400 | October 01,2010 |
| | | | | 0 | | 250400 | October 01,2011 |
| | | | | 0 | | 250400 | October 01,2012 |
| Splitter 1:32 _1 | | Splitter 1:32 cost | | 2 | | 1220 | October 01,2008 |
| | | | | 0 | | 60 | October 01,2009 |
| | | | | 0 | | 60 | October 01,2010 |
| | | | | 0 | | 60 | October 01,2011 |
| | | | | 0 | | 60 | October 01,2012 |
| Splitter 1:32 _2 | | Splitter 1:32 cost | | 2 | | 1220 | October 01,2008 |
| | | | | 0 | | 60 | October 01,2009 |
| | | | | 1 | | 670 | October 01,2010 |
| | | | | 0 | | 90 | October 01,2011 |
| | | | | 0 | | 90 | October 01,2012 |
| Splitter 1:32 _3 | | Splitter 1:32 cost | | 5 | | 3050 | October 01,2008 |
| | | | | 0 | | 150 | October 01,2009 |
| | | | | 1 | | 760 | October 01,2010 |
| | | | | 0 | | 180 | October 01,2011 |
| | | | | 1 | | 790 | October 01,2012 |



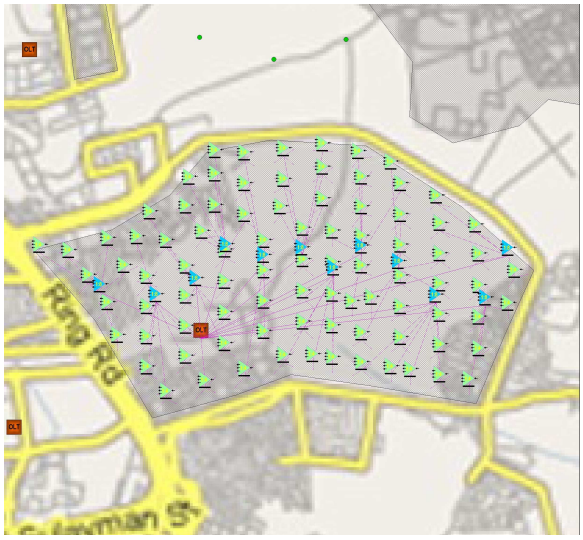
# Example I – urban area brownfield

***xDSL vs. FTTH brownfield***



# Example II – urban area greenfield

*FTTH vs. WiMAX greenfield*

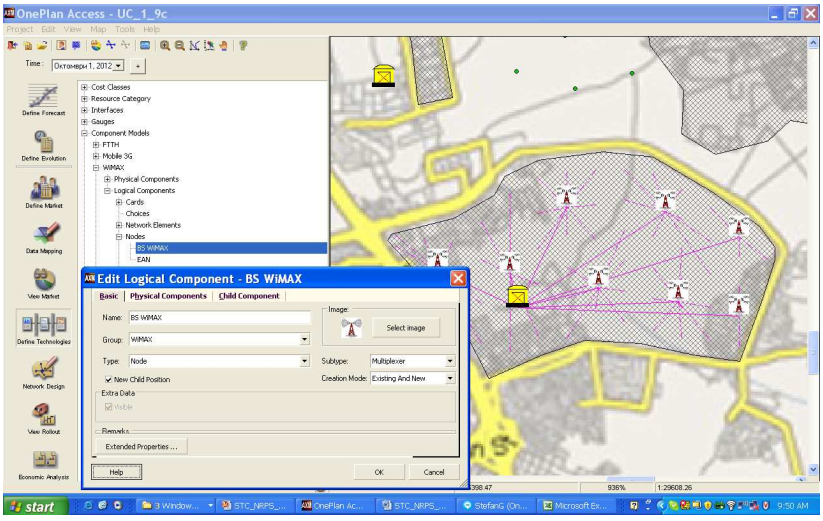



***FTTH***



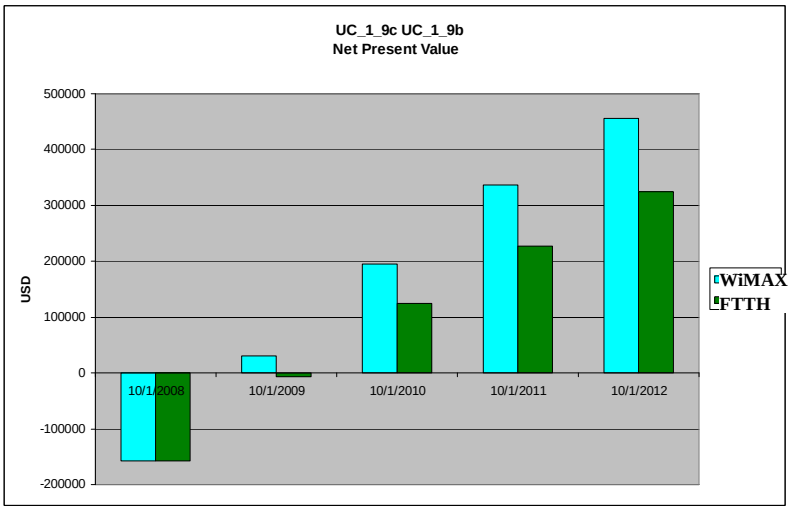
# Example II – urban area greenfield

***WiMAX***



# Example II – urban area greenfield

***FTTH vs. WiMAX greenfield***

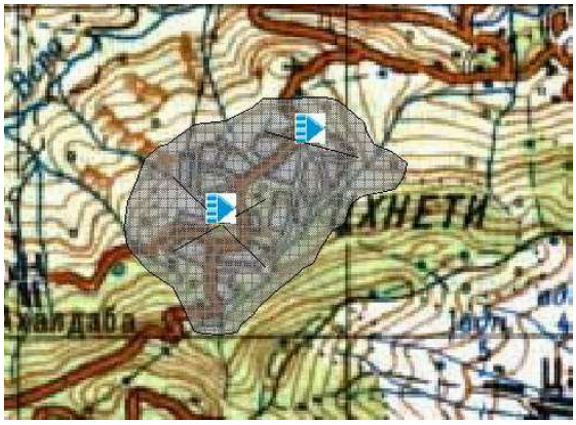





# Example III (a) – rural area

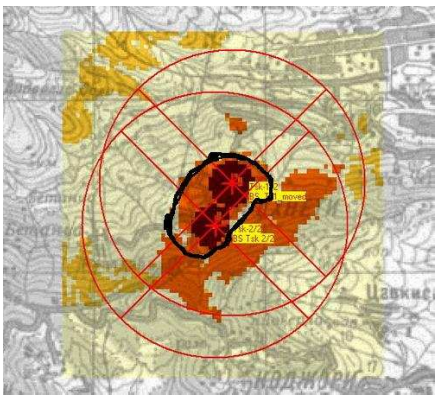
***xDSL vs. WiMAX rural area***

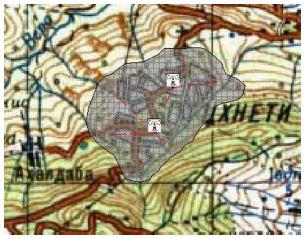
***xDSL***



# Example III (a) – rural area

***WiMAX***

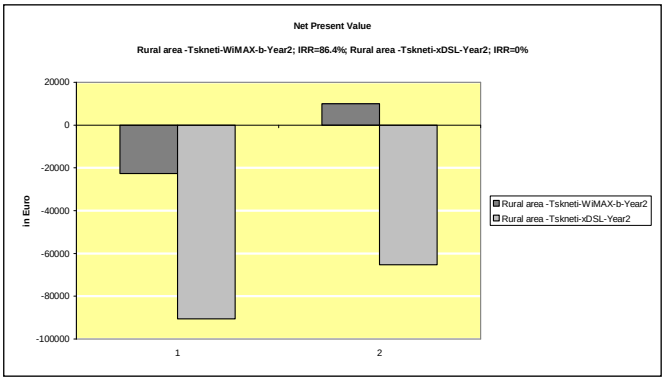






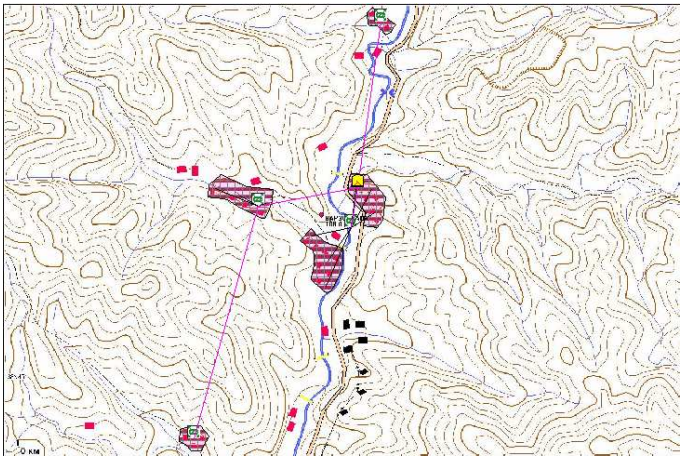
# Example III (a) – rural area

***xDSL vs. WiMAX rural area***



# Example III (b) – rural area

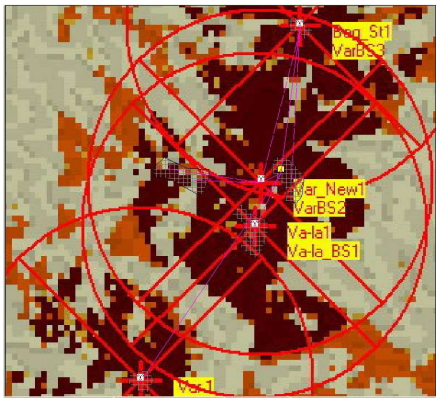
***xDSL vs. WiMAX rural area***



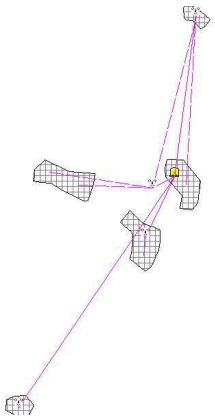
***xDSL***



# Example III (b) – rural area

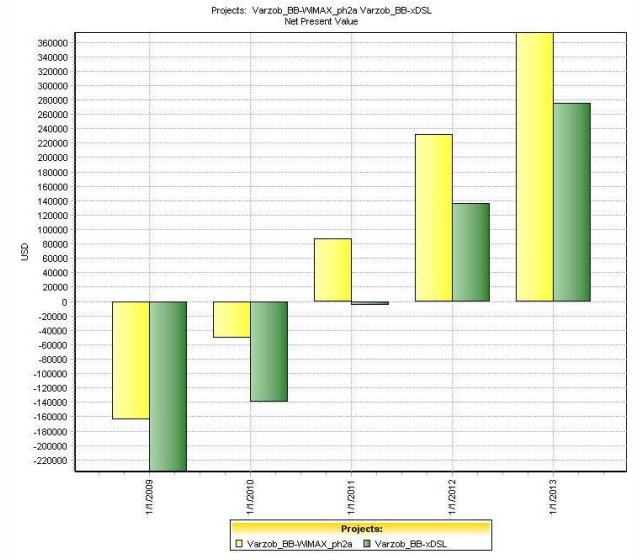



***WiMAX***



# Example III (b) – rural area

***xDSL vs. WiMAX rural area***






# Improvement of the selection of access technology studies

**Present core network portion in the network expenses :**

- **as additional average cost per customer**
- **as total additional cost, related to the uppermost access network node**

**Present additional costs related to running the business ( marketing of services, customer care, etc.) :**

- **as additional average cost per customer**
- **as total additional cost, related to the uppermost access network node**