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# Fixed broadband solutions for rural areas: a techno-economic analysis

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# Content

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- Introduction
- Network scenarios
- Costing methodology
- Results
- Conclusions

## Introduction

# Status of NGA deployment in the European Union

### Achievement of the Digital Agenda Targets (as of 2014)

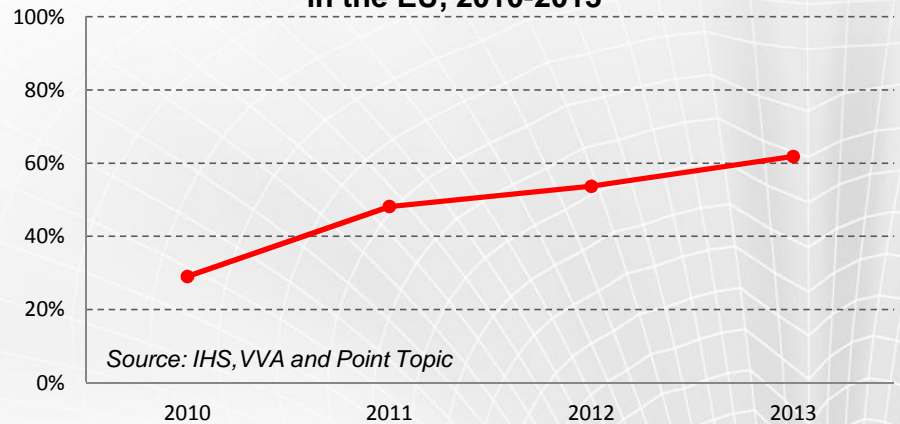
Basic broadband for all by 2013: 100% in 2013 ✓ **Mission accomplished!**

Fast broadband (>30Mbps) for all by 2020: 62% in 2013 **Not yet, but as of 2014 there are 6 years left.**

#### NGA networks and coverage:

- Cable Docsis 3.0 (41.2%)
- VDSL (31.2%)
- FTTP (14.5%)

Next Generation Access (NGA), >30Mbps, broadband coverage in the EU, 2010-2013

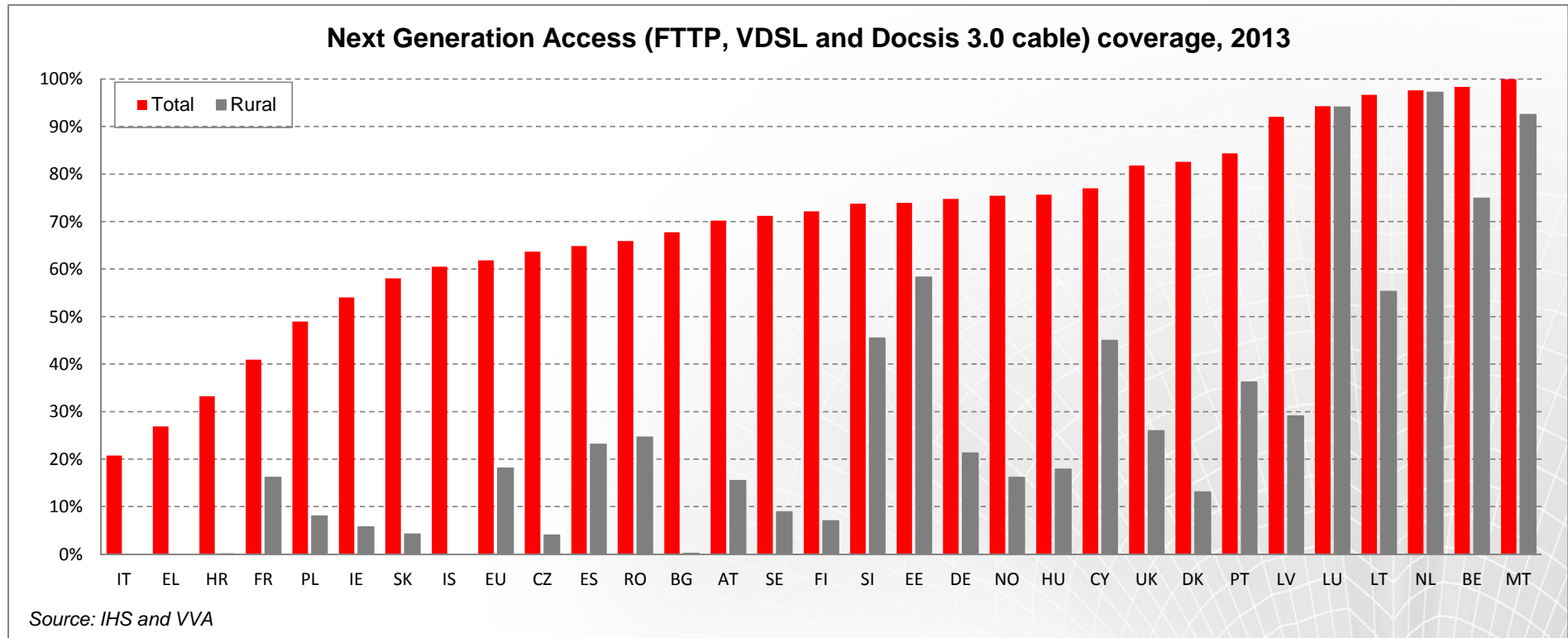


**Next Generation Access (NGA) covers 62%, but in rural areas the penetration is low.**

Source: European Commission, Digital Agenda Scoreboard 2014

## Introduction

# Lack of NGA deployment in rural areas in Europe



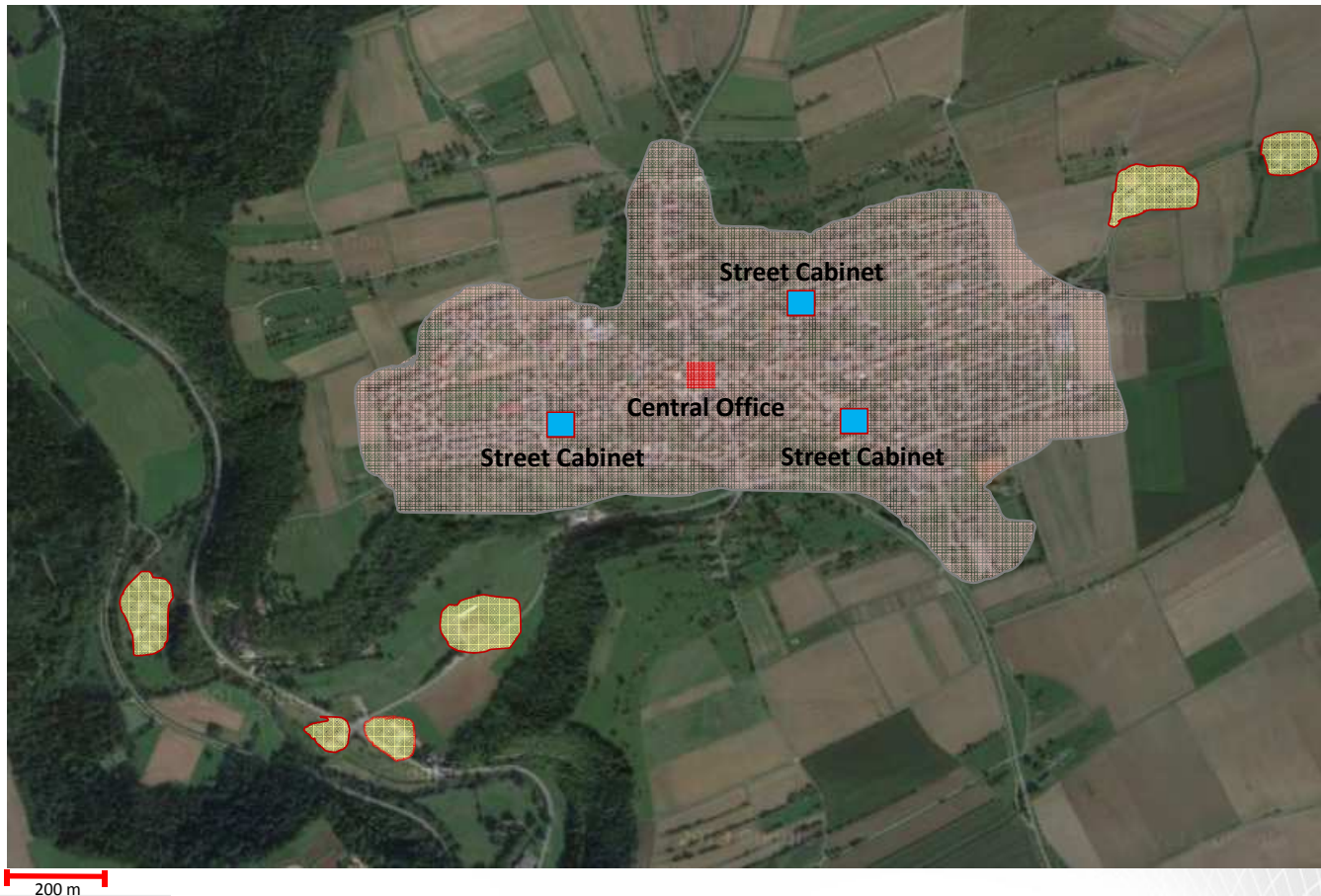
NGA rural coverage: 18.1% (mostly through VDSL)

Source: European Commission, Digital Agenda Scoreboard 2014



# What is a rural area? Example of a village and its surroundings

- This is a satellite picture of google maps of a village in Germany.
- The results presented in this study are **not** based on this specific case.



- In this case two types of households are identified:
- a) those that are close to the Central Office located in the village (in pink), and
  - b) those that are far away (in yellow)

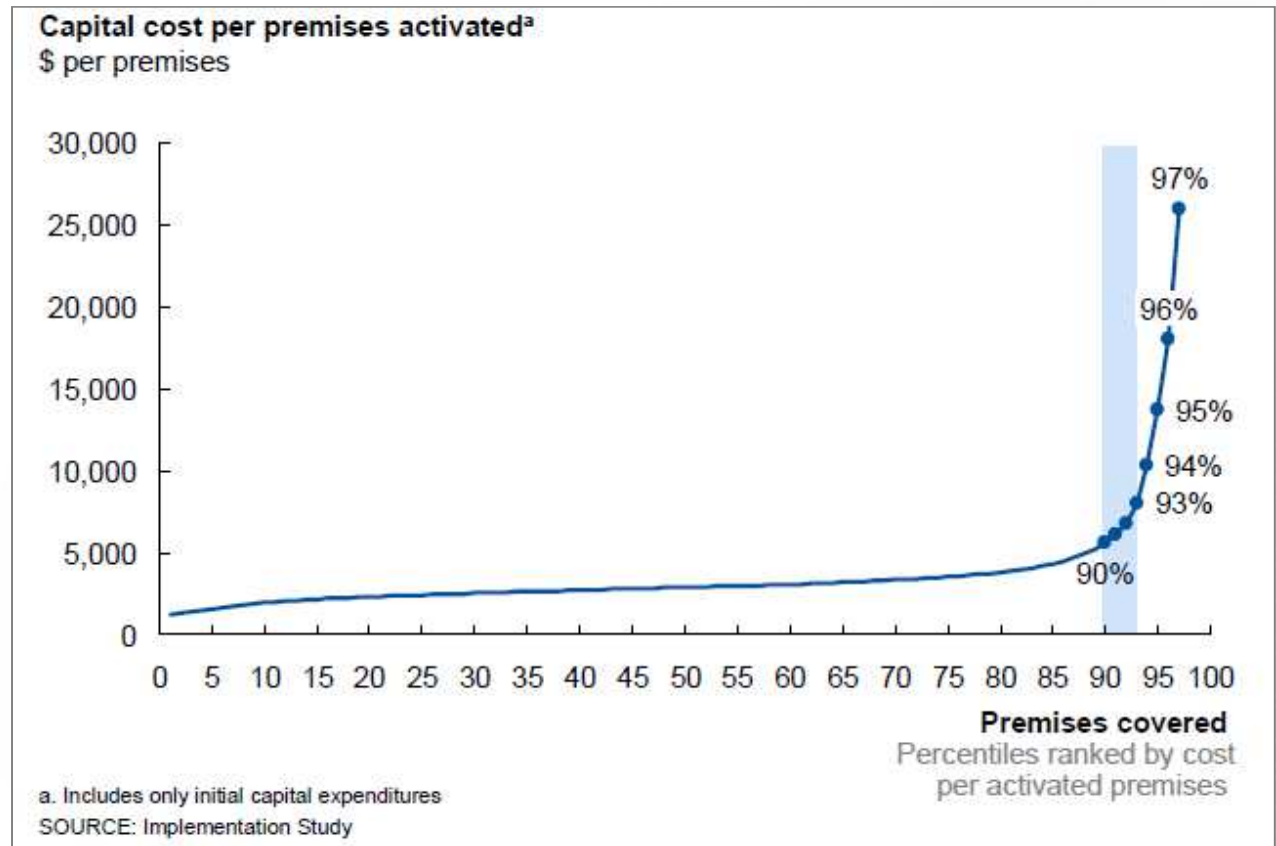
## Australian NBN Co: Importance of the cost analysis

# Why 93% with fibre? The cost curve provides the answer

- “The cumulative and marginal cost curve of the fibre access network ranges from 0 to 100% coverage of premises in Australia.”
- It helps to understand “**where it becomes more dramatically more expensive to service additional premises**”.
- “The cost curve demonstrates that the incremental cost to connect premises accelerates very sharply **after the 93<sup>rd</sup> percentile.**”

Source: Australia NBN Implementation Study

### Fibre to the premises cost curve

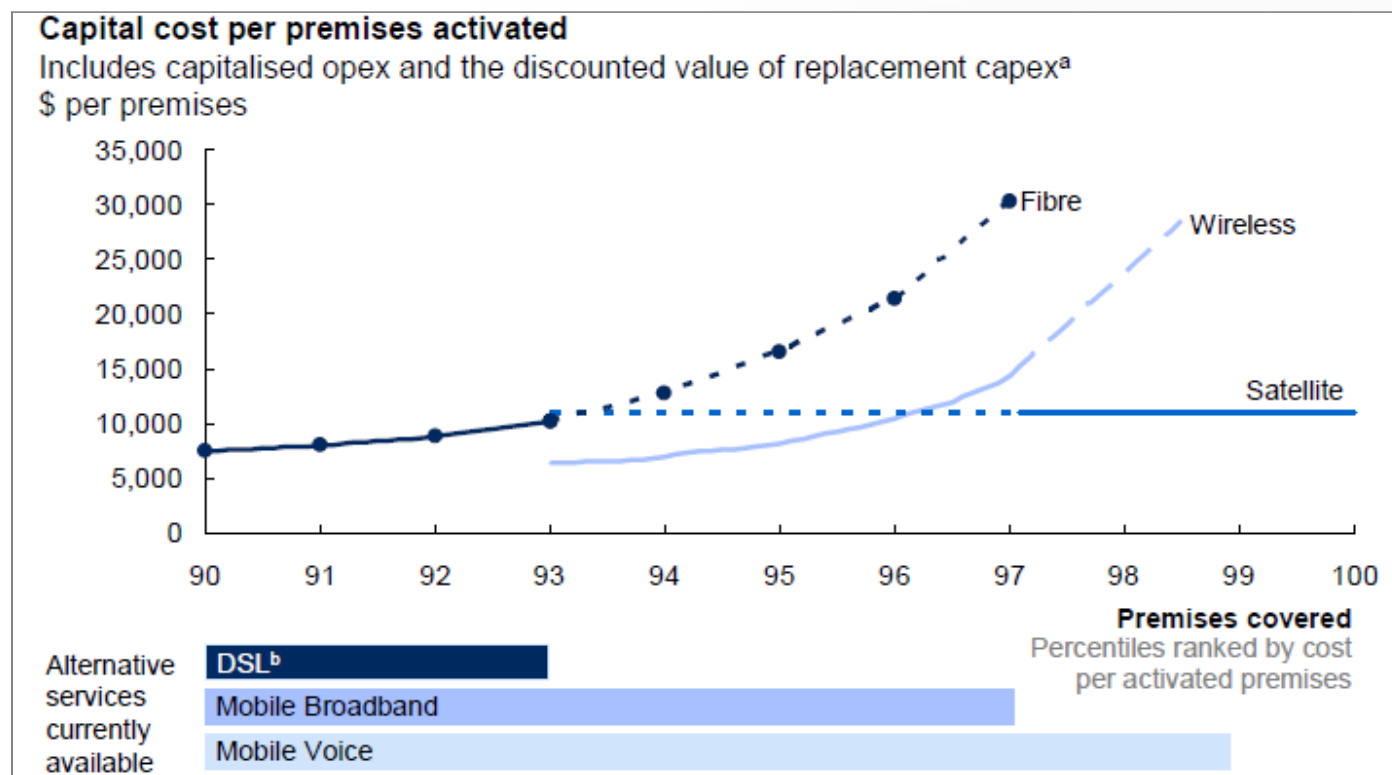


## Australian NBN Co: Importance of the cost analysis

# A mix of fibre, wireless and satellite networks

- “Government’s coverage objective should be interpreted as ensuring at least 12Mbps peak data rates are available to all premises beyond the fibre footprint.”
- “NBN Co should offer a wholesale Ka-band satellite broadband service targeting the final 3% of premises.”
- “A fixed wireless service should provide coverage between the 94<sup>th</sup> and 97<sup>th</sup> percentiles.”

### Cost comparison of alternative technologies in the final 10 percent



Source: Australia NBN Implementation Study

## Introduction

# Motivation and Objectives

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- In many cases NGA deployment in urban areas - and for a few suburban areas - can be provided by means of competition. The business case in these areas is rather clear.
- As of 2014, there is very little deployment of NGA networks in rural areas.
- Policy makers and operators in Europe are examining different possibilities to provide high-speed fixed broadband services in rural areas over the next years.
- *This presentation examines the use of different NGA networks in rural areas.*
- *A techno-economic analysis of the following networks is provided:*
  - *FTTC Vectoring*
  - *FTTdP-Street G.fast*
  - *FTTdP-Building G.fast*
  - *FTTH GPON*



# Content

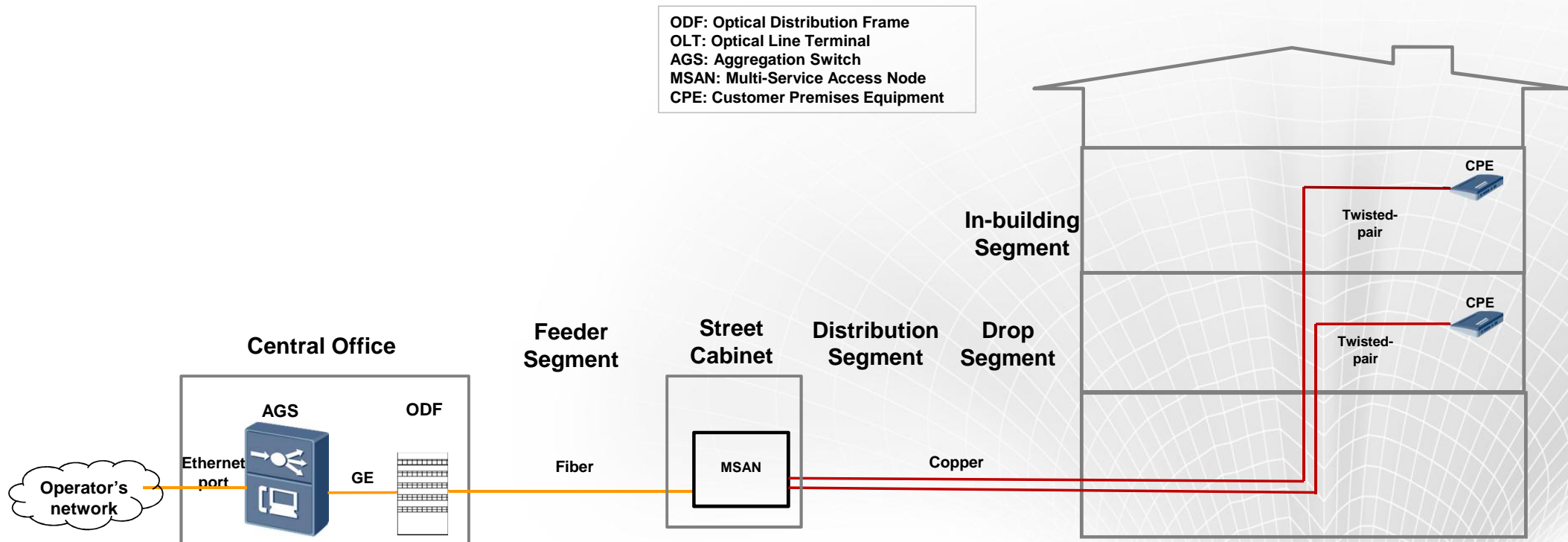
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# Network architecture

## FTTC Vectoring

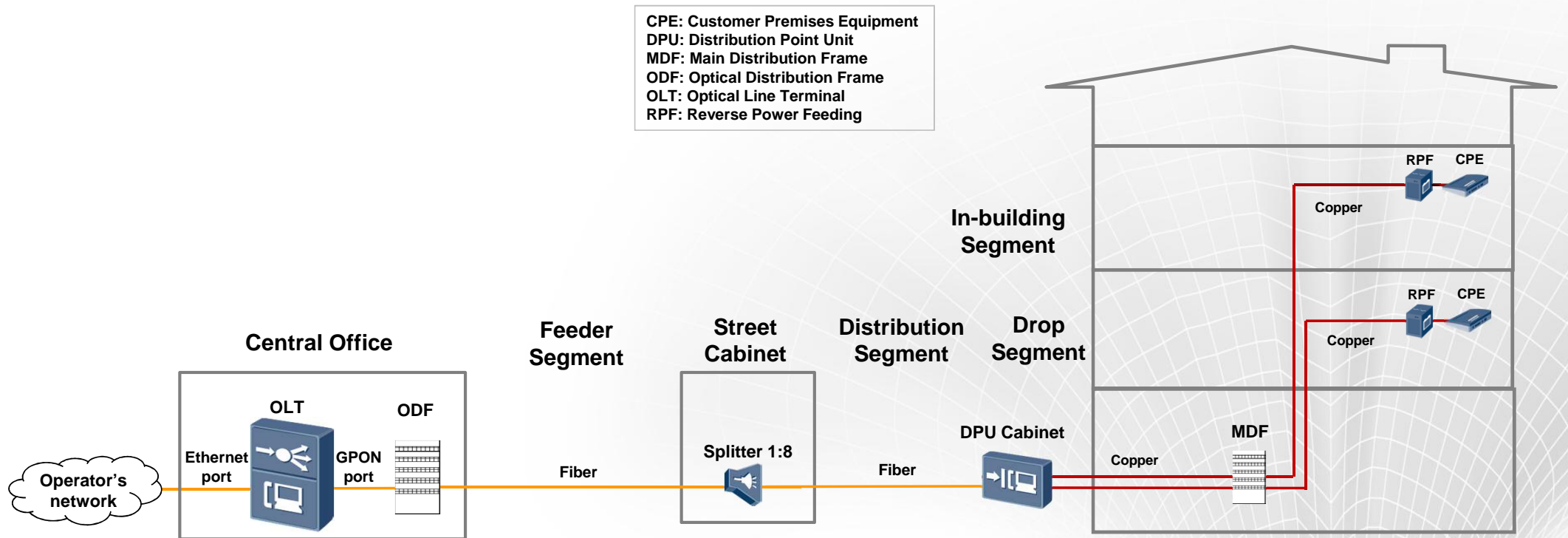
- This is a reference architecture.
- No fault management system is considered in this architecture



# Network architecture

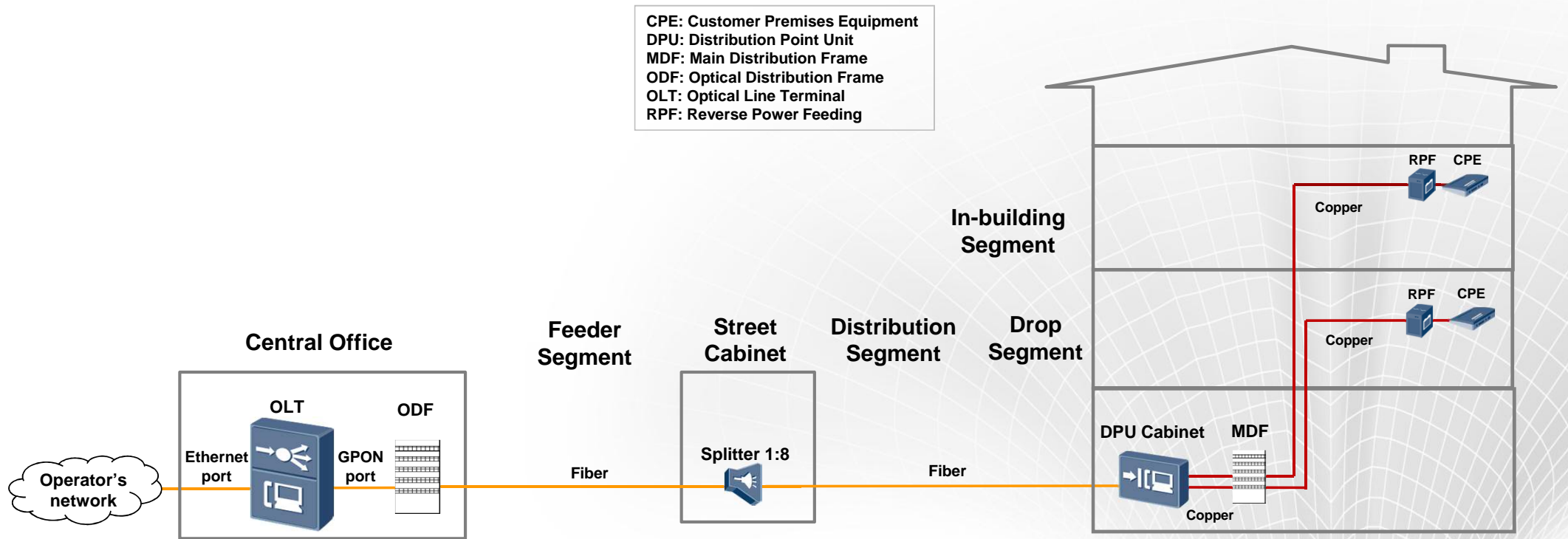
## FTTdP-Street G.fast

- This is a reference architecture.
- No fault management system is considered in this architecture



# Network architecture FTTdP-Building G.fast

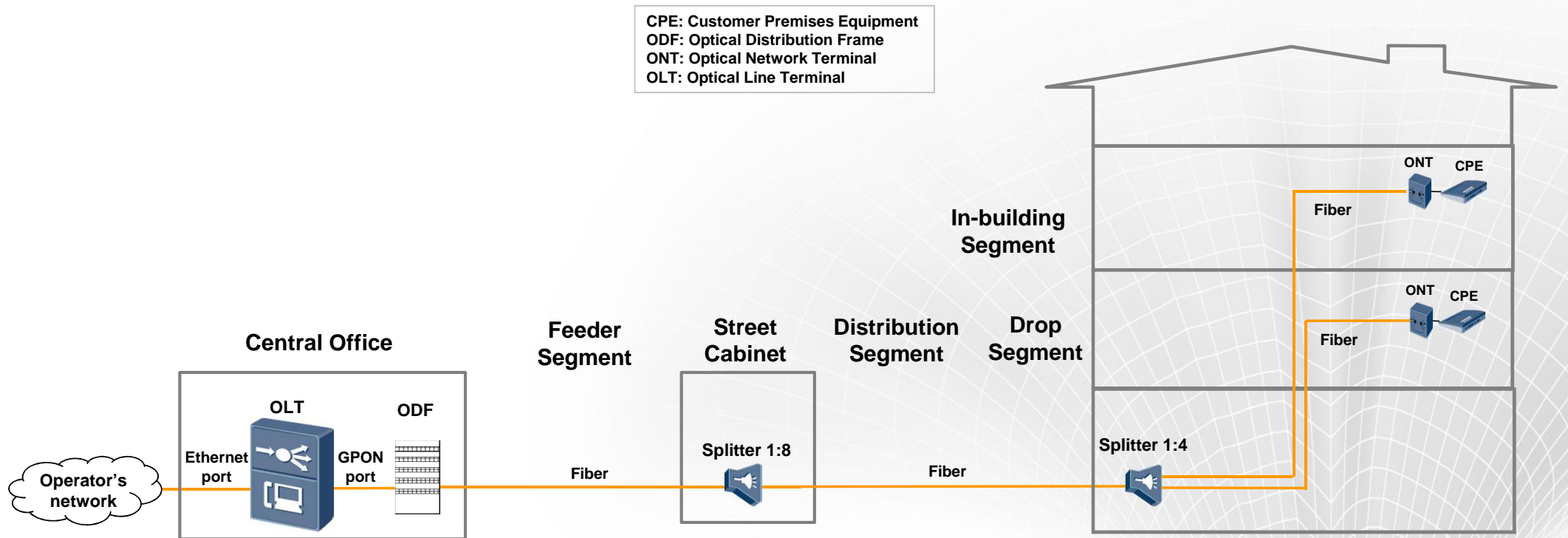
- This is a reference architecture.
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# Network architecture FTTH/GPON

- This is a reference architecture.
- No fault management system is considered in this architecture



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## Assumptions for the average rural area

Item	Value
Total number of subscribers per Central Office	3,000
Average feeder segment length	2,500 m
Average distribution segment length	220 m
Average drop segment length	26 m
Number of households per building	5
Time period for the analysis	15 years

- These values are not based on the example of a rural area shown in the previous slide.

## Type of results presented in the study

	CAPEX/OPEX?	Market Share	Effect of churn rate on the number of subscribers?
1) Homes Passed	only CAPEX	100%	No
2) Homes Connected	CAPEX and OPEX	50%	Yes

### CAPEX:

- Material and installation of equipment (Homes Passed and Homes Connected)
- Connection works of a new user (Homes connected)

### OPEX:

- Maintenance of the equipment (Homes connected)

### GREENFIELD APPROACH:

Feeder and Distribution segments: The ducts in the feeder and distribution segment should be deployed.



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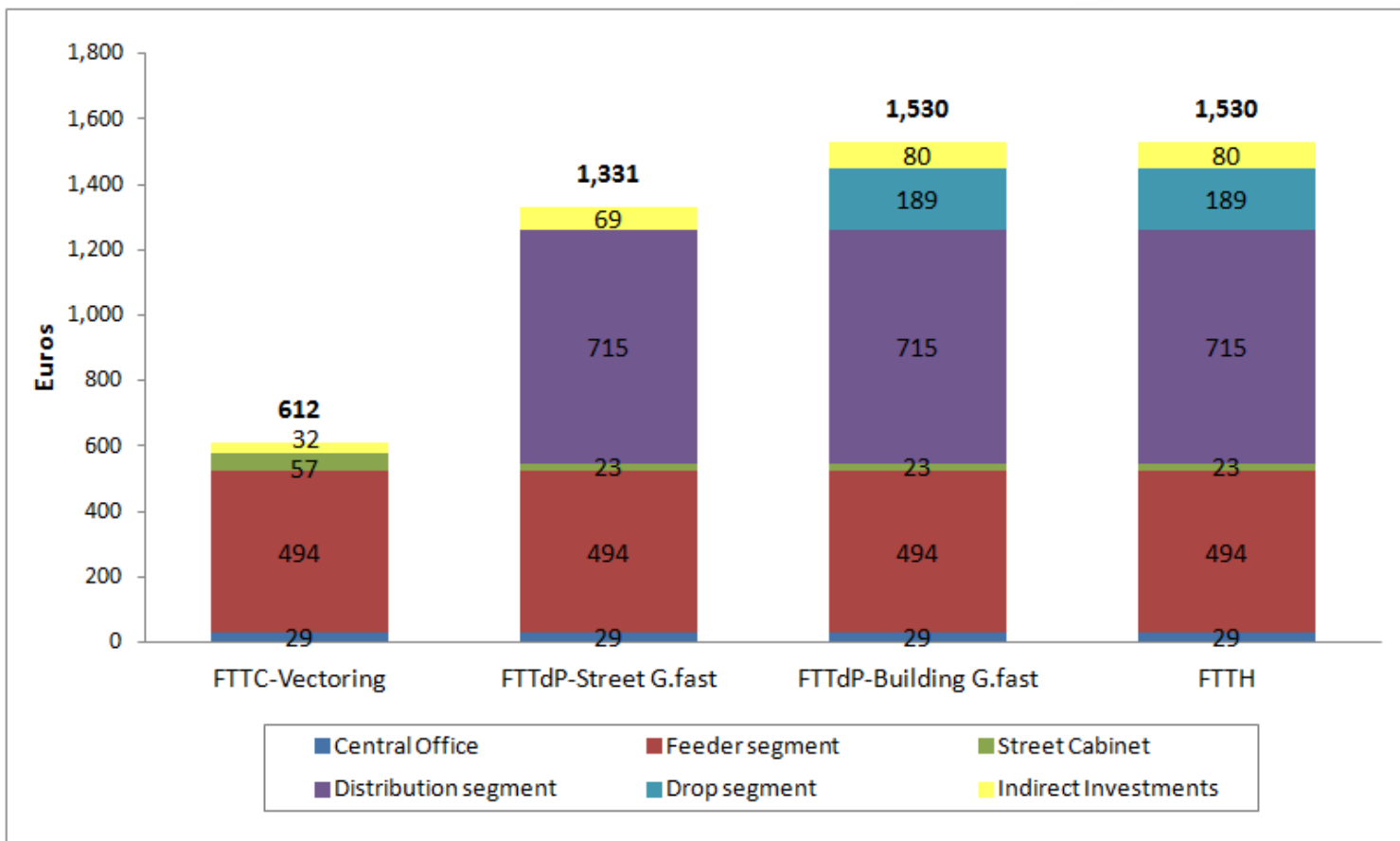
# Set of Results

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- Cost per Home Passed, CAPEX only, 100% market share
- Cost per Home Connected, CAPEX and OPEX, 50% market share
- Techno-economic comparison

## Rural Area

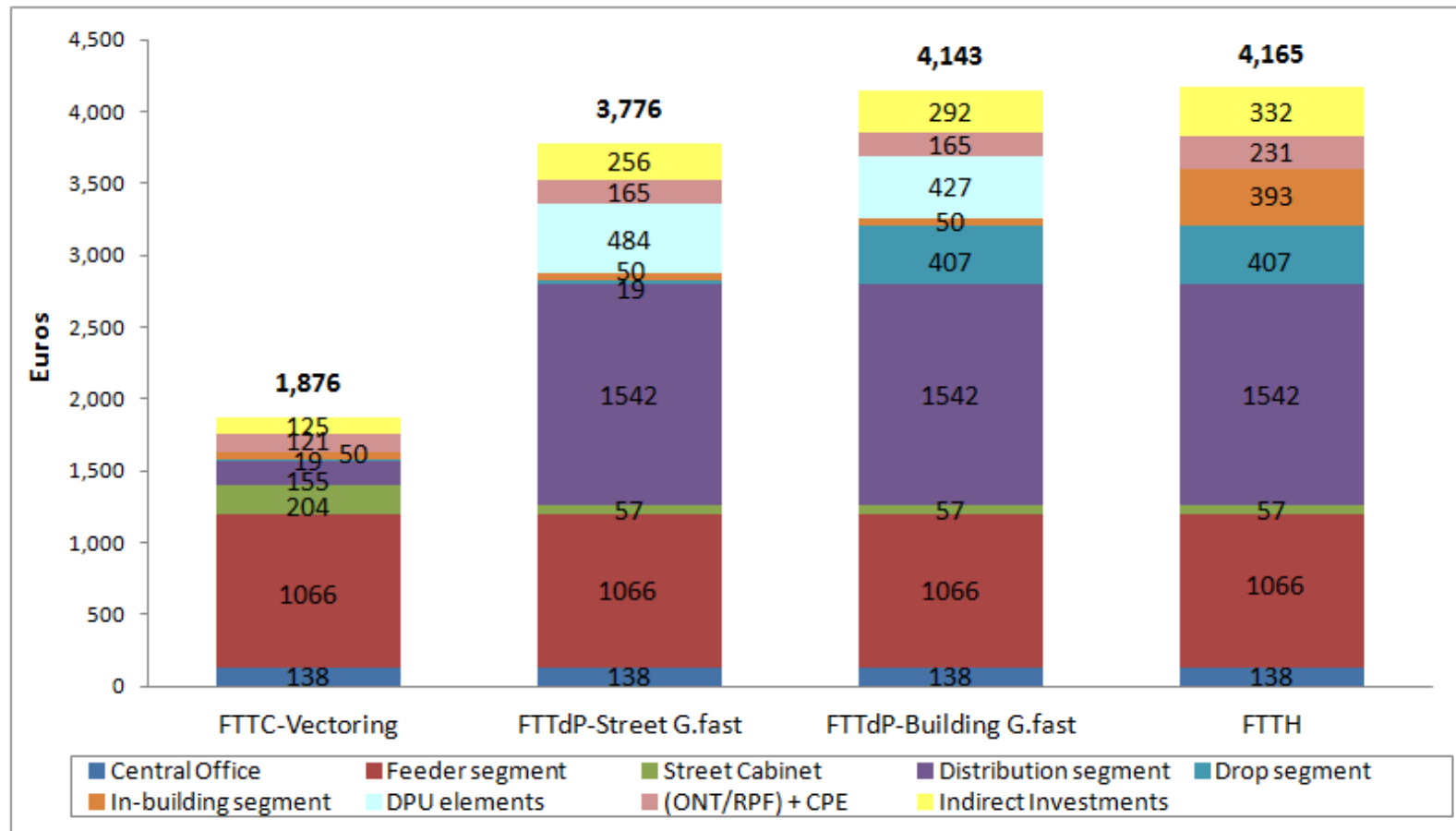
# Cost Per Home Passed: CAPEX only, 100% market share



### Cost Reductions achieved vs. FTTH:

- FTTdP-Building G.fast: 0%
- FTTdP-Street G.fast: 13%
- FTTC-Vectoring: 60%

# Cost per Home Connected, CAPEX and OPEX, 50% market share: Time period: 15 years. It includes the effect of the churn rate (10%). Rural area



**Cost Reductions achieved vs. FTTH:**

- FTTdP-Building G.fast: 1%
- FTTdP-Street G.fast: 9%
- FTTC-Vectoring: 55%



Rural area

## Techno – economic comparison

<b>Network type</b>	<b>Theoretical transmission capacity (Cost per home connected, 50% market share)</b>
<b>FTTC-Vectoring</b>	[100 Mbps] (distance of 250 m) (1,876 €)
<b>FTTdP-Street G.fast</b>	[80-100 Mbps] (GPON splitting ratio of 32) (3,776 €)
<b>FTTdP-Building G.fast</b>	[80-100 Mbps] (GPON splitting ratio of 32) (4,143 €)
<b>FTTH GPON</b>	[80-100 Mbps] (GPON splitting ratio of 32) (4,165 €)

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## Conclusions

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- In rural areas, the cost of FTTC-Vectoring is lower than the cost of the other networks described (FTTH and FTTdP G.fast)
- The cost of FTTdP G.fast is lower than the cost of FTTH.
- The question that operators and policy makers will ask is: *which broadband capacity should be provided?*
- More rural scenarios will be studied to understand better the technical and cost implications of fixed broadband access networks.

# Thank You

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