Fibre for 5G: the story of convergence

Study by D&O committee - FTTH Council Europe
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FTTH conference 2020

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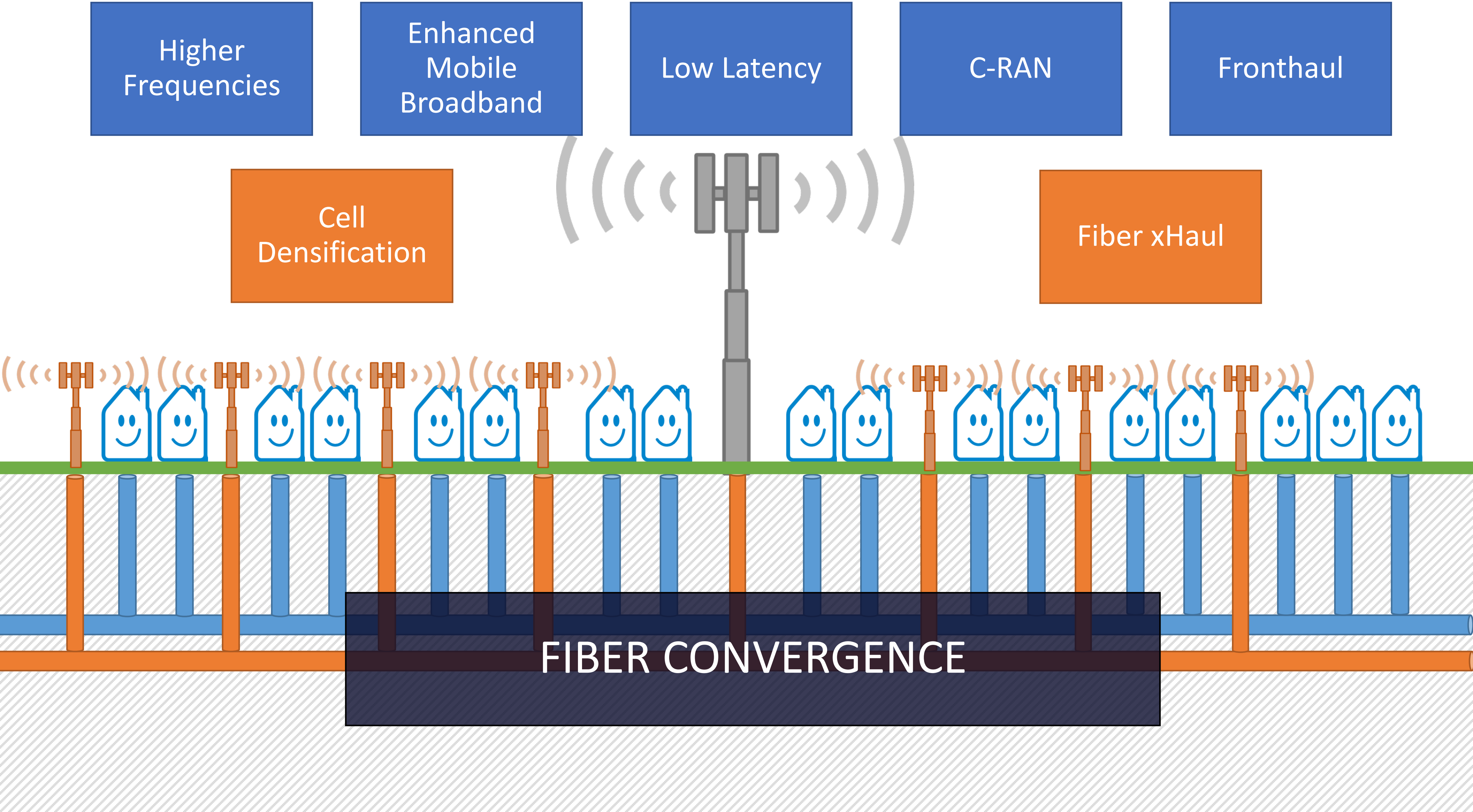
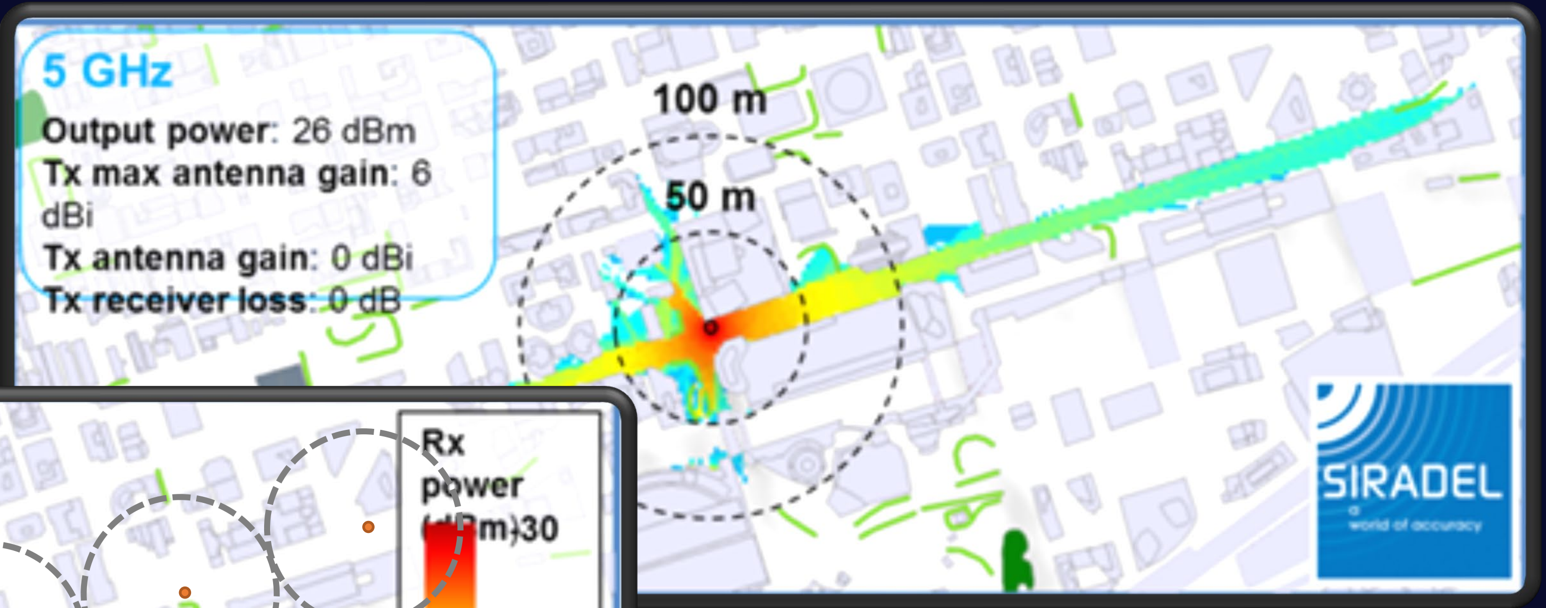
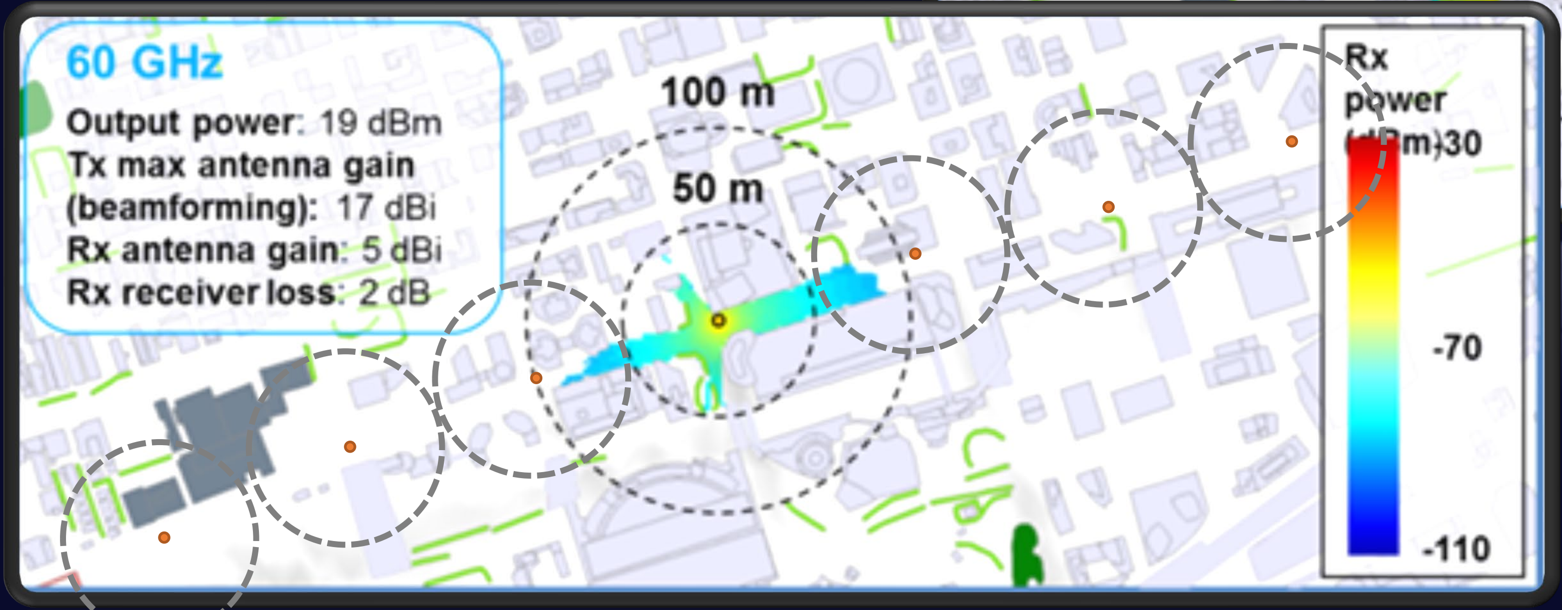
What % of Cost for 5G Fibre xHaul can be saved by convergence with FTTH?
What is the impact of area density or cell density?
Study 2019
What is the impact of time and demand uncertainty in a phased rollout?
Study 2020


Higher Frequencies
Enhanced Mobile Broadband
Low Latency
C-RAN
Fronthaul
Cell Densification
Fiber xHaul
FIBER CONVERGENCE

Impact of Frequency on Coverage





* Source: Siradel

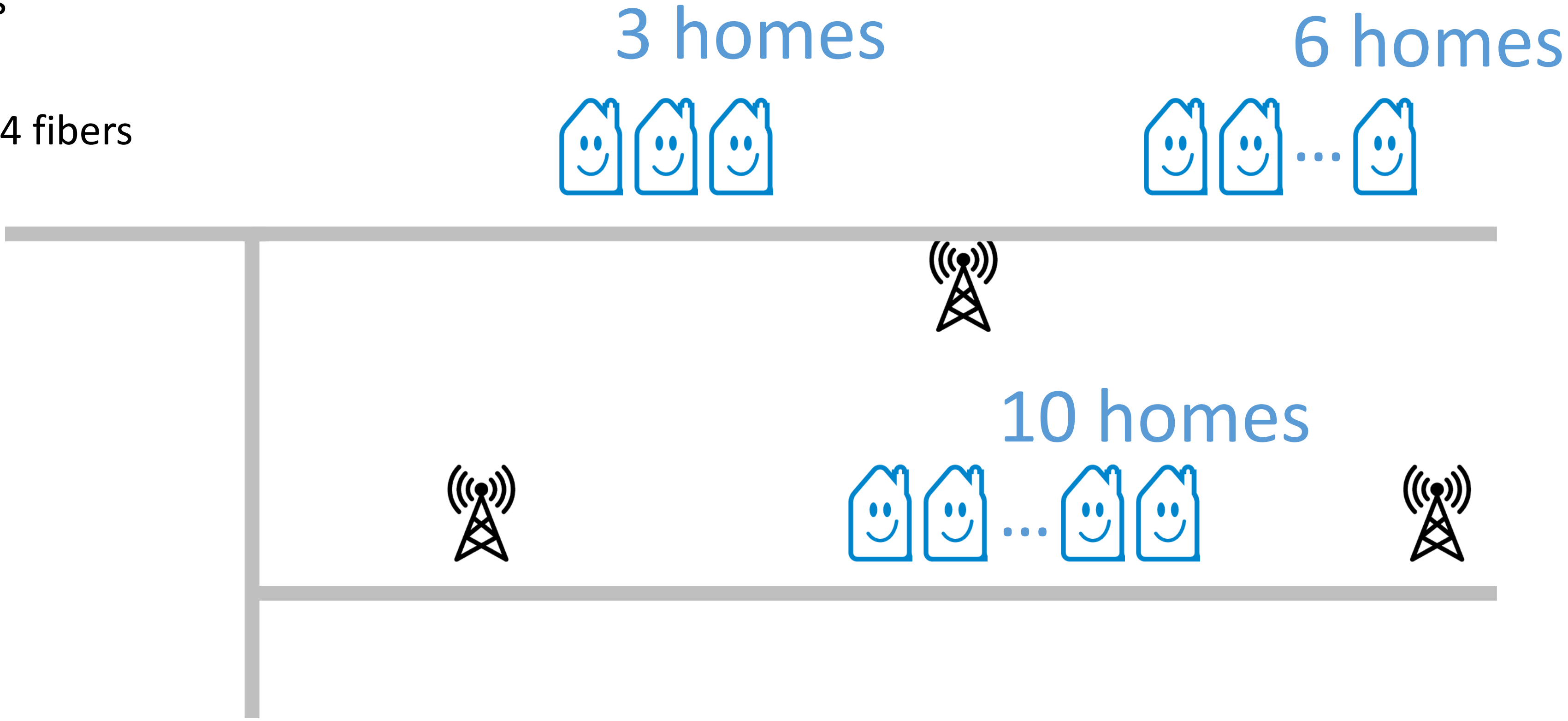
5G – FTTH: Value of Convergence

1 Converged Network vs. 2 Standalone Networks

Concept illustration

A Home requiring 2 fibers

A 5G antenna requiring 24 fibers



5G – FTTH: Value of Convergence

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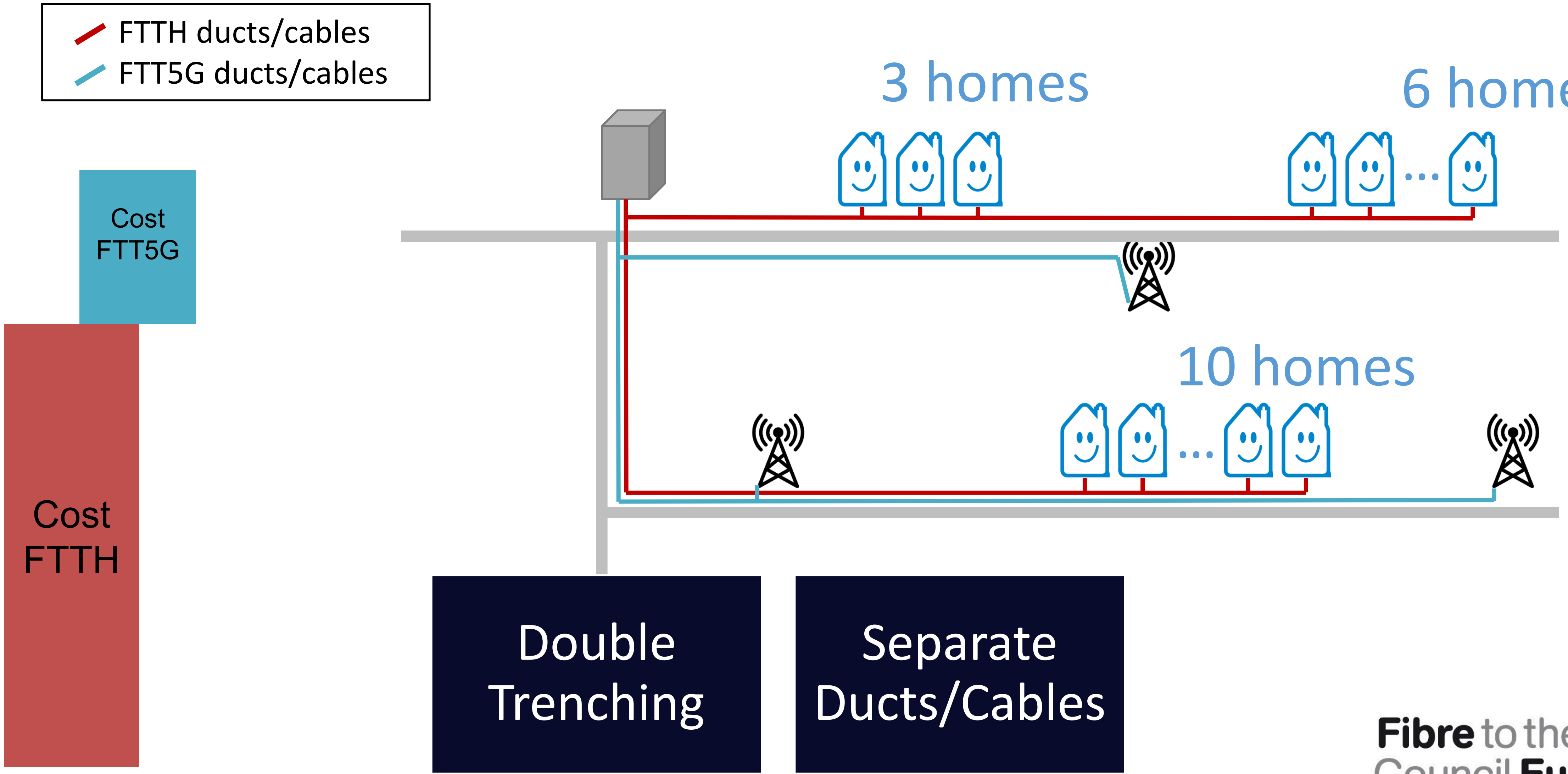

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5G – FTTH: Value of Convergence

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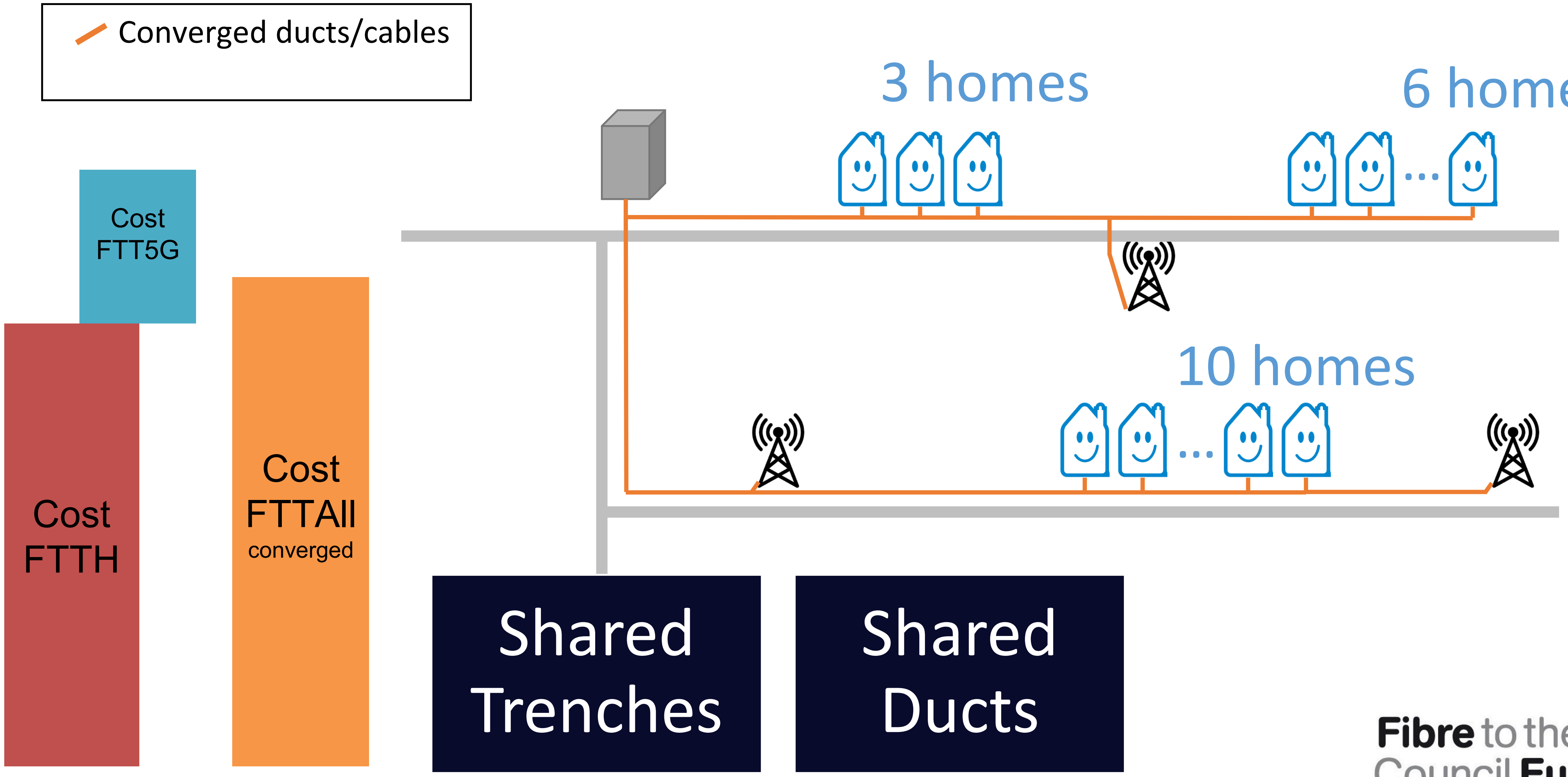

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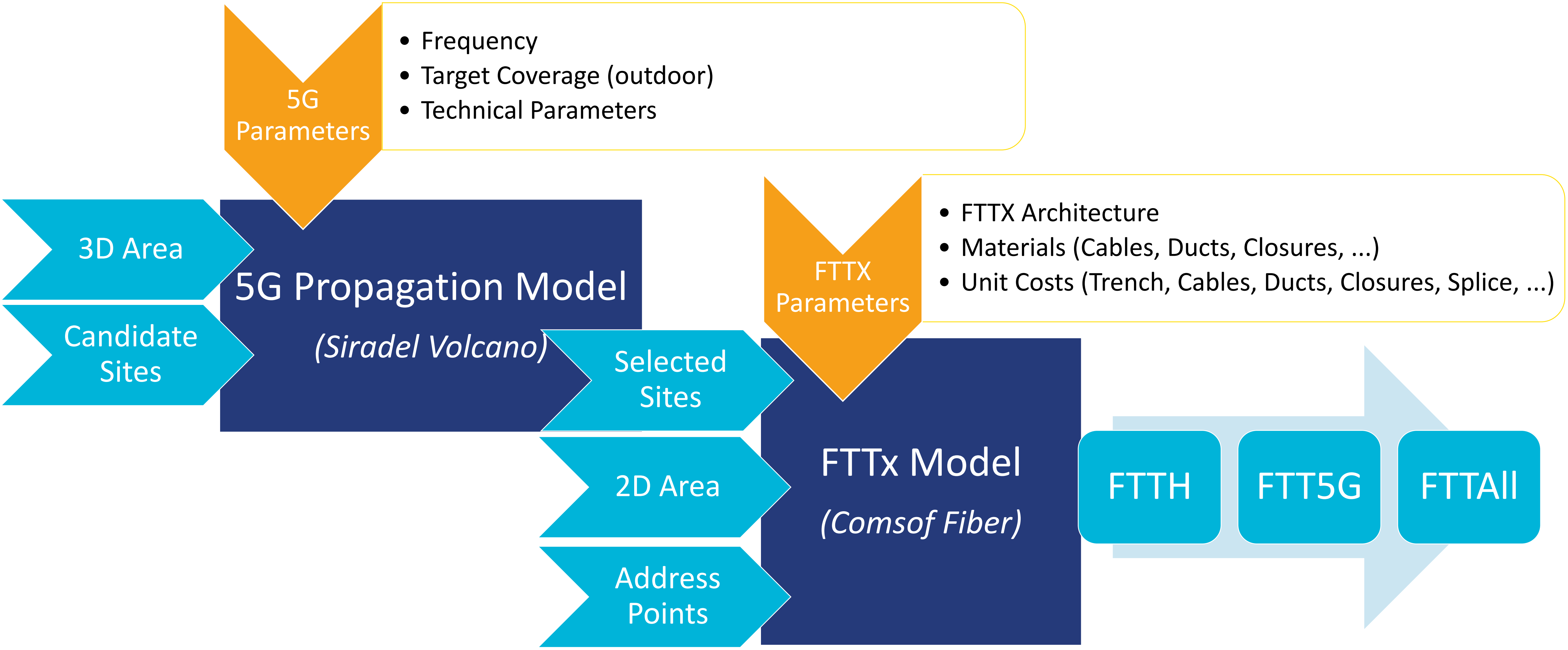
5G – FTTH: Value of Convergence

Calculation Model & Assumptions



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5G – FTTH: Value of Convergence

3 Areas – Various Densities

Urban

High Dense

- 4k Buildings
- 30k Homes
- 24k inh/km²
- Lots of "Visitors"

Suburban

Medium Dense

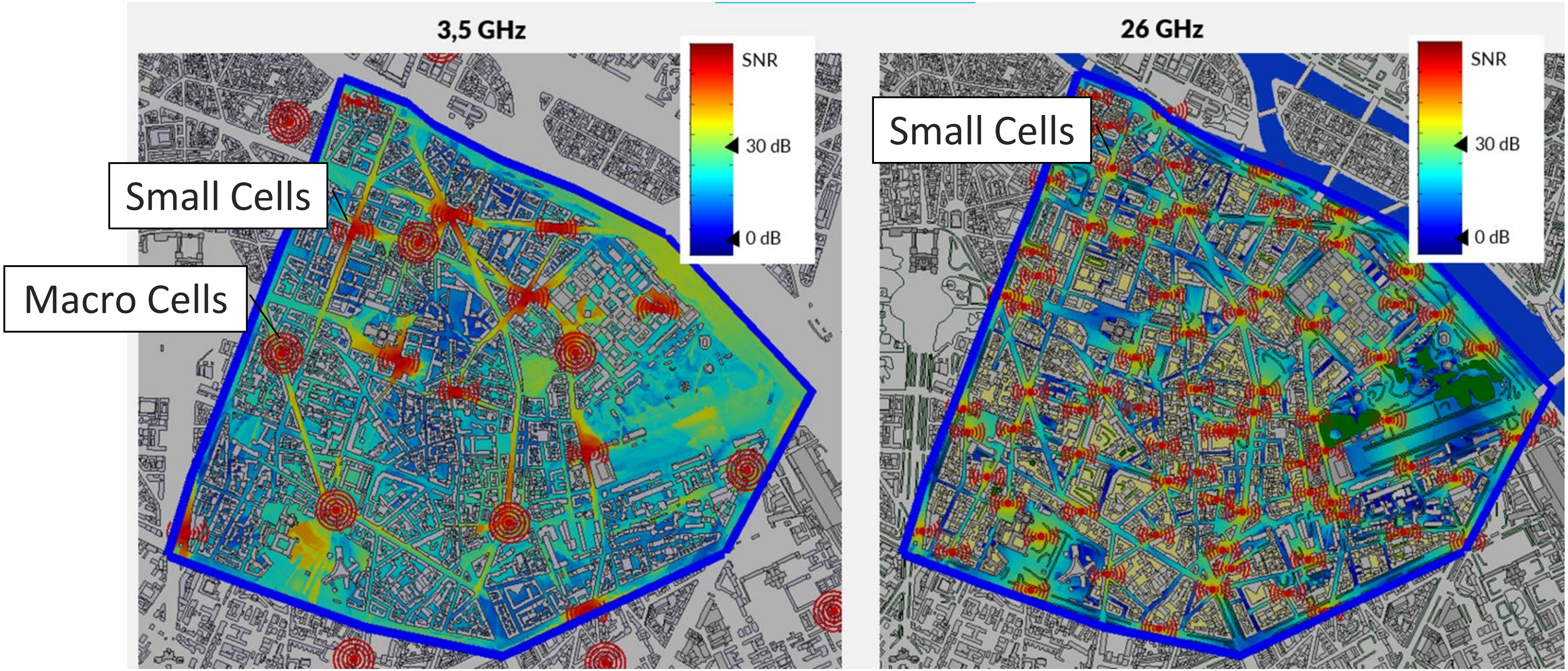
- 5,7k Buildings
- 5,7k Homes
- 3,5k inh/km²

Rural

Low Dense

- 7,1k Buildings
- 7,1k Homes
- 95 inhabitants/km²

High Cell Density: 5G Small Cells @ 3,5GHz + 26GHz (95%)



Source: Siradel (Volcano Model)

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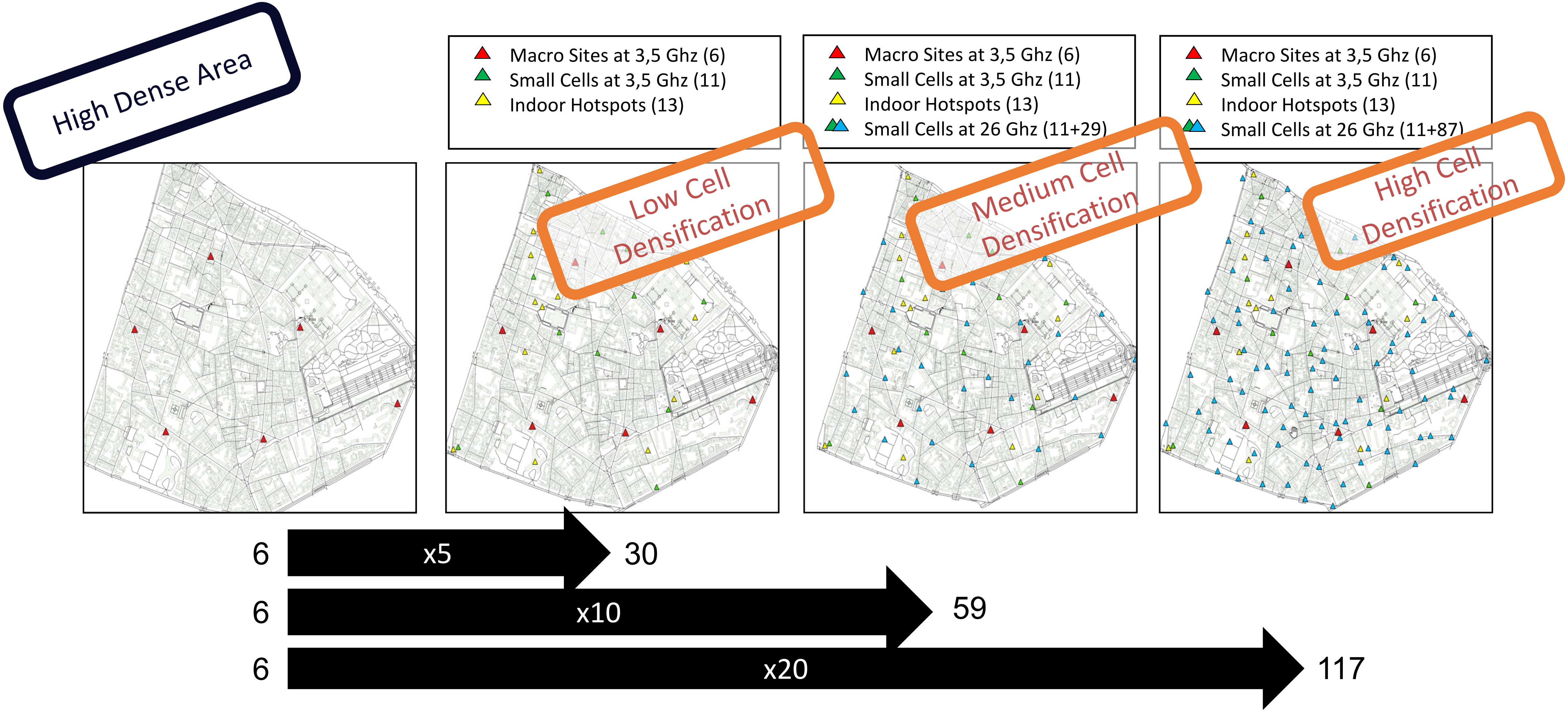
Output: Selected Sites per Area and Cell Density



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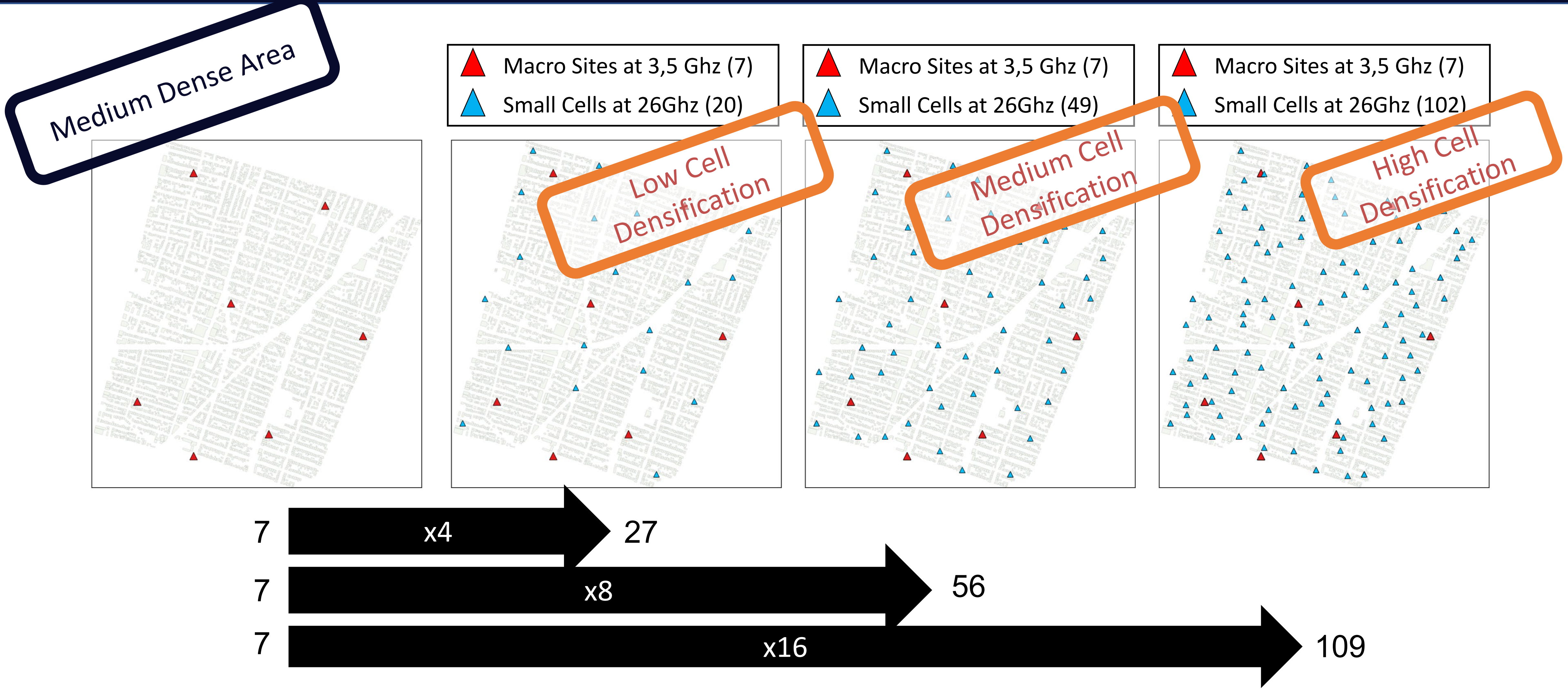

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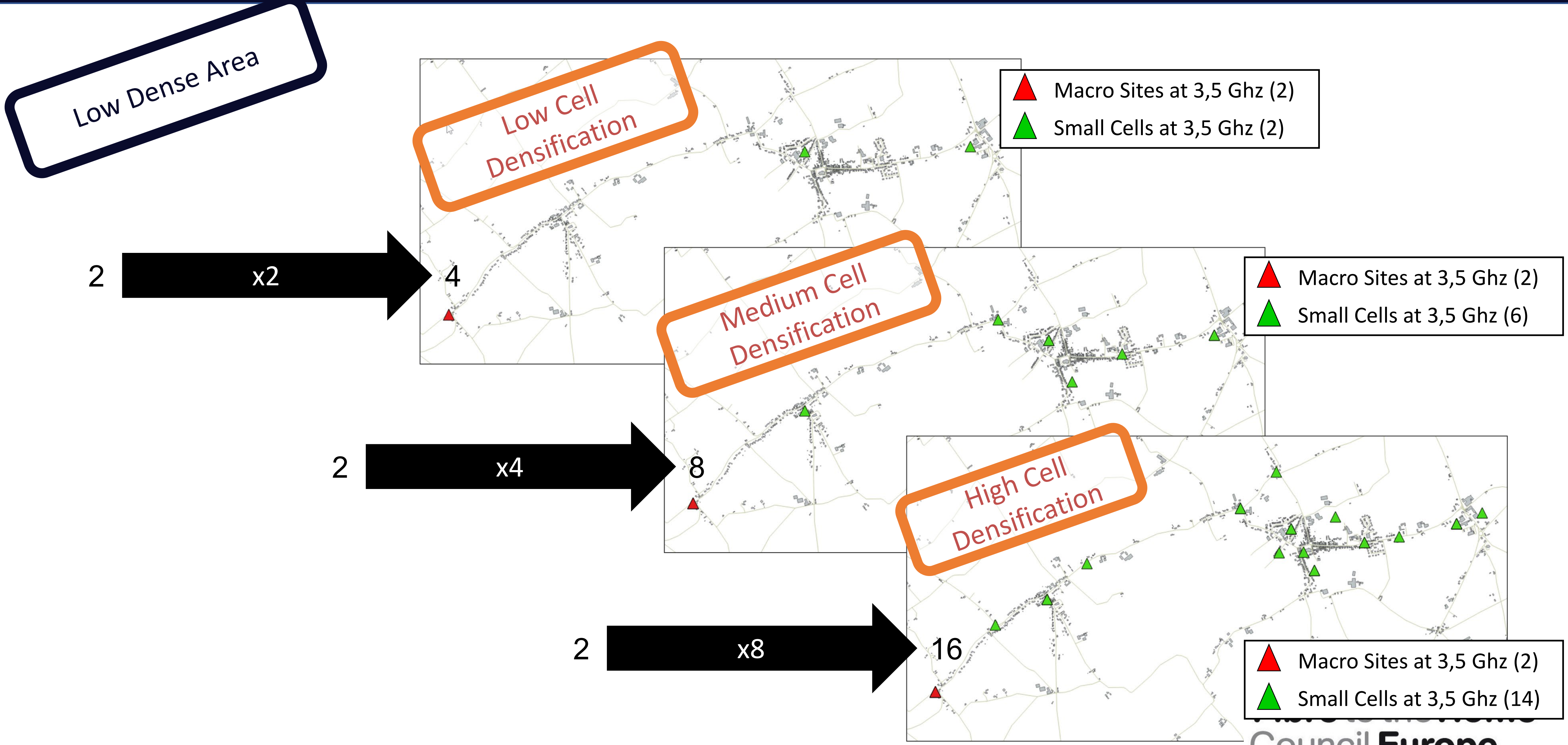

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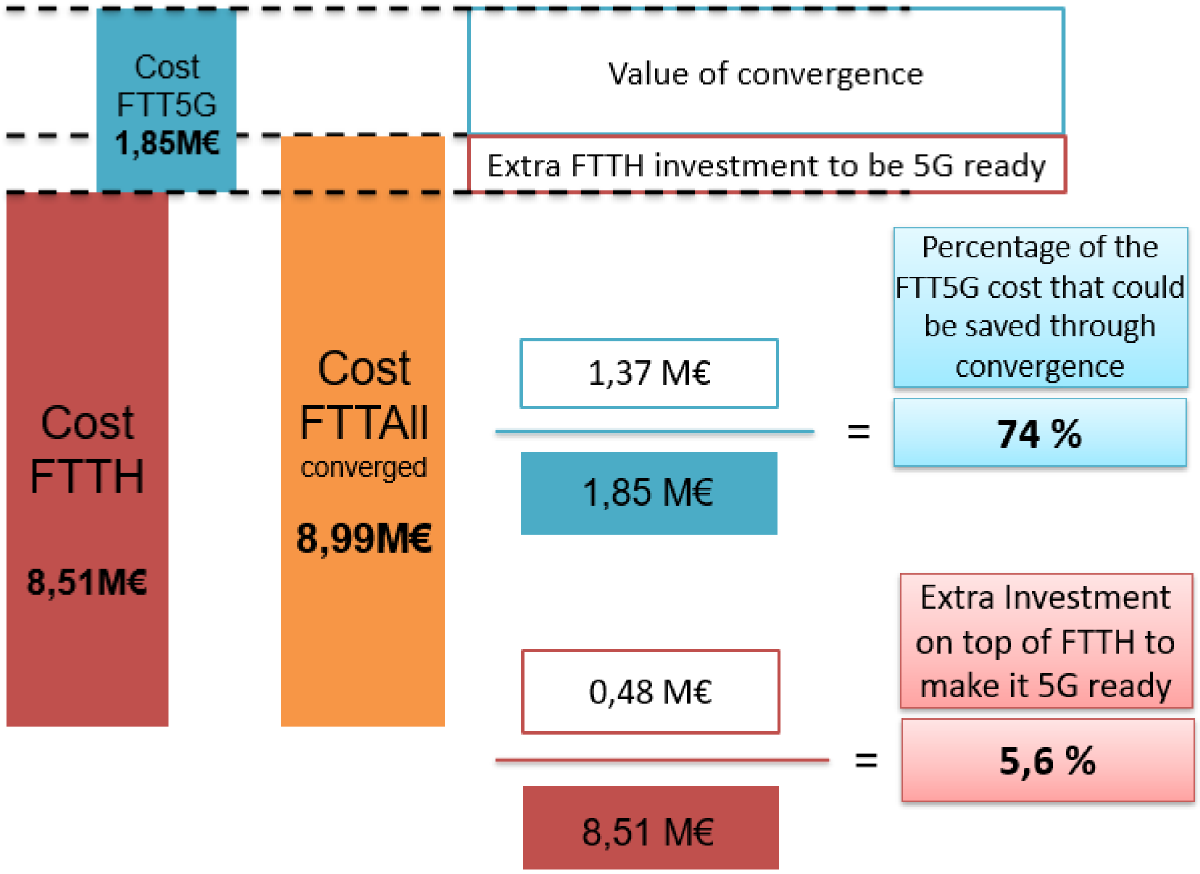
5G – FTTH: Value of Convergence

Example Result: High Dense Area – High Dense Cells



Between 65% and 96% of Fibre costs for 5G xHaul can be eliminated

by rolling out an optimised and future proof converged fibre network

The extra investment needed to immediately make an FTTH network ready for 5G (even for high density of cells) is only 1% to 7%

A risk worth taking?

What if we rollout FTTH and high-dense 5G in different phases over time, not knowing the 5G fiber demand at the time of our FTTH deployment?

We need to foresee spare capacities on top of FTTH for reuse in future 5G fibre rollout

How much spare capacity is needed to benefit from convergence?
What is the cost reduction for FTT5G for a certain level of spare capacity?

5G – FTTH convergence

Study 2020 - Assumptions

High Dense Area

- 30k homes
- 24k inh/km²
- Fiber network: underground/ducts

Phase 1 = FTTH with X% spare:

- 12%
- 24%
- 48%

Phase 2 in Year Y =

- Year 1 + 5
- NPV based on discount rate of 8%

Year Y: High Cell Density

- 95% coverage at 26Ghz
- Cell densification with Factor 20

Year 1: FTTH with X% spare ducts

Year Y: FTT5G maximally reusing spare capacity

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5G – FTTH convergence

Study 2020 - Assumptions

Distribution Material	Feeder Material
Microducts with ABF	Microducts with ABF
2f, 12f cables	12f, 96f cables
12-way Microduct Bundles (7/3.5)	7-way Microduct Bundles (14/10)

Fiber Demand
2f per Home
12 active + 12 spare fiber per 5G site
GPON technology (1:32 for FTTH / 1:4 for FTT5G)

12 way

7 way

Distribution – Spare	Feeder – Spare	Average Spare
1 microduct out of 12	1 microduct out of 7	12%
2 microducts out of 12	2 microduct out of 7	24%
4 microducts out of 12	4 microduct out of 7	48%

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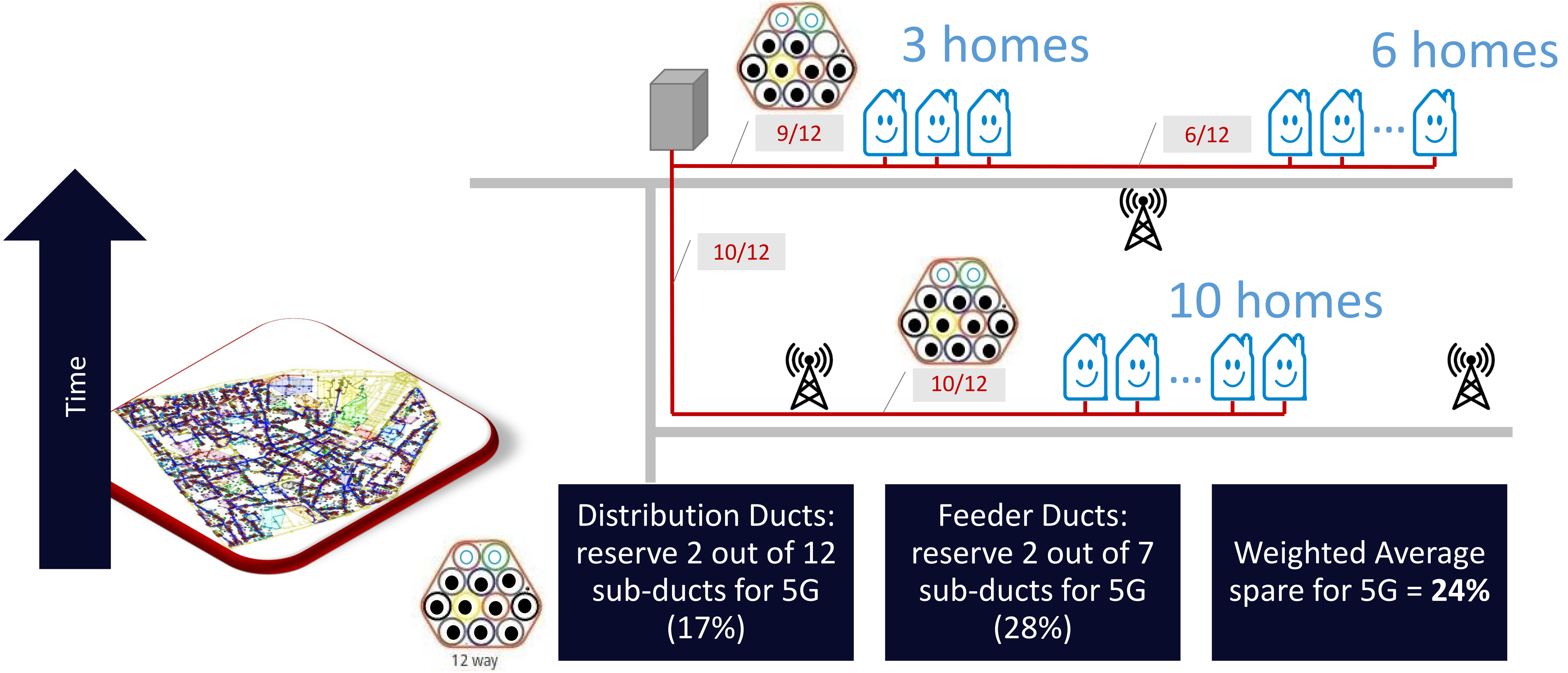
5G – FTTH convergence

Example: FTTH with 24% spare, then FTT-5G



Distribution Ducts: reserve 2 out of 12 sub-ducts for 5G (17%)

Feeder Ducts: reserve 2 out of 7 sub-ducts for 5G (28%)

Weighted Average spare for 5G = **24%**

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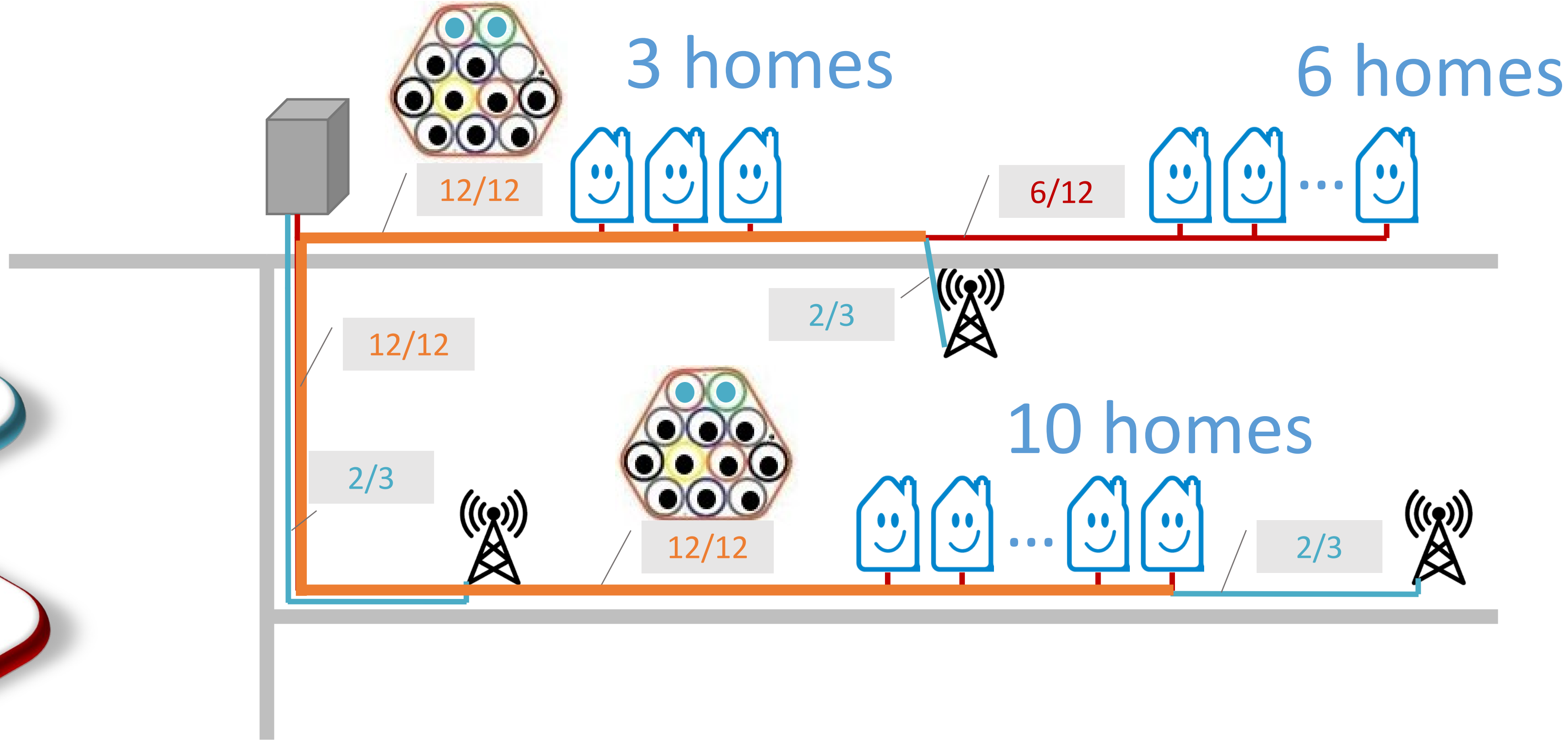
5G – FTTH convergence

Example: FTTH with 24% spare, then FTT-5G



Partly Double Trenching	Partly Avoid Trenching	Partly Separate Ducts	Partly Reused Ducts

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5G – FTTH convergence

Case 1: FTTH with 0% Spare, then FTT-5G

Total cost = 10.356 kEUR | Total NPV = 9.766 kEUR

2026: standalone FTT-5G network = 1.846 kEUR | NPV (5Y) = 1.256 kEUR

2021: standalone FTTH network = 8.510 kEUR

5G – FTTH convergence

Case 1: FTTH with 0% Spare, then FTT-5G

	0% Spare (kEUR)
Total NPV	9.766
FTT5G (NPV-5Y)	1.256
FTTH with spare	8.510

5G – FTTH convergence

Case 2: FTTH with 12% spare, then FTT-5G

	0% Spare (kEUR)	12% Spare (kEUR)
Total NPV	9.766	9.543
FTT5G (NPV-5Y)	1.256	1.030
FTTH with spare	8.510	8.513

5G – FTTH convergence

Case 3: FTTH with 24% spare, then FTT-5G

	0% Spare (kEUR)	12% Spare (kEUR)	24% Spare (kEUR)
Total NPV	9.766	9.543	8.968
FTT5G (NPV-5Y)	1.256	1.030	444
FTTH with spare	8.510	8.513	8.524

5G – FTTH convergence
Case 4: FTTH with 48% spare, then FTT-5G

	0% Spare (kEUR)	12% Spare (kEUR)	24% Spare (kEUR)	48% Spare (kEUR)
Total NPV	9.766	9.543	8.968	8.915
FTT5G (NPV-5Y)	1.256	1.030	444	372
FTTH with spare	8.510	8.513	8.524	8.543

5G – FTTH convergence

Case 5: Optimally Converged FTTH/FTT-5G network

	0% Spare (kEUR)	12% Spare (kEUR)	24% Spare (kEUR)	48% Spare (kEUR)	Optimally Converged (kEUR)
Total NPV	9.766	9.543	8.968	8.915	8.991
FTT5G (NPV-5Y)	1.256	1.030	444	372	0
FTTH with spare	8.510	8.513	8.524	8.543	8.991

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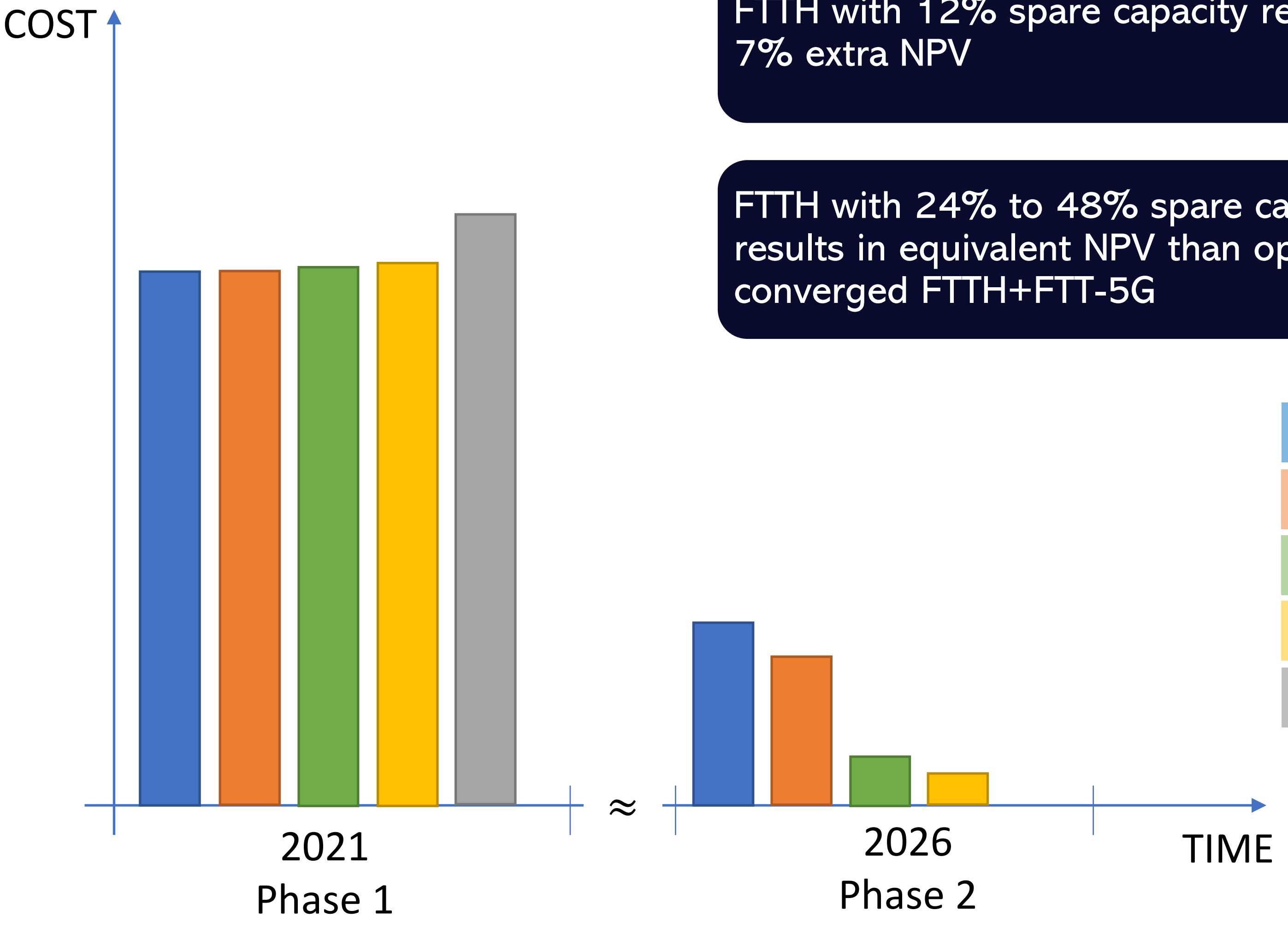
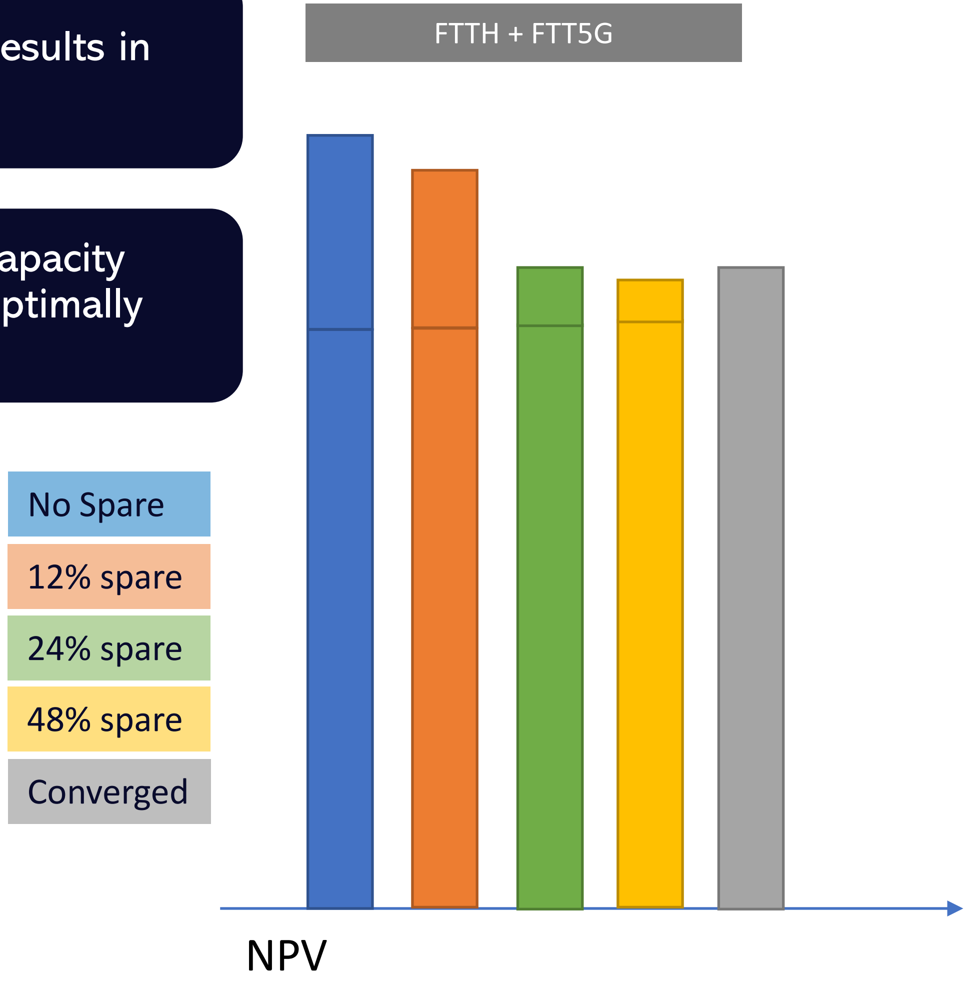
5G – FTTH convergence

Results Phased rollouts

FTTH with 12% spare capacity results in 7% extra NPV

FTTH with 24% to 48% spare capacity results in equivalent NPV than optimally converged FTTH+FTT-5G





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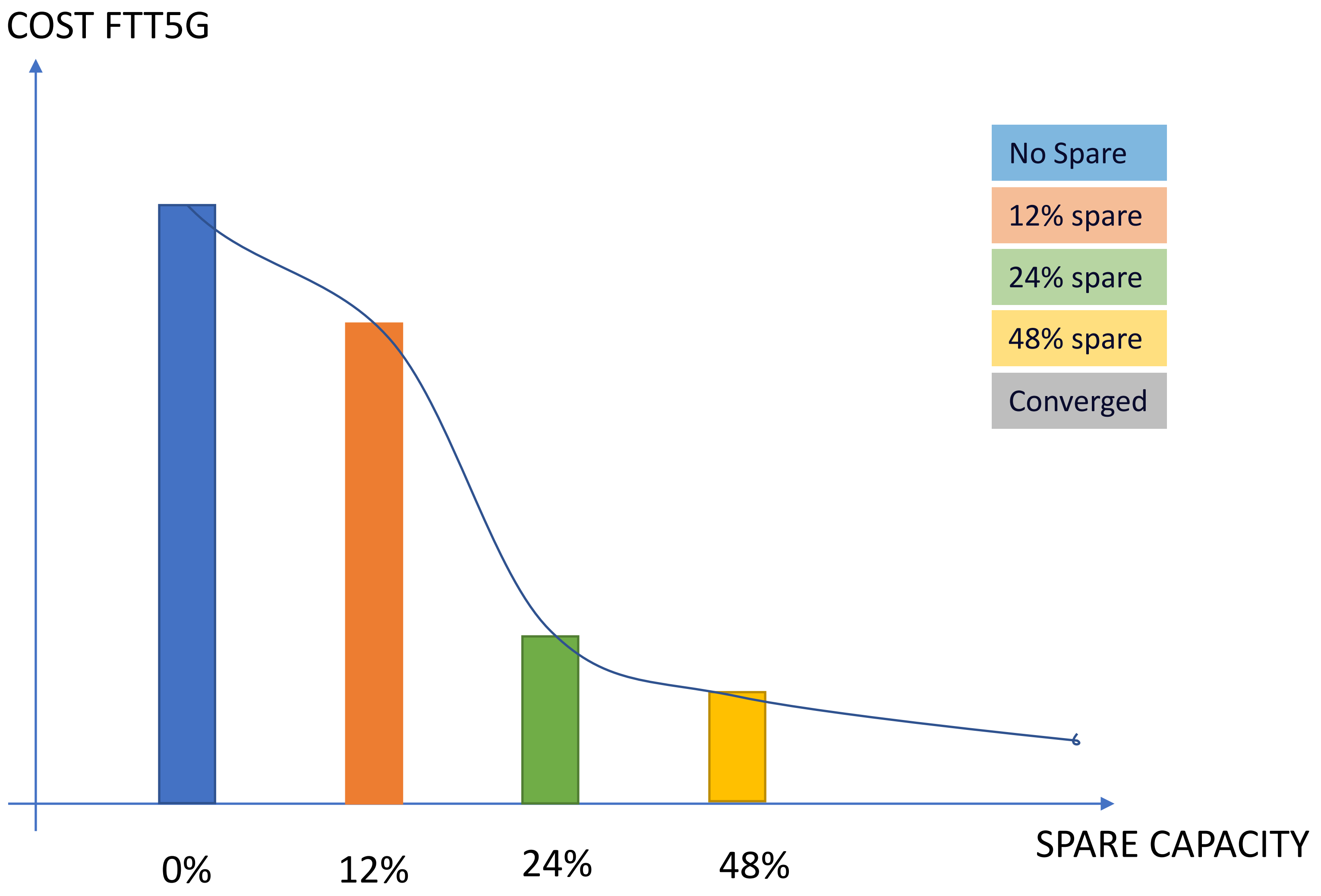
5G – FTTH convergence
Results Phased rollouts



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Conclusions

Key findings

Deploying FTTH today should include enough spare capacity for future 5G applications

Deploying FTTH today with limited spare capacity will result in significant additional costs for future 5G

If 5G needs are not yet known, a flexible 5G ready network based on sufficient spare capacity can be built that will not cost more than the ideal case

Numbers from use case

The extra costs for the necessary spare capacity in FTTH is limited (less than 1%)

The cost of FTT5G when build on top of an FTTH network with limited or no spare capacity, is 2 to 3,5 times more expensive than with sufficient spare

The total NPV with sufficient spare capacity is similar to the ideal converged network cost

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Thanks to the 5G working group 2020
Within the D&O Committee

Rudy Musschebroeck (Commscope)
Mike Knott (Corning)
Boushra Kanj (Detecon)
Barbara Tonarelli (Adtran)
Tom Bambury (Fujikura)
Michael Timmers (Nokia)
Raf Meersman (Comsof)

Q&A

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Thank you for your attention!

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