Profitable Broadband Deployment and its Limits

International WIK Conference on „National Strategies for Ultrabroadband Infrastructure Deployment: Experiences and Challenges“

April 26th – 27th, 2010, Berlin

Dr.Thomas Plückebaum
wik-consult GmbH

wik CONSULT

Agenda

1. **Introduction**
2. Model approach
3. Critical market share
4. Country results
5. Impact of regulatory measures
6. Multi Fibre approach
7. Nationwide investment
8. Outlook: subsidies
9. Summary

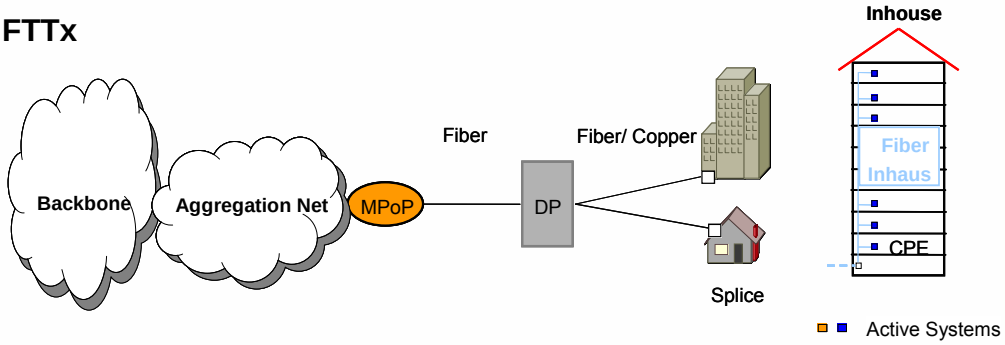
wik CONSULT

Under which circumstances is a roll out of broadband fibre access networks profitable in a competitive environment?

Geotype		Cluster	Subscriber density per km²
Urban	(1)	Dense Urban	> 10.000
	(2)	Urban	> 6.000
	(3)	Less Urban	> 2.000
Suburban	(4)	Dense Suburban	> 1.500
	(5)	Suburban	> 1.000
	(6)	Less Suburban	> 500
Rural	(7)	Dense Rural	> 100
	(8)	Rural	≤ 100

- Clusters with decreasing subscriber density
- Different FTTx architectures (FTTC/ VDSL, FTTH PON and P2P) (assumption; FTTB somewhere inbetween)
- Different regulatory measures (duct access, dark fibre, fibre LLU/ SLU)
- Multifibre approach
- Profitable area

- **FTTx**



wik CONSULT

Agenda

1. Introduction
2. **Model approach**
3. Critical market share
4. Country results
5. Impact of regulatory measures
6. Multi Fibre approach
7. Nationwide investment
8. Outlook: subsidies
9. Summary

Bottom-up LRIC model

- Greenfield assumption
- First and second movers, incumbent as first mover
- Steady state – no ramp up – one period (year)
- Long term consideration
- Fttx replaces copper
- Scorched node: MDF as active (10%) or passive (90%) network nodes
- Private and business customers with service mix (single – triple play):

Type of subscriber	Average Revenue per Subscriber (in €)	Share of the Total Customer Base (in %)	Accu-mulated %
Single Play	20.0	18.2	18.2
Double Play	35.0	59.1	77.3
Triple Play	45.0	13.6	90.9
Business	50.0	9.1	100.0
Total	35.0	100.0	

Example: Germany

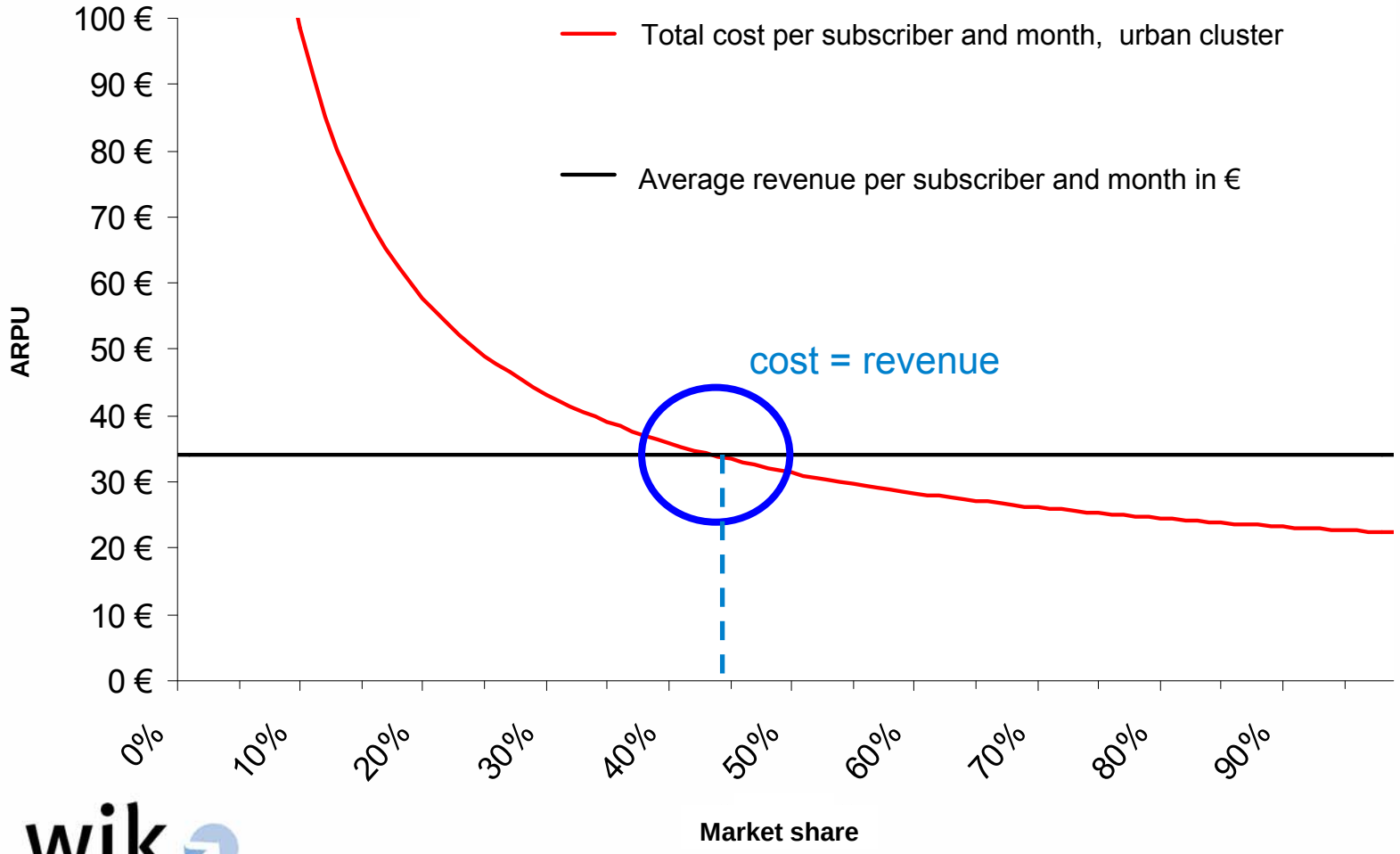
wik CONSULT

Agenda

1. Introduction
2. Model approach
3. **Critical market share**
4. Country results
5. Impact of regulatory measures
6. Multi Fibre approach
7. Nationwide investment
8. Outlook: subsidies
9. Summary

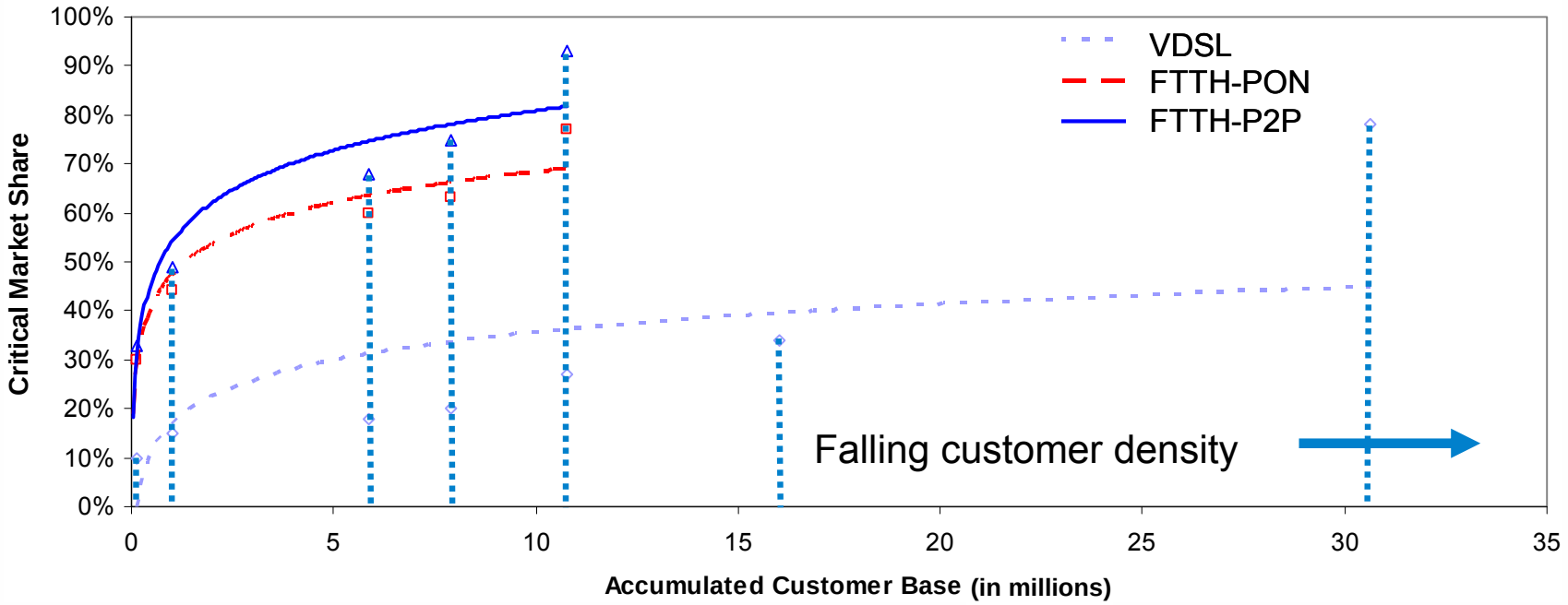
The critical market share is the market share needed by an operator in order to just achieve profitability

Determination of the critical market share for a single cluster: illustration



A 100% fibre roll out is not profitable, for none of the Fttx architectures

Critical market shares of an incumbent rolling out Fttx



Source: WIK-Consult, The Economics of NGA, Brussels 2008, German Case

Agenda

1. Introduction
2. Model approach
3. Critical market share
4. **Country results**
5. Impact of regulatory measures
6. Multi Fibre approach
7. Nationwide investment
8. Outlook: subsidies
9. Summary

Even the cheapest architecture (FTTC VDSL) has limited viability in all countries

- In no country is FTTC/FTTH roll-out profitable for all homes
  - 25 % FTTH viable in France
  - 72 % VDSL viable in Germany
- Profitable investments in NGA require substantial market shares

Viability of NGA roll-out for incumbents across countries and technologies

Network Type	Country					
	DE	FR	SE	PT	ES	IT
VDSL	71.5%	n.r.	18.3%	39.0%	67.4%	100.0%
PON	25.1%	25.2%	18.3%	19.2%	12.2%	17.6%
P2P	13.7%	18.6%	18.3%	19.2%	12.2%	12.6%

Percentage of population viably adressable

n.r. – not realisable

Source: WIK-Consult, The Economics of NGA, Brussels 2008, German Case

There is poor replicability for any of the architectures in any country

- Even when a second mover has access to ducts of the incumbent replication of infrastructure is rarely viable

Replicability of NGA roll-out for a second mover, 80 % access to existing ducts at current cost-based prices

Network Type	Country					
	DE	FR	SE	PT	ES	IT
VDSL	18.5%	n.r.	n.v.	39.0%	n.r.	17.6%
PON	0.3%	6.8%	n.v.	n.v.	n.v.	1.6%
P2P	0.0%	6.8%	n.v.	n.v.	n.v.	0.2%

n.v. – not viable
n.r. – not replicable

Source: WIK-Consult, The Economics of NGA, Brussels 2008, German Case

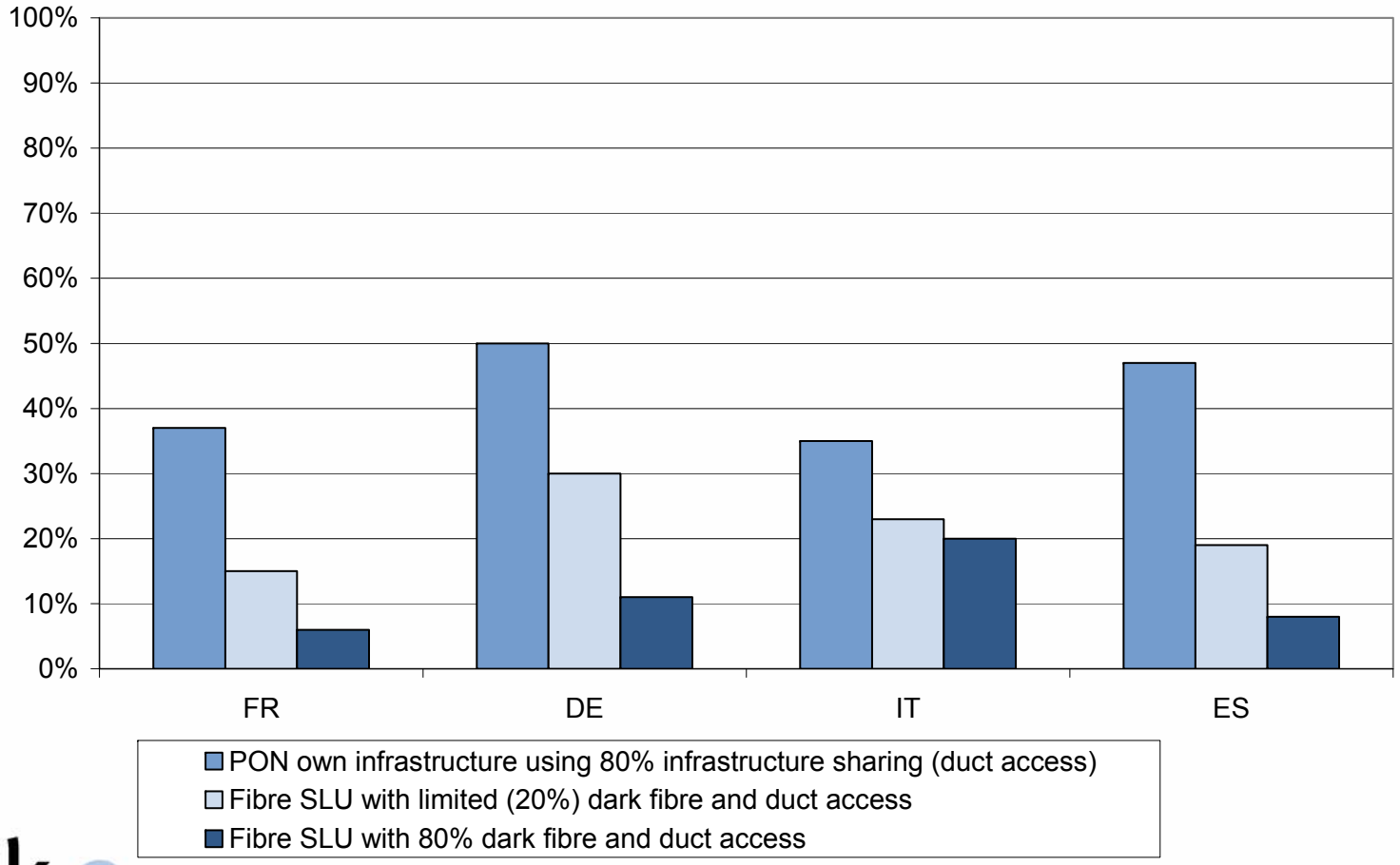
Agenda

1. Introduction
2. Model approach
3. Critical market share
4. Country results
5. **Impact of regulatory measures**
6. Multi Fibre approach
7. Nationwide investment
8. Outlook: subsidies
9. Summary

wik CONSULT

Regulatory measures help to improve the situation of replicability, but not in covering the whole country

Impact of regulatory measures on the critical market shares of alternative operators in the urban cluster (PON architecture)

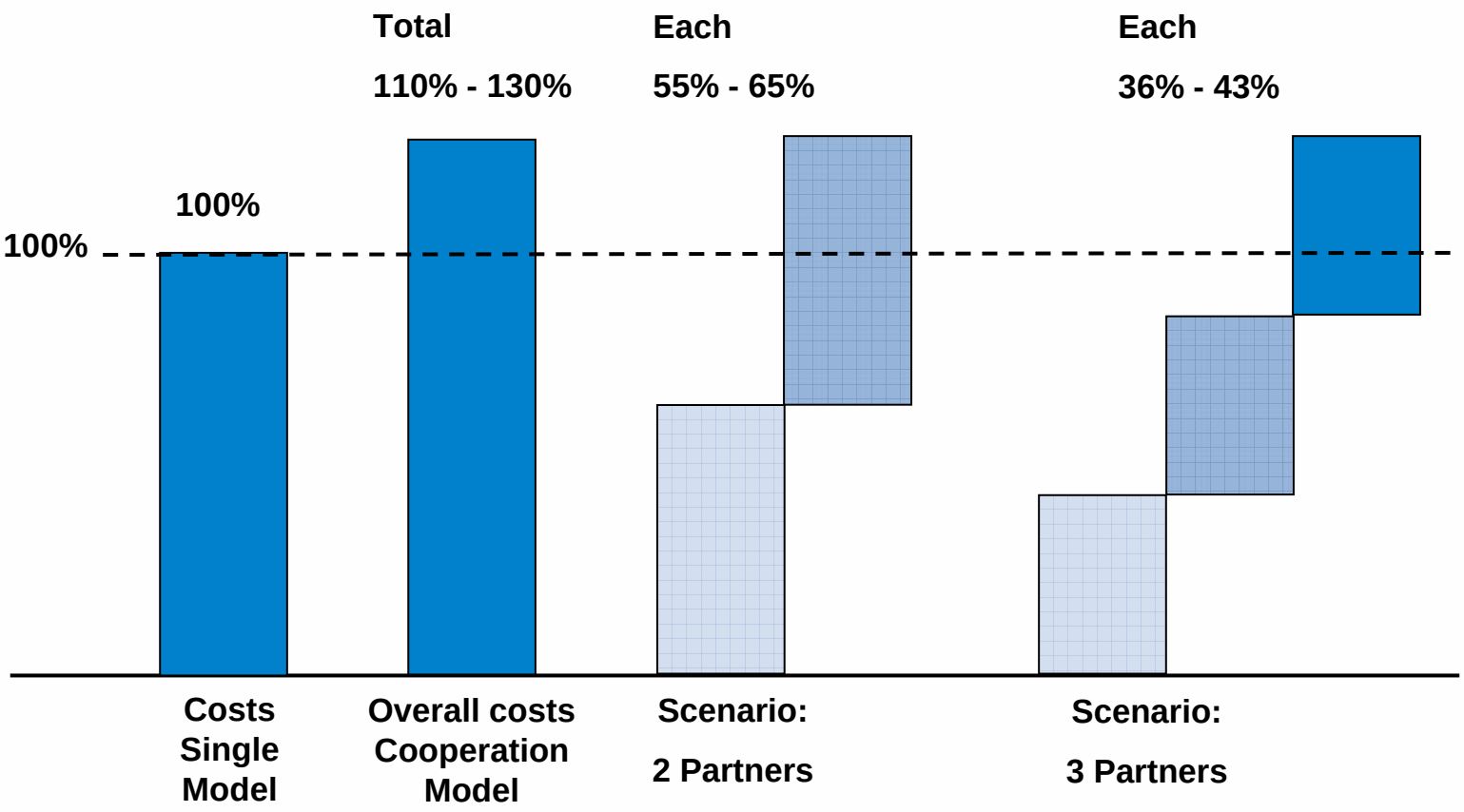


Source: WIK-Consult, The Economics of NGA, Brussels 2008, German Case

Agenda

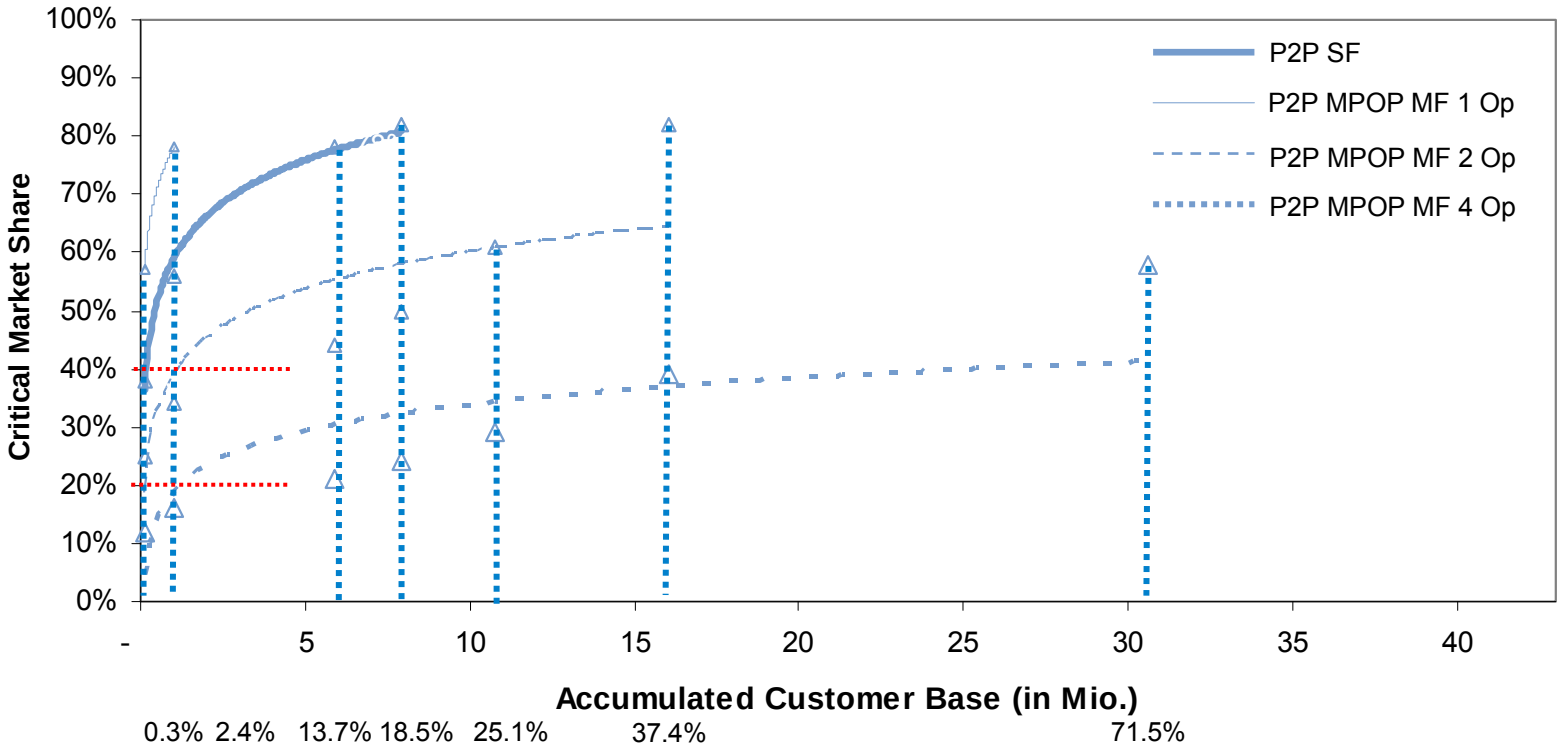
1. Introduction
2. Model approach
3. Critical market share
4. Country results
5. Impact of regulatory measures
6. **Multi Fibre approach**
7. Nationwide investment
8. Outlook: subsidies
9. Summary

Multi Fibre – the idea to save cost per operator



Source: WIK-Consult, The Economics of NGA - Addendum, Brussels 2009, (German Case)

Multi Fibre Cooperation improves the coverage of profitable fibre roll and its replicability, but not reaching 100% (here: P2P MPoP)



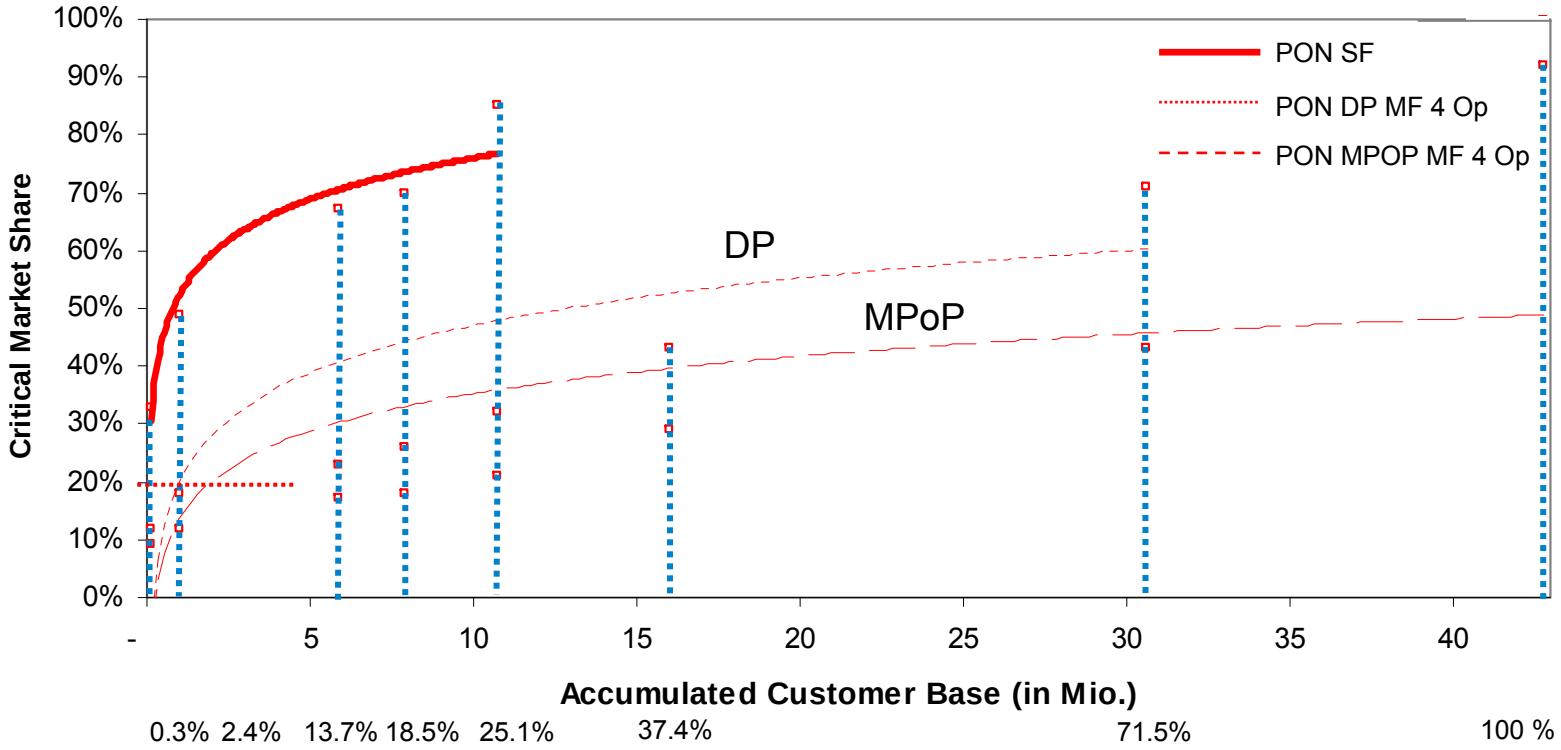
Source: WIK-Consult, The Economics of NGA - Addendum, Brussels 2009, (German Case)

Each of the 2/ 4 operators have to achieve the critical market share for profitability!

wik CONSULT

4 cooperation partners make handover at MPoP more profitable than at DP for both PON and P2P …

(here: PON 4 Op_DP vs. MPOP)



… because the commonly used feeder infrastructure (DP – MPoP) is cheaper per operator than 4 individual separate ducts (… at least, if they do not already exist for free).

wik CONSULT

Source: WIK-Consult, The Economics of NGA - Addendum, Brussels 2009, (German Case)

Unequal market shares suffer from high entry barriers, the major cooperation partner will be subsidized

Single fibre + unbundling	**Incumbent**	**Market share**	100 %	80 %	60 %	50 %	40 %
		Cost per line	10	10	10	10	10
	Altnet	**Market share**	0 %	20 %	40 %	50 %	60 %
		Cost per line	0	10	10	10	10
Multi-fibre case	**Incumbent**	**Market share**	100 %	80 %	60 %	50 %	40 %
		Cost per line	6	7.50	10	12	15
	Altnet	**Market share**	0	20 %	40 %	50 %	60 %
		Cost per line	∞	30	15	12	10
	Assumptions: (1) Only shared investment considered (80 % - 85 % of total invest) (2) Two cooperation partners considered (3) Investment multi-fibre model = 120 % investment of single fibre model (4) Sharing rule: 50:50 (5) Numbers are for illustration purposes only						

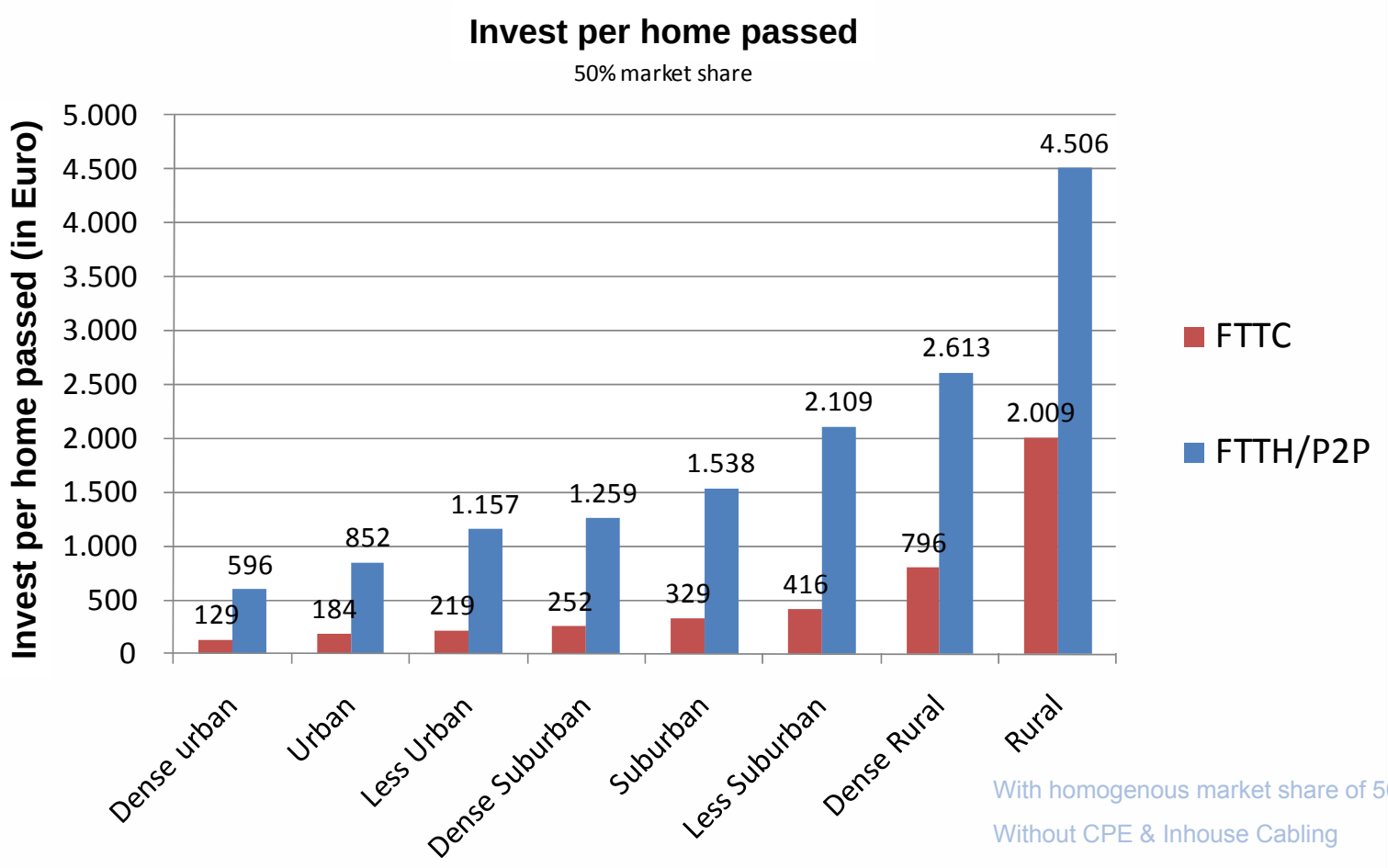
wik CONSULT

Source: WIK-Consult, The Economics of NGA - Addendum, Brussels 2009

Agenda

1. Introduction
2. Model approach
3. Critical market share
4. Country results
5. Impact of regulatory measures
6. Multi Fibre approach
7. **Nationwide investment**
8. Outlook: subsidies
9. Summary

The less dense populated, the higher the invest per home, FTTH/P2P invest larger than FTTC



With homogenous market share of 50%

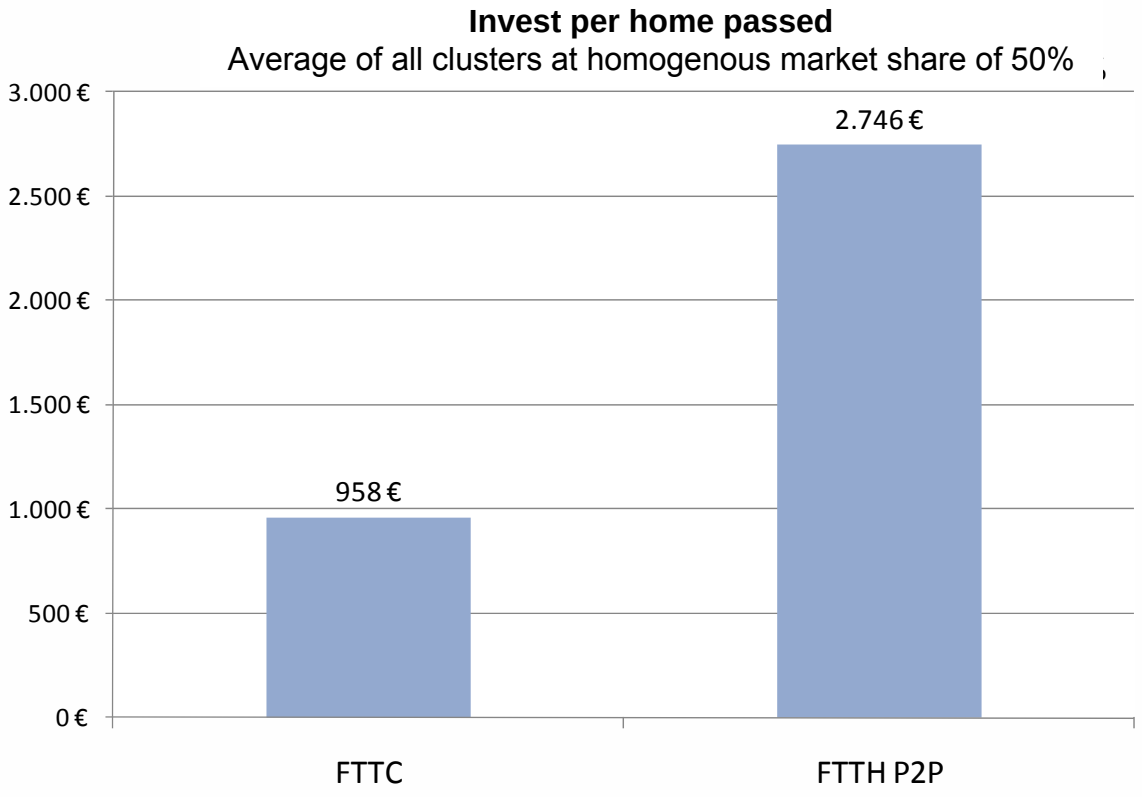
Without CPE & Inhouse Cabling

Source: WIK-Consult, Breitband – Bandbreite für Alle, Diskus 332, Bad Honnef, 2009

Total investment in Germany varies with architecture

FTTC: ca. 41 Mrd. Euro

FTTH/P2P: ca. 117 Mrd. Euro



without CPE & Inhouse Cabling

> 95% of invest is for **passive infrastructure**

(trenches, ducts, cables, distribution frames, manholes, sleeves, …)

wik CONSULT

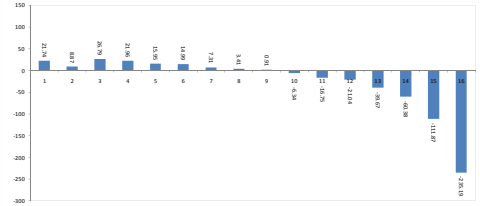
Agenda

1. Introduction
2. Model approach
3. Critical market share
4. Country results
5. Impact of regulatory measures
6. Multi Fibre approach
7. Nationwide investment
8. **Outlook: subsidies**
9. Summary

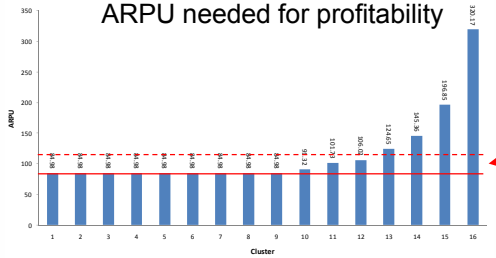
wik CONSULT

Outlook: Different approaches of subsidies may be applied in oder to increase the viability of a broadband roll out

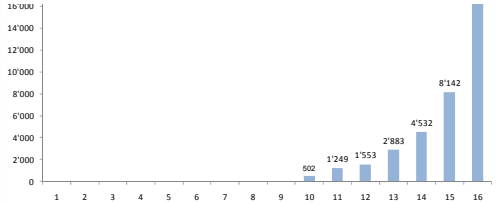
Profit and loss per customer and month



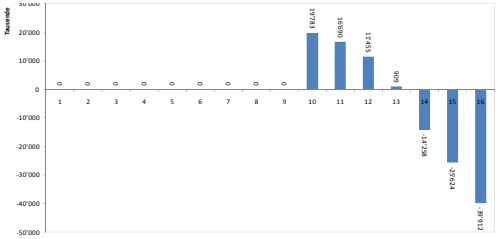
ARPU needed for profitability



Additional investment needed for viability



Cross subsidies: remaining profit and loss



- Price differentiation per cluster may enlarge coverage
- A universal service contribution as surcharge on fees may enlarge coverage
- Investment subsidies per customer access or per cluster may enlarge coverage
- Cross subsidies from profitable clusters into deficit clusters may enlarge coverage

Agenda

1. Introduction
2. Model approach
3. Critical market share
4. Country results
5. Impact of regulatory measures
6. Multi Fibre approach
7. Nationwide investment
8. Outlook: subsidies
9. **Summary**

Summary

- A nationwide broadband roll out is not viable for any of the current fixed network architectures
- Regulatory measures (duct and fibre access) improve the viability and replicability, but are not sufficient for nationwide coverage
- Only fibre LLU may improve replicability up to the coverage of the first mover
- Multi Fibre approaches increase total investment and reduce investment per operator, increasing coverage but tending to discriminate market entrants. Handover at MPoP/ MDF site better than at Street Cabinet/ Manhole/ Distribution Point
- Enduring bottlenecks persist
- Subsidies in a variety of approaches may help to enlarge the coverage up to nationwide access to broadband networks

wik CONSULT

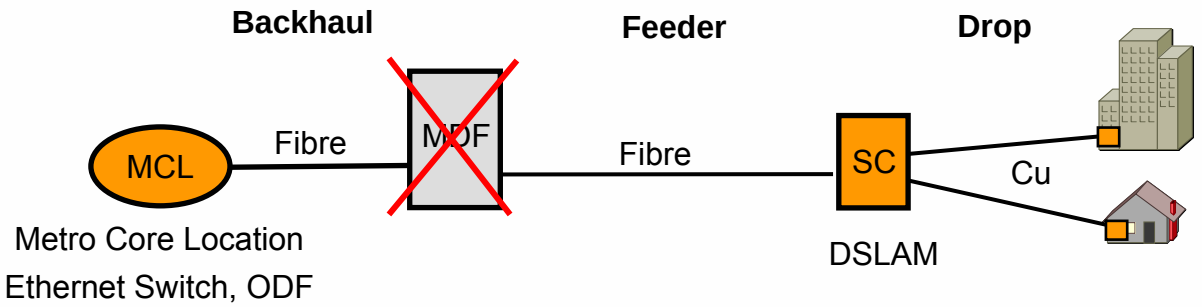
Dr. Thomas Plückebaum

WIK-Consult GmbH
Postfach 2000
53588 Bad Honnef
Deutschland
Tel +49 (0) 2224-9225-20
Fax +49 (0) 2224-9225-68
eMail t.plueckebaum@wik-consult.com
www. wik-consult.com

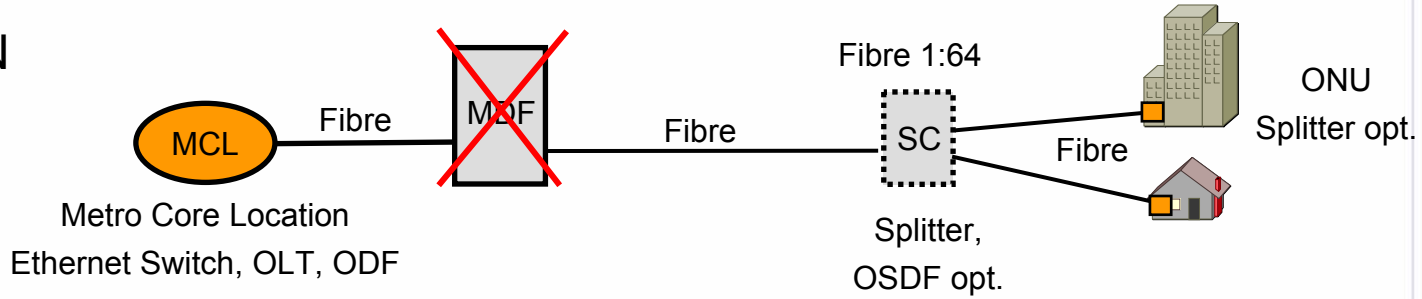
2. Modelling Approach (5)

We consider three access network technologies

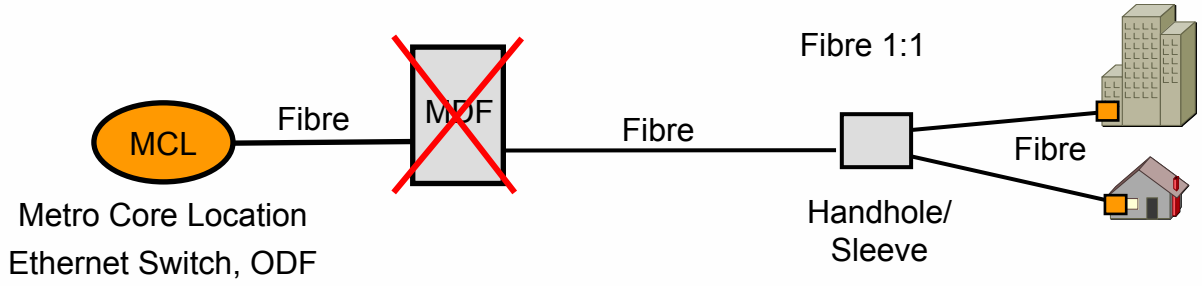
- VDSL



- FTTH PON



- FTTH P2P



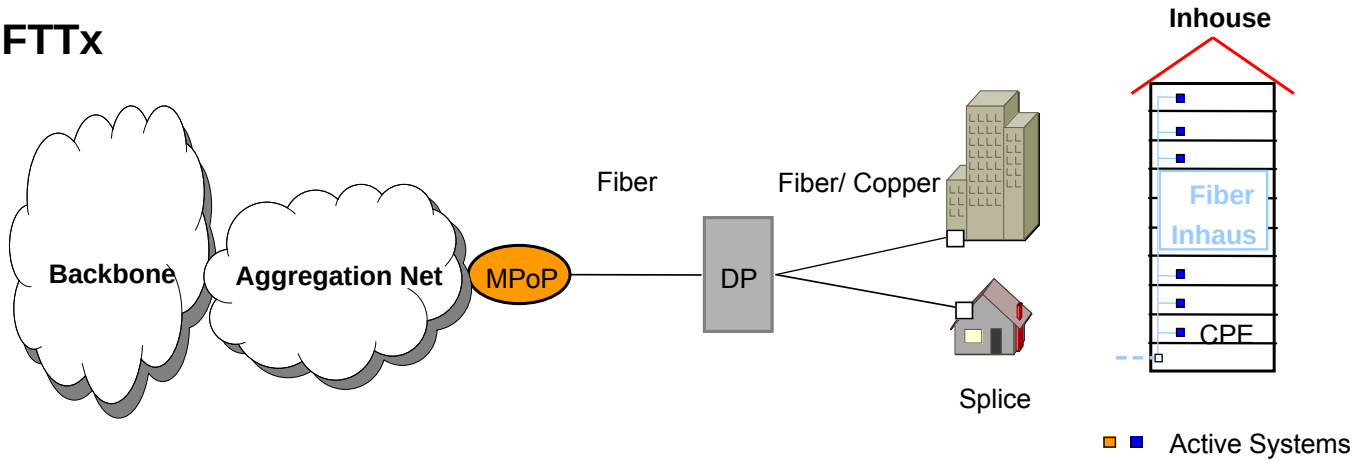
Traffic concentration now on a higher level than MDF

Active Electronic Equipment

2. Modellansatz (6)

- **Multi Fiber schließt eine Wohnung mit mehr als einer Faser an und teilt die Investitionen mit möglichen Kooperationspartnern**

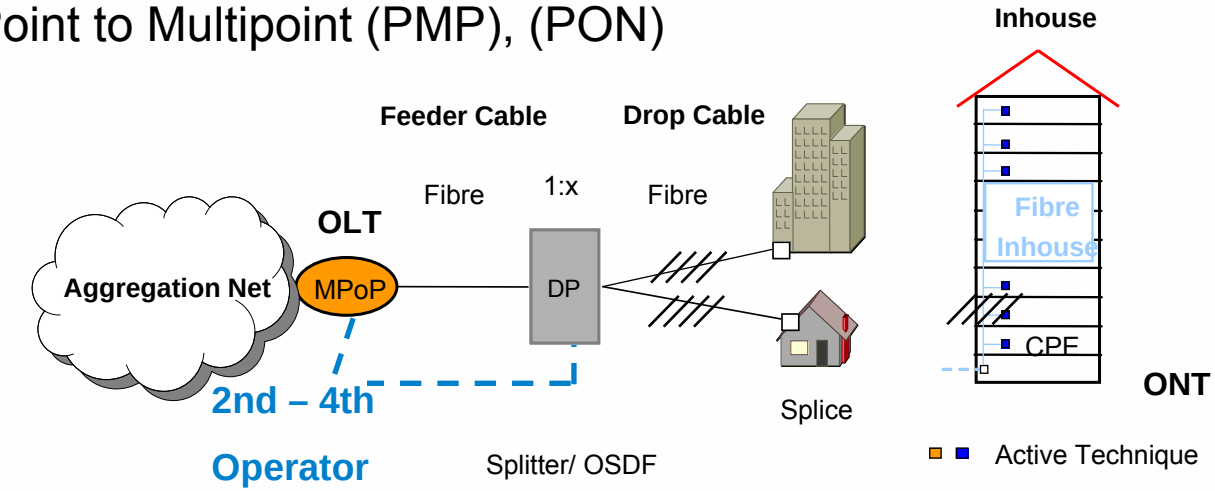
- **FTTx**



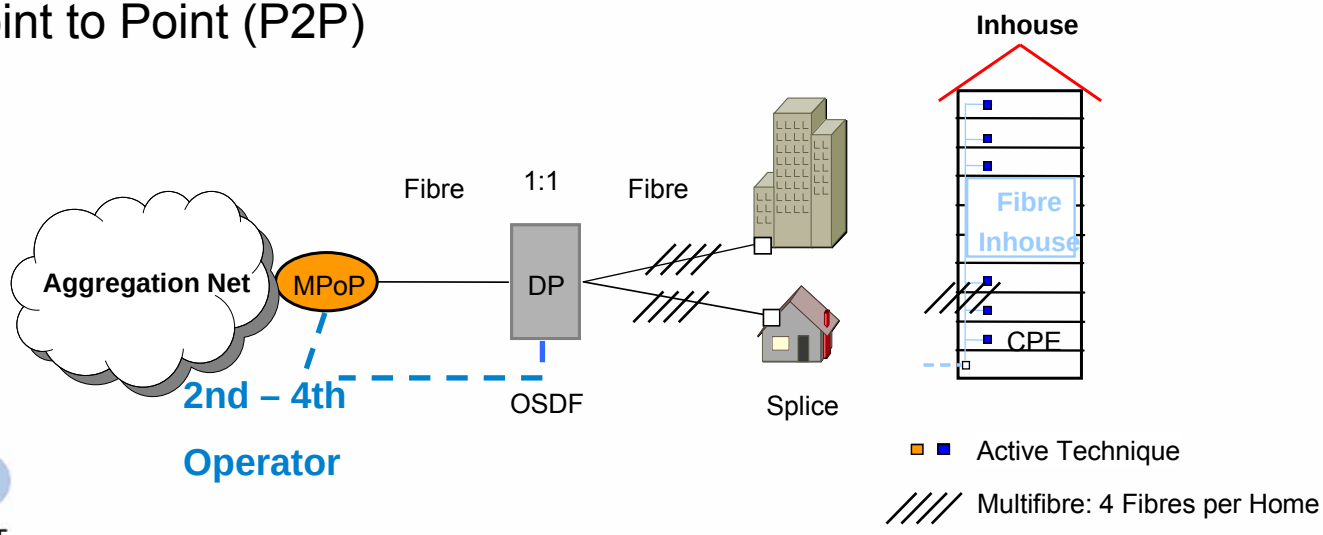
Co-investment arrangements

Modelling the multi-fibre case

- FTTH Point to Multipoint (PMP), (PON)

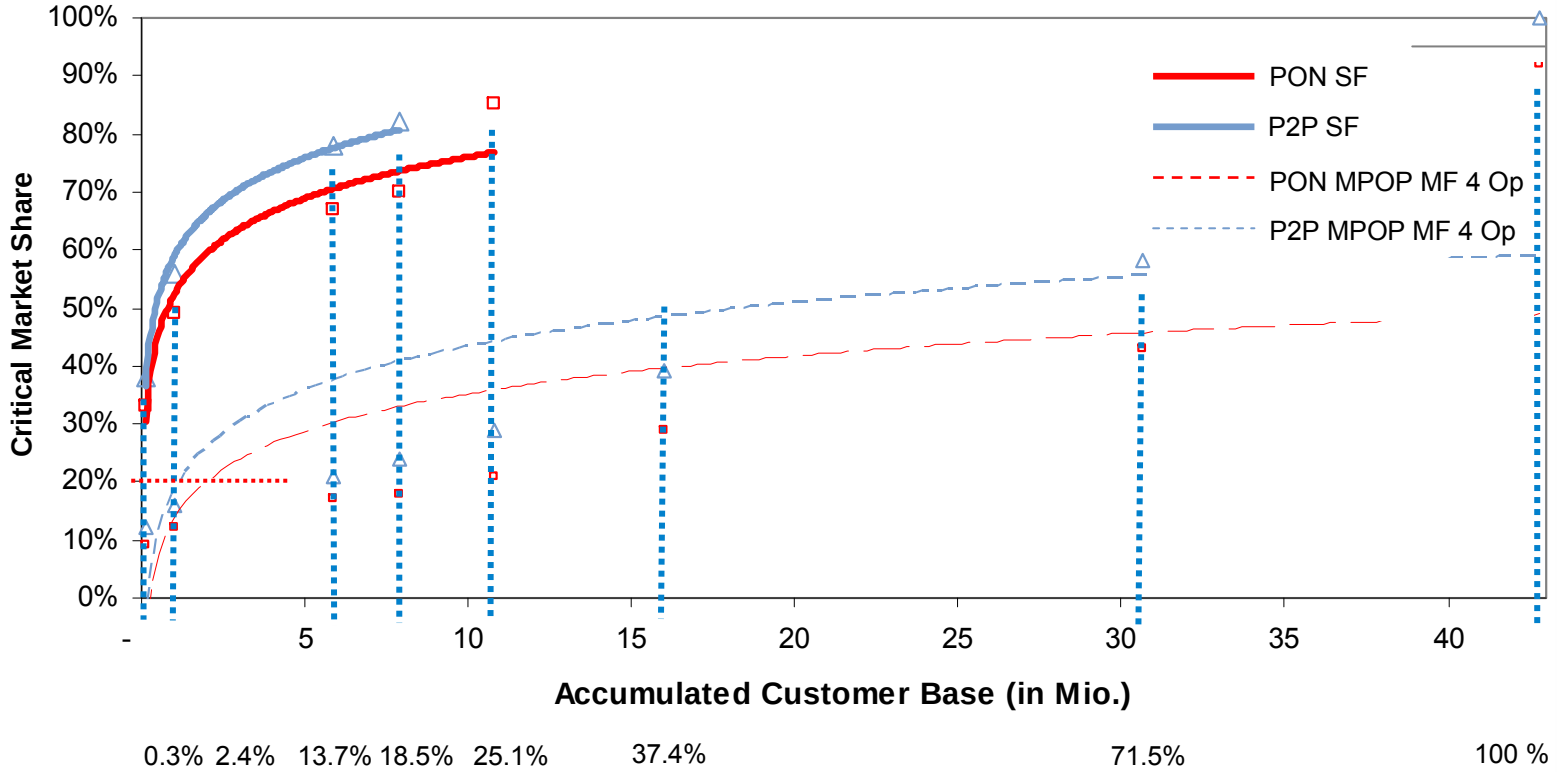


- FTTH Point to Point (P2P)



wik CONSULT

FTTH PON is more profitable than P2P in both handover scenarios (DP resp. MPoP), … (here: 4 Op_PON MPOP vs. P2P MPOP)



… but may be seen less furture proof (asymmetric, limited bandwidth, exchange of network components for upgrades, …).

Because of less fibres needed in the feeder segment (DP – MPoP) PON often suits better in brownfield implementations.

wik CONSULT

2. Modelling Approach (6)
Access opportunities

- Regulatory means which can be modelled
- **FTTC/vDSL scenario**
  - Sharing of street cabinets
  - Use of existing empty ducts or dark fibre for backhaul
- **FTTH PON scenario**
  - Fibre SLU (sub loop unbundling)
  - Sharing of OSDF (concentration point equivalent to street cabinet)
  - Duct access or dark fibre for backhaul or full loop
- **FTTH P2P scenario**
  - Fibre LLU at the Metro core location
  - Duct access or dark fibre
- **Means of construction**
  - Use and sharing of aerial cable
  - Common construction of trenches/ ducts

wik CONSULT

2. Modelling Approach (9)
Operator Models

- First Mover
- Incumbent (sells MDF sites)
- Second Mover (here 10% less ARPU)
  - 20 % Infrastructure Sharing (ducts, aerial cabling)

    80 % Infrastructure Sharing (ducts, aerial cabling)
  - 20 % Dark Fibre Access

    80 % Dark Fibre Access
  - 20 % Dark Fibre / Duct Access

    80 % Dark Fibre / Duct Access
  - VDSL: SLU

    PON: own fibres or fibre SLU

    P2P: own fibre or fibre LLU

3. Model results (5)

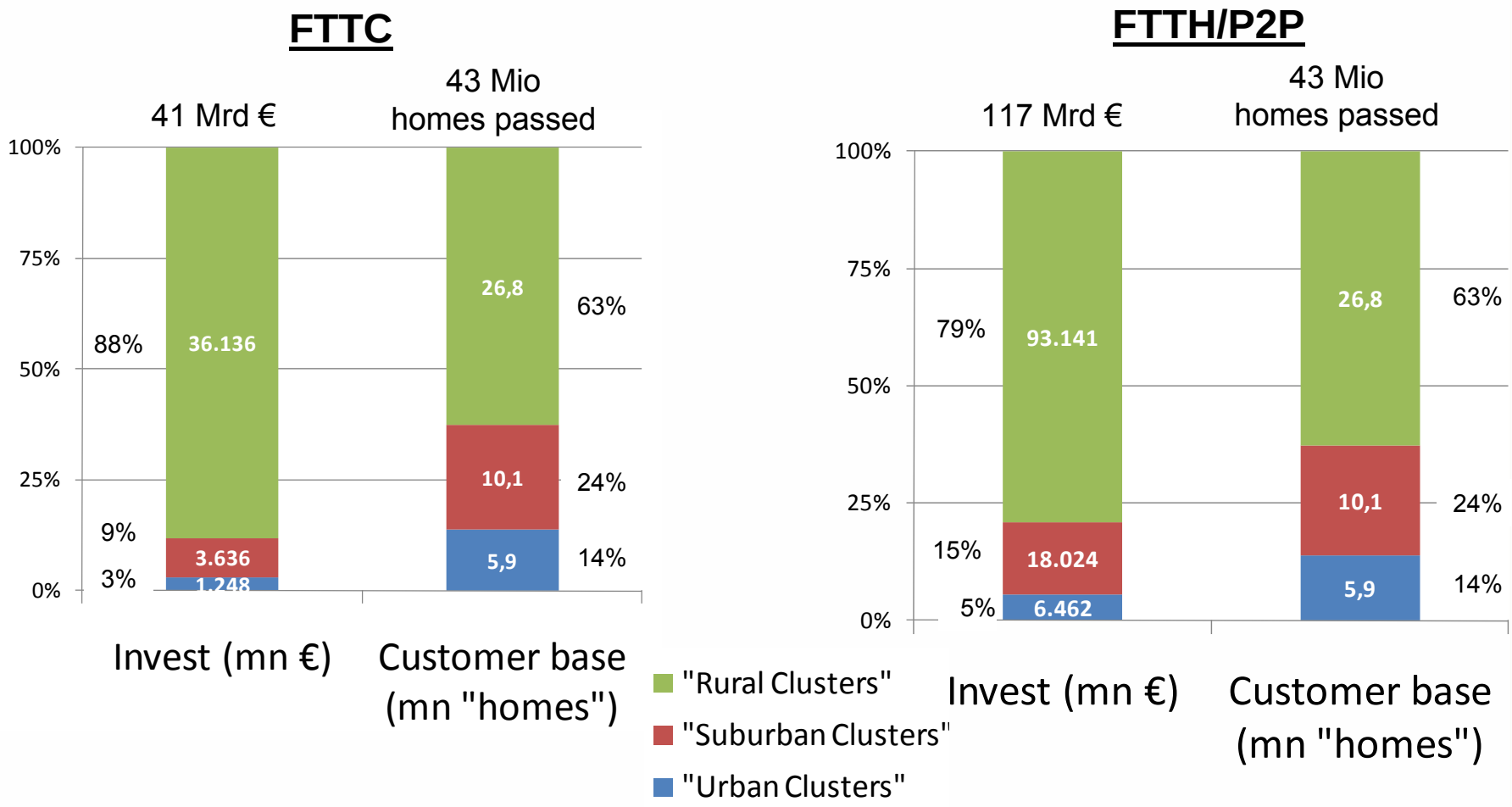
Table of viability and replicability

PON - DE									
Cases		First Mover Cases		Second Mover Cases					
Cluster	Accumulated Customer Base	Stand Alone	Incumbent	80% Infrastructure Sharing	20% Infrastructure Sharing	SLU + 80% Dark Fibre and Infrastructure Sharing	SLU + 80% Dark Fibre	SLU + 20% Dark Fibre and Infrastructure Sharing	SLU + 20% Dark Fibre
Dense Urban	0,3%	33%	30%	35%	38%	8%	8%	20%	20%
Urban	2,4%	48%	44%	50%	55%	11%	11%	30%	30%
Less Urban	13,7%	65%	60%	65%	73%	12%	12%	33%	33%
Dense Suburban	18,5%	69%	63%	69%	78%	17%	17%	38%	38%
Suburban	25,1%	83%	77%	83%	94%	22%	21%	50%	49%
Less Suburban	37,4%	n.v.	n.v.	n.v.	n.v.	36%	27%	66%	61%
Dense Rural	71,5%	n.v.	n.v.	n.v.	n.v.	61%	81%	n.v.	n.v.
Rural	100,0%	n.v.	n.v.	n.v.	n.v.	n.v.	n.v.	n.v.	n.v.

n.v. = not viable

wik CONSULT

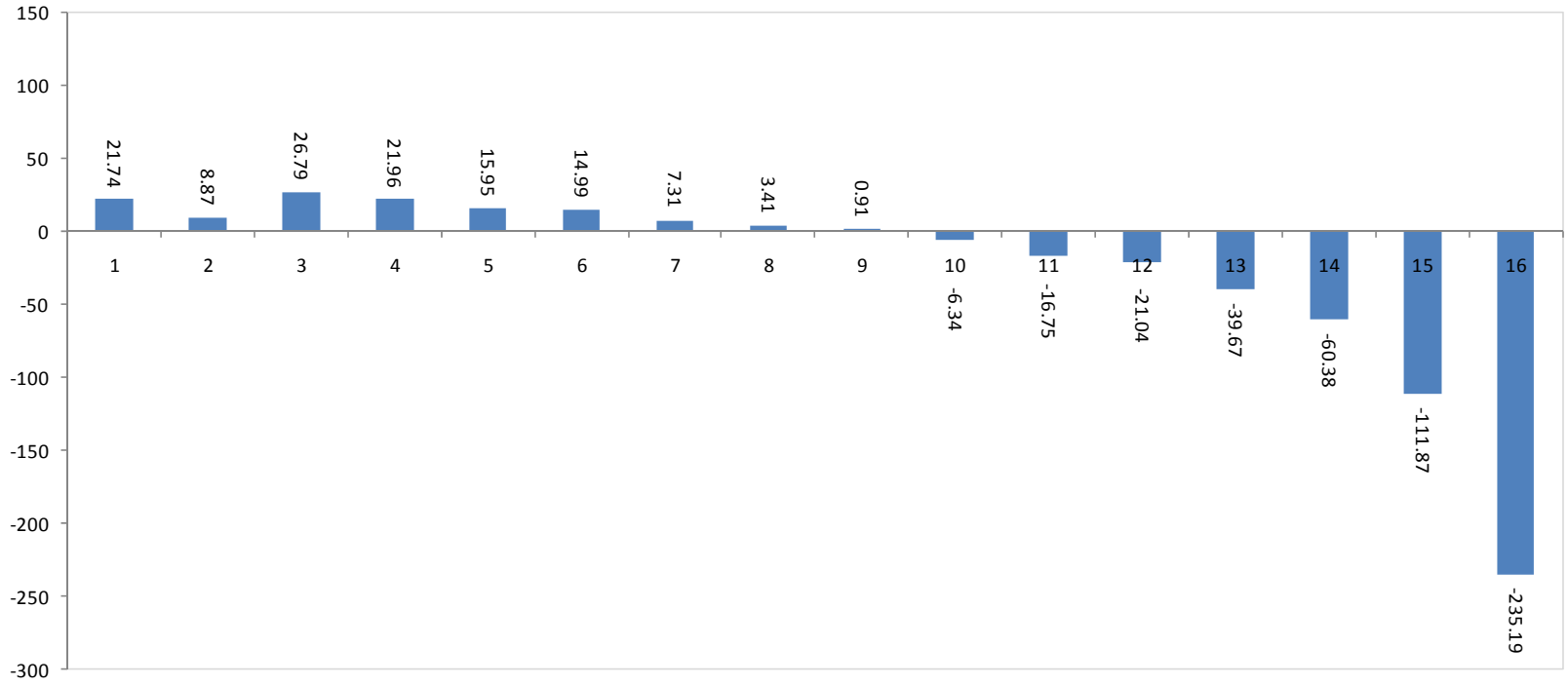
Rural clusters need the largest share of investment, with FTTC even more than with FTTH/P2P



Homogenous market share of 50%, without CPE & Inhouse Cabling

3.6 Grundversorgungsbetrachtung des Glasfaserausbaus

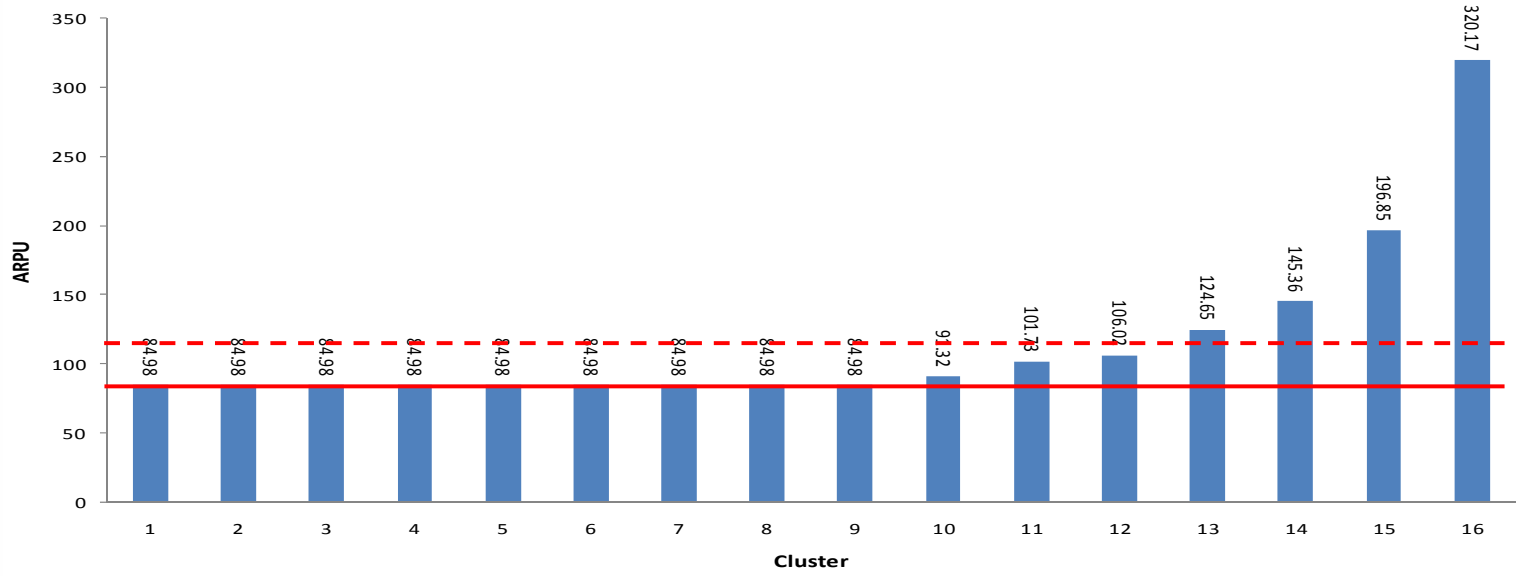
Gewinn und Verlust pro Kunde und Monat (in CHF)



- Durch Preisdifferenzierung ließe sich die Ausbaugrenze ausdehnen

3.6 Grundversorgungsbetrachtung des Glasfaserausbaus

Für Kostendeckung benötigter ARPU pro Kunde und Monat (in CHF)



Für profitablen Vollausbau erforderlicher ARPU (84.98+31.87 CHF) pro Kunde und Monat

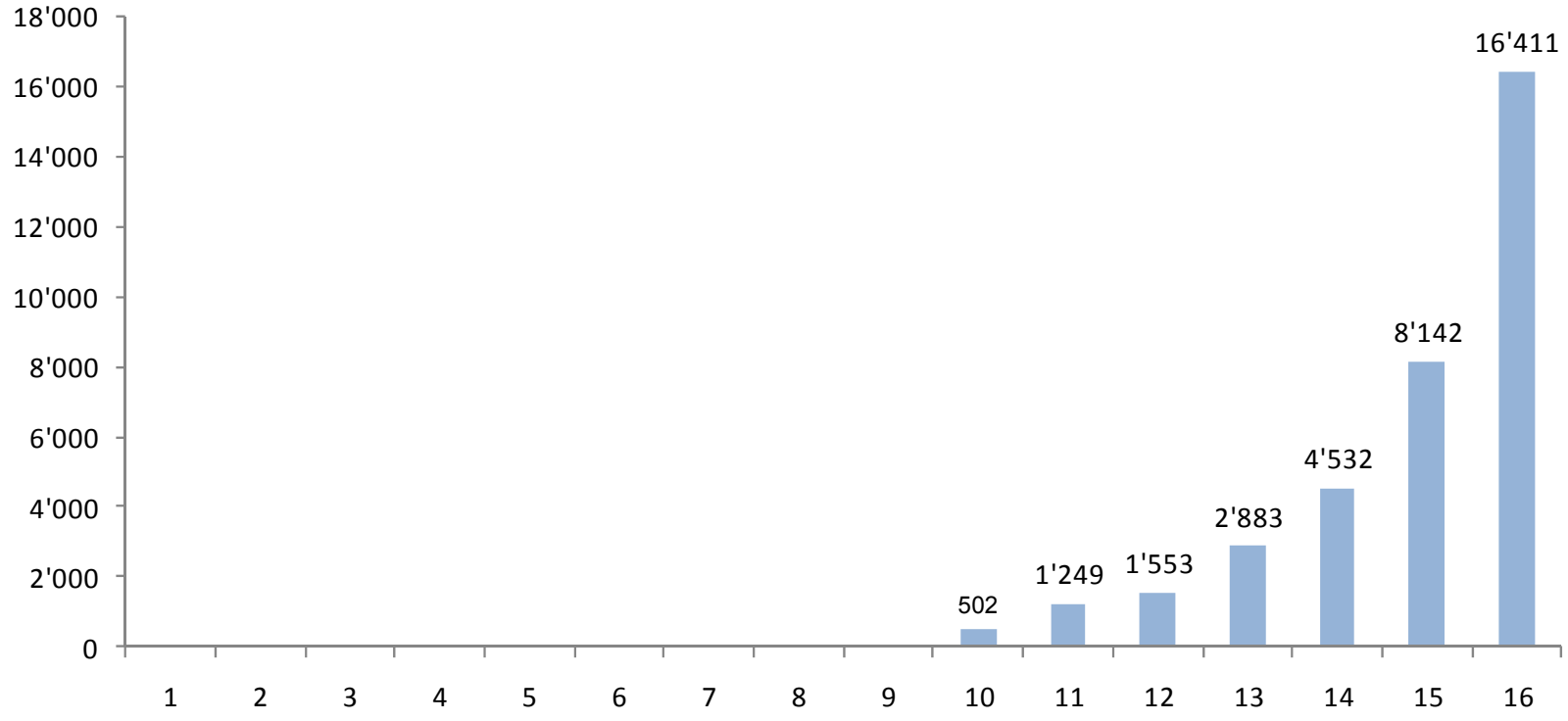
Modell relevanter ARPU (84.98 CHF) pro Kunde und Monat

- Durch "Grundversorgungsabgabe" ließe sich die Ausbaugrenze erweitern

wik CONSULT

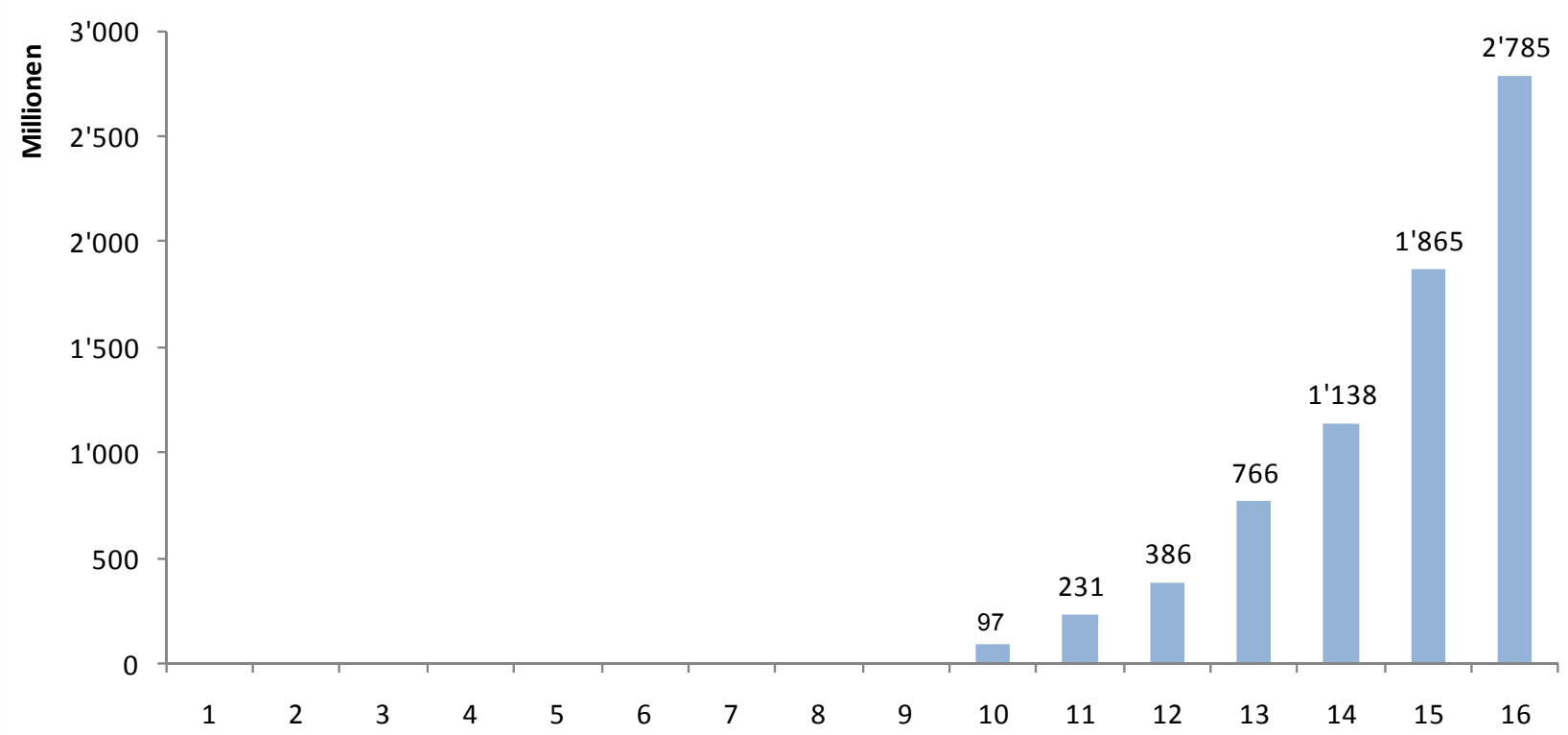
3.6 Grundversorgungsbetrachtung des Glasfaserausbaus

Erforderlicher Investitionszuschuss pro Kunde im Subventionsfall (in CHF)



wik CONSULT

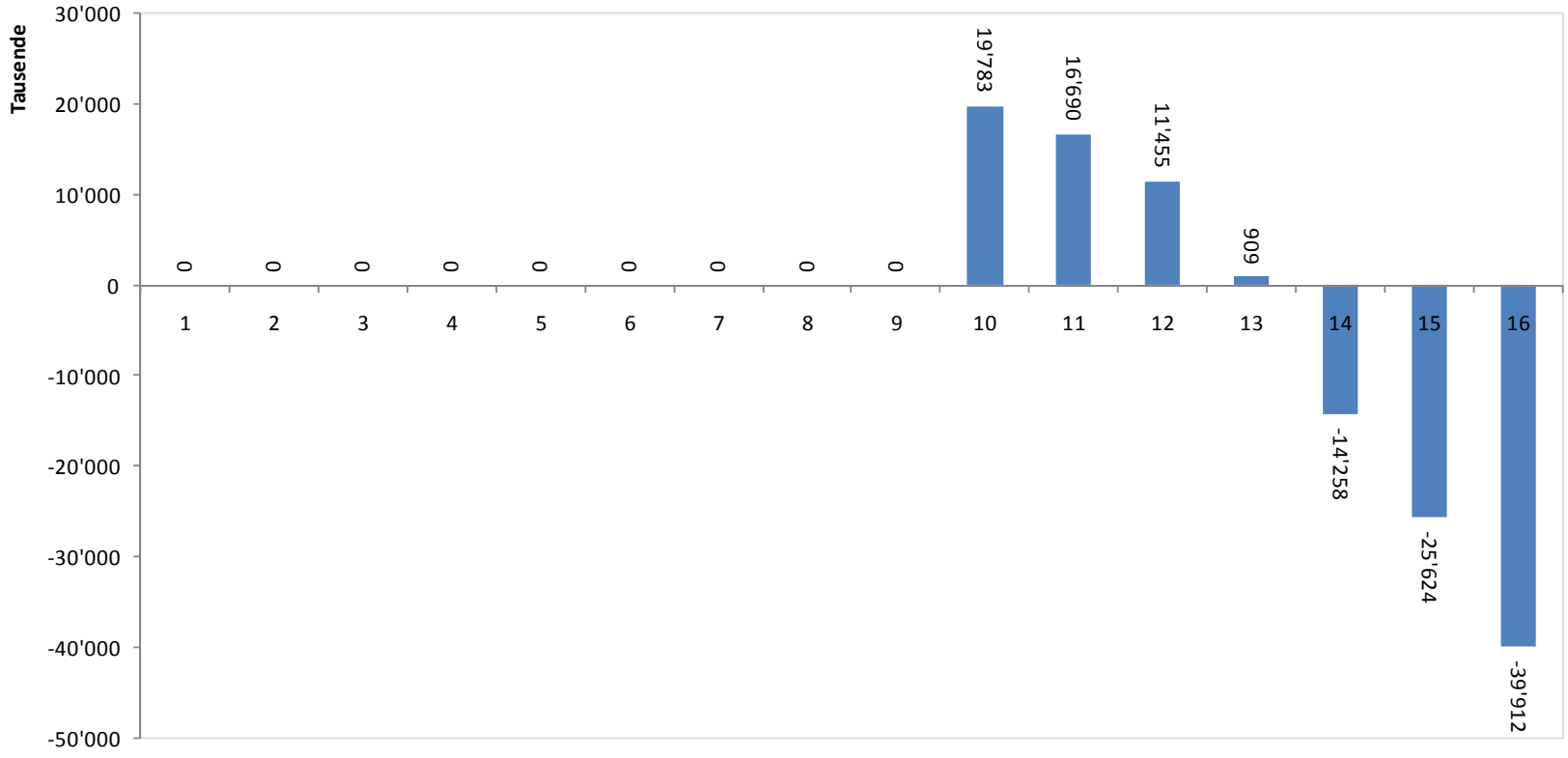
Erforderlicher Investitionszuschuss im Subventionsfall (in Mio. CHF)



Quelle: WIK-Consult

3.6 Grundversorgungsbetrachtung des Glasfaserausbaus

Verbleibender Gewinn und Verlust pro subventioniertem Cluster bei Quersubventionierung (in CHF)



- Durch interne Subventionierung unprofitabler Gebiete durch profitable Gebiete lässt sich die Ausbaugrenze (deutlich) erweitern