
Day 2 – Session 8

Key documents, regulatory accounting overview

European Commission

Key documents - references



- Commission Recommendation C(2002)561 amending Recommendation 98/511/EC of 29 July 1998, as last amended by Recommendation 2000/263/EC, on Interconnection in a liberalised telecommunications market (Part 1 - Interconnection Pricing)
http://ec.europa.eu/information_society/policy/ecomm/doc/info_centre/recomm_guidelines/interconnection_recommendation/c_2002_561_en.pdf
- Commission Recommendation on Interconnection in a liberalized telecommunication market. Part 2: Accounting separation and cost accounting
http://ec.europa.eu/information_society/policy/ecomm/doc/info_centre/recomm_guidelines/interconnection_recommendation/c98160en.doc
- Commission Recommendation of 19 September 2005 on accounting separation and cost accounting systems under the regulatory framework for electronic communications (2005/698/EC)
<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2005:266:0064:0069:EN:PDF>



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Cost models

Key documents – cost models

- Analysis, Mobile BULRIC (Bottom-up Long Run Incremental Cost) model for OPTA (the regulator of the Netherlands), 14 June 2006
- The World Bank, A model for calculating interconnection costs in telecommunications, 2003
- European Economics, Cost Structures in Mobile Networks and their Relationship to Prices, Final Report for the European Commission, 2001
- ITU, Report on interconnection, study group 1 (2002-2006)
- COSITU, Software for the Calculation of Costs, Tariffs and Rates for Telephone Services Telecommunication Development Bureau (2004 Edition), SERVICE PACK 2
<http://www.itu.int/ITU-D/finance/COSITU/SP2/cositu-sp2-manual.pdf>
- Presentation about COSITU
<http://www.itu.int/ITU-D/finance/COSITU/presentation-cositu-en.pdf>



WACC – Weighted Average Cost of Capital

Key documents – WACC

- Copenhagen Economics, WACC (Weighted average cost of capital) for the fixed telecommunications networks in Sweden, Oct. 26, 2007
- IRG (Independent Regulators Group) – Regulatory Accounting, Principles of Implementation and Best Practice for WACC (Weighted average cost of capital) calculation, February 2007
http://www.irg.eu/streaming/erg_07_05_pib_s_on_wacc.pdf?contentId=543314&field=ATTACHED_FILE

Accounting methodologies.

Key documents and sources

- MCA (the regulator of Malta), Guidance on Accounting Methodologies for Regulatory Accounting Purposes, March 2003
- RTR (the regulator of Austria), Forward Looking Long Run Incremental Costs for the calculation of interconnection fees, Roland Belfin & Martin Lukanowicz, 15.01.1999
- Principles of implementation and best practice regarding accounting separation and cost accounting as decided by the Independent Regulators Group November 2002
- www.irg.eu

ITU Expert-Level Training for national regulatory authorities on cost model development

Day 3

Nov. 12, 2008

Day 3 - Agenda

Day 3 - overview

Goal:
>Accounting standards

Session 9: Accounting standards and concepts

Session 10: LRIC, LRAIC, SAC, ABC, FDC differences economics and rationale

Session 11: Cost of capital WACC

Session 12: Practical experiences

Day 3 – Session 9

Accounting standards & concepts

We can distinguish three different costing perspectives.

Costing perspectives

Accounting Costs

- This perspective focuses on the recording of the actual incurred costs by the operator. The focus is on the historically recorded costs (i.e. it is backward-looking). Data sources include corporate financial accounting and more detailed management accounting measures. In the past, regulators relied almost exclusively on accounting data as their source of information for cost studies.

Engineering Costs

- This perspective is primarily concerned with forward-looking management decisions. Engineering cost analyses assess different ways of meeting a specified objective, such as provisioning a certain amount of capacity. The goal of engineering cost analysis is generally to determine the optimal method of building telecommunications facilities.

Economic Costs

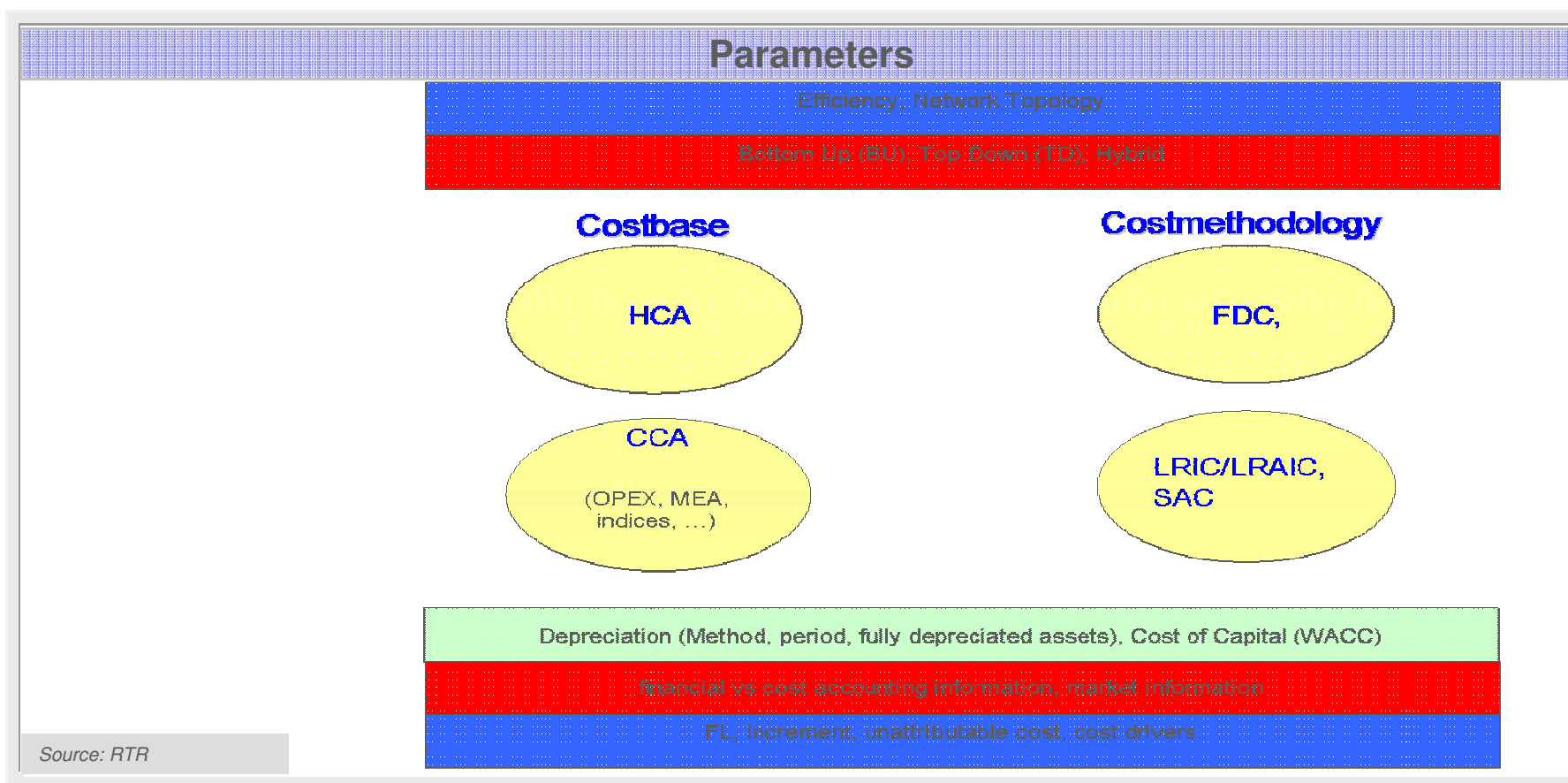
- The objective of this costing perspective is to determine the structure of efficient prices, that is, prices that maximize consumer and producer surplus. Economic costing uses a forward-looking approach that emphasizes concepts of cost variability, incremental costs and opportunity costs.

Source: World Bank



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Accounting standards define the most important rules.



HCA – historical cost accounting; CCA – current cost accounting;
 FDC – fully distributed cost; LR(A)IC – long run (average) incremental cost;
 SAC – stand alone cost, FL – forward looking



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Accounting standards need to be developed.

Accounting standards

- Issue
 - Reliable rules concerning regulatory accounting
 - Tailored to the local needs
 - Oriented on purpose
 - Basis for checks
- Legal basis
 - Who is responsible to define accounting standards?
 - How to enforce accounting standards?
- Process
 - Consultation?

Source: RTR



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Accounting standards should cover the basics.

Accounting standards

- Issues
 - Purpose
 - Data collection
 - Checks
 - Reporting
 - Publication & confidentiality
 - Audit
 - Accounting standards
 - Methods
 - Most important parameters
 - Models
- Process
 - Who defines them?
 - Who is involved?

Source: RTR



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Accounting standards should determine the granularity.

Accounting standards

- Issues
 - Services
 - Regulated
 - Non-regulated
 - Network elements
 - Overheads & joint costs
 - Relation to financial accounting
 - Periods
 - Traffic volumes
 - Tariffs
 - Interfaces between systems
 - Full data vs. samples

Source: RTR



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Day 3 – Session 10
LRIC, LRAIC, SAC, ABC

To simulate the results of Competitive Market Environments should be the target of tariff regulation

Tariff setting - principles

- Effective competition fulfils the functions normally assigned to regulation:
 - It permits adequate returns to the firm that operates efficiently
 - it provides products according to demand
 - It precludes excessive profits and prices;
 - it weeds out inefficiency and
 - it rules out cross subsidies
- For any competitive service that is not about to be discontinued, earnings must in the long run reimburse:
 - variable cost and fixed as well as common cost and
 - the cost of the incremental capital
- Moreover, the absence of cross subsidies means that no product will ever bear the fixed cost of another, and common cost for several products will be allocated in relation to the relative demand for those products. ([WB87] p.17)
- Using the competitive market as a standard reference model for regulation, the concerns over cost causations maybe satisfied.

Source: RTR



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Definitions are important in order to have the same understanding.

Some cost definitions

- **variable cost**
Component of the total cost whose **magnitude changes** to some degree **when output changes**
- **fixed cost**
Cost which must be **incurred** if any **non-zero quantity** is supplied
Even in the long run fixed costs do not become (volume) variable
- **sunk cost**
Outlay that is **committed** for some considerable period of time
Within this period (maybe of indeterminate duration) the firm **cannot withdraw** its commitment
Fixed cost may or may not be sunk
Economists define the long run implicitly in terms of sunk cost, not as some fixed time interval, but as the shortest period of time necessary for all the current sunk cost become variable
Long run also means that equipment and labour of a plant were used in **optimal configuration** so that **cost** - for whatever volumes of service supplied - **are minimized**
- **marginal cost (MC):** Cost caused by the provisioning of **one additional unit** of service

Source: RTR



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Definitions are important in order to have the same understanding.

Some cost definitions (continued)

- **stand alone cost (SAC)**

is defined as the **cost** that would be **incurred** by an **efficient entrant** if it were to provide that **service alone** (in the case of a combination with some other services the concept becomes the SAC of the combination of services)

The competitive market standard for regulation requires that no price or prices be **permitted** to yield revenues that **exceed** the corresponding **stand alone cost**

Since SAC is the **ceiling** that complete competitive **freedom of entry** imposes upon rates, then the protection of customers against overpricing is guaranteed.

Source: RTR



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The general welfare and fees based on marginal cost.

Some cost definitions (continued)

- The competitive market model implies that floors under rates should be based on incremental cost while ceilings should be based on stand alone cost
- But the model implies more than this:
 - At what **value** the rate ranges in between that floor and that ceiling **will depend upon demand**, upon the **magnitude of the marginal cost** and the required recovery of joint and common cost
 - Moreover, the actual rate must **never** be chosen by a **mechanistic procedure** Rather, the firms **decision makers must be allowed** to take **demand differences** into account in selecting the amount by which the marginal costs of a particular service is to be **marked up**

Source: RTR



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Causation Concerns and The Incremental Cost Test.

Some cost definitions (continued)

- A **incremental cost test** can tell us whether a rate for a service covers (among variable) all the fixed costs for which it (alone) is responsible. If these costs are **not covered**, the service(s) must be receiving a **cross subsidy** and that burden is foisted upon the customer of other services
- Where a fixed cost is caused in common by two or more services, the adequacy of the contribution by that group is tested by comparing their combined revenues with the incremental cost incurred by the group together (combinatorial analysis)

Source: RTR



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Long Run Cost vs. Short Run Cost.

Some cost definitions (continued)

- **short run marginal cost (SRMC)**

is defined as the actual additional **cost** that will be **incurred** by a **firm** as the result of a **unit increase in volume** of activity, **given the imperfections** in choice of the facilities of the enterprise (plant, equipment, technology, etc.) and any other commitments (e.g. agreements with labour units) that are **already in place** and that temporarily circumscribe management's freedom of decision

- **long run marginal cost (LRMC)**

in contrast, is the **cost** of an **additional unit** produced under **ideal conditions** relating to plant size and equipment capacity, efficient technology (MEA – modern equivalent asset) and to contracts, etc.

LRMC is the cost that an additional unit of output incur if management's decisions were not constrained by (imperfect) past decisions (current levels of business and state of technology)

Source: RTR



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Common Misunderstandings.

Some cost definitions (continued)

- the long run is not a calendar length of time nor a specific date
Because many discussions fail to recognise this usage several misapprehensions become common:
The first and most important of these is the notation that since investments are sunk in the short run, they are not part of the short run variable cost, but they are included in the long run cost.
⇒ SRMC (short run marginal cost) < LRAC (long run average cost) **is wrong**, because of optimal capacities and capital stock of the LR-concept
- short run cost figures ignore future consequences of current decisions
⇒ **is wrong** e.g. current cut in some prize which stimulates demand that determines increase in capacity. If later demand is decreasing, the discounted present value of that unused capacity is a legitimate component of the SRMC (short run marginal cost).
- In the long run all fixed costs disappear
and that consequently, all cost become variable ⇒ **is wrong**
The Problem arises out of the confusion between fixed and sunk cost.
It is true that **in the long run sunk cost will be zero** (this is the definition of long run) and the firm can close down totally any and all of its activities without incurring any loss of its sunk outlays
But that does **not** make all those **cost volume variable**, and in general, the **fixed costs** of the firm **will remain invariable in the long run** even if they are sunk cost in the short run

Source: RTR



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Common Misunderstandings.

Some cost definitions (continued)

- at least in the long run, variable cost must change proportionally with volume

⇒ **is wrong**

Adam Smith's famous example of economies of scale in a pin factory had nothing to do with the spreading of fixed cost

Rather, the idea was that volumes permits labour to be used more efficiently (division of labour/specialisation) so that a 100% increase in output requires much smaller percentage increase in the (variable) cost of labour

The correlation whether a 20% rise in volume will raise the variable cost by 15, 20 or 25 percent, even in the long run, is an empirical issue which can only be settled with the aid of data

Source: RTR



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Cost causation.

Cost causation

- In the context of cost causations we have to distinguish between different levels
 - Is a specific plant, equipment or labour (resource) **necessary to supply** a service?
 - Are the cost of such a resource **joint/common or direct attributable**?
 - Are the cost of such a resource **fixed or volume variable**?
 - **Who should bear** the costs?
 - How should these costs be covered (by one-off charge, by month, minutes, Kbit, ...)

Source: RTR



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Cost causation.

Cost causation – illustrative examples

- In the case of a **termination service** we need to provide such a service:
 - the core network and the access network is necessary in **fixed and mobile networks** (the service of the access includes the possibility to establish outgoing calls and the delivery of incoming calls)
 - most of the costs are joint costs of the usage of the network, some costs are directly attributable (e.g. billing costs at wholesale level; **fixed and mobile**) and therefore directly allocated to termination rate, some to a group of service (e.g. HLR in mobile; on net and terminating calls) and allocated as incremental cost.
 - The retail costs (including handset subsidies) in **fixed and mobile networks** are not attributable to termination, because these cost are not necessary at wholesale level (e.g. a service provider that offers retail services has to bear the retail cost, the host-net is not involved)
 - the cost of the core network in **fixed and mobile networks** are partly fixed (e.g. backhaul transmission, because of coverage requested by demand) other parts are volume (minutes) dependent (variable).
 - The cost of the access in **fixed and mobile networks** are not minutes variable, they are fixed but in some degree variable against coverage (depending on density and the number of subscribers)

Source: RTR



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Cost causation.

Cost causation – illustrative examples (continued)

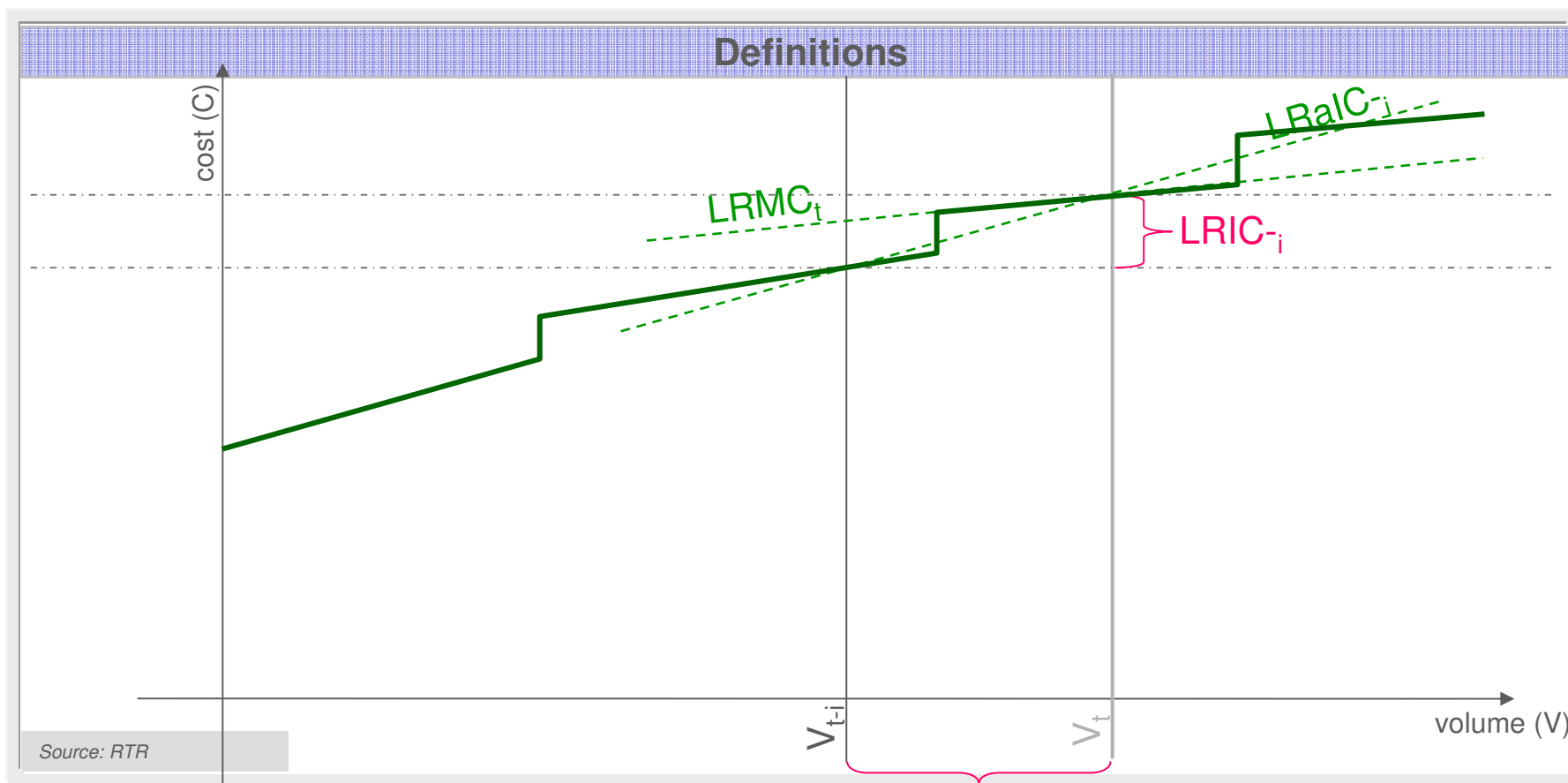
- In the case of a **termination service** we need to provide such a service:
 - by **convention** the cost of the fixed access network are paid by the subscriber with a (ad 5) fixed monthly rental. The cost of the (fixed) core network is (5) paid on retail level per usage, in some cases as package for some minutes is paid with an fixed extra fee or included in the monthly rental. On wholesale level only the cost of the core network is compensated by the termination rate.
 - In mobile networks there exists many different tariff schemas on retail level (ad 5) prepaid: only usage, postpaid: with and without monthly rental, with all-inclusive fixed fee etc. By **convention** on wholesale level the cost of the **total mobile network** is compensated by the termination rate.
- ***If the cost causation is so similar in fixed and mobile networks, why they are treated regulatory so different?***
- ***What is the difference in service for an (full duplex) interconnected Network, if a mobile subscriber calls a fixed subscriber or vice versa?***

Source: RTR

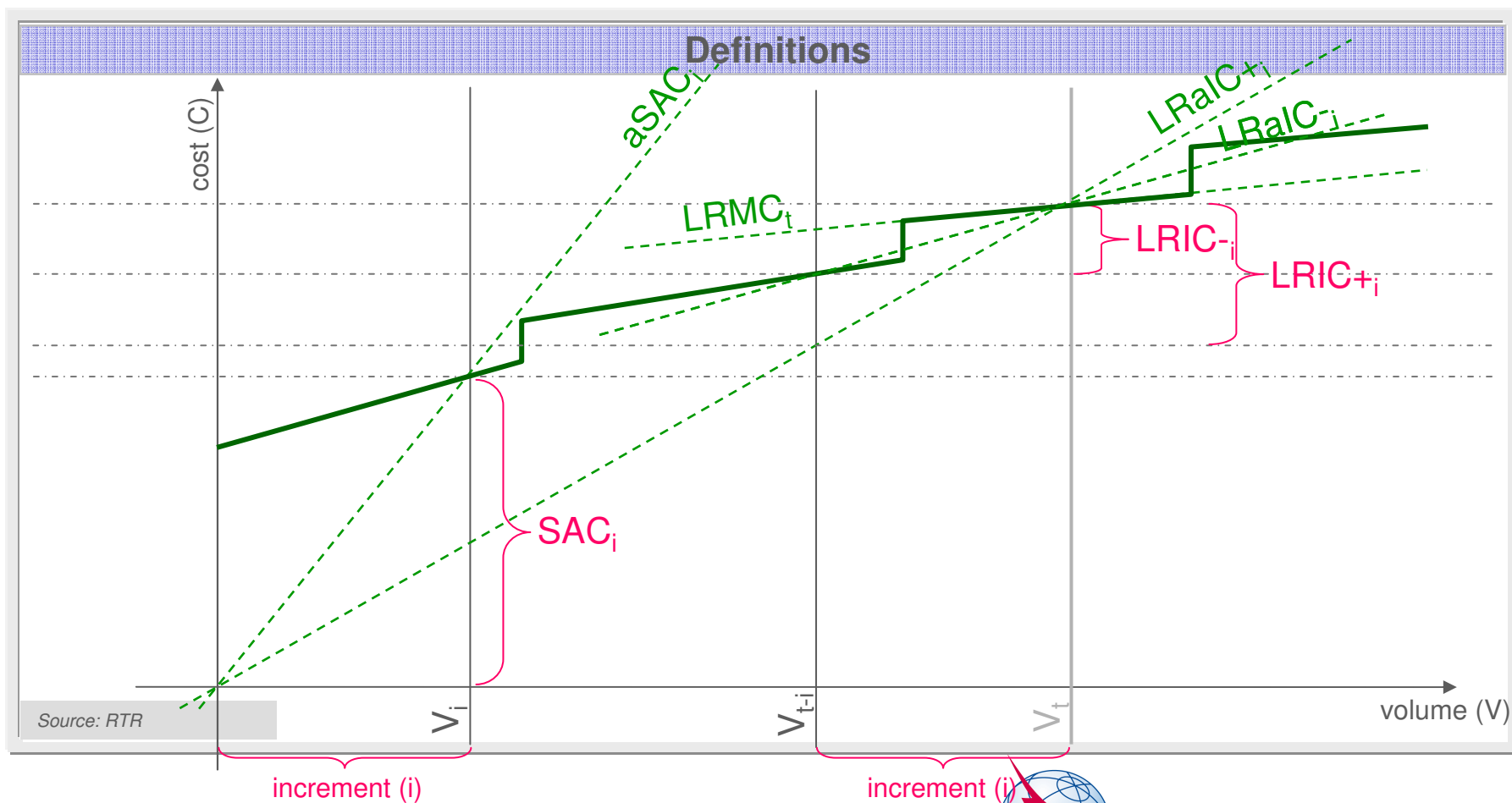


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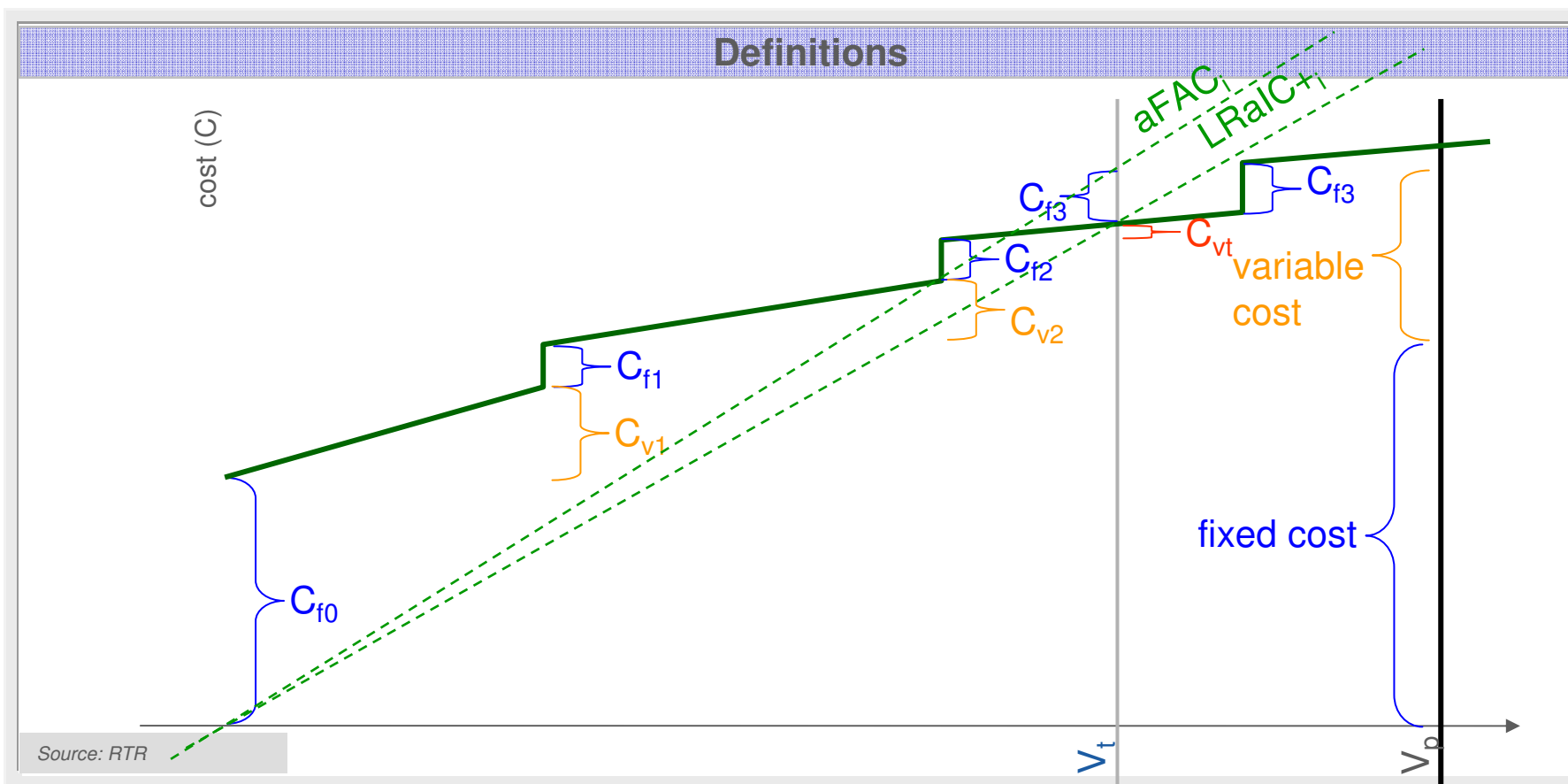
The concept of LRIC, LRaIC, SAC and LRMC.



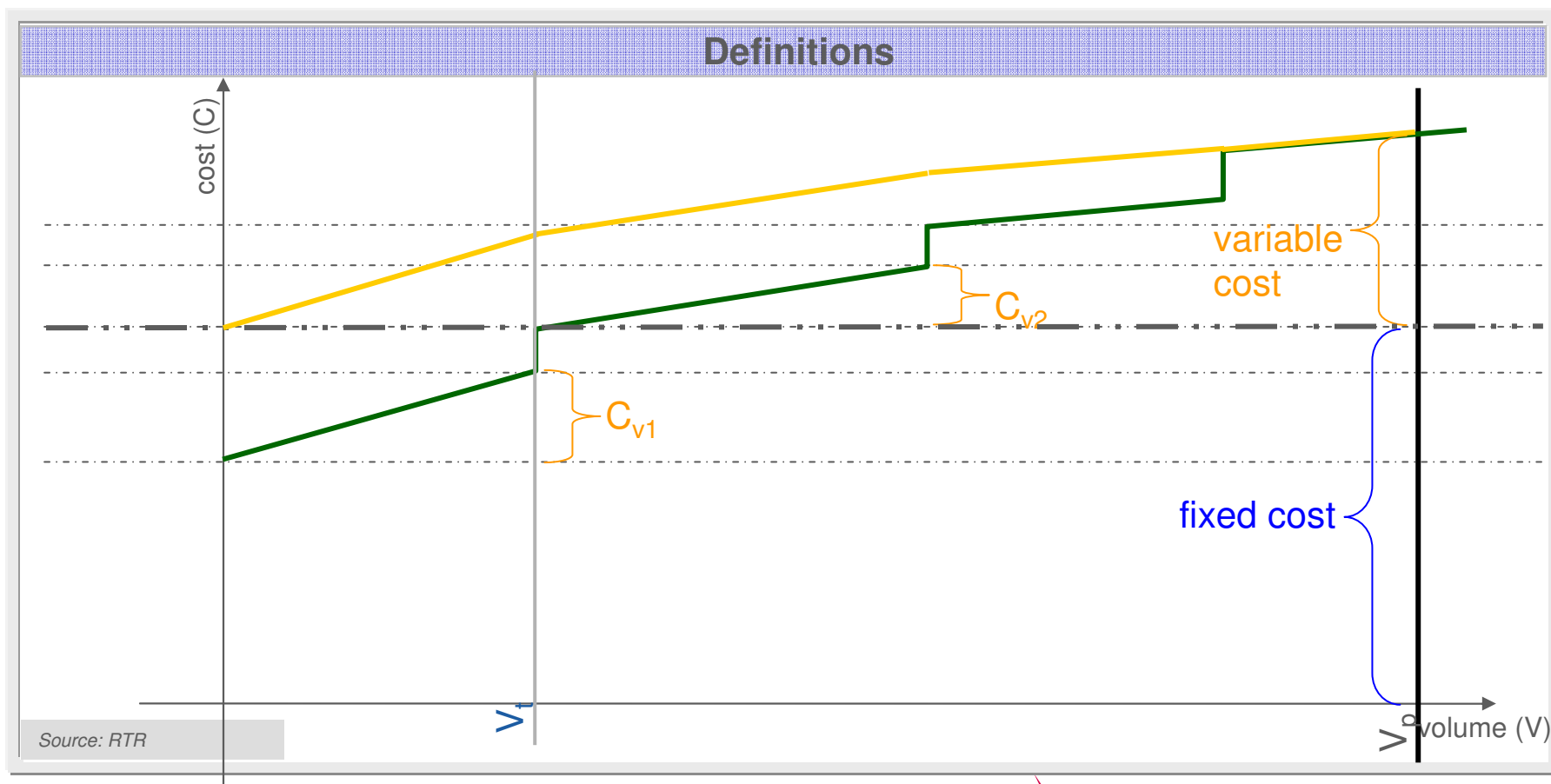
The concept of LRIC, LRaIC, SAC and LRMC.



LRAIC versus Fully Allocated (historical) Cost.



LRAIC versus Fully Allocated (historical) Cost-function.



HCA, CCA, FL-LRAIC principles.

		Definitions						
		principles						
		time horizon	stand alone criteria	fixed costs are variable	shared and common cost	valuation of assets	network equipment	network topology
Accounting Method	Historical Cost Accounting HCA	past	all costs are distributed	no	distributed on an arbitrary basis	historical bookvalues	existing	existing
	Current Cost Accounting CCA	today	all costs are distributed	no	distributed on an arbitrary basis	current replacement values	existing	existing
	FL-LRAIC	future, regulation period	-	-	markup for common cost	current (future) replacement values	latest available and proven technology	efficient topology
		-	-	yes		-	-	-
		-	operations necessary	-		-	-	-

Source: RTR

HCA, CCA, FL-LRAIC principles.

		Definitions								
Accounting Method		cost			accounting method			models		
		depreciation	staff (service and maintenance)	cost of capital	activity based costing (ABC)	element based	product based	top down	bottom up	
		Historical Cost Accounting HCA	given from bookkeeping	existing staff and cost of change	determined by operator	possible	possible	possible	yes	no
		Current Cost Accounting CCA	determined by operator	existing staff and cost of change	determined by operator	possible	possible	possible	yes	no
FL- LR AIC	economic based	efficient service provision	reasonable rate of return (e.g. WACC)	-	possible	possible	yes	yes		
	-	-	-	-						
	asset necessary	staff necessary	capital necessary	must						

Source: RTR

Day 3 – Session 11
Cost of capital WACC

WACC

WACC (Weighted average cost of capital) formula

The WACC is calculated according to the following formula:

$$\text{WACC pre-tax real} = \left[\frac{D}{D+E} \times R_d \right] + \left[\frac{E}{D+E} \times R_e \times \frac{1}{1-t} \right] - i$$

D : market value of the debt

E : market value of equity

R_d : marginal cost of debt

R_e : marginal cost of equity

t : marginal tax rate

i : inflation rate

Source: RTR

CAPM

CAPM (Capital Asset Pricing Method) formula

When applying the Capital Asset Pricing Method (CAPM), the marginal cost of equity is defined as:

$$R_e = R_{rf} + \beta (R_m - R_{rf})$$

R_{rf} : risk-free rate

R_m : expected rate of return on the market (or sector)

$(R_m - R_{rf})$: market (or sector) risk premium

β : market (or sector) beta

Source: RTR



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WACC calculation in telecommunications in Europe.

Case

WACC calculation in telecommunications in Europe 2002



	Return on capital (Pre-tax)	Approach	Determined by	Sector versus market data
B	Originating: 13,67% Terminating: 12,77%	CAPM WACC	NRA	Sector
DK	Not applicable ¹	Not applicable ¹	Not applicable ¹	Not applicable ¹
D	NRA : 8,75% SMP-operator: 12,5 %	Balance-sheet based WACC	NRA	Not applicable ²
EL	13,12%	CAPM WACC	SMP-operator and approved by the NRA	National sector
E	12,34%	CAPM WACC	NRA	Market
F	Interconnection: 12% Mobile: 17% ULL: 10,4%	CAPM WACC	NRA	Sector
IRL	12%	CAPM WACC	NRA	Sector
I	13,5%	CAPM WACC	NRA	Sector
L	No answer to survey			
NL	Terminating: 10,7% Originating: 12,3% Price cap: 10,8%	CAPM WACC	NRA	Sector
A	NRA: 9,34% SMP-operator: 12%	CAPM WACC	NRA	Sector
P	SMP-operator: 13,31%	CAPM WACC	NRA	National sector
FIN	Various	Various	SMP-operator	Various
S	Fixed: 15% Mobile: 15,02%	Fixed: Historic rate of return Mobile: WACC	Fixed: Validated by NRA Mobile: NRA	Not applicable ²
UK	13,5% ³	CAPM WACC	NRA	National sector ⁴

The values presented in the table are the most recent.
WACC: weighted average cost of capital CAPM: Capital Asset Pricing Method
ULL: Unbundling of local loop related services


Source: Andersen



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WACC calculation for ULL in Australia.

Case



	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09
D/V ratio	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
E/V ratio	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Risk-free (rf)	0.0623	0.0587	0.0590	0.0483	0.0582	0.0515	0.0582	0.0582	0.0635
Risk premium	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Asset beta	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Equity beta	0.8299	0.8301	0.8301	0.8305	0.8301	0.8304	0.8301	0.8301	0.8300
Tax rate (e)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Debt premium	0.0102	0.0102	0.0102	0.0102	0.0102	0.0102	0.0102	0.0102	0.0195
Issuance cost	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008
Gamma	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Return on equity	0.1121	0.1085	0.1088	0.0982	0.1080	0.1013	0.1080	0.1080	0.1133
Return on debt	0.0733	0.0697	0.0701	0.0594	0.0692	0.0625	0.0692	0.0692	0.0838
WACC (post-tax vanilla)	9.66%	9.30%	9.33%	8.26%	9.25%	8.58%	9.25%	9.25%	10.15%
WACC (pre-tax exclusive of imputation benefit)	10.85%	10.45%	10.48%	9.30%	10.39%	9.65%	10.39%	10.39%	11.35%

Source: ACCC


ULL – Unbundling of local loop



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WACC calculation for fixed network in Sweden.

Case

WACC for fixed network in Sweden 

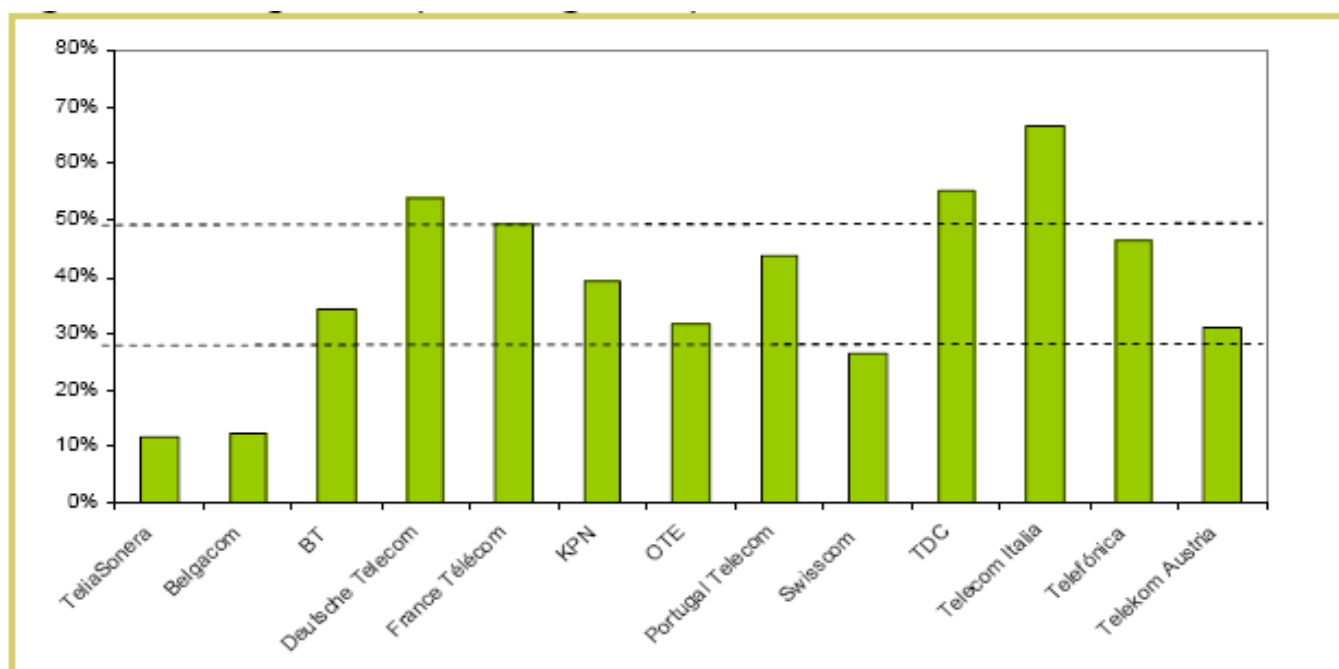
	Low gearing	High gearing
Risk free rate	4.19%	4.19%
Debt Risk Premium	0.80%	1.30%
Cost of debt	3.6%	4.0%
Risk free rate	4.19%	4.19%
Equity Risk Premium	4.75%	4.75%
Levered beta	0.80	1.05
Cost of Equity	7.98%	9.18%
Gearing	30%	50%
Tax rate	28%	28%
Post-tax WACC	6.7%	6.5%
Pre-tax WACC	9.3%	9.1%
Mid-point	9.2%	

Source: Copenhagen Economics

Gearing for European integrated operators.

Case

Gearing for European integrated operators



Note: The gearing is measured from the total equity in august 2007 and interest bearing debt from annual reports in 2006. Both the median and the average are 39%. The dotted lines illustrate our chosen gearing range.

Source: Copenhagen Economics

Unlevered betas for European integrated operators.

Case

Unlevered betas for European integrated operators



Operator	Unlevered (asset) beta
TeliaSonera	1,09
Belgacom	0,69
BT	0,83
Deutsche Telecom	0,69
France Telecom	0,81
KPN	0,68
OTE	0,74
Portugal Telecom	0,44
Swisscom	0,37
TDC	0,44
Telecom Italia	0,45
Telefonica	0,65
Telekom Austria	0,35
Average (except TeliaSonera)	0,60

Source: Copenhagen Economics

Asset betas for US companies

Case

Asset betas for US companies



- No pure play comparators available for BT's copper access business
- But useful indicative evidence available from comparing equity beta estimates of US telecoms companies:
 - Local Exchange Carriers ("LECs") – offer access and local calls services;
 - long-distance carriers

Company	Asset beta	Equity beta at BT's gearing level (35%)
Bell South	0.57	0.88
SBC Communications	0.49	0.75
Verizon Communications	0.53	0.81
LECs average		0.81
AT&T	0.66	1.02
Sprint	1.06	1.63
Long-distance average		1.33

Source: OFCOM



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Examples WACC.

Parameters of the WACC formula used by overseas regulatory authorities

Regulatory authority	Source	Year of proceeding	Asset beta	Equity beta	Market debt share (%)
Norwegian Post & Telecom Regulatory Authority	Johnson (2006)	2006	1.0 - 1.6	1.04-1.67*	20
Ofcom, UK	Ofcom (2006)	2006	0.9 - 1.45	1 - 1.6	10
OPTA, The Netherlands	OPTA (2006)	2006	1.08*	1.27	20
Ficora, Finland	Ficora (2005)	2005	1.1 - 1.3	1.4 - 1.43	10 - 30
PTS, Sweden	Marsden Jacob Associates (2004)	2003	1.0 - 1.1	1.08 - 1.3	10 - 20
An EU country known to WIK (information considered confidential)	N/A	2006	1.0	1.16	18
Average**			1.13	1.28	17.2

* Not provided in the source. Value derived from the beta value provided (asset beta in case of the Norwegian, and equity beta in the case of OPTA) using equation (2) in the text.

** Where a range instead of a single figure is to be included in the average, the lower and the upper values are each taken as an individual observation.

Source: WIK



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Parameters WACC.

Case

parameter values used in the WIK-MNCM

Parameter	Values
Risk-free interest rate (r_f) (%)	4.434
Market risk premium (r_m) (%)	4.5
Equity beta (β_e)	1.32
Market debt share (D) (%)	17.2

Source: WIK

MNCM – Mobile Network and Cost Model



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Betas.

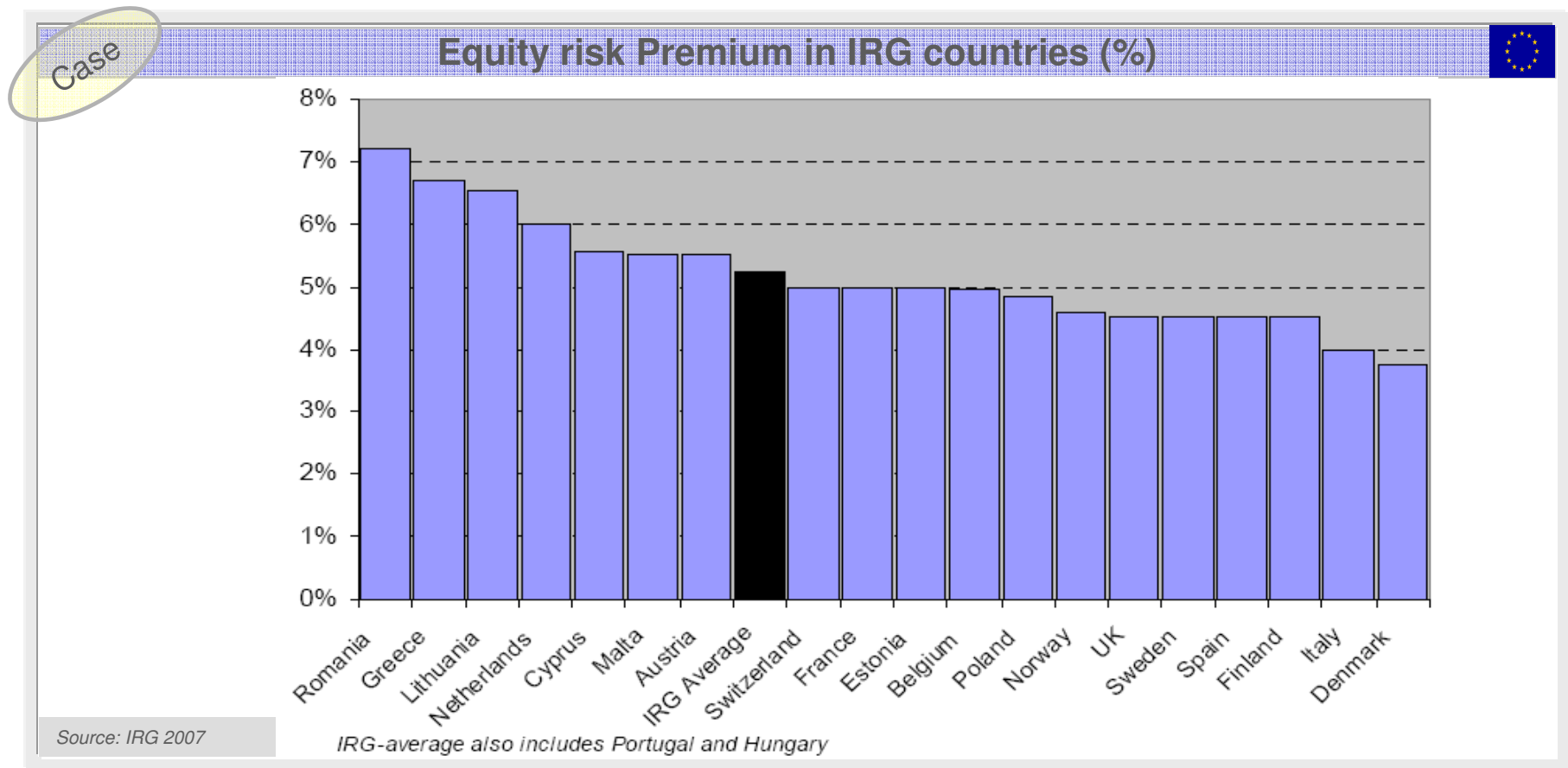
Beta estimates for mobile operators from Damodaran

Company	Estimated equity beta	Tax rate* %	Market debt share %	Implied asset beta
Cosmote Mobile	0.51	35.9	5.3	0.49
Mobistar	1.35	29.4	5.6	1.30
O2	1.81	2.6	7.5	1.68
Telefonica Moviles	1.31	35.8	22.3	1.11
Vodafone	1.31	0.0	13.4	1.13
Average	1.26	20.7	10.8	1.14
Average excluding outliers	1.32	21.7	13.8	1.18

* The tax rate figures are presumably derived from the financial reports of the companies and would thus reflect actual taxes paid relative to a proxy of the relevant taxable income and would therefore represent very rough estimates of the effective tax rate. The low and zero rates of tax for O2 and Vodafone, respectively, appear to be due to impairment losses that have been recognised by tax authorities.

Source: WIK

Risk premium.

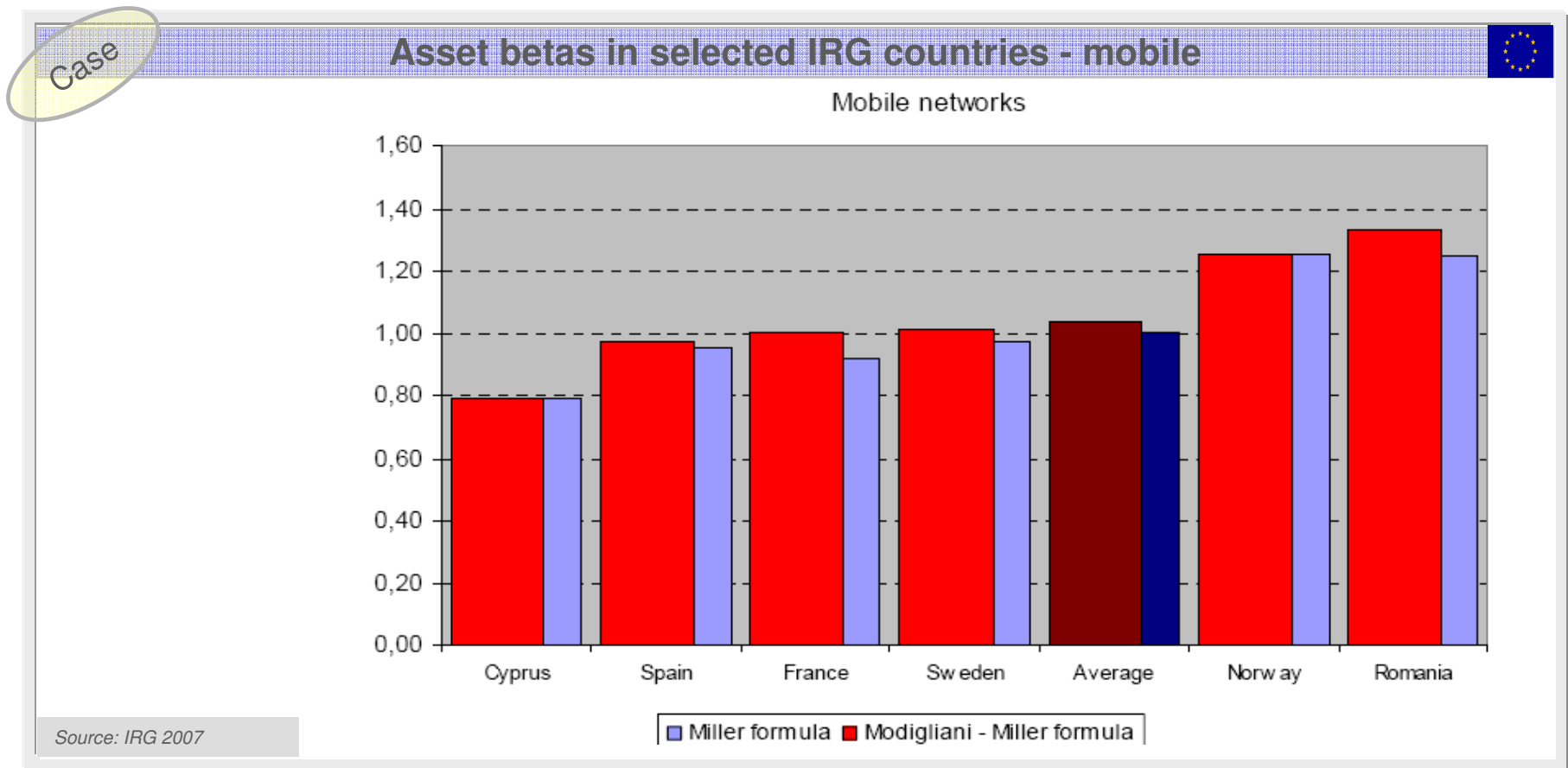


IRG – Independent Regulators Group



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Betas.

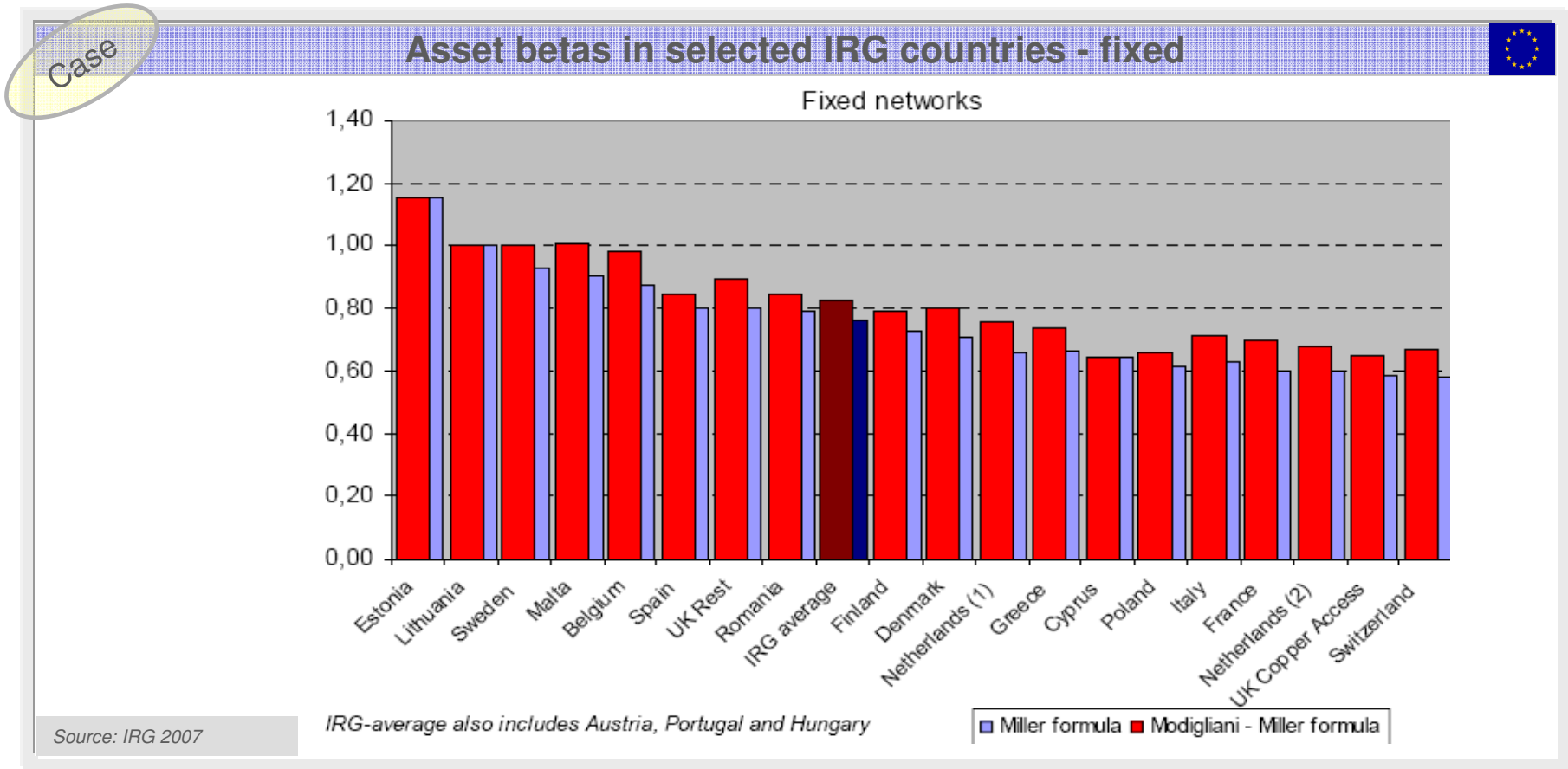


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Betas.



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Day 3 – Session 12

Practical experiences

Regulation is based on the definition of relevant markets. Practice shows that application of cost accounting systems is different in different markets.

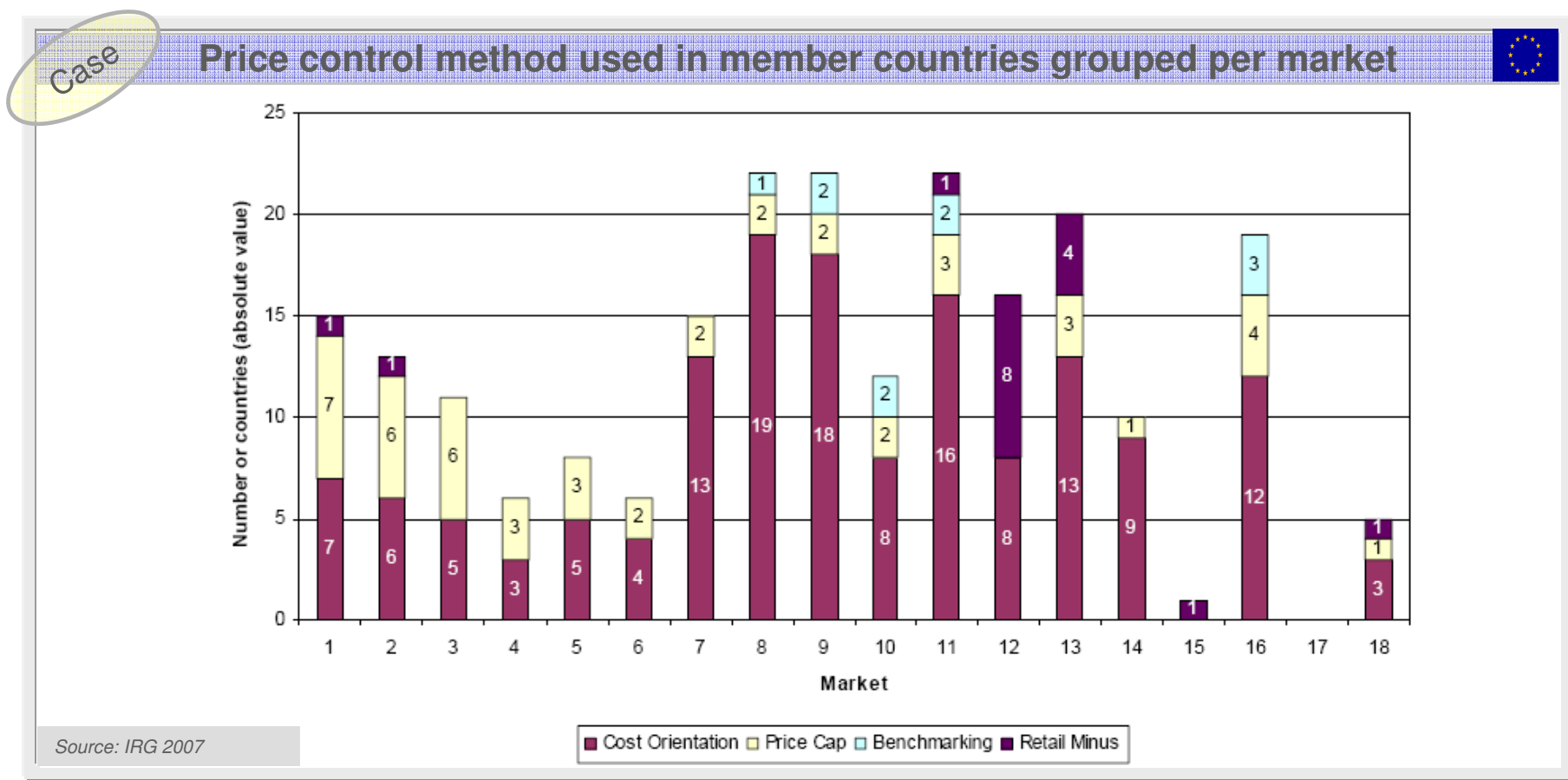
Recommended relevant markets						
18 markets as per recommendation on relevant markets	Retail Fixed Voice	access network residential	connected	Access	1	Retail Fixed Voice
		access network non-residential				
	Retail leased lines	national telephone residential	x	Origination	2	Wholesale Fixed Voice
		international tel. residential	x			
	Wholesale Fixed Voice	national tel. non-residential	x	Termination	3	Wholesale Fixed Voice
		international tel. non-residential	x			
	Wholesale ULL Broadband	minimum set of leased lines	x	Unbundling	4	Wholesale ULL Broadband
		call origination fixed				
	Wholesale Leased lines	termination on individual networks		Bitstream	5	Wholesale Leased lines
		transit fixed	x			
	Wholesale Mobile	unbundled access		Terminating Segments	6	Wholesale Leased lines
		broadband access				
	Wholesale Radio/TV	terminating segments		Termination	7	Wholesale Mobile
		trunk segments	x			
		access and call origination				
		call termination				
		International Roaming	x			
		Broadcasting	x			

7 markets as per latest recommendation

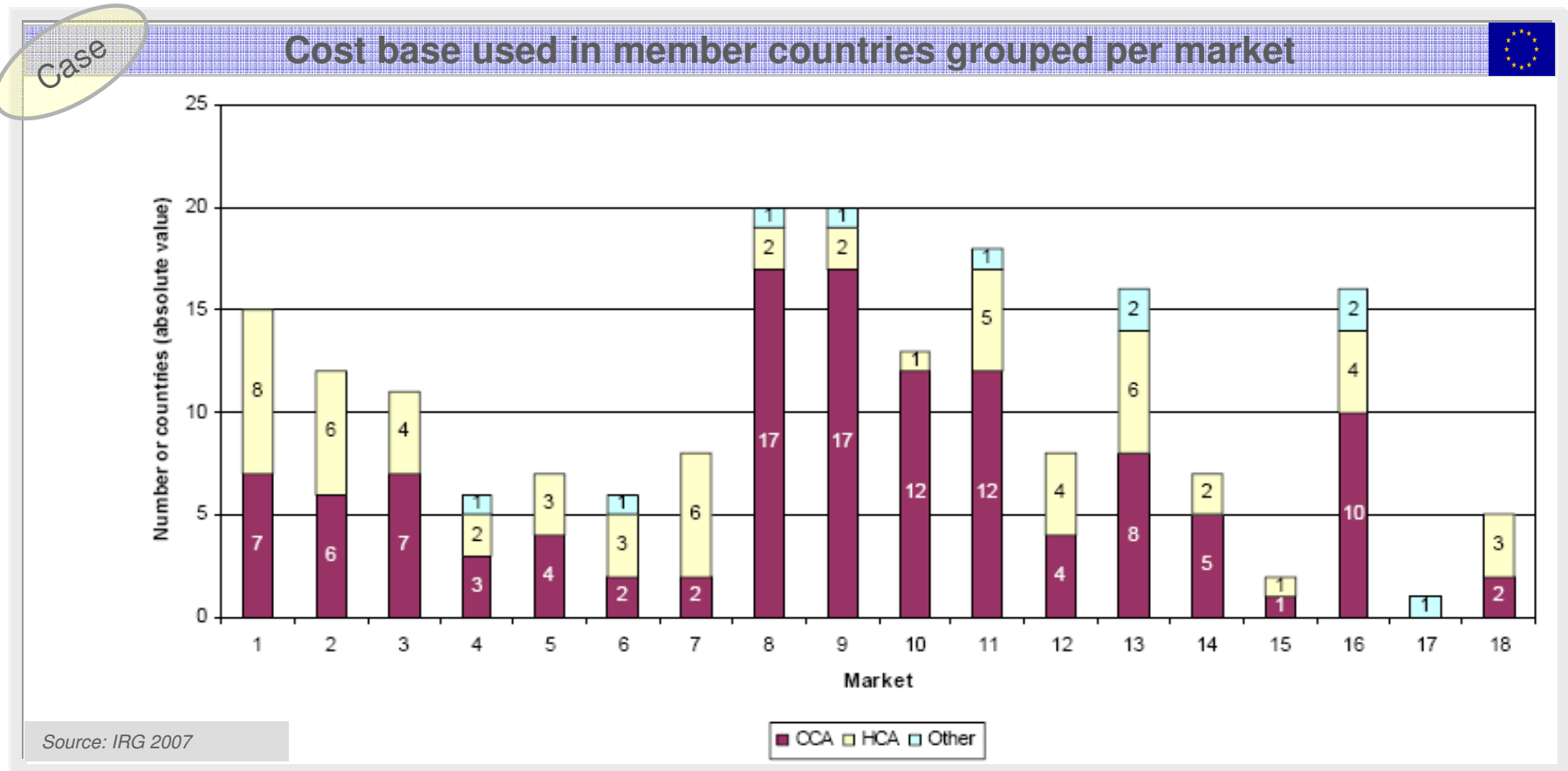


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In most market cost orientation is the prevailing method used.



In most markets CCA is used as a basis.



CCA – Current cost accounting
HCA – Historical cost accounting

Various approaches all over Europe: Benchmarking vs. cost-oriented regulation vs. cost models.

Case	Cost base used in member countries for mobile termination 2006																			
	AT	BE	CY	CZ	DK	EE	ES	EL	FR	HU	IRL	IT	LT	LU	LV	NL	PT	SE	SI	UK
Bottom-up LRIC								✓					✓			✓		✓		✓
Top-down LRIC*	✓	✓	✓						✓		✓	✓								✓
Benchmarking					✓	✓				✓				✓			✓			
Set reductions each year														✓						
Top-down Fully allocated costs				✓			✓								✓					✓

Source: CRA research, based on regulatory decisions from regulators' websites and EC comments to the decisions imposed by national regulators.
 Note that as of June 2006, Belgium, Denmark, Greece and Luxembourg had not yet adopted final measures * Includes benchmarking based on LRIC

ITU Expert-Level Training for national regulatory authorities on cost model development

Day 4

Nov. 13, 2008

Day 4 - Agenda

Day 4 - overview

Goal:
>Accounting models

Session 13: Overview models (top down, bottom up, hybrid models)

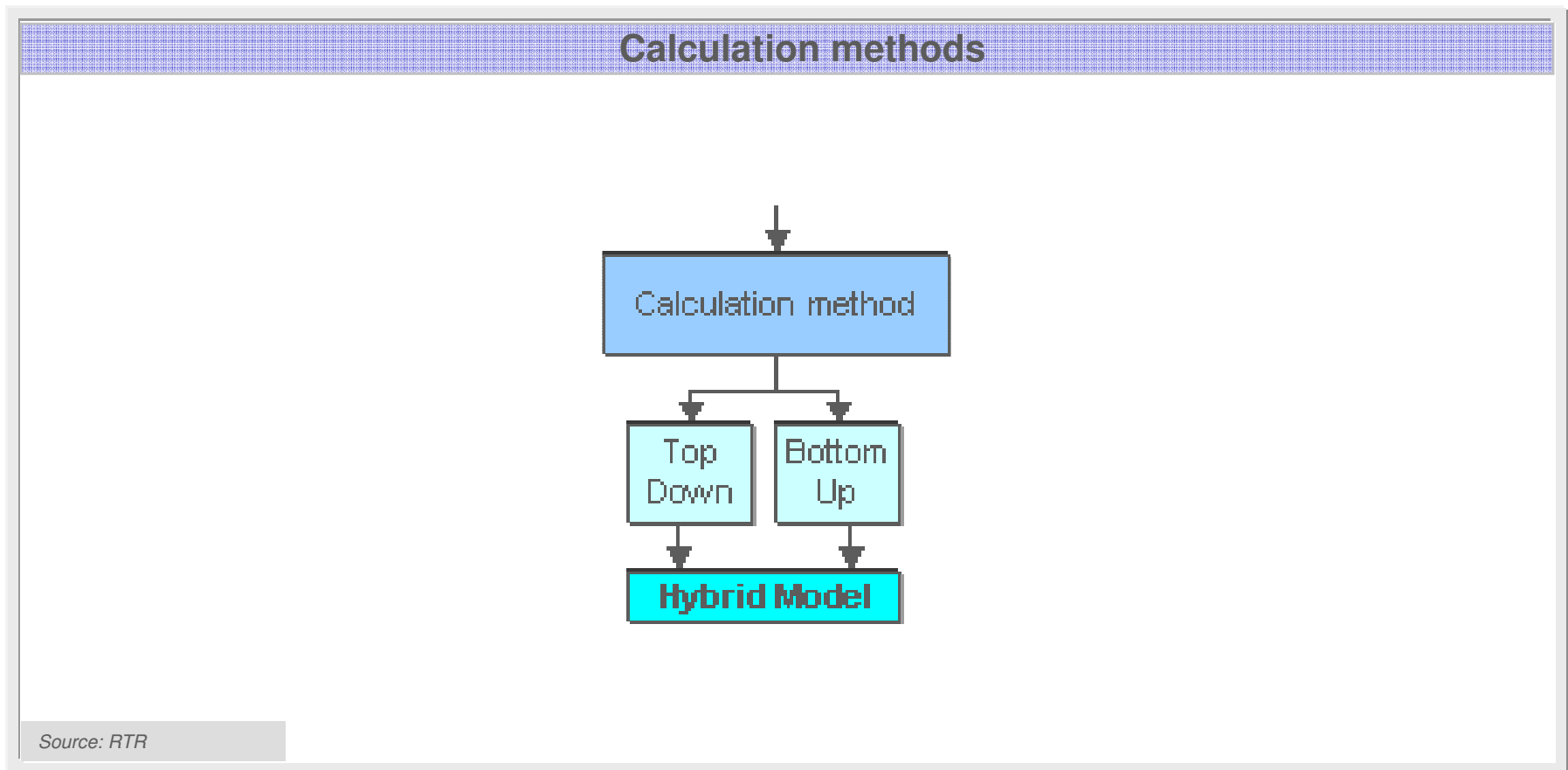
Session 14: Key assumptions (e.g. scorched earth vs. scorched node)

Session 15: Fixed, mobile, universal service, retail and wholesale models

Session 16: Practical experiences

Day 4 – Session 13
Overview models

Different calculation methods can be used.



One possibility to calculate costs is a top down model.

Top Down

- Based on the data provided by incumbent
- Often confidential company data
- Based on existing network and embedded historic cost
- Critical issues
 - exact separation between core and access network
 - depreciation period
 - rate of return
- Real World Data (no assumptions)

Source: RTR



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Another possibility to calculate costs is a bottom up model.

Bottom Up

- To estimate the infrastructure investments of an efficient network.
- Analytical model to determine an abstract state-of-the-art network with an optimal network topology.
- Scorched node approach:
geographical location of the MDF (Main distribution frame) sites as given.
- Scorched earth approach:
location of the MDF (Main distribution frame) sites optimised too.

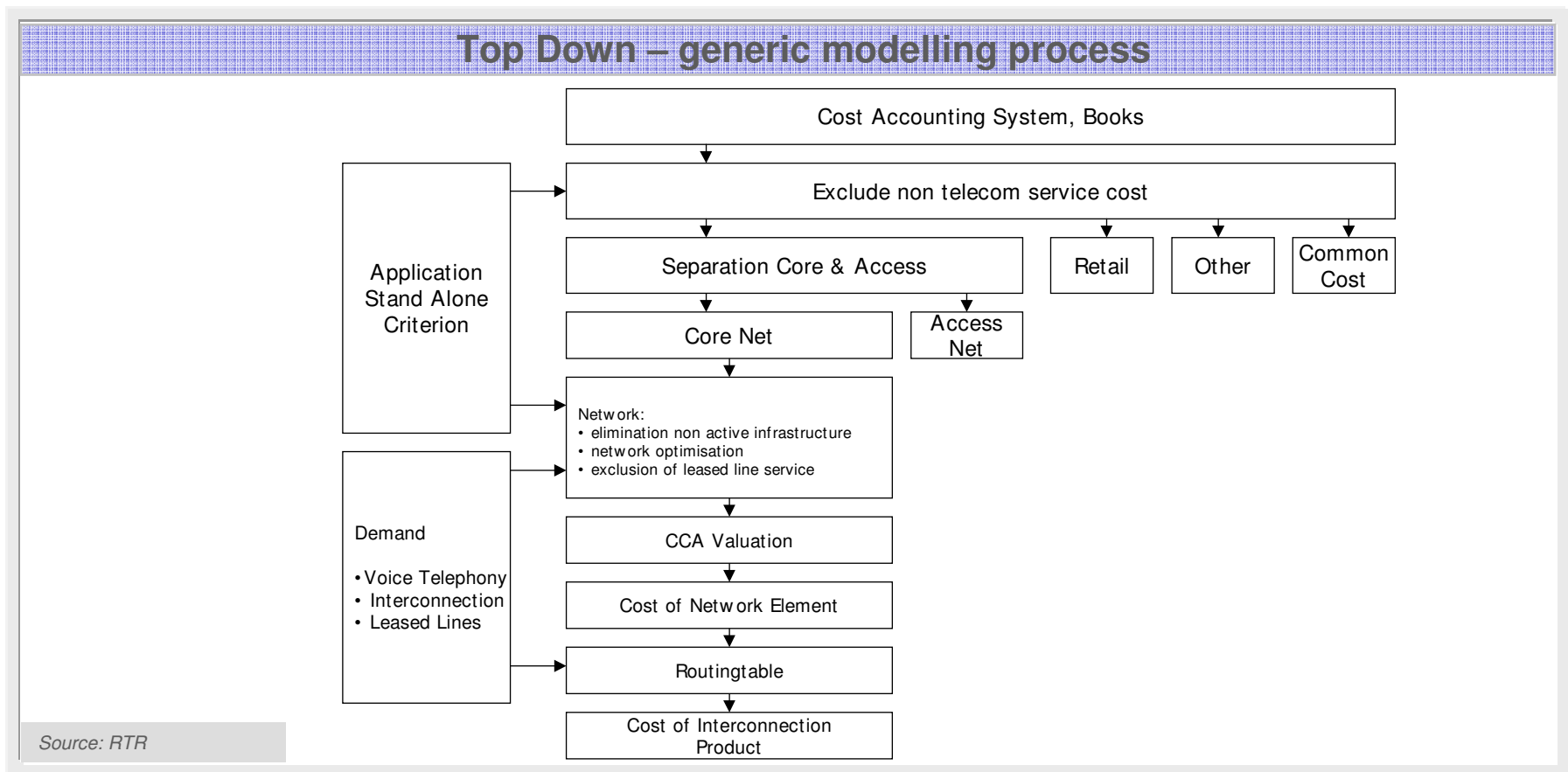
Source: RTR



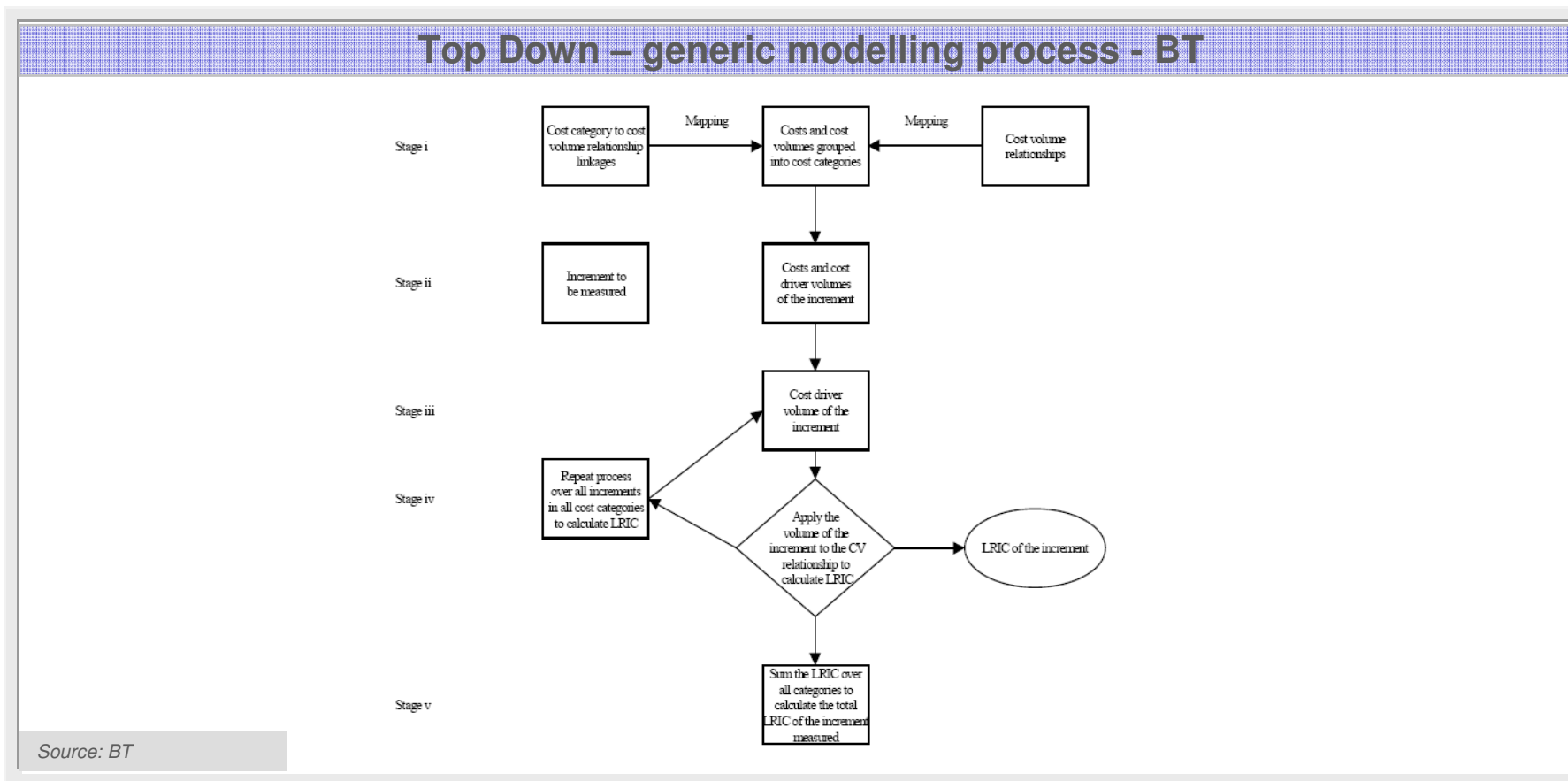
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Top down models

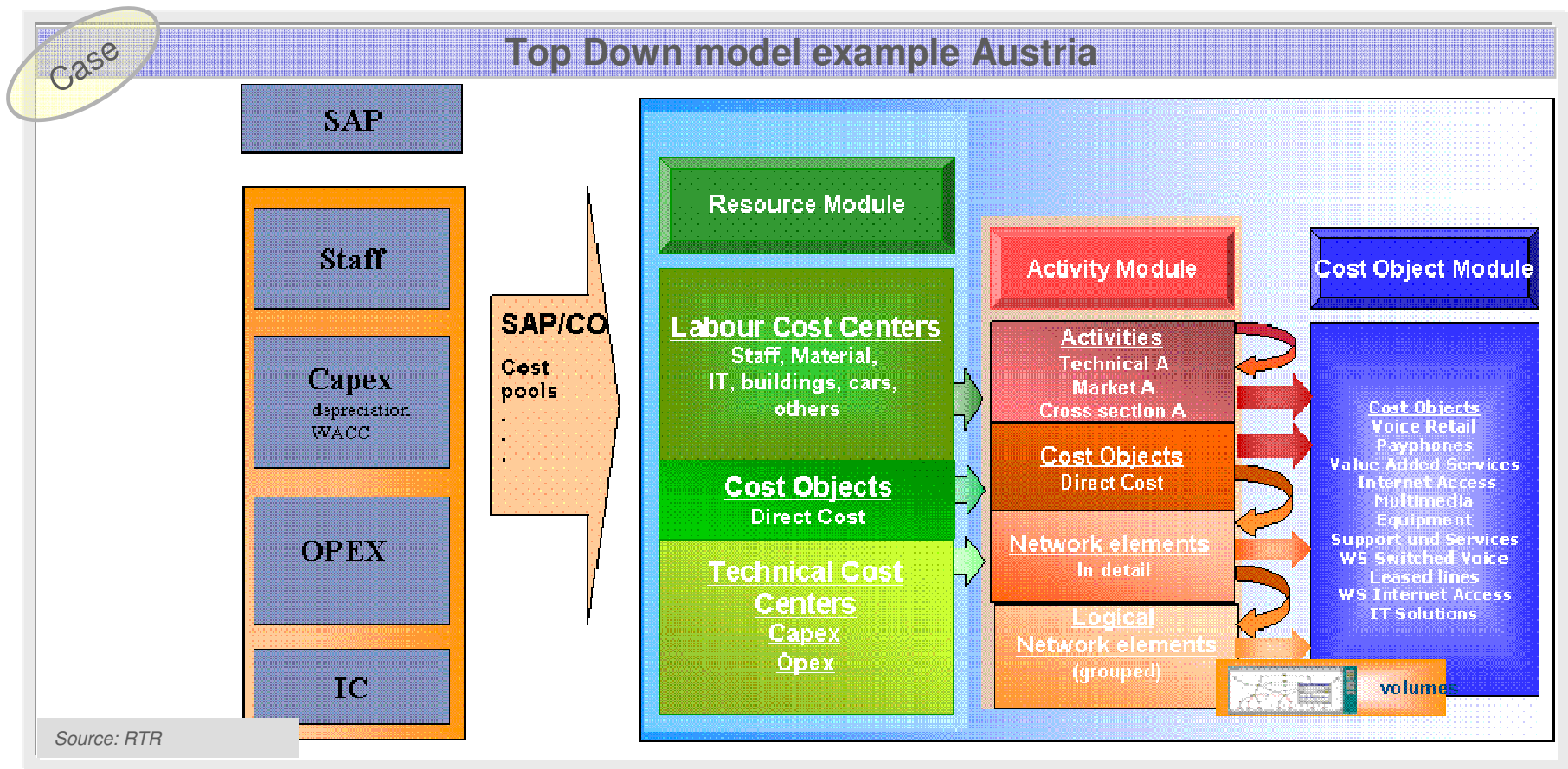
For all top down models a generic modelling process can be described.



For all top down models a generic modelling process can be described.



Top down model example



For a top down calculation an Excel model can be used for the last step of calculation.

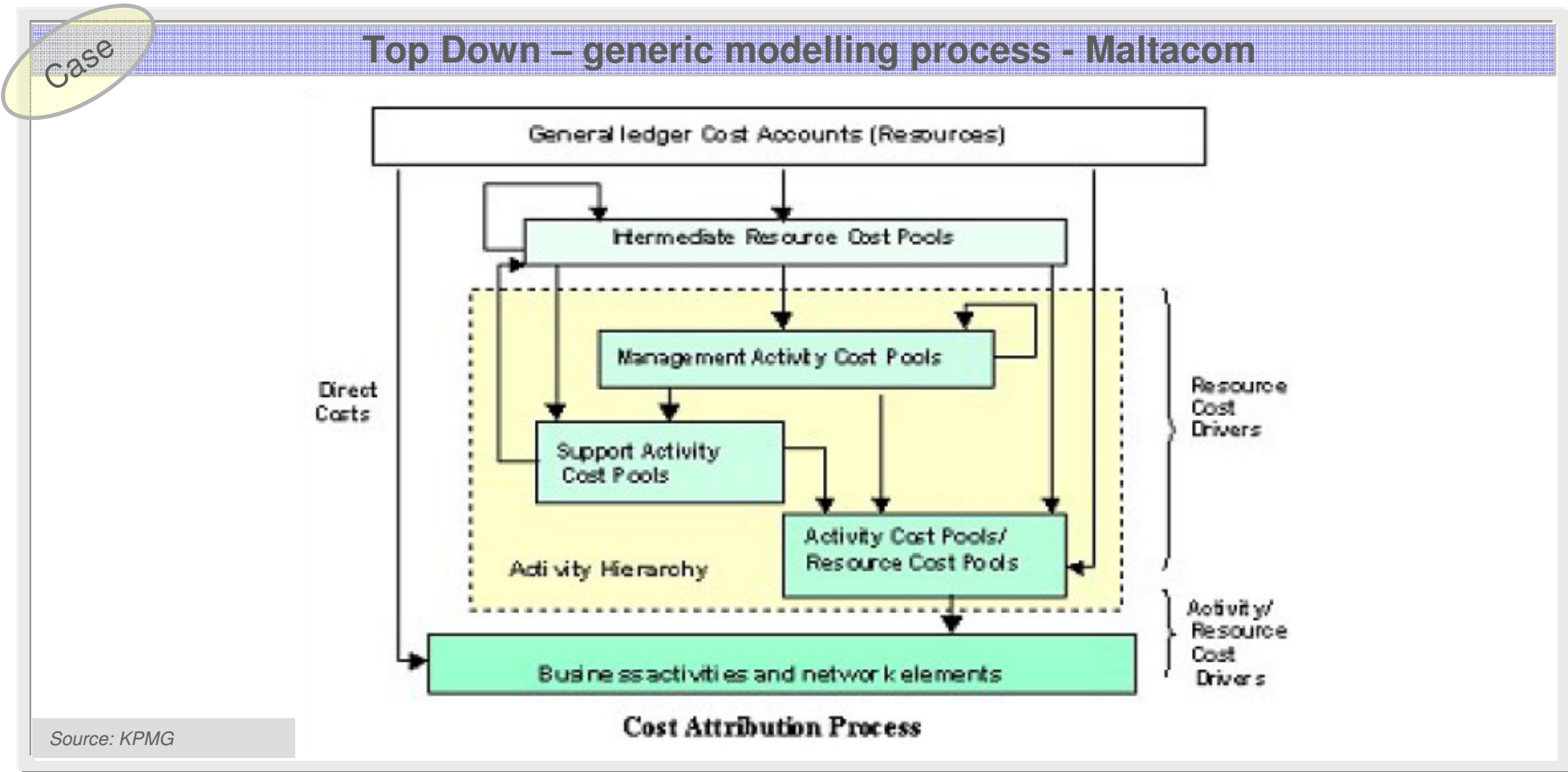
Case

Top Down – Excel model - routing table

		net elements									probability	cost per route	average cost
		route	switch					transmission/trench					
			international exchange node	upper level backbone node	lower level backbone node	access node	concentrator	HTT	TT	T			
total cost		xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx				
customer products	local call	1				1							
		2				1							
		3				1							
	national call	1		1	1		2			2			
		2		1	1		1			2			
		3		2	2		2	1		2			
inter-national call	1	1	1	1	1			1	1				
interconnection	local IC	1			1	1							
		2			1	1							
	national IC	1		1	1	1			1	1			
sum usage													
cost per net element													

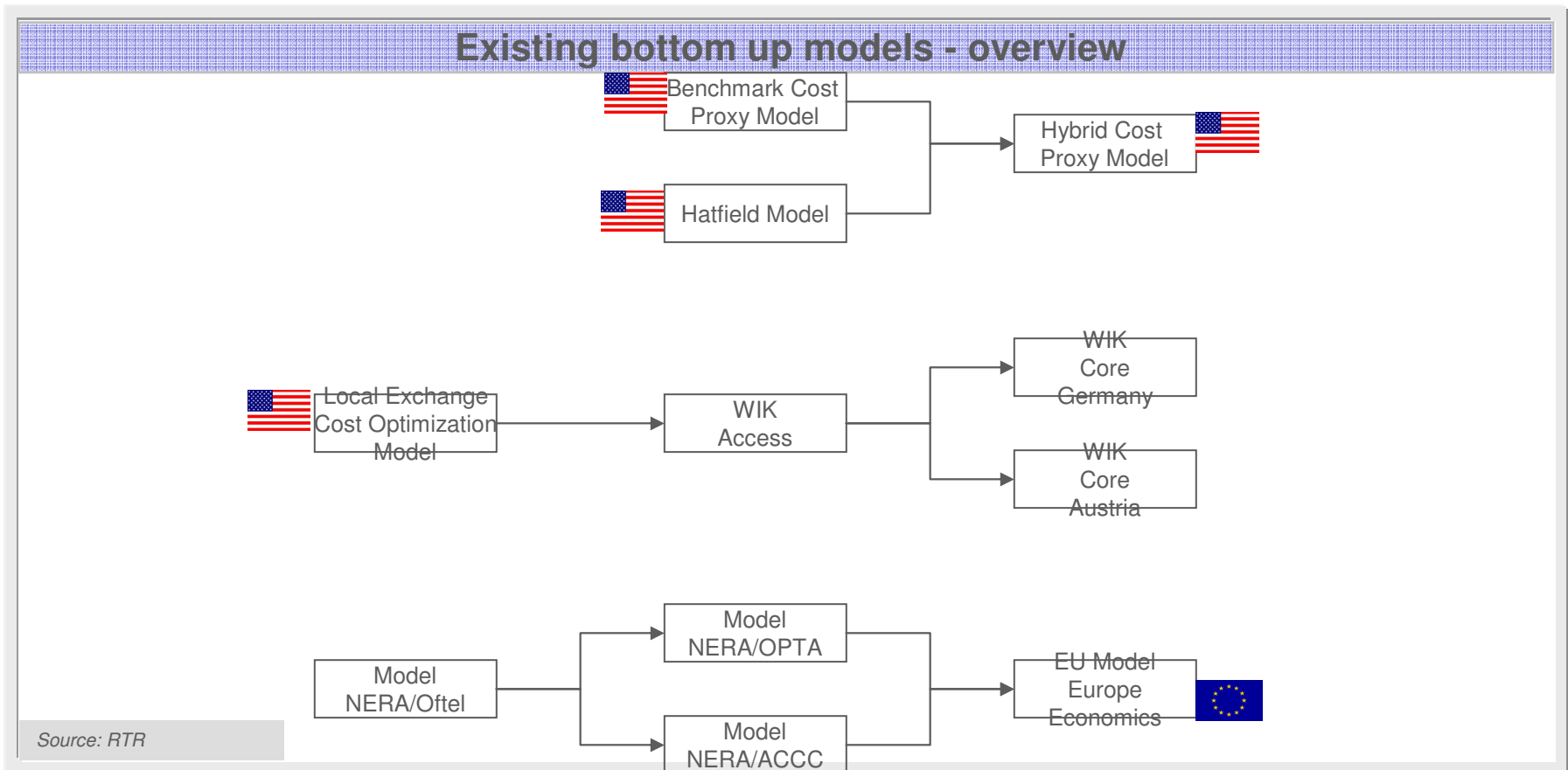
Source: RTR

For all top down models a generic modelling process can be described.

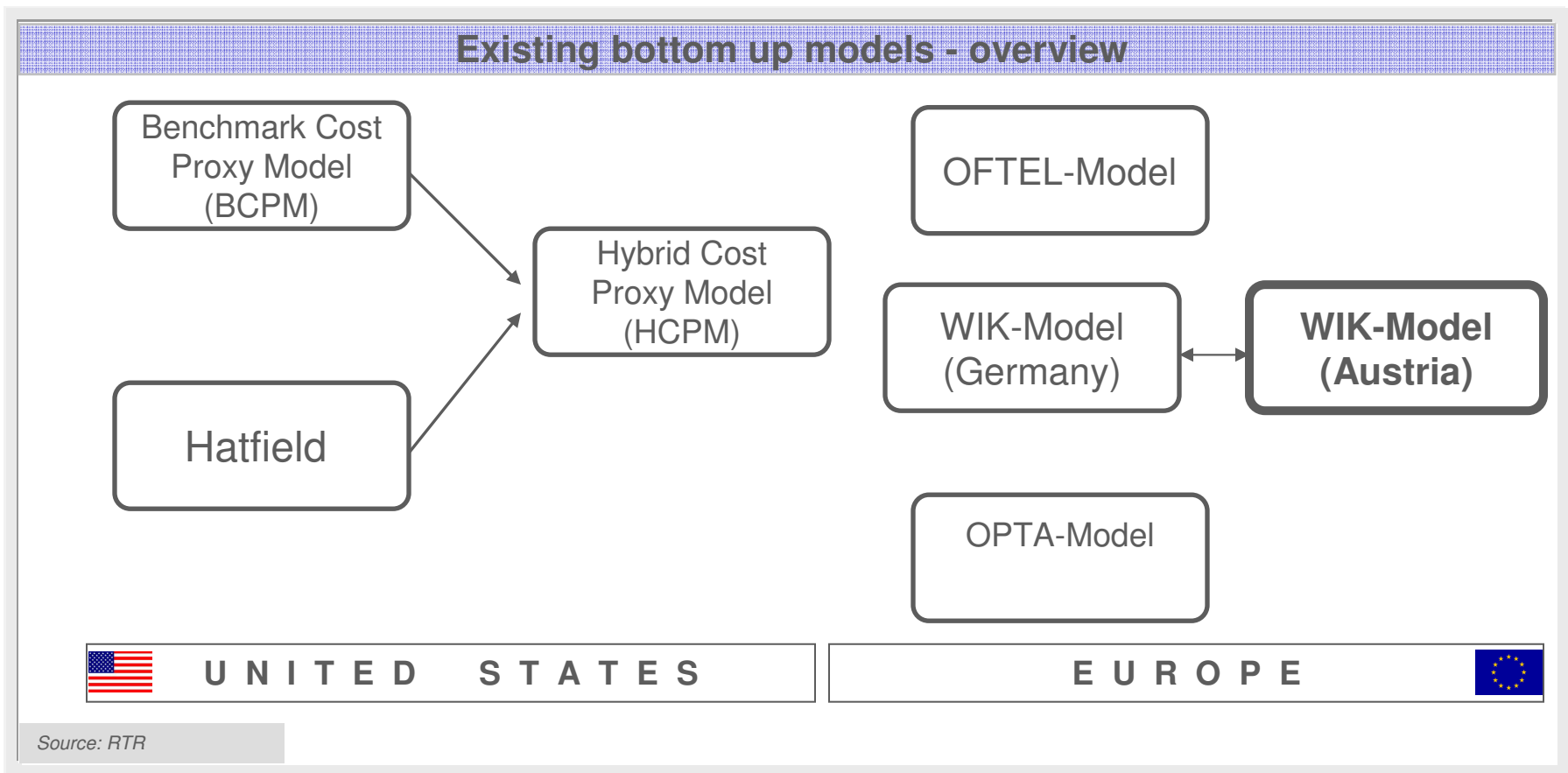


Bottom up models

Several bottom up models already exist.



Several bottom up models already exist.



Each model has its characteristics.

Top Down vs. Bottom Up

	Top Down Model	Bottom Up Model
Cost base	Embedded costs, historic costs	Economic costs
Point of view	Historic > forward looking	Forward looking
Valuation	Historic > current costs	Current costs, replacement cost
Technology	Implemented used technology	Efficient optimal technology
Database	Confidential company data	Publicly available data

Source: RTR

Each model has its characteristics.

Top Down vs. Bottom Up		
	Bottom-up models	Top-down models
Advantages	<p>Can model costs that an efficient entrant would face</p> <p>Flexible — can change assumptions readily</p> <p>Transparent — much of the information used is publicly available</p>	<p>Incorporate actual costs</p> <p>Useful for testing results from bottom-up model</p> <p>May be faster and less costly to implement, but this depends on how well categories in the financial accounts match the data required</p>
Disadvantages	<p>May optimize “too much” or omit costs. If this happens, the operator will be under-compensated and will reduce investment in the network</p> <p>Modeling of operating expenditure is usually based on simple margins instead of real-world costs</p> <p>Data needed for the model may not exist</p> <p>The modeling process can be time-consuming and expensive</p>	<p>Include the firm’s actual costs, and so are likely to incorporate inefficiencies</p> <p>Less transparent — confidentiality issues mean other stakeholders may not have access to the information used</p> <p>The parties may dispute the cost allocation rules used (the rules used to allocate shared and common costs among specific services)</p> <p>Data may not exist in the required form</p>

Source: ITU



Hybrid models

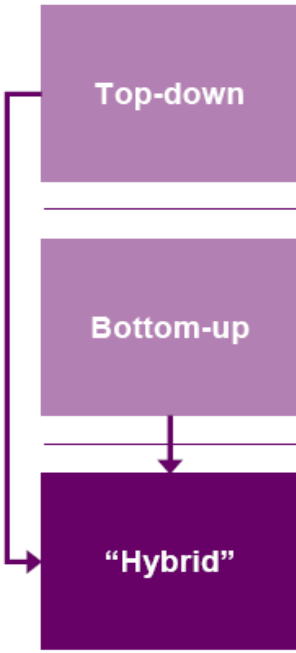
Each model has its strengths and weaknesses.

Top Down vs. Bottom Up

	Top Down	Bottom Up
Cost base	Embedded costs, historic costs	Economic costs
Point of view	Historic ➤ forward looking	Forward looking
Valuation	Historic ➤ current costs	Current costs, replacement cost
Technology	Implemented used technology	Efficient optimal technology
Database	Confidential company data	Publicly available data
+	<ul style="list-style-type: none"> • complex network modelling • real not ideal cost • all costs are included • reliable data source • practical background 	<ul style="list-style-type: none"> • based on public parameters • transparent • contribution of industry • discussed with market parties
-	<ul style="list-style-type: none"> • inefficiencies • lack of forward looking data • complex - not easy to understand • not transparent for the market 	<ul style="list-style-type: none"> • simplified relations • sensible to main parameters • assumptions necessary (e.g. demand) • operating costs not modelled in detail

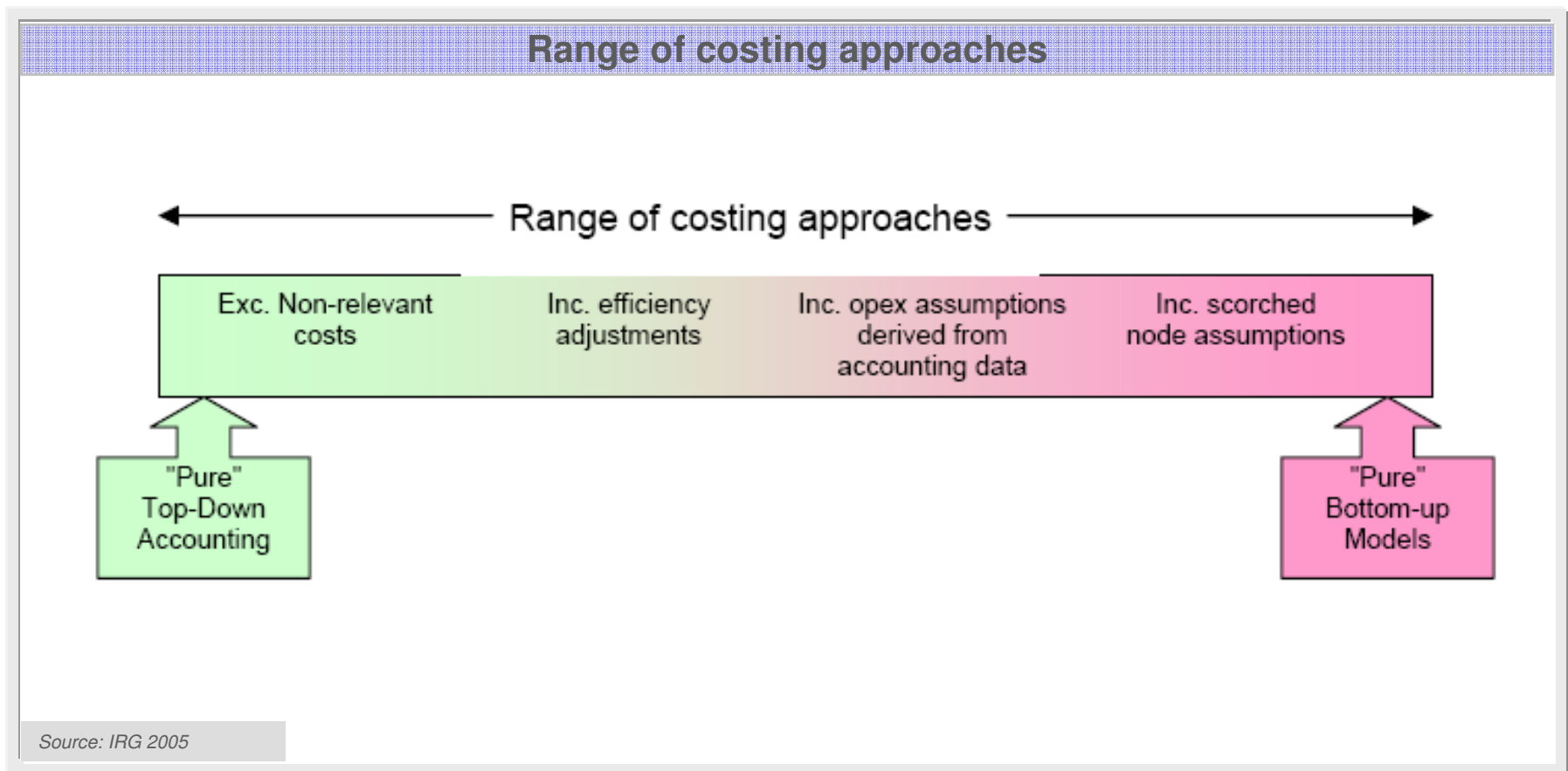
Source: RTR

Advantages and disadvantages of different models.

Different models			
	Methodology	Benefits	Drawbacks
	<p>Top-down</p> <ul style="list-style-type: none"> Begin with historical accounting cost levels and forecast on the basis of observed output / cost relationships 	<ul style="list-style-type: none"> Helps ensure that relevant historical costs are not omitted Most straightforward 	<ul style="list-style-type: none"> Limited forecast accuracy in the presence of significant volume changes / new cost types Should consider any current inefficiencies
	<p>Bottom-up</p> <ul style="list-style-type: none"> Identify granular components of cost and define cost-causal relationships to link the quantity of each of these with output, based on practical and theoretical evidence 	<ul style="list-style-type: none"> Gives improved understanding of cost drivers Copes with larger volume fluctuations / new asset types Does not lock in cost inefficiencies 	<ul style="list-style-type: none"> May overlook some efficiently incurred costs Increased complexity
	<p>“Hybrid”</p> <ul style="list-style-type: none"> Combine both approaches; develop a bottom-up model which is calibrated to reach the same total cost levels as historical accounting data 	<ul style="list-style-type: none"> Combines all of the advantages above 	<ul style="list-style-type: none"> Most complex

Source: OFCOM

Of course there are also some in between solutions possible.



Top down and bottom up models can have different dimensions.

Range of costing approaches				
	Top-Down		Bottom-Up	
	HCA	CCA	HCA	CCA
Fully Distributed Costs	✓	✓	✗	✗
Stand alone	✓	✓	✗	✓
Embedded direct costs	✓	✓	✗	✓
Marginal Costs	✓	✓	✗	✓
Long-run average incremental costs	✗	✓	✗	✓

Source: Andersen

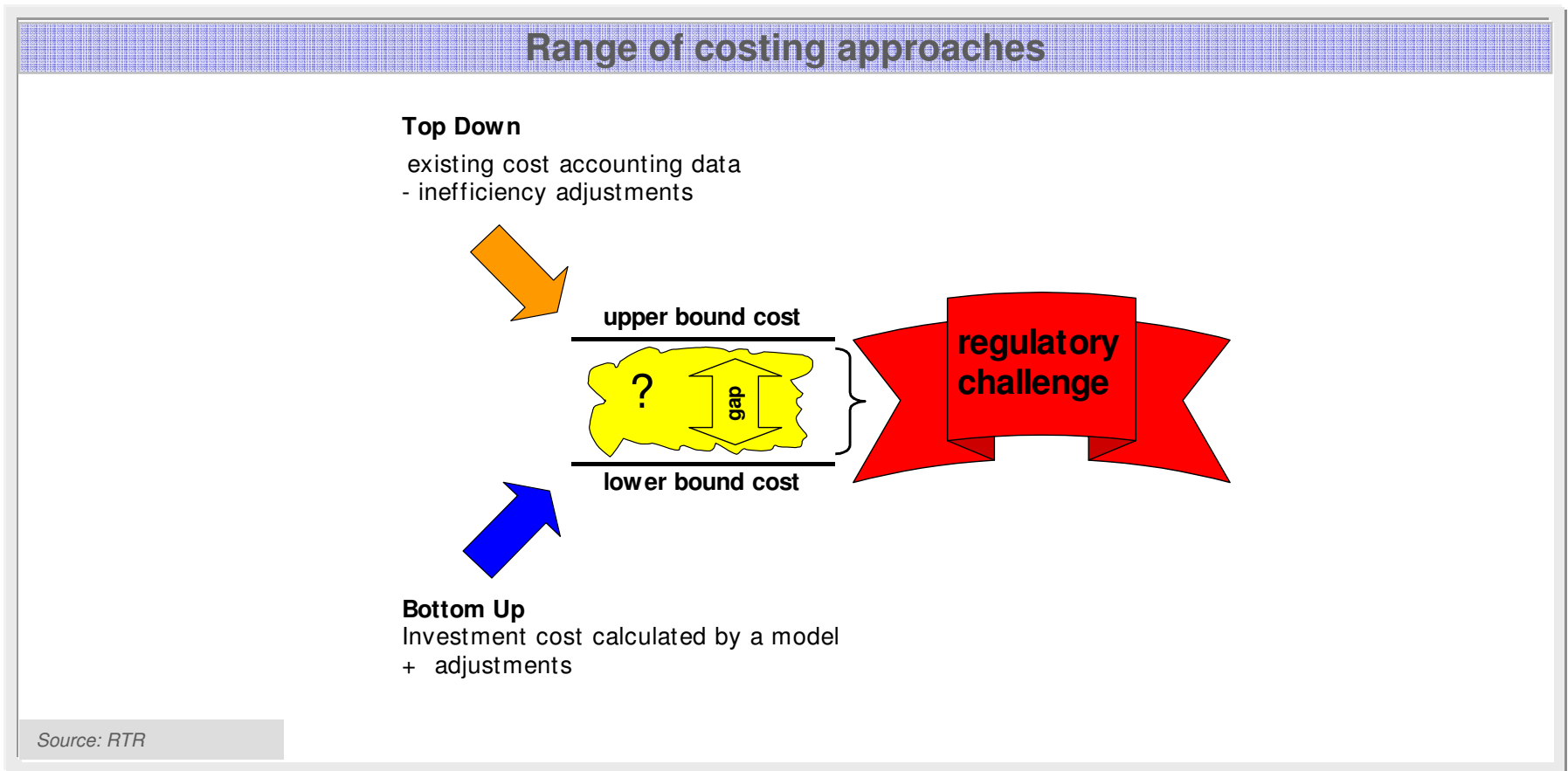
HCA – historical cost accounting

CCA – current cost accounting



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Often the results of top down and bottom up are reconciled.



Often the results of top down and bottom up are reconciled.

Differences between top down & bottom up

Top down – Bottom up

- Real World - Ideal Network assumptions
 - Demand - Capacity (full)
- Cost of Capital
 - Depreciation Period/Methods
 - (reasonable) Rate of Return - Risk
- Operating Cost
 - Identifying cost factors
 - Process-cost analysis vs. percentage of Investment

Source: RTR



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One important question is how detailed a model should be.

Simple vs. extensive models

same Model for FL-LRAIC (IC, ULL) and end-customer tariffs (different input data) should be used	
Simple Models	Extensive Models
+ Simple assumptions	detailed modelling
Simple to build	sub-results to be shown
Fast to implement	results easy to defend
Easy to learn	
Easy to sell	
- Results?	Demanding in modelling, using, input data, ...

Source: RTR

IC – interconnection

ULL – unbundling of local loop



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The case for a bottom-up model.

The case for a bottom-up model

- Dependence on incumbents database can be reduced significantly
- Improved understanding of telcos network costs
- Transparent rate setting process
 - Model serves as a platform for discussion
 - Reasons for diverging views can be identified
- Not a substitute for top-down analysis; rather a useful complement

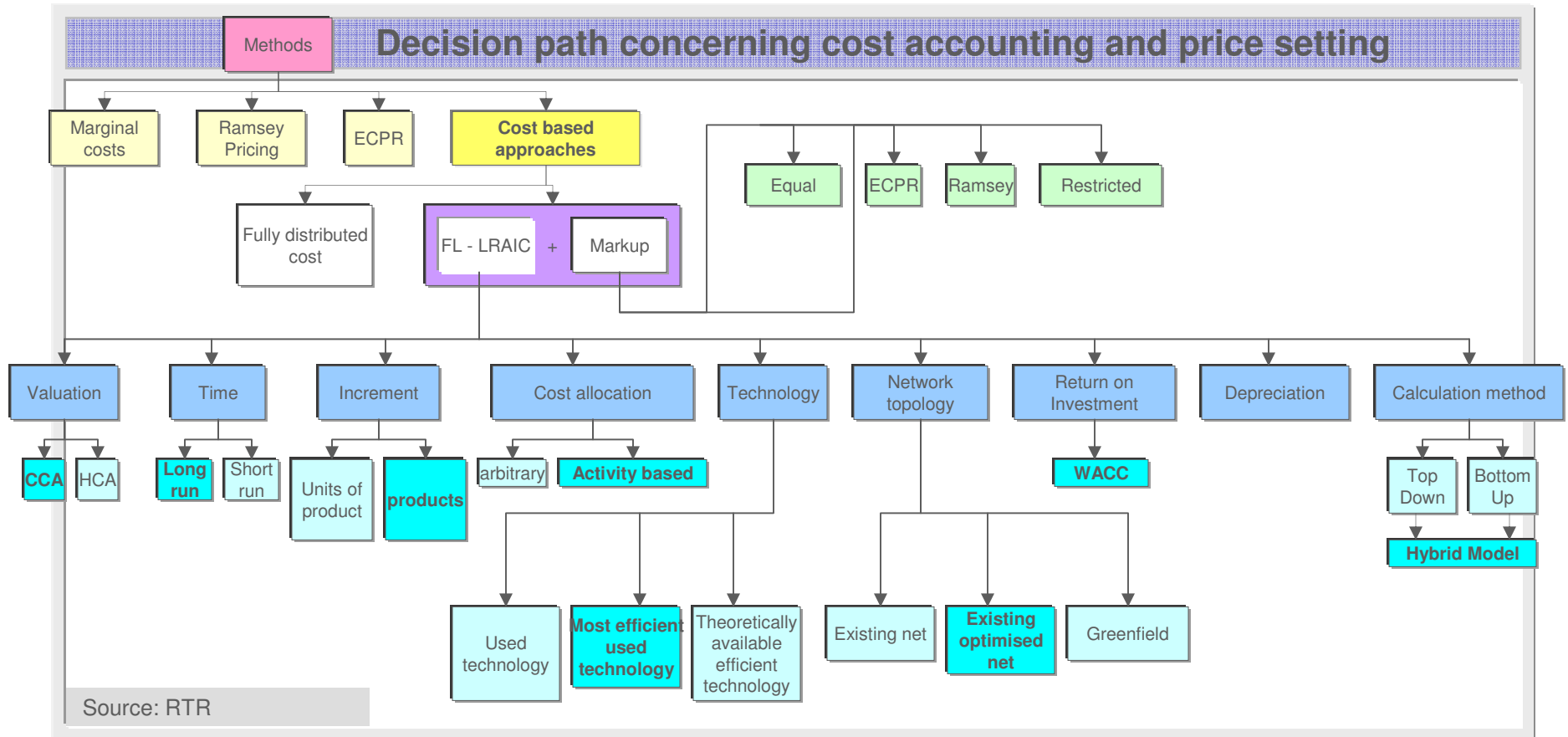
Source: WIK



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Day 4 – Session 14
Key assumptions

On the way to cost oriented wholesale tariffs a lot of decisions are necessary.



ECPR - efficient component pricing rule

One important parameter is the assumption concerning network nodes.

Scorched node vs scorched earth

- One of the key decisions to be made in FL-LRIC cost modeling is related to the question whether to adopt a 'scorched node' or a 'scorched earth' approach.
- In a top down modeling environment this is a decision between whether or not to allow the incumbent to base its costs on the existing network topology (scorched node) or on a ideal network topology that would meet the demands of a fully efficient operator (scorched earth).
- In a bottom up modeling environment this is a decision between whether or not the bottom up model should take into account the existing network topology (scorched node), or that the costs in the model should be based on a ideal topology (scorched earth).

Source: IRG



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One important parameter is the assumption concerning network nodes.

Scorched earth

- A scorched earth approach, also called the Greenfield scenario, assumes that optimally dimensioned switches would be employed at locations that are optimal to the overall transmission design. The scorched earth scenario reflects the structure of a completely new network that would have been designed from scratch. The main difficulty in this approach is the agreement between all market parties on the optimal network structure. Moreover it may be considered unreasonable not to allow the incumbent to recover its costs, caused by the existing network configuration, since it can not change this fundamentally within a reasonable period of time.

Source: IRG



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One important parameter is the assumption concerning network nodes.

Scorched node

- A scorched node approach, on the other hand, assumes that the existing nodes will still be used in the model. However, the scorched node approach replaces existing technologies with optimal technologies that are able to deliver equivalent functionality (MEAs) (e.g. this could mean the replacement of an analogue tandem switch by a digital tandem switch and possibly also the replacement of a host switch by a remote concentrator). Moreover, it assumes the utilization of optimal transmission technologies that connect these different nodes. This approach has the advantage that it takes into account the current geographical situation of the existing incumbent. However, this may perhaps not be the most efficient solution, compared to the scorched earth approach.

Source: IRG



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One important parameter is the assumption concerning network nodes.

Scorched node vs scorched earth

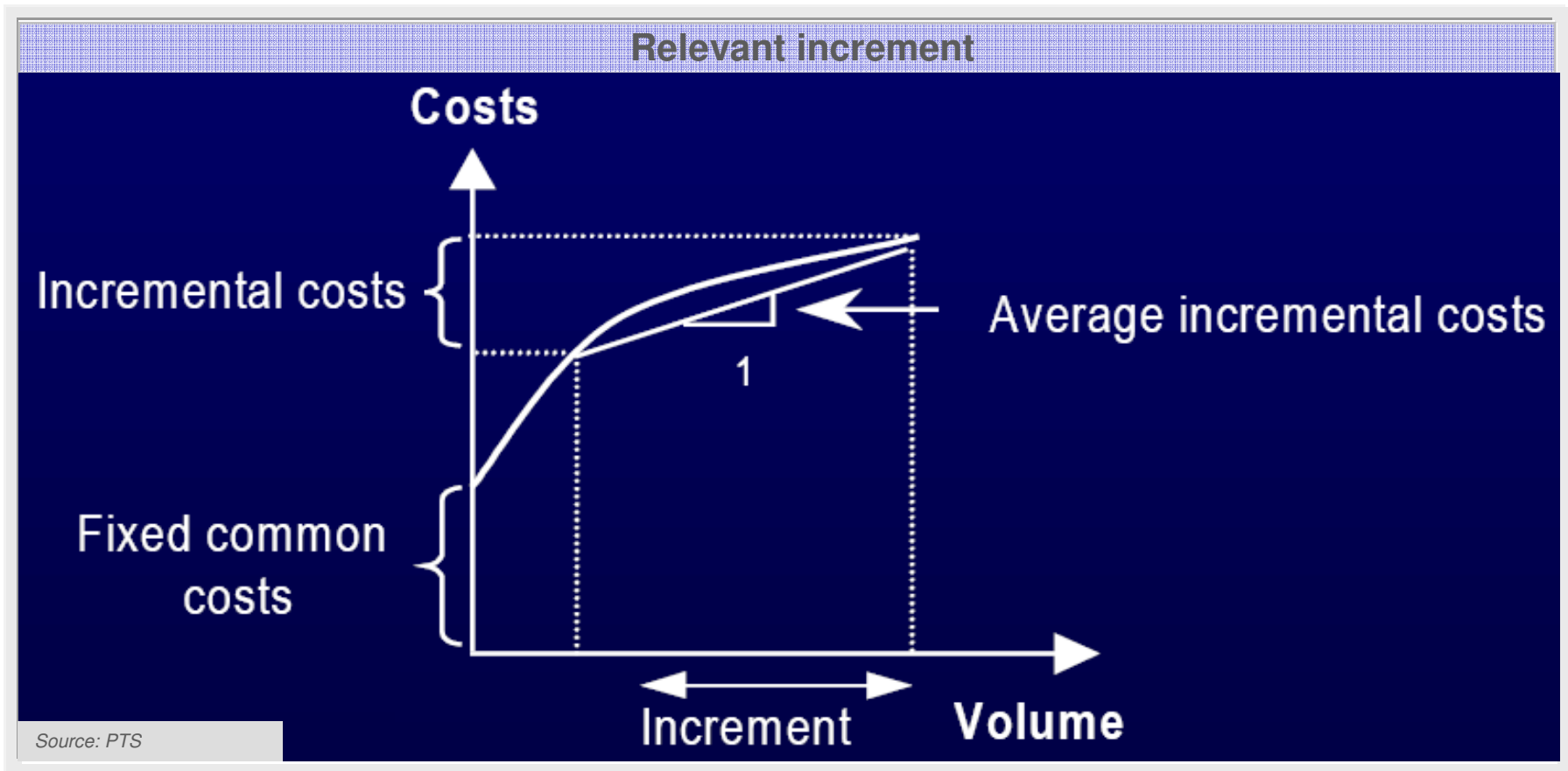
- Scorched earth represent ideal new entrant's network
 - Scorched node, takes the location of nodes as given, radical optimization of existing network, networks evolve over time
- Definition of scorched node
 - What is a node?
 - Is the number and location of nodes fixed? Or only the location (site)?
 - Is it possible to introduce additional nodes? Empty nodes/sites?
 - How radical can the equipment in a node be changed?

Source: RTR



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One key question is the definition of the increment.



One key question is the definition of the increment.

Relevant increment

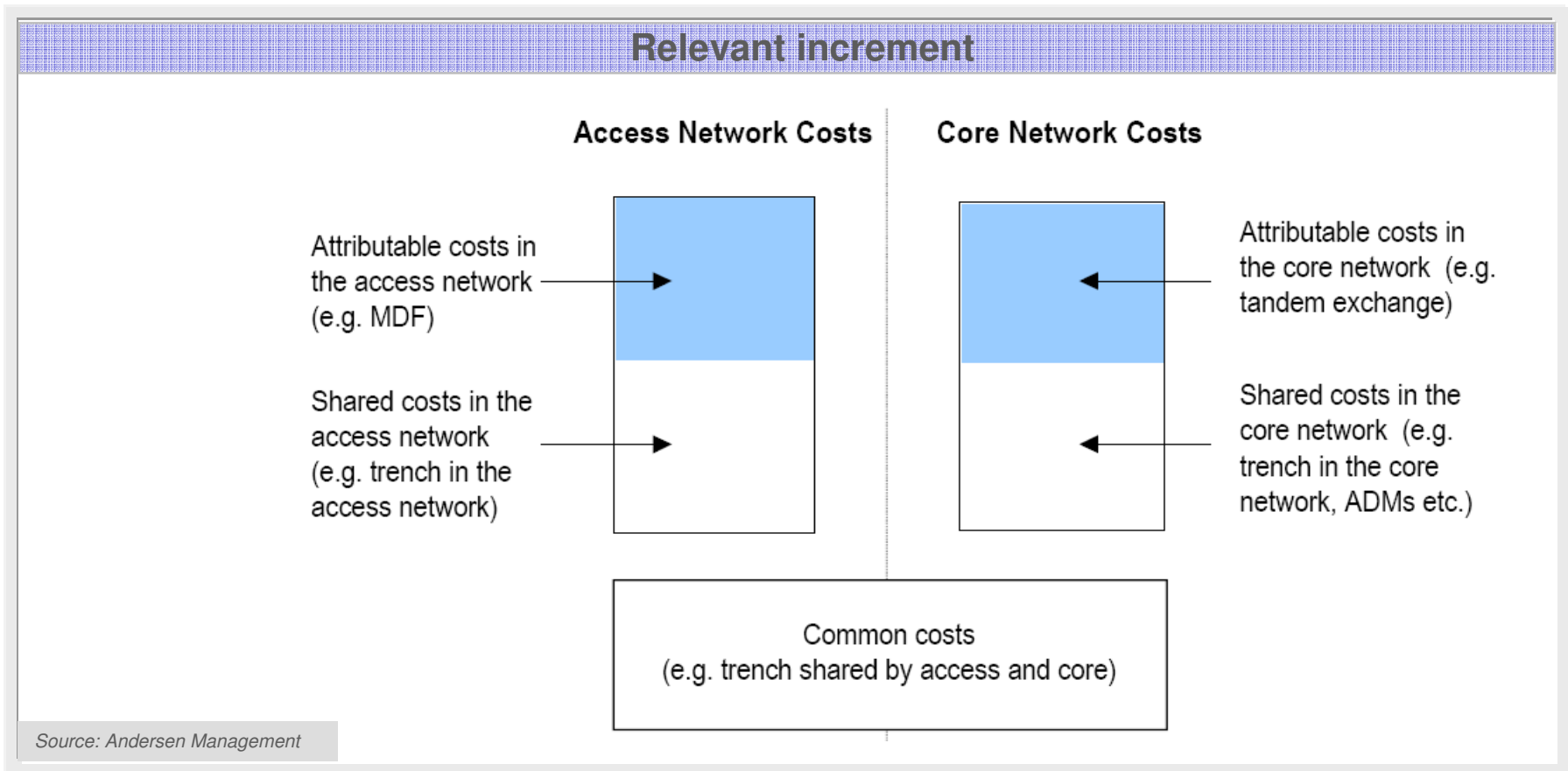
- How should the (size of) increment be defined?
 - All services using the network?
 - Only PSTN-services?
 - Only interconnection services?
- Small versus large increments
 - The smaller the increment, the smaller the LRIC and the larger the common costs

Source: RTR



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One key question is the definition of the increment.



One key question is the definition of the increment.

Relevant increment

- Commission Recommendation on Interconnection Pricing - part 1 of 15 October 1997:
- “..the entire investment cost entailed in any point of interconnection, and any investment in network and switching capacity required to handle interconnected traffic, would be avoidable, and thus captured by a long-run incremental cost measure. The total of all such measures, **including the incumbent operator's own increment in traffic**, would then form the total of all incremental interconnection costs. This figure would then be divided up in a fair and transparent manner between the notified operator and those interconnecting, with the result that the cost of interconnection to any party is the long run average incremental cost (LRAIC).
- An argument for large increments

Source: European Commission



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One key question is the definition of the increment.

Relevant increment

- It is proposed to define the following increments:
 - Access increment: All services using the access network
 - Core increment: All services using the core network
 - Other increments (mobile, international, cable-TV etc.)
- Motivation:
 - Fair allocation of cost between incumbent and interconnecting operators (non-discriminatory)
 - Reduces the common cost component (larger share of costs included in LRIC)

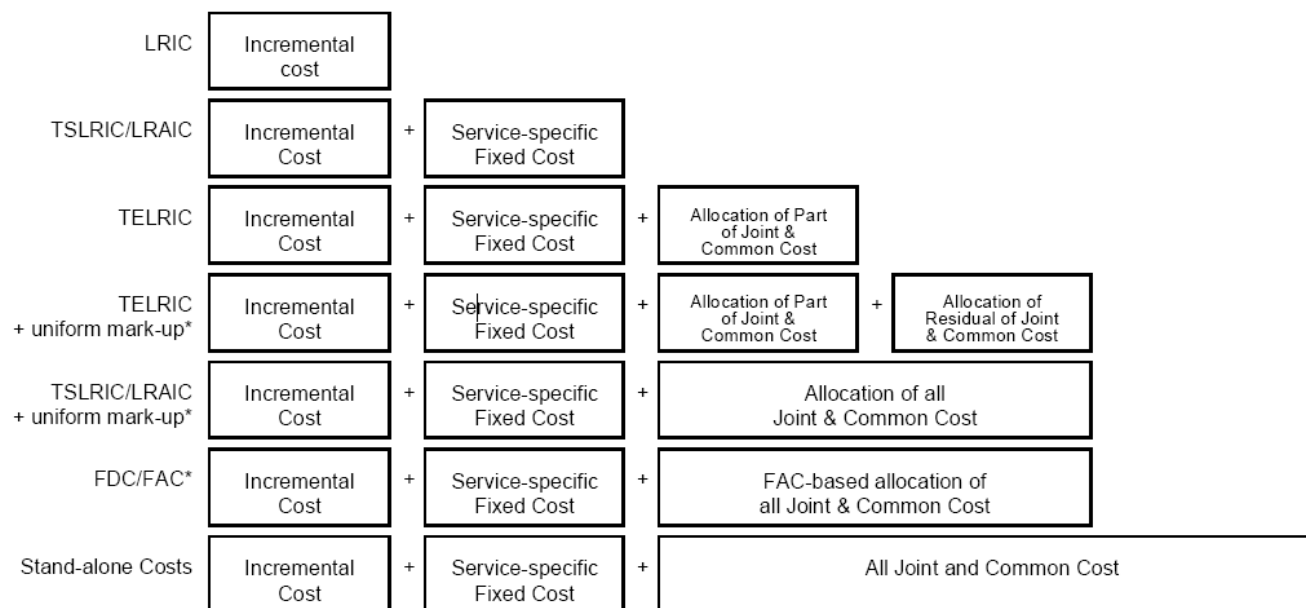
Source: RTR



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One key question is the definition of the increment.

Relationships between costs, costing methods & allocations



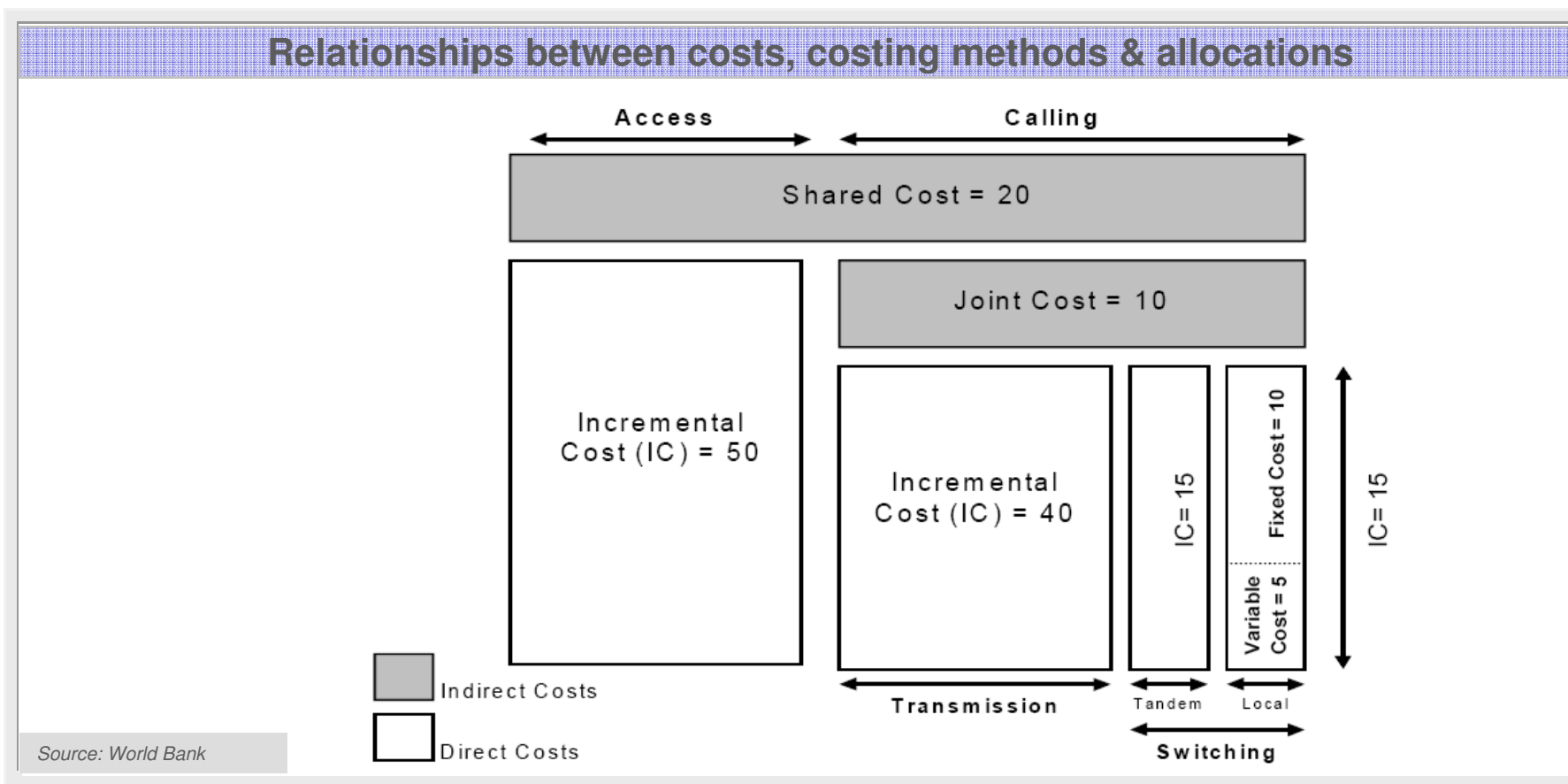
- Notes:**
1. For TSLRIC/LRAIC the increment is defined as the total service. Hence, indirect cost elements are shaded while direct cost elements are not shaded.
 2. In this example, FDC/FAC is assumed to be calculated based on forward-looking economic cost methodology.
 3. The total costs of the 3 cost concepts identified by an asterisk, *, do not necessarily have to be equal, as shown in this example.
 4. Note the relative sizes of the costing concepts are indicative only and should not be taken as an approximation of actual costs.

Source: World Bank

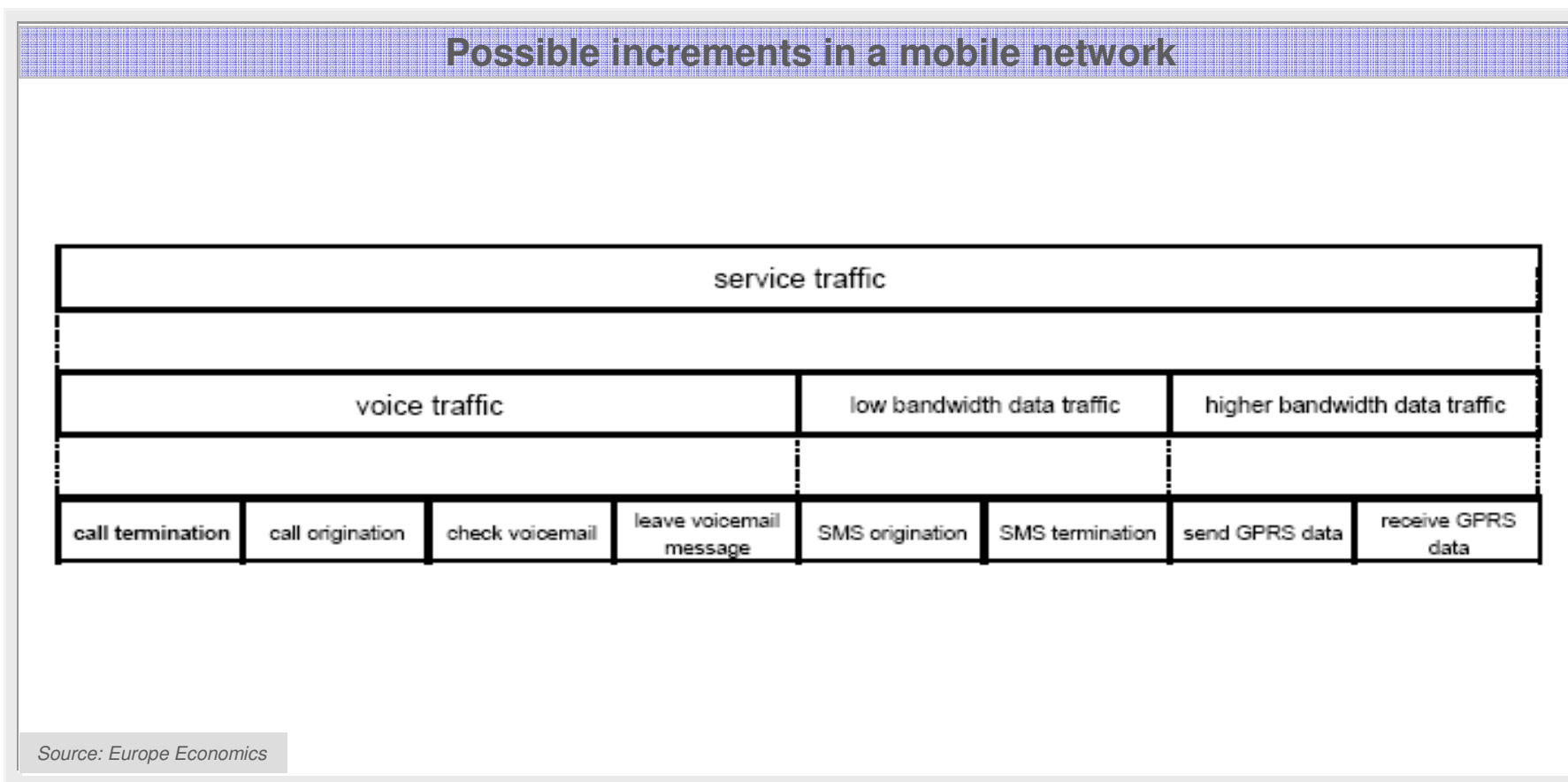


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One key question is the definition of the increment.



One key question is the definition of the increment.



One test is the so called “stand alone criterion”.

Stand alone criterion

- All overhead and joint costs should be checked to see whether they would be avoidable if a service were not offered. For this purpose the so-called “stand alone criterion” is applied. By “stand alone costs” we mean the costs which would be unavoidable if only one specific product or product group were supplied. In the case of interconnection, all costs which an operator would incur if it only offered interconnection come under stand alone costs. Starting from the joint and overhead costs of an operator, which in reality offers more products (e.g. retail services like local and distance calls, or wholesale services like interconnection), every cost item has to be checked with regard to its necessity for interconnection.
- For example, marketing costs (e.g. sponsorship of a sports event) which serve to increase consumer awareness cannot be taken into account when calculating the FL-LRAIC for interconnection fees because these costs are not incurred by supplying interconnection.
- An example of overhead costs which should be taken into consideration are the costs for accounting, in that even a firm which only offered interconnection would incur unavoidable costs for accounting. Therefore a proportion of the cost which is captured by the stand alone cost is added to the interconnection fee in the form of a mark-up.

Source: RTR



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Cost of goodwill should not be included in the calculation.

Goodwill

- includes
 - strategic value of company
 - customer base
 - growth opportunities
- no activity based attribution to interconnection service possible
- **not included** in calculation for mobile termination

Source: RTR



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Cost of marketing should not be included in the calculation.

Marketing

- Marketing is necessary to attract own customers
- for interconnection service no end-user marketing is necessary
- cost of marketing is not included in calculation
- other costs which are not included
 - cost of customer care
 - cost of end-user billing
 - cost of handset subsidies
 - cost of SIM cards

Source: RTR

External effects should not be included in the calculation.

External effects

- Due to interconnection external effects may arise.
- According to a pure application of the stand alone criterion they should not be taken into account in the cost calculation.

Source: RTR



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One important parameter is the rate of return.

Rate of return - general

- Considerations
 - In calculating the reasonable rate of return, which operators notified as having Significant Market Power are allowed to charge in their interconnection tariffs, the use of the Weighted Average Cost of Capital (WACC) formula is widely accepted.
- Principle of implementation and best practice IRG (PIB- principles of implementation and best practice):
 - In calculating the reasonable rate of return IRG considers the application of the WACC formula to be a principle of implementation and best practice.

Source: IRG



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Depreciation plays an important role.

Depreciation - general

- Considerations
- In a FL-LRIC modeling exercise it is necessary to calculate an annualized cost for consumption of capital assets. Consideration needs to be taken of the relevant asset life, an appropriate depreciation period (if different) and, depending on the method of calculation, the cost of capital. It is widely accepted that annualized costs should be calculated on the basis of economic depreciation which would include an appropriate allowance for the cost of capital. While conceptually not difficult, economic depreciation is in practice very difficult to calculate.
- The main problem is that estimating economic depreciation is very information intensive.
- Because of the practical difficulties with calculating economic depreciation more simple approaches are often preferred. However, the yardstick by which these simpler approaches should be judged is how close they are likely to come, given the nature of the asset concerned, to the theoretically correct measure of depreciation.

Source: IRG



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Day 4 – Session 15

Fixed, mobile, universal service, retail models

Fixed vs. mobile interconnection.

Fixed vs. mobile interconnection

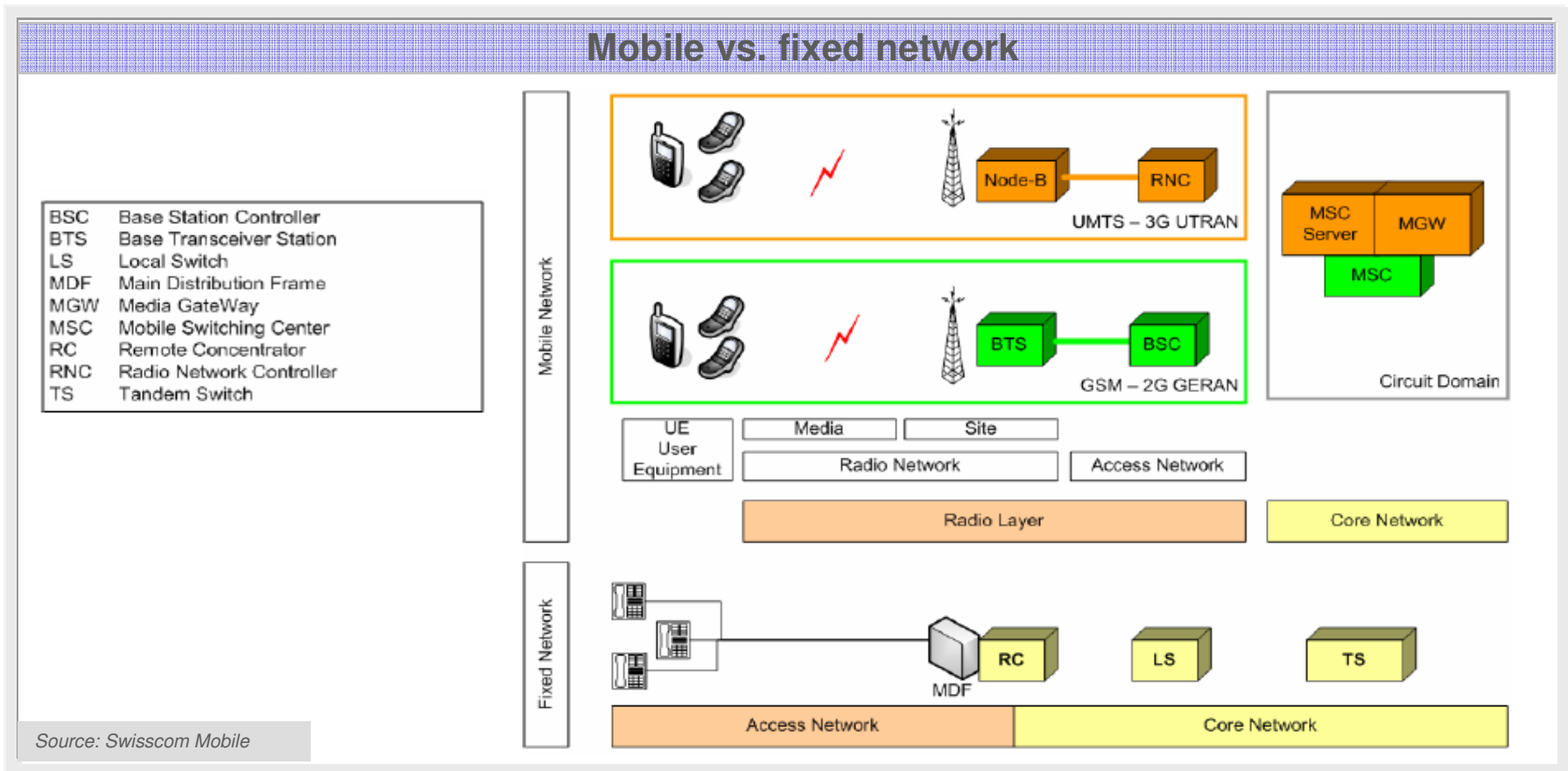
- Mobile issues
 - Frequency fees
 - Capacity
 - Distinction of access and core network
 - Coverage obligations

Source: IRG



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Mobile vs. fixed Network.



.....

For universal service a higher level of detailed analysis is necessary.

Generic universal service obligation cost calculation

- | | | |
|-----|---|---|
| (1) | | Costs of service delivery avoidable if there were no universal service |
| (2) | - | Revenues forgone from these services |
| (3) | = | Direct Net Cost |
| (4) | - | Value of any indirect benefits that flow from being a USO provider |
| (5) | = | Overall Net Cost of Universal Service |

Therefore the

- costs,
- lost revenues and
- advantages

of the provisioning of Universal Services have to be taken into account

Source: RTR



.....

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Model selection.

Strategic issues selection of a model

- Purpose of a model
 - Tariffs
 - End user tariffs
 - Wholesale tariffs
 - Networks
 - Fixed networks
 - Mobile networks
 - Mixed networks
 - Access networks
 - Core networks

Source: RTR



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Model selection.

Strategic issues selection of a model

- Data availability
 - Operator specific vs. general data
- Complexity
 - Data inputs
 - Level of optimization
 - Complexity of existing models & systems
- Availability of expertise and staff
- Availability of budget (open models vs. “customized” models)
- Time frame for the process and results

Source: RTR




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Day 4 – Session 16

Practical experiences

The use of models can vary over time.

Case	Models used in Austria	
■ 03/1998 Interconnection - first decision	➤ Top Down Model (Incumbent - modified)	
■ 07/1999 Unbundling	➤ Bottom Up Model (VAT-Wolf - modified)	
	➤ Top Down Model (Incumbent - modified)	
■ 11/1999 Mobile Interconnection	➤ Top Down (SMPO - modified)	
■ 12/1999 Interconnection 2000 (IC2k)	➤ Bottom Up Model (WIK + TKC)	
	➤ Top Down (Incumbent - modified)	
■ 06/2000 Unbundling 2000	➤ Bottom Up	

Source: RTR

The use of models can vary for different services.

Case

Situation in Austria



- **Retail fix:** ex-ante FL-HC-FDC based on Top down-model of incumbent (annually audited)
- **Wholesale Core** (Interconnection,) Hybrid (middle of adopted TD-Model (CCA-FL-LRAIC) and BU-CCA-FL-LRAIC scorched node Model)
- **Wholesale Access** (ULL) Bottom up-CCA-FL-LRAIC scorched node Model, Incumbent was not able to deliver realistic top down-values)
- **Mobile only wholesale:** Top down adopted
- Special cases: Universal Service Obligation; WLR (Wholesale line rental); Bitstream Access, subscriber database,
- WACC: calculated for each operator (fix and mobile)

Source: RTR



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Different countries use different models.

Case

Models used in Europe 2007



- **Top Down:**
 - Austria, Belgium, Switzerland, Cyprus, Spain, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Malta, Norway, Portugal, Poland, Spain, United Kingdom, Slovenia, Turkey
- **Bottom Up:**
 - Austria, Belgium, Switzerland, Cyprus, Czech republic, Estonia, France, Germany, Greece, Hungary, Ireland, Malta, Netherlands, Romania, Spain, Lithuania, Poland
- **Hybrid:**
 - Finland, Denmark, Hungary, Portugal, Romania, Sweden, Lithuania

Source: RTR



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Different countries use different models.

Case

Models used in Europe 2002 – framework before 2002



	Interconnec- tion	Leased lines	Voice telephony	Unbundled local loop	Accounting separation
B	FL-CCA	HCA	HCA	Not applicable ¹	HCA
DK	HCA	HCA	HCA	HCA	HCA
D	FL-CCA	HCA ¹²	Not applicable ²	FL-CCA	Not applicable ³
EL	(FL-CCA) ⁴	HCA	HCA	(FL-CCA) ⁴	HCA/CCA (mixed)
E	CCA	CCA	CCA	Not applicable ⁵	CCA
F	FL-CCA	FL-HCA	FL-HCA	FL-CCA	HCA
IRL	FL-CCA	FL-HCA	FL-CCA	FL-HCA (Opex)/ FL-CCA (Capex) ⁶	HCA & CCA ⁷
I	FL-CCA	FL-HCA	FL-HCA	FL-HCA	FL-HCA
L	No answer to survey				
NL	FL-CCA	FL-HCA	FL-HCA	FL-CCA	HCA /FL-CCA (mixed)
A	FL-CCA	HCA	HCA	FL-CCA	Not applicable ³
P	FL-HCA	HCA	HCA	Not applicable ⁵	HCA
FIN	Various ⁸	Various	Not applicable ⁹	Not applicable ¹⁰	Various
S	FL-HCA	FL-HCA	FL-HCA	FL-CCA	(FL-HCA) ¹¹
UK	FL-CCA	FL-CCA	FL-CCA	FL-CCA	CCA

Source: Andersen

HCA: Historical Cost Accounting FL-HCA: Forward-Looking costing based on historical costs
CCA: Current Cost Accounting FL-CCA: Forward-Looking costing based on current costs



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Different countries use different models.

Case

Models used in Europe 2002 – framework before 2002



	Interconnec- tion	Leased lines	Voice telephony	Unbundled local loop	Accounting separation
B	FDC	FDC	FDC	Not applicable ¹	FDC
DK	FDC	FDC	FDC	FDC	FDC
D	LRAIC	FDC ¹⁷	Not applicable ²	LRAIC	Not applicable ³
EL	(LRAIC) ⁴	FDC	FDC	(LRAIC) ⁴	FDC / LRAIC (mixed)
E	FDC	FDC	FDC	Not applicable ⁵	FDC
F	LRAIC	FDC	FDC	LRAIC	FDC
IRL	LRAIC	FDC	LRAIC	LRAIC ⁶	FDC & LRAIC ⁷
I	FDC	FDC	FDC	FDC	FDC
L	No answer to survey				
NL	Terminating: LRAIC Originating: EDC	FDC	FDC	EDC	LRAIC/EDC /FDC
A	LRAIC	FDC	FDC ⁸	LRAIC	Not applicable ³
P	FDC	FDC	FDC	Not applicable ⁵	FDC
FIN	Various ⁹	Various ¹⁰	Not applicable ¹¹	Not applicable ¹²	FDC
S	FDC ¹³	FDC ¹³	FDC ¹³	FDC ¹³	(FDC) ¹⁴
UK	Distributed ¹⁵ LRAIC & FDC ⁷	FDC ¹⁶	FDC	LRAIC & FDC ⁷	FDC

FDC: Fully-Distributed Costs EDC: Embedded Direct Costs
LRAIC: Long-Run Average Incremental Costs

Source: Andersen



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Different countries use different models.

Case

Models used in Europe 2002 – framework before 2002



	Bottom-up/ top-down	% Direct costs	Unattributable cost %	Treatment Common costs
<u>B</u>	Top-down	nd	4%	EPMU, number of FTE
<u>DK</u>	Top-down	nd	nd	nd
<u>D</u>	Bottom-up	nd	Not applicable ¹	EPMU
<u>EL</u>	Top-down	12,5%	18%	nd
<u>E</u>	Top-down	nd	10% (maximum imposed)	nd
<u>F</u>	Both	nd	nd	EPMU
<u>IRL</u>	Both	nd	nd	EPMU
<u>I</u>	Top-down	90% of network costs in 1998	< 10% in 1998	EPMU
<u>L</u>	No answer to survey			
<u>NL</u>	Terminating: bottom-up Other: top-down	nd	nd	nd
<u>A</u>	Both	97,65% (top- down)	1,25% (top-down)	nd
<u>P</u>	Top-down	70%	21%	nd
<u>FIN</u>	Various	Various	Various	Various
<u>S</u>	Top-down	nd	nd	nd
<u>UK</u>	Top-down	Nd	1%	Various ²

EPMU: Equal proportional mark-up

nd: not disclosed

Source: Andersen



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Regulation is based on the definition of relevant markets. Practice shows that application of cost accounting systems is different in different markets.

Recommended relevant markets						
18 markets as per recommendation on relevant markets	Retail Fixed Voice	access network residential	connected	Access	1	Retail Fixed Voice
		access network non-residential				
	Retail leased lines	national telephone residential	x	Origination	2	Wholesale Fixed Voice
		international tel. residential	x			
	Wholesale Fixed Voice	national tel. non-residential	x	Termination	3	Wholesale ULL Broadband
		international tel. non-residential	x			
	Wholesale ULL Broadband	minimum set of leased lines	x	Unbundling	4	Wholesale Leased lines
		call origination fixed		Bitstream	5	
	Wholesale Leased lines	termination on individual networks		Terminating Segments	6	Wholesale Mobile
		transit fixed	x	Termination	7	
	Wholesale Mobile	unbundled access				Wholesale Radio/TV
		broadband access				
	Wholesale Radio/TV	terminating segments				
		trunk segments	x			
		access and call origination				
		call termination				
		International Roaming	x			
		Broadcasting	x			

7 markets as per latest recommendation



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For access services FDC is still the most used methodology.

Case


Retail access services – models used

(Colours code: **increasing** **decreasing** **stable**)

Market	Number of countries with some kind of price control and/or accounting obligation so far	Most common Cost Base	Most common Accounting Methodology	Most common Price Control Method	Summary
Market 1 Fixed Call Access Residential	19	53% CCA 37% HCA	74% FDC	37% Cost Orientation	Beside Cost Orientation, Price Cap (37%) is widely accepted. A few countries don't have any regulation on this market or only regulation on Wholesale Line Rental.
Market 2 Fixed Call Access Non- Residential	17	35% HCA 35% CCA	65% FDC	35% Cost Orientation 33% Price Cap	Beside Cost Orientation, Price Cap is widely accepted. A few countries don't have any regulation on this market or only regulation on Wholesale Line Rental.


Source: IRG

For retail call services FDC is still the most used methodology.

Case	Retail call services – models used					
Market 3 National fixed services residential	15	47% CCA	73% FDC	54% Price Cap 33% Cost Orientation	Price Cap and Cost Orientation are mostly employed. A few countries don't have any regulation on this market.	
Market 4 International fixed Services Residential	10	50% CCA	70% FDC	40% Others	Price Cap and Cost Orientation are employed. More countries than in Mkt 1-3 don't have any regulation on this market.	
Market 5 National fixed Services Non-Residential	12	42% CCA	67% FDC	42% Cost Orientation	Beside Cost Orientation, Price Cap and Other Methods are more and more accepted. A few countries don't have any regulation on this market.	
Market 6 International fixed Services Non-Residential	10	40% HCA	60% FDC	40% Cost Orientation	This market is the most competitive, in many countries there is no regulation in place due to effective competition.	

Source: IRG


For fixed termination services LRIC is the most used methodology.

Case	Fixed termination services – models used				
Market 8 Wholesale Fixed Call Origination	23	83% CCA	57% LRIC 35% FDC	83% Cost Orientation	
Market 9 Wholesale Fixed Call Termination	23	83% CCA	57% LRIC/LRAIC	78% Cost Orientation	

Source: IRG



For unbundling services LRIC is the most used methodology.

Case	Unbundling services – models used					
Market 11 Unbundled Access	24	58% CCA	50% LRIC/LRAIC 33% FDC	67% Cost Orientation	In most countries regulation in place.	
Market 12 Broadband Access Wholesale	18	44% CCA 33% HCA	39% FDC	44% Retail Minus 44 % Cost Orientation	Retail Minus surpassed Cost Orientation which is always very common anyway.	

Source: IRG

For mobile termination services the trend is LRIC.

Case	Mobile termination services – models used				
Market 16 Wholesale Mobile Call Termination	22	55% CCA	41% LRIC/LRAIC 36% FDC	55% Cost Orientation	

Source: IRG

