Memorandum

Draft Reconciliation Report: Top-down model vs Bottom-up LRAIC model v2.5.0

1 Summary

The reconciliation of the top-down model provided by TDC and the bottom-up model produced by NITA forms an important part of the process of creating a hybrid LRAIC model which reflects the costs of an efficient SMP operator in Denmark.

However, in this revision of the hybrid model, some far-reaching changes were made which created difficulties in reconciling costs between the TD and BU models. In version 2.5 of the LRAIC model, the traditional core TDM infrastructure has been replaced by an all IP-based network, which is deemed to be the modern equivalent asset in an NGN environment. As a result, many of the technical products in the top-down model no longer have direct equivalents in the bottom-up model. By the same token, where IP equipment is currently deployed in TDC's network, this is on a much lower scale than that presumed in the BU model since it does not as yet convey the bulk of voice (and data) traffic. So even though both models include media gateways, VoIP session border controllers or softswitches, assumed equipment and traffic volumes will not be comparable.

Moreover, the TD model is based on demand volumes for 2007, the basis for the 2008 regulatory accounts, while the data in the BU model has since been updated to 2008 volumes. Due to these factors, NITA found that a detailed product-level reconciliation did not yield any meaningful results, as it was effectively comparing apples and pears. Therefore, the analysis has been performed at an aggregated cost level, based on a comparison of network element costs rather than product costs.

For the purposes of this reconciliation, costs have been grouped into the following broad cost pools:

Access

- Trench, duct, civil works
- Copper cable
- Fibre cable
- Distribution points
- NTPs

Core

- Trenching, cabling
- Transmission equipment
- Exchange equipment

Colo & Other

- Housing, racks
- Cabling
- Power
- BSA-related
- Raw copper-related
- IC-related

For each category, a comparison was made of gross replacement costs (GRC) as well as annual costs based on annualised GRC, direct opex and indirect opex.

A summary of the reconciliation results is shown below:

Summary

	Top down DKK	Bottom up DKK	Variance BU / TD
GRC	**30,020,851,523**	**33,060,905,786**	**110%**
Annualised GRC	3,663,878,380	2,239,509,626	61%
Direct opex	2,694,226,840	1,539,503,820	57%
Indirect opex	903,924,725	671,592,646	74%
Total annual costs	**7,262,029,945**	**4,450,606,091**	**61%**
Expensed capex	-	1,778,545,277	
Annual & expensed	**7,262,029,945**	**6,229,151,369**	**86%**

Notes
TD: Extraordinary costs are included in direct opex
TD: Accommodation, power & aircon costs are included in annualised GRC but not GRC
BU: Common site costs are included in direct opex

On a GRC basis, the BU model values assets at 10% higher than the TD model. It should be noted that not all cost categories in the TD model have been assigned GRC values. The missing items are worth an estimated DKK 710 million in GRC terms, based on their annualised GRC, which would reduce the difference between the two models to 8%. The main explanation for the variance, however, is likely to be found in the different interpretations of the Modern Equivalent Asset (MEA) principle in the two models. While the BU model has replaced the entire core network with an IP-based infrastructure, the TD model still retains elements of its existing SDH platform as the MEA for older technologies such as ATM and DXX. As a result, the reconciliation ends up comparing two rather different asset bases with correspondingly different valuations.

On an annual basis, including expensed capex, the BU model costs are 14% below the TD costs included in the reconciliation (approx 95% of total costs in the TD model). The lower annual cost is largely due to the deployment of more efficient assets in the BU model, based on a single platform, rather than various legacy networks included in the TD model, with associated higher maintenance costs.

The reconciliation results for total annual costs, including expensed capex, are shown below:

	Top down	Bottom up	Variance
	Total annual cost	Total annual cost	Total annual cost
	DKK	DKK	BU / TD
Access			
Trench, duct, civil works	[redacted]	1,464,126,256	[redacted]
Copper cable		462,441,127	
Fibre cable		36,757,915	
Distribution points		122,705,819	
NTP		2,012,105,886	
Access other	-	(5,326,279)	
Total	**3,913,154,242**	**4,092,810,724**	**105%**
Core			
Trenching, cabling	[redacted]	464,527,399	[redacted]
Transmission equipment		184,292,869	
Exchange equipment		1,212,361,503	
Core other		97,375,149	
Total	**2,542,637,024**	**1,958,556,921**	**77%**
Colo & Other			
Housing, racks	[redacted]	18,709,321	[redacted]
Cabling		25,466,680	
Power		20,379,783	
BSA-related		30,229,153	
Raw copper-related		65,536,118	
IC-related		11,614,070	
Other		5,848,599	
Total	**806,238,679**	**177,783,724**	**22%**
Total all network models	**7,262,029,945**	**6,229,151,369**	**86%**

A detailed examination of the individual network models is provided in Sections 4 and 5 of this report, following an overview of the reconciliation methodology and scope in Section 2, and a discussion of costing methods and network sizing in Section 3.

The document concludes with a review of compliance with the common and top down guidelines set out in the Model Reference Paper published by NITA in 2008. This is provided in Sections 6 to 8.

Contents

2 Introduction

2.1 Method and Scope of Reconciliation

As part of the LRAIC modelling and consultation process, the top-down model delivered by TDC on 19 January 2009 was reconciled with the draft bottom-up model released by NITA in January 2009 (v2.5.0), which together will make up the Draft LRAIC Hybrid model.

The reconciliation has been performed mainly at the input, rather than output level, for two reasons. First, gross replacement costs are provided for network elements (or inputs) only, making a GRC comparison at product (or output) level unfeasible. Second, in version 2.5 of the LRAIC model, the traditional core TDM infrastructure has been replaced by an all IP-based network, which is deemed to be the modern equivalent asset in an NGN environment. As a result, many of the technical products in the top-down model no longer have direct equivalents in the bottom-up model, or assume very different volumes. Moreover, the TD model uses demand volumes for 2007, the basis for the 2008 regulatory accounts, while the BU model v2.5.0 uses 2008 volumes.

Due to these factors, NITA found that a detailed product-level reconciliation did not yield any meaningful results, as it was effectively comparing apples and pears. Therefore, the analysis has been performed at an aggregated cost level, based on a comparison of network element costs rather than product costs. While these still differ significantly (for example, the BU model no longer contains network elements for SDH), costs at this level can be analysed within broad categories, such as cabling, trenching, transmission or exchange equipment, even though they may be based on different technologies.

2.2 Cost Categories

Costs have been grouped into the following cost pools:

Access
- Trench, duct, civil works
- Copper cable
- Fibre cable
- Distribution points
- NTPs

Core
- Trenching, cabling
- Transmission equipment
- Exchange equipment

Colo & Other
- Housing, racks
- Cabling
- Power
- BSA-related
- Raw copper-related
- IC-related

For each category, a comparison was made of GRC costs as well as annual costs based on annualised GRC, direct opex and indirect opex.

The splits between Access, Core and Colocation are based on the individual feeder models that make up the BU model and are before reallocation of some network element costs from Core to Access. For ease of modelling, some access equipment, such as POTS line cards and MDF, is included in the Core model and reallocated to Access in the Consolidation model. The costs in the reconciliation retain the original modelling structure where line cards are included in Core. This was done so that the BU costs in the reconciliation can be compared directly to the aggregate costs in the Consolidation model, C_Services, before they are allocated to individual products. The division of costs into Core and Access is therefore somewhat arbitrary and should be seen as a convenient classification rather than a precise definition of the relevant LRAIC increment.

3 Comparison of Costing Methods and Volumes

Some of the differences between costs in the TD and BU models can be attributed to the way in which costs have been allocated to network elements, and to different assumptions regarding network size and utilisation.

3.1 Cost Approach in the TD model

The top-down model contains a number of options which allow the user to inspect costs based on Current Cost Accounting (CCA) principles, Gross Replacement Costs (GRC) or annualised GRC. The reconciliation is based on a comparison of GRC rather than CCA costs, as this reflects the capital expenditure in the BU model.

Annualised GRC in the TD model is based on tilted annuities. The BU model includes a number of different annualisation options, including straight line depreciation, standard and tilted annuities and economic depreciation. To make the comparison between TD and BU meaningful, all assets in the BU model have been annualised based on tilted annuities for this exercise.

In accordance with the MRP guidelines, the TD model uses a cost of capital of 9.5%, but has made this an input that can be modified by the user. For this exercise, the WACC in the TD has been changed to 8% to make it consistent with the BU model. As TDC have pointed out in their documentation, any changes in WACC will not feed through into the CCA calculations, but since the reconciliation has focused on GRC rather than CCA this is immaterial.

The cost inputs for network elements in the top down model are partly exogenous and partly endogenous to the model, ie. some network element costs are calculated by the model rather than based on direct user inputs. For the purposes of this reconciliation, endogenous network element costs have not been included since they are composed of inputs from other network elements and would otherwise lead to double-counting. As a result, in some instances the TD network elements are broader than the BU network elements. For the most part, however, the TD costs are more disaggregated than the costs used in the BU model, since top-down costs are derived from in-house cost accounting systems which are much more detailed than typical cost break-downs used in bottom-up models.

3.2 Network Sizing

In general terms, the network sizing of the two models ought to be consistent as they are both intended to cover the same broad scale and scope – that of a national incumbent multi-service telecommunications operator in Denmark. Within the BU model, the network sizing is relatively explicit, this being the nature of such models. However, within the TD model this is not the case. This is for two reasons:

- The underlying assumption of a TD model is to include what is there, except where explicit adjustments are made.
- The actual TD model delivered by TDC actually commences part way down the overall top-down cost allocation process, in that it starts with costs that have already been allocated to individual network elements. Furthermore, no quantity information for those network elements is included within the TD model.

For the above reasons, it is only possible to draw network sizing comparisons by exploring the documentation provided alongside the TD model.

Two specific network sizing quantities are referred to in the TD model documentation: km of core fibre; and numbers of copper pairs.

With regard to the first of these, the TD model documentation states that the number of core fibre km (taken by NITA to refer to trench km plus underwater cable km) used within the model is 16,725 km, representing a 12.9% reduction in the actual number in TDC's network today. Within version 2.5.0 of the BU model the total is 14,454 km. This results in a variance of only 116%.

With regard to the number of copper pairs, the TD model documentation states that 2,585,163 pairs are in use with an assumed utilisation of 65%. This indicates that the TD model costs are based on 3,977,174 pairs. Within version 2.5.0 of the BU model, the number of pairs in use is 2,403,735 pairs representing a variance of only 107.5%. The degree of utilisation varies in the BU model depending on where the cable is situated in the access network.

Location in network	Total pairs costed	Pairs in use	Utilisation
ASM-PDP	3,236,289	2,403,735	74%
PDP-SDP	3,354,564	2,403,735	72%
SDP-NTP	5,176,639	2,403,735	46%

4 Gross Replacement Cost

The TD model provides a single cost figure for GRC, which excludes costs of housing, power, ventilation etc. These latter costs are captured by the annualised GRC category (see Section 5 below). The TD model further includes a column for extraordinary costs, which is a contingency for unforeseen expenditure. For the purposes of the reconciliation, these costs have been added to direct opex. The TD documentation further states that capitalised operating costs have been included in GRC and that opex has been corrected accordingly to avoid double-counting.

Some network elements in the TD model are based on technology that is now outdated and from an MEA perspective would no longer be modelled, such as ATM and DXX platforms. These have not been assigned any gross replacement values by TDC and instead other NEs have been dimensioned to carry the additional volume of traffic. Also, the number of SDH elements has been reduced in order to reflect a forward looking network. However, these platforms still account for a significant share of operational expenditure. As there are no direct equivalents in the BU model, these costs can be reconciled only within a broad cost pool, such as Transmission.

The BU model calculates two separate elements of capital expenditure: Equipment and Installation. These have been added together for comparison with the top-down GRC figures. Common site costs such as security, site preparation and backup power have been added to GRC where applicable.

4.1 Civil Works and Cabling

The results of the reconciliation are shown below:

	Top down	Bottom up	Variance
	GRC	GRC	GRC
	DKK	DKK	BU / TD
Access	[redacted]		[redacted]
Trench, duct, civil works		20,615,934,831	
Copper cable		4,543,577,160	
Fibre cable		112,424,551	
Total		**25,271,936,543**	**107%**
Core			
Trenching, cabling	**1,997,802,458**	**2,736,124,456**	**137%**

4.1.1 Access network

The TD model does not provide separate GRC or annual costs for trench and duct, cabling, splitters and network termination points in the access network. These costs are included in two very large network elements:

	GRC	Direct opex	Indirect opex	Annualised GRC	Extraordinary costs
NE0001 - AC_KOBBERPAR	[redacted]				
NE0012 - AC_FIBERPAR					

However, TDC's regulated accounts show the following GRC breakdown for NE0001 – AC_Kobberpar (in DKK million):

Trench, ASM-PDP-SDP	[redacted]
Trench, SDP-NTP	
Copper cable, ASM-PDP-SDP	
Copper cable, SDP-NTP	
Cable installation	
Distribution points	
Cross connect	
NTP	
Planning cost	

This breakdown has been used in the reconciliation to separate out cabling, trenching, DP and NTP costs. Planning costs, which have no equivalent cost pool in the reconciliation, have been added to the largest category, trenching. Opex and annualised GRC have been split in the same proportion as GRC.

In the absence of any detailed information on NE0012 – AC_Fiberpar, these costs have been split into trench, cabling and NTP in the same proportions as for AC_Kobberpar. This method is not likely to produce fully realistic results, but given the lack of detail in the TD data provided, it has been necessary to rely on estimates.

The combined total for trenching, copper and fibre cable in the TD model is [redacted] below the equivalent total in the BU model, at DKK [redacted]TD) compared with DKK 25.3 million (BU). At closer inspection of the figures, NITA found that the price per metre for deploying fibre in the access network is rather moderate, which indicates that it might be sharing trench cost with the copper model. However, since assumptions on trenching and ducting distances are not transparent enough, it is not possible to judge if similar principles have been adopted.

4.1.2 Core network

There is a significant difference in GRC for core trenching and cabling between the two models. Even though TDC have maintained that the trench analysis carried out by NITA produced superoptimal trenching distances resulting in unrealistically low costs, the BU costs for the national fibre network, including digging, are in fact 37% higher than those shown in the TD model. One reason for this may be the different allocation of installation costs. According to TDC, the network installation costs regarding copper backbone are assigned directly to the SDH model instead of passing through the Fibre network model. In the absence of further information, however, NITA has been unable to evaluate the impact of this allocation, or to identify other obvious explanations for the discrepancy.

4.2 Distribution Points and NTPs

	Top down	Bottom up	Variance
	GRC	GRC	GRC
	DKK	DKK	BU / TD
Access			
Distribution points	[redacted]	765,224,739	[redacted]
NTP		1,655,560,237	
Total	**1,852,598,926**	**2,420,784,977**	**131%**

The main difference here is in the cost attributed to network distribution points (NTPs). The bottom-up figure is much higher since it contains installation costs for PSTN, ISDN and ADSL which in the TD model are annualised or included in direct opex. The BU model does not annualise these costs but instead treats them as expenses (see Section 5.1 below).

The table below gives a comparison where the expensed BU installation costs are shown separately. If the corresponding direct opex items are added into the TD costs, the total cost pool in the BU model is in fact 5% below that of the TD model.

	Top down	Bottom up	Variance
	GRC	GRC	GRC
	DKK	DKK	BU / TD
Access			
Distribution points	[redacted]	765,224,739	[redacted]
NTP equipment & installation (to be annualised)		249,170,435	
NTP installation (to be expensed)	-	1,406,389,803	
Access installation included in direct opex*	[redacted]	-	
Total	**2,554,421,447**	**2,420,784,977**	**95%**

*calculated as the excess of TD direct opex over BU in the Access model

4.3 Transmission and Switching

	Top down	Bottom up	Variance
	GRC	GRC	GRC
	DKK	DKK	BU / TD
Core			
Transmission equipment	[redacted]	342,814,769	[redacted]
Exchange equipment		2,145,158,236	
Total	**2,611,072,332**	**2,487,973,005**	**95%**

Transmission and switching should be considered jointly, since the demarcation lines between them have become rather blurred in the NGN scenario envisioned by the BU model. Taken together, the respective cost pools are very close, with the TD model costs just 5% above the BU model. Given the higher efficiency of the single IP platform modelled in the bottom-up scenario, compared with multiple legacy platforms in the top-down model, a much larger variance might be expected. However, TDC have indicated that in order to comply with the MEA requirements in the MRP, gross replacement costs for obsolete platforms such as ATM and DXX have been reallocated to IP and Ethernet platforms, and SDH network elements have been scaled down, which will have reduced TDC's existing cost base. Moreover, TDC have not provided GRC values for a number of miscellaneous costs relating to wholesale services and installation, even though these have been assigned annualised GRC values. The missing GRC total in the core network segment is estimated to be worth around DKK 235 million.

It should be noted that a direct comparison of individual network elements has not been possible, given the different technologies modelled. Where IP equipment is currently deployed in TDC's network, this is on a much lower scale than that presumed in the BU model since it does not as yet convey the bulk of voice (and data) traffic. So even though both models include media gateways, VoIP session border controllers or softswitches, assumed equipment and traffic volumes will not be comparable.

4.4 Co-location and Other Services

Only a limited number of co-location network elements have been included in the TD model, therefore it has not been possible to perform a full reconciliation at network element level. Where costs have been provided, these are for opex and annualised GRC only. As a result, no reconciliation has been carried out for GRC costs.

5 Annual Costs

In the TD model, annual costs consist of the following elements:

- Annualised GRC
- Direct Opex
- Indirect Opex

A supplement is added to annualised GRC to take account of software, housing, power, ventilation etc, which are not captured by the Gross Replacement Costs. In aggregate, the supplement is worth DKK 365 million, roughly 10% of total annualised GRC. There are, however, significant differences in the relative size of the mark-up for different asset classes. In the Copper model, the supplement adds between 1-4% to annualised GRC, whereas in the Switching model it is a much more significant element of A-GRC, in some cases making up the bulk of the cost. This is shown in the table below, which is an extract from the TD model.

Network Element - TD model		A-GRC	GRC (medio 2007)	A-GRC supplement	Supplement as % Mark-up on A-GRC
NE0015 - SW_RSS/SSS	Subscriber stage	[redacted]			
NE0016 - SW_LX_TRAFFIC	Local switch				
NE0297 - SW_LX_CALL	Local switch				
NE0017 - SW_TX_TRAFFIC	Transit switch				
NE0298 - SW_TX_CALL	Transit switch				
NE0027 - SW_PSTN_PORT	Line card plus share of subscriber stage				
NE0029 - SW_ISDN2_PORT	Line card plus share of subscriber stage				
NE0032 - SW_ISDN30_PORT	Line cards (incl. customer chain) plus share of subscriber st				
NE0020 - SW_INT_TRAFFIC	Int'l switches				
NE0300 - SW_INT_CALL	Int'l switches				
NE0240 - SW_30_GRUPPER	For IC 30 group subscription				

In the BU model, the costs of housing, power and ventilation are included in direct opex (see Section 5.3 below).

Operating expenditure is divided into direct and indirect opex. Indirect costs are non-network costs relating to common overhead, working capital, etc, which are allocated to products via mark-ups as no direct cost causality can be established.

In the BU model, not all capex is annualised. Instead, about 85% of capex in the Co-location model and 6% of capex in the Access model is expensed, ie. treated as one-off costs. These costs relate primarily to installation of NTPs, bitstream access and raw copper. Expensed capex is shown separately in the reconciliation and should be considered alongside annualised capex, though a direct comparison is not valid given that it includes the full amount of GRC rather than the 'year-one' annualised cost.

5.1 Annualised Capex

Annualised gross replacement costs in both models are calculated by applying a tilted annuity. Given that the LRAIC model is a one-year model, only the first year figure is used. This is sensitive to input variables such as cost of capital, asset lifetimes and price trends as well as original asset values. The reconciliation has corrected for cost of capital effects by setting WACC at 8% for both models; however, differences in asset lives and price trends remain important factors.

The results of the reconciliation are shown below:

	Top down Annualised GRC DKK	Bottom up Annualised GRC DKK	Bottom up Expensed GRC DKK	Variance Annualised GRC BU / TD
Access				
Trench, duct, civil works	[redacted]	1,220,208,288	-	[redacted]
Copper cable		291,334,472	-	
Fibre cable		15,832,741	1,434	
Distribution points		84,486,648	-	
NTP		-	1,655,560,237	
Total	**2,463,890,691**	**1,611,862,148**	**1,655,561,672**	**133%**
Core				
Trenching, cabling	[redacted]	213,014,457	-	[redacted]
Transmission equipment		72,816,813	-	
Exchange equipment		337,879,820	-	
Core other		-	-	
Total	**1,049,415,686**	**623,711,089**	-	**59%**
Total	**3,513,306,377**		**3,891,134,909**	**111%**

Annualised GRC of Access trench and duct is lower in the BU model, even though the original asset value is 10% above that of the TD model. This is principally due to two reasons:

- The TD model assumes an asset life of 20 years for Kobberpar and Fiberpar, the network elements containing trench costs, while the BU model assumes 40 years for ducted trench and 20 years for cable and non-ducted trench. Hence, the BU 'year-one' cost will be more heavily discounted than the equivalent TD cost.

- The TD figure includes an A-GRC supplement, worth about DKK 53 million, for housing, power and ventilation. In the BU model, these costs are included in direct opex.

The significant difference in A-GRC for copper cable can be explained by the different treatment of installation costs. In the reconciliation, some installation and materials costs are included in the TD copper cable cost pool, but with a shorter economic life of 3-5 years. In the BU model, materials are included in copper costs but installation is expensed and included in NTP costs (worth DKK 1,655 million undiscounted). Due to the different cost allocations and annualisation treatments, it is not really possible to compare like with like (though an attempt has been made in Section 5.2.1 below).

Further differences arise from different assumptions regarding price trends. The BU model (v2.5.0) applies a 6% price increase to copper pair, while the TD model assumes 5% for the copper element and 0%-2% for the installation and materials element.

The table below shows how the TD annualised figure is calculated. If the TD copper cable cost pool, including installation and materials, had been annualised in full over 20 years at a 6% price trend, the corresponding annualised GRC would be comparable to the

BU cost, at DKK 320 million (NB. the difference in variance between GRC and A-GRC is caused by the A-GRC supplement).

	GRC	Asset life	Price trend	A-GRC*
TD costs	DKK m			DKK m
Copper	[redacted]			
Installation - PSTN				
Installation - ISDN2				
Installation - ADSL				
TD 'What if' result				
BU				
Variance (BU/TD)				
*incl. A-GRC supplement				

On that basis, the annualised TD value for copper cable is only 9% higher than the annualised BU value.

Variances in the annualised costs of core transmission and switching are again mainly due to different assumptions regarding economic lifetimes and price trends. This is unsurprising, given the different technologies deployed.

5.2 Opex

Direct opex refers to network-related expenditure such as network management, maintenance and planning and, in the BU model, includes costs of accommodation, power and air-conditioning. In the TD model, these latter costs are shown separately as an 'A-GRC supplement' and included in TDC's annualised GRC figures. It should be noted, therefore, that there is some overlap between the annualised GRC and direct opex cost categories, and a comparison between TD and BU will be more meaningful if they are considered in combination.

In the BU model, common site costs such as security, site preparation or backup power have been annualised and added to direct opex.

Indirect opex is shown as a separate column in the TD model to account for allocations of common overheads, such as corporate management, finance, IT, etc. In the BU model, these costs are not included in network element costs but are allocated to unit costs at the product level via a number of mark-ups. These mark-ups comprise:

- Common business costs (Corporate overheads, Human Resources, Finance, Support systems, Administration)
- Working capital
- IC specific and commercial costs (Customer oriented costs, Billing, Debtor handling, Other IC specific costs)

In the reconciliation, common business costs have been allocated to network elements via the same mark-up used in the BU model. IC specific and commercial costs are shown as a separate category in indirect opex (under 'Other').

In the actual BU model, working capital is allocated via uplifts which have been added to the mark-ups for common business costs. In the reconciliation, BU working capital is shown separately, as the allocation in both the BU and TD models is performed at product rather than network element level. It is in essence a redistribution of indirect opex from Access to Core. This is because raw copper is prepaid quarterly, creating an increase in cash, while interconnection services are paid in arrears, thereby 'locking up' cash.

The assumptions used in the two models are as follows:

	Top down	Bottom up
Debtor days		
Access	**-15**	**-15**
Core	**105**	**85**

If debtor days in the bottom-up model were to be adjusted upwards from 85 to 105, the cost of working capital would almost double from DKK 8.8 million to DKK 16.3 million.

5.2.1 Direct Opex

It has been difficult to perform a detailed opex reconciliation, as the two models do not adopt the same approach to the treatment of costs which cannot be allocated to network elements (or technical products) on the basis of cost causality. These additional costs account for over half of direct opex in the TD model, as shown below:

Top-Down Model	**Direct opex***
	DKK
Allocated to Technical Products	1,542,365,489
Wholesale	219,942,810
Installation	614,089,914
Infrastructure network elements	184,471,016
Infrastructure support functions	530,989,561
Staff functions	137,497,851
Debitor working capital	(4,269,407)
Sum of Costs	**3,225,087,233**
Not allocated to TP	**1,682,721,745**

*incl. extraordinary costs

The BU model, by contrast, treats such costs as indirect opex, broken down as follows:

Bottom-Up Model	**Indirect opex**
	DKK
Total non-network costs (Overheads)	577,142,271
IC costs	88,030,076
Less non-regulated wholesale	(2,401,504)
Working capital	8,821,802
	671,592,646

In addition to the direct opex costs shown above, the TD model includes indirect opex, worth DKK 904 million. According to the model documentation, "indirect costs are typically management fees, financial services, staff functions, IT etc. which have been isolated from the total operational cost pool." The documentation or the model calculations do not make it clear, however, whether the indirect cost pool is in fact included in the direct opex figures above and reallocated to network elements as indirect opex, or whether the indirect costs are separate exogenous inputs. The reconciliation has assumed the latter, though NITA would welcome further clarification of this issue.

The TD figures further appear to include some direct opex for activities that have not been modelled in the BU model, such as infrastructure support relating to mobile networks or International Holdings. These costs, worth DKK [redacted] million, have therefore been excluded from the reconciliation. An attempt has been made to find BU equivalents for the remaining unallocated cost categories, though the information provided in the TD model and documentation has not been sufficient to permit a solid analysis and interpretation of these additional costs.

The reconciliation results for direct opex are shown in the table below.

	Top down	Bottom up	Variance
	Direct opex	Direct opex	Direct opex
	DKK	DKK	BU / TD
Access			
Trench, duct, civil works	[redacted]	55,263,610	[redacted]
Copper cable		111,520,582	
Fibre cable		16,187,625	
Distribution points		22,408,385	
NTP		310,604,330	
Total	**1,217,807,053**	**515,984,532**	**42%**
Core			
Trenching, cabling	[redacted]	191,658,051	[redacted]
Transmission equipment		87,729,708	
Exchange equipment		718,267,505	
Core other		-	
Total	**986,810,254**	**997,655,263**	**101%**
Colo & Other			
Housing, racks	[redacted]		
Cabling			
Power			
BSA-related			
Raw copper-related			
IC-related			
Other			
Total	**489,609,533**	**25,864,024**	**5%**
Total all network models	**2,694,226,840**	**1,539,503,820**	**57%**

The variance in direct opex in the Access model can be explained by the different treatment of installation costs, which in the BU model have been expensed, as mentioned previously – see Section 4.2 for a discussion of opex in the Access Network. In aggregate, both models are closely matched, as shown in the table below. This suggests that discrepancies are due to different ways of accounting for costs (GRC, expensed GRC, direct opex), and to different boundaries between GRC and operating expenses, rather than any real differences in the networks modelled.

Memorandum

	Top down	Bottom up	Variance
	GRC, Opex	GRC, Opex	GRC, Opex
	DKK	DKK	BU / TD
Access			
Access GRC (to be annualised)	2,463,890,691	1,611,862,148	65%
Access equipment (Direct opex)	515,984,532	515,984,532	100%
Access installation (Direct opex)*	701,822,521	-	
Access installation (expensed)	-	1,655,561,672	
Total	**3,681,697,744**	**3,783,408,352**	**103%**
*Residual after matching BU equipment opex			

It should also be noted that some of the opex allocations in the TD model, for example for trenching and cabling, are based on estimates (see Section 4.1.1) and should therefore be considered within broader, rather than narrow, cost pools.

In the Core model, even though there are discrepancies between direct opex allocated to individual cost pools, in aggregate the TD and BU costs are closely matched.

Some costs included in TD Access and Core have no direct equivalents in the BU model, given the different technologies deployed and the different allocation methodologies, and have been grouped together in the Colo & Other increment under 'Other' for convenience. This amounts to DKK [redacted] million. The TD model further includes DKK [redacted] million of opex related to BSA and raw copper installation. This corresponds to DKK 83 million of expensed capex in the BU model, though a comprehensive comparison of bitstream and LLU costs has not been possible due to lack of more detailed information.

5.2.2 Overheads

Indirect opex, which comprises common business costs and working capital, is substantially higher in the TD model. The costs should be considered in aggregate, as some of the TD costs shown under 'Other' in the Colo & Other increment can be matched to some costs contained in 'Core other'. Given that indirect opex is an arbitrary allocation of common costs, it is in any case not very meaningful to consider individual cost categories in isolation.

As mentioned previously, the two models adopt different approaches to the treatment of direct and indirect opex, and some of the costs included in BU indirect opex are shown as direct opex in the TD model (see Section 5.2.1 above).

The two models also differ in their treatment of working capital. In the BU model, this is included in the Access and Core increments under indirect opex, while the TD model shows working capital as a stand-alone costs category. The two WC cost pools are not comparable, however, as the TD model provides figures for the cost of Debtor Capital and Stock only, while the WC figure in the BU model also includes Creditors and Cash.

The remaining discrepancies between TD and BU overheads must presumably be attributed to different FTE assumptions. However, due to insufficient information about TDC staff numbers within individual functional areas, a more detailed reconciliation and review of indirect opex and overheads has not been possible.

Reconciliation results for indirect opex:

	Top down	Bottom up	Variance
	Indirect opex	Indirect opex	Indirect opex
	DKK	DKK	BU / TD
Access	[redacted]		[redacted]
Trench, duct, civil works		188,654,358	
Copper cable		59,586,073	
Fibre cable		4,736,115	
Distribution points		15,810,786	
NTP		45,941,318	
Access other		(5,326,279)	
Total	**231,456,497**	**309,402,372**	**134%**
Core	[redacted]		[redacted]
Trenching, cabling		59,854,892	
Transmission equipment		23,746,349	
Exchange equipment		156,214,179	
Core other		97,375,149	
Total	**506,411,085**	**337,190,569**	**67%**
Colo & Other	[redacted]		[redacted]
Housing, racks		2,410,718	
Cabling		3,281,411	
Power		2,625,959	
BSA-related		3,895,061	
Raw copper-related		8,444,404	
IC-related		1,496,486	
Other		2,845,666	
Total	**166,057,142**	**24,999,705**	**15%**
Total	**903,924,725**	**671,592,646**	**74%**

6 Compliance Report

The following sections present NITA's assessment of the top-down model's compliance with the Criteria set out in the Model Reference Paper (MRP). Where appropriate, reference is made to TDC's own assessment of criteria compliance in addition to the view/response of NITA.

6.1 Status of TDC Submission

TDC initially submitted their Top-Down model on 19th January 2009. A revised version was provided on 6th February 2009 and additional supporting data on co-location were provided on 28th February 2009.

6.2 Key to Symbols Used in Table

✓	indicates that the model complies with the criteria
÷	indicates that the model does not comply with the criteria
?	indicates that it has not yet been possible to determine compliance
( )	modifies the symbol meaning [(✓) almost complies; (÷) hardly complies]

In some instances two symbols have been included. This is because some criteria can be considered as two parts which may have differing levels of compliance. For each criterion which is wholly or partially non-compliant a statement is made as to whether such non-compliance is considered a problem and any remedial action which is required. In order to ensure that timescales are not compromised, remedial actions have only been specified where essential.

7 Common Guidelines

Criterion	Description	Compliance Status	Remarks from TDCs comments appear in the upper box NITAs comments appear in the lower box
CG1	For shared costs where some degree of cost causality can be established, they should be recovered in a manner that reflects that causality (that is, on the basis of proportionate usage). For remaining common costs, the default should be to use equi-proportionate mark-ups. Where justifiable, the equi-proportionate mark-ups can be applied in a number of steps – for example, marking up for wholesale and retail billing costs prior to marking up for central corporate overheads.	?	TDC: The TD model uses same allocation keys as the Regulatory Accounts, which is based on the ABC method. The main part of costs has been allocated due to cost causality whereby equi-proportional mark-ups have been avoided. NITA: It has not been practically possible to review cost allocations in the separated accounts since relevant input data and underlying calculations have not been submitted to NITA. Therefore compliance is unclear.
CG2	The models should be based on forward-looking long run average incremental costs. No migration costs should be included. The models should allow coverage of common costs. These costs should be shown separately.	✓	MEA adjustments have been performed where appropriate - mainly for the transport model, where the number of SDH elements has been reduced in order to reflect a forward looking network. See appendix 2. The common costs consist mainly of opex. On NE level the opex is split between direct opex for each NE and a share of common opex attributed to each NE. The model is based on forward looking cost including modern equivalent assets where TDC has deemed appropriate. Indirect cost is shown separatly.
CG3	For the core network, the increment should include all services that use the core network. For the access network, the increment should include all services that use the access network. The LRAIC of co-location is the cost incurred in providing co-location services. These definitions include the services that the SMP operator's network division provides to its own retail division as well as services to other operators.	✓	The 11 sub-network models cover the traffic services TDC offers other operators and its retail division. It has not been possible to deduct Co-location services on services level. The total yearly co-location costs can be seen in the sheet 'Market' The model is compliant in this respect.

Criterion	Description	Compliance Status	Remarks from TDCs comments appear in the upper box NITAs comments appear in the lower box
CG4	The models should include line cards in the access increment. Other exchange related costs should be considered either traffic related, and hence included in the core increment, or fixed and hence common between the two increments. Note that not all of the services in the access network (e.g. raw copper) will actually require a line card.	✓	The line card and a share of the RSS is allocated to the access increment, see appendix 1. The model includes line card cost in the access increment.
CG5	The models should identify the costs that are common between other increments and the core and access network increments.	(✓)	The costs common between increments can be identified in the network models, e.g. the copper and fibre models that feed into subsequent models. The TD-model distinguishes between direct OPEX and indirect OPEX (as well as extraordinary costs). HoweverIt is not clear how common cost is allocated to other increments than core and access network. As regards the network (infrastructure) models these are not included in the submission from TDC to NITA.
CG6	The models should include all standard PSTN/ISDN and Broadband services.	✓	The standard PSTN/ISDN services are defined/produced in the switch network model. Broadband services are calculated in the IP/Ethernet models. The model includes all standard PSTN/ISDN and Broadband services.
CG7	When dimensioning the network, the leased-lines traffic volume should include leased lines provided to retail customers, to other operators and to the network operator. Leased lines used by the network operator should not be	✓	The leased line volumes are included in the SDH network model. Leased lines costs are calculated from net-element level to technical product level only.

Criterion	Description	Compliance Status	Remarks from TDCs comments appear in the upper box NITAs comments appear in the lower box
	double counted as "other services". The models will not need to calculate the costs of leased lines explicitly. Leased lines should only be included for dimensioning of the network and for ensuring that a fair amount of shared costs are allocated to leased line services as well.		NITA: Leased lines are implicitly included in the modelled network.
CG8	The models should split all the "other services" into two major groups: - one comprising cable TV services and all those services that are likely to mainly to use separate electronic equipment and share with other services only duct and fibre (and to some degree transmission equipment) of the core network; and - one comprising data services (by type) using the totality of the core network.	✓	The TD model includes all services e.g. cable TV's rent of leased lines. The Ethernet-, ATM- and IP-models include the total data traffic in the network. The model includes and is showing the underlying services included in area "other services".
CG9	The models should show, for each service, routing factors or, if not possible, a consistent alternative measure of how, on average, each service uses the core network. The models should also be flexible enough to allow for changes in routing factors / alternative measures.	✓	In the sub network models the sheets marked named 'RF_xxx" contain routing factors for the TPs modelled in each network model. The model allows change of routing factor values. TDC can however not recommend this due to interdependencies between routing factors and between routing factors and volumes. See appendix 5. Routing parameters can be altered in the model

Criterion	Description	Compliance Status	Remarks from TDCs comments appear in the upper box NITAs comments appear in the lower box
CG10	Prices used in the models should reflect those that an efficient operator with the bargaining power of an SMP operator would face.	✓	Regarding historical cost, the prices are taken from the Regulatory Accounts systems. These prices reflect the purchase prices that TDC have obtained as an efficient operator. GRC values have been determined with respect to the amount of equipment required given that the full network is replaced. In this approach, the bargain power (due to the element volume) is respected.
			The model appears compliant in this respect. However, no information has been provided on the actual unit prices paid by TDC.
CG11	The models should model the costs for 2007. In subsequent years (including prior to the revised hybrid model's use for price setting in 2010), the base year of the revised hybrid model will be adjusted accordingly, though there is no formal requirement for the top down model to be updated from year to year.	✓	The TD model models 2007 volumes and costs.
			The model is compliant.
CG12	The models should use a "replacement-cost concept" to estimate current costs. Replacement cost in the revised hybrid model should correspond to the cost of buying new equipment in the base year. For the top-down model, replacement cost should be based on CCA values calculated using the MEA. For properties in general, the building costs should be valued in accordance with the method previously developed by NITA. With this method, the public property values are adjusted by a factor representing the difference between the market price and the public valuation in each geographical area	✓	The replacement concept can be chosen in the control sheet. Replacement cost for assets can be chosen, while operating costs are based on historical cost in all circumstances.
			TD-model is capable of estimating current cost using both replacement cost based on new assets and CCA values. Building cost is valued in accordance with the method developed by NITA.

Criterion	Description	Compliance Status	Remarks from TDCs comments appear in the upper box NITAs comments appear in the lower box
CG13	Both models should only include efficiently incurred operating costs. Operating costs related to retail activities should either not be included or should be clearly marked such that the retail cost element of every product is very apparent.	✓	Retail costs are not included in the model. The costs for retail (and wholesale) markets in the "Market" sheet only include network relevant cost. Retail costs such as customer handling, billing, marketing etc. are not included. TDC assert that retail cost is not included in the model.
CG14	For the top-down model, the annualisation approach used in the statutory accounts should be adopted (straight line depreciation), modified to incorporate CCA adjustments. To facilitate comparisons with the revised hybrid model, the top-down model should also include the ability to use tilted annuities. It is acceptable to just use tilted annuities if, but only if, TDC is able to (for each asset class) provide assurance that the GRC, lifetime, price trend, and WACC are consistent between the top-down and regulated accounts. The revised hybrid model should have the flexibility to use both straight-line depreciation and (tilted) annuities, with the latter being the default approach. In addition, to the extent practical, the revised hybrid model should also include the facility to use economic depreciation.	✓	The TD model uses straight line depreciation for historical costs and tilted annuity for GRC. If CCA is chosen, CCA correction modifies the historical cost calculations (depreciations and cost of capital). The TD-model includes the ability to use tilted annuity and current cost accounting (CCA adjustments to the historical cost)
CG15	NITA will be undertaking a review of the cost of capital that should be applied as part of the 2010 pricing decisions and will be consulting with the industry as part of this process. Initially, both models should use 9.5% as the cost of capital. NITA will inform on the final cost of capital that will be used in the revised hybrid once the cost of capital review has been concluded.	✓	9.5% cost of capital is applied in the model as default. The percentage can be altered in the Control Panel. This will influence the cost of capital calculation on historical cost as well as the tilted annuity calculation. The CCA correction on cost of capital cannot be changed since these calculations are performed outside the model. The cost of capital used in the model is 9.5%.
CG16	The models should include a separate calculation for the cost of working capital of an efficient operator for the Core and Access increments due to the difference in	✓	The cost of working capital is calculated in the "Product" sheet based on debtor days in the "I-Debtor" sheet.

Criterion	Description	Compliance Status	Remarks from TDCs comments appear in the upper box NITAs comments appear in the lower box
	payment method for services such as raw copper (which are paid in advance) compared to services such as interconnect traffic (which are paid for in arrears).		NITA: The model meets the criterion.
CG17	The model should show separate cost components for call set-up and call duration. This requires the calculation of both set-up and duration related costs and element stages (volume). The model should also show separate cost components for fixed and usage-related costs for broadband and Bitstream products.	✓	Setup and traffic related costs to switched interconnect is shown in the "Products" sheet. The fixed costs of bit stream products come from the copper network model while the usage related part is calculated in the Ethernet network model. The model shows cost for set-up and duration for interconnection and fixed and conveyance for Bitstream access.
CG18	The models should identify cost categories such that there is only one exogenous cost driver for each. The models should aggregate, in a clear manner, the cost of network elements used in the modelled services such that it is clear as to how the overall cost of a particular service is comprised of the cost of individual network elements.	✓	The inclusion of the explicit costs and volume flow through the network models makes it clear how the service costs are comprised. The costs for each technical product have one singular driver attached. The volumes are listed in column C/D in "Technical_Products" The model is able to demonstrate how costs for network elements are allocated to services.
CG19	Costs related to assets can include capitalised operating costs ("own work capitalised"). In the revised hybrid model, these should be separately identified.	(✓)	Historical costs as well as GRC value contain capitalised operating costs. The operating costs used in the model are corrected in order to avoid double-counting. NITA has not been able to identify how capitalised operating cost have been corrected in the model. NITA notes that TDC claims that the model is corrected for this.

Criterion	Description	Compliance Status	Remarks from TDCs comments appear in the upper box NITAs comments appear in the lower box
CG20	Co-location products should be costed individually, and the costs should be disaggregated to provide as much information on the different types of costs incurred as possible. At a minimum, the costs of accommodation, the costs of installation, the costs of power, the costs of security, the cost of equipment and other costs should be shown separately.	÷	The co-location costs can be seen as a 'market' in the "Markets" sheet. It has not been possible to further deduct the total costs. Total cost for co-location is shown in the TD-model. The costs of accommodation, the costs of installation, the costs of power, the costs of security, the cost of equipment and other costs are <u>not</u> shown separately.

8 Top down Guidelines

Criterion	Description	Compliance Status	Remarks from TDCs comments appear in the upper box NITAs comments appear in the lower box
TD1	The model should separate/group costs into homogeneous cost categories. The same cost categories as are contained within the regulatory accounts can be used, but it must still be explained why they are believed to be reasonable in the context of the top down model.	✓	Net element costs are perceived as homogeneous cost categories with separate life times and price trends. These categories are further used in the Regulatory Accounts and as origins for network model input and GRC-calculations. The Net element level has therefore been chosen as 'building bricks' in the TD model. The model is using the same cost categories/network element cost as in the Separated Accounts
TD2	The model documentation should explain clearly how information used in the top-down model relates to the CCA and HCA regulatory business segmentation accounts. Should any information used in the model relate directly to the statutory accounts, then this too needs to be documented. The documentation should also explain clearly how additional information sources have been used, and the assumptions underlying key inputs and outputs of the model.	✓	The TD model's HCA and CCA calculations are based on the regulatory accounts. In order to ensure consistency with the Regulatory Accounts, no direct input from the statutory accounts are used. Some supplementary documentation of e.g. FTEs, building areas etc. is based on information from outside the Regulatory Accounts since these accounts do not contain such information. Model is compliant.

TD3	The gross asset valuation in the top-down model should reflect the replacement cost of the modern equivalent assets.	✓	Estimation of modern equivalent assets has been done to all the network models. Where the technology will not be used in a forward looking perspective, zero costs are stated for the net element (e.g. the ATM and DXX). The replacement costs for the substituting technology include cost to carry volume from the obsolete technology platform (e.g. ATM is replaced by Ethernet/IP).
			NITA believes that the modern equivalent asset in the core network is an All-IP network. However, NITA accepts that for the TD model the MRP stated that an all-IP nework was not necessary. TDC has applied GRC valuations on the basis that theTD-model remains circuit switched.
TD4	The top-down model should value those assets that would be replaced with assets using the same technology on the basis of absolute valuation where current prices exist. In cases of mature platforms where equipment has not been purchased for some time, and current prices are not available, indexation may be used. Such use of indexation will need to be explained in the model documentation.	✓	A part of the switch platform costs has been indexed due to few purchases in the preceding years, whereby prices do not reflect appropriate bargaining power. In such cases, the asset values have been adjusted with the price trend.
			In general, the TD-model values assets on the basis of absolute valuation. Indexation is permitted.
TD5	The model documentation should provide a rationale for the asset prices assumed in the model. All volume and trade discounts that an SMP operator would expect to receive should be included.	✓	The prices in the model are not assumed but based on real acquisitions in the past. TDC, as an efficient operator, seeks to obtain maximum discounts from it vendors.
			The model appears to be consistent with this criterion.
TD6	The MEA definition, that the top-down model should use, is that of an asset that can produce the same services produced by the existing asset at lowest cost, adjusting where possible to reflect differences in operating costs, quality, asset lives and space requirements. Adjustments to take into account differences in service quality and functionality, operating costs and space requirements should be undertaken.	?	See comments on TD3.
			The lack of visibility to the underlying network models means that it is not possible to assess this criterion.

TD7	Where the difference between the current and historic cost of the asset is likely to be small relative to the overall gross asset valuation or the asset life is short (3 years or less), the top-down model may use historic costs. No more than 10% of the total value of the assets may be valued according to historic costs. The model documentation should justify the decision to use historic costs where the asset life is greater than 3 years.	✓	GRC values have been found for all network related asset categories. See input sheet 'Net elements'. Approximately 4% of the total NBV has no assessment on GRC, which indicates compliance with this criterion.
TD8	The top-down model should use the method previously developed by NITA to adjust the public valuations for operational land and buildings.	✓	The values of land and buildings are taken from the Regulatory Accounts, which is broadly in line with NITA's method. This approach has been accepted by NITA in the MRP hearing. See CG12
TD9	An SMP operator should show the utilisation level for exchanges, transmission equipment, optical fibre, copper cable, buildings and other significant asset categories and explain why they believe this is efficient, for example by drawing comparisons with current deployment practices.	✓	See documentation in appendix 2 and 3. NITA notes that utilisation levels are shown in appendix 2 and 3.
TD10	SMP operators should provide a reasoning for their ratio of actual number of pairs to subscriber lines in different parts of their access network and in different geo-types. Where the telecom network and cable TV network are in common ownership and share duct and trench, then the associated costs should be split between pro rata to their respective number of customers.	✓/÷	Regarding utilisation, see appendix 2. Cable TV buys capacity on 3rd party commercial conditions. These costs and revenues are parts of the Regulatory Accounts upon which the TD model is based. TDC provides some reasoning on the utilisation levels applied in the model. As regards trench and duct cost in the access network, these costs in the TD-model appears not be split between telecom network and cable TV in accordance with the criteria.

TD11	SMP operators should adopt similar principles when assessing the GRC of fibre in the access network as to when assessing the GRC of copper cable and again provide a reasoning for the ratio of actual fibre pairs to used fibre pairs in different parts of the access network. In addition, the valuation steps should be adapted if necessary to reflect the different types of fibre usage in the access network (fibre to large business customers, fibre to the street cabinet, fibre to the home).	?	TDC has documented the costs of digging new fibre to NITA in the autumn 2008 as input to the hybrid model. The GRC values are based on the same principles and used irrespectively of the intended use. NITA has recieved cost information from TDC on this. However, since assumptions on trenching and ducting distances are not transparent, it is not possible to confirm if similar principles have actually been adopted. It is unclear if/how data from this set of GRC values is used as input for the material cost for fibre in the separated accounts/TD-model.
TD12	SMP operators should justify any use of radio in the access network. If copper would be cheaper, and there is no other justification for using radio, then the asset should be valued with copper as the MEA for radio.	✓	No radio is used. Compliant.
TD13	SMP operators should quantify costs separately where two or more cost drivers exist for an equipment type. SMP operators should also provide information to support their policy on equipment lives and, if appropriate, provide a reasoning for attaching the same asset lifetime to hardware and software.	✓	See comments on CG18. Lifetimes and price trends are similar to values used in the Regulatory Accounts. See NITA comment on CG 18.
TD14	When optimising in the top-down model, it is not necessary to consider, for example, whether transmission equipment should be replaced with packet switched equivalents. However, when calculating costs, outdated technological solutions should be replaced by modern equivalent technology according to the MEA principle. The top-down model should use SDH equipment as the MEA for any remaining PDH equipment, except possibly for low capacity routes.	✓	See comment on TD3. Please refer to Nita's comment on TD3.

TD15	SMP operators should provide supporting evidence of current installation practices for selecting the appropriate fibre count of optical fibre cable in the core network, including details of the relevant costs for different fibre count cables.	(÷)	Se comment on TD11 There is no information on how many fibre strands are assumed in the cost for fibre backbone. Price information ofndifferent cable sizes can be obtain from the model/separate data submission. See also TD 11.
TD16	Top-down models should identify trenching costs for different terrain types, and for ducted compared to direct buried cable. The model documentation should provide supporting evidence regarding the relative proportions of the different terrain types and also explain the rationale for any differences in costs in different parts of the network for the same terrain type.	÷	Se comment on TD11. It is not possible to identify costs for different terrain types in the TD-model.
TD17	Where the telecommunications network and other utilities share duct and trench, costs of shared stretches of trench should be split pro rata to the number of used ducts or used cables depending on the trench sharing agreement adopted unless a more appropriate cost driver exists. The chosen cost driver should be documented, for example by drawing comparisons with trench/duct sharing agreements in force.	✓	A typical trench sharing agreement has been provided to NITA in the fibre documentation submitted in the autumn of 2008. NITA has received information from TDC´s on its view on the possibility to share trench in the core and access network.
TD18	No value should be attached to vacant space, except where it can be shown that it is economically rational to maintain this vacant space.	(✓)/?	TDC is continuously reducing space in order to remain efficient. In the approach vacant space is avoided. See appendix 3 for reduction in square meters. The data from TDC shows reductions in square meter used for different purposes. However, it is unclear if there is vacant space included in the remaining space (of the total space owned or hired).

TD19	The top-down model should identify where possible all costs associated with co-location. Justification is required for any cost estimates and these should be checked with actual cost information when this is available. Furthermore, it should be ensured that no double counting occurs.	✓	The total amount of co-location costs have been modelled on 'market' level in order to avoid double counting with other markets.
			See CG 20.
TD20	The top-down model should measure annualisation costs using the FCM concept. Costs should include holding gains or losses, provided the model documentation can justify their inclusion.	✓	Gain and losses are implemented via the CCA approach, which the user can choose.
			The FCM approach is used
TD21	The top-down model should not attribute a value to fully depreciated assets. The SMP operator should show the extent of these assets by asset class and vintage and the model should have the flexibility to allow a value to be attributed to these assets	(✓)/÷	No fully depreciated assets are included in the depreciations. It is not possible in the Regulatory Accounts to distinguish between fully depreciated assets that are in use or no longer in use. In order to capture assets for the full network, the GRC method should be chosen.
			NITA is not convinced that there are no fully depreciated assets included in the depreciation charge (due to the way GRC and NRC is derived from GBV and NBV). However, there is also a possibility that the same CCA method would give rise to insufficient depreciation charge. NITA does not intend to pursue this point. There is no flexibility within the model to attribute a value to fully depreciated assets. Asset vintages are not shown in the model.
TD22	The top-down model should use the rolling-forward methodology to calculate net replacement cost. The NBV to GBV methodology may be used as an exception, but the choice of this methodology must be documented along with its reason.	(✓)	Implemented using CCA.
			NBV to GBV ratio is used in the model. TDC have explained that they have insufficient data on price trends. NITA accepts this.

TD23	The top-down model should only include efficiently incurred operating costs (including any costs that arise because of legal obligations). The model documentation should provide evidence that the operating costs are based on efficient operating practices.	(✓)/÷	TDC investigated in 2008 whether the fixed net division could be outsourced (like the mobile division was outsourced to Ericsson the year before). TDC found that no external company was able to make an attractive offer compared to TDC's own operating costs. This conclusion sees TDC as a result of en efficient operation of the fixed network.
			TDC asserts that operating costs are efficient. The model documentation does not include evidence that TDC´s operating cost are based on efficient operations.
TD24	The top-down model should allocate operating costs to the various services on the basis of ABC. Supporting documentation should describe the cost drivers and how the model assumes they affect operating costs for each activity. The documentation should also describe which activities the different services consume.	(✓)	The Regulatory accounts, which the TD model is based upon, are based on ABC. See Regulatory account documentation for further details.
			See CG 1
TD25	Separate volume measures are required for access and core trench/duct and potentially for other increments.	✓	Volumes can be found in the network models "RF_XXX" sheets.
TD26	Relevant volume measures for copper and fibre cable are subscriber lines in the access network and fibre systems in the core network. Subscriber lines need to be broken down by cable type (copper, fibre) and fibre systems by both equipment type and hierarchical level.	✓	The break down of fibre can be seen in the sheet "C_Fiber"

TD27	A range of separate volume drivers will be required for exchanges depending on the type of exchange, its position in the network hierarchy, and the products and services using it. The volume drivers selected need to reflect the impact the volume will have had on the sizing of the particular exchange and thus are also relevant for the allocation of the usage of the exchange. Due to the variety of different services that could use the same type of equipment, it will also be necessary to develop translation factors such that, where applicable, common measures of usage can be used.	✓	The break down of exchanges can be seen in the sheet "C_Switch"
TD28	The starting point should be to use subscriber lines as the volume driver for DLSAM line cards and bits per second or packets per second as the volume driver for DSLAM common parts. Bits per second or packets per second should also be used for Ethernet switches and IP routers. Departures from this, for example to take account of Quality of Service requirements, should be documented.	✓	The Ethernet and IP network model uses MB pr. year which is a similar measurement to bit per second. The QoS requirements are handled by weightings between the routing factors in the network models.
TD29	In order to measure respective volume usage of services having disparate usage units, such as PSTN traffic and leased lines, PSTN minutes should be converted by default into Mbps equivalents. Further adjustments are required to take account of differentials in the intensity of usage.	✓	The required SDH capacity needed for switching is calculated in the SDH network model, whereby a conversion is avoided.
TD30	Where staff related volume measures are used within the top-down model, the SMP operator should provide documentation on how usage intensity has been measured by functional area within its organisation. Where activities or functions have been outsourced, the SMP operator will need to provide documentation on the cost of the outsourcing arrangements and the scope and scale of the services provided.	✓	See appendix 4 for FTE by activity. TDC has no outsourcing of the network core competences, only a smaller outsourcing of supporting functions. These costs are included. A FTE split has also been provided by TDC on the 4th of March

TD31	When performing the various calculations to progress from cost categories to per unit-costs of the relevant products and services, the top-down model should not needlessly discard disaggregated cost information. This is to enable the resultant per-unit-cost information to be analysed in a relatively straightforward manner, thus facilitating comparisons to be performed with outputs from the revised hybrid model.	✓	The total costs from net elements are routed to technical products in order to show the allocation of costs. This despite of the fact that only a part of the technical products are used to calculate unit cost for the LRAIC regulated products.
TD32	As a minimum, the model should show the cost of other increments grouped together in a single "Other" increment– it is not necessary to show the cost of each of the increments, or indeed to analyse the total and unit costs of products and services within the increments. However, products and services within the Other increment that also utilize equipment within the network covered by the Core increment should have that usage taken into account both when sizing the equipment in the Core increment and also when allocating the costs to the various products and services that use the equipment.	✓	The implemented network models includes all trafic routed in TDC's net. No kind of 'other' routing has taken place.
TD33	Remaining common costs, such as overheads, should be allocated across all of the increments in a fair and reasonable manner. The default method for this should be equi-proportionate mark-ups, but only where other methods that better reflect true cost causality cannot be found.	÷	The operation costs are split into direct and indirect costs, which can be separately chosen in the control panel sheet. NITA has not been able to find out from the model how indirect cost has been allocated to network elements.

TD34	The model should show routing factors for each relevant network element/cost category, covering both the traditional PSTN and SDH network and also the IP-based network used for broadband and Bitstream services. Information should be provided separately for all relevant products and services, including the Core and Access components of products and services that are included within other increments.	✓	The routing factors and the access and core components are shown in the network models. Routing factors are shown in the TD-model
TD35	The cost analyses should include: - A model. Unless standard software such as MS Excel is used, NITA should be provided with the facility to run the model; - Detailed model documentation; and - Supplementary analyses and calculations, including analyses of utilisation ratios, useful life of assets, share of overhead and indirect costs included for the individual interconnection products, MEA-adjustments, efficiency studies etc.	✓/÷	The TD model is built upon the Regulatory Accounts system which is documented to NITA in details. Supplementary analyses have been submitted where necessary. Some documentation has been submitted to NITA in the autumn 2008 for the hybrid model update. The TD-model is in Excel. NITA has not been given access to the underlying network models (infrastructure models) Model documentation is provided. NITA have received supplementary data from TDC.
TD36	The model documentation should describe the method used to determine the costs of the listed products and services.	✓	The method used is aligned with NITA's model reference criteria. Given the implementation in Excel, the calculations and the applied methods can be traced back and forth between the sheets.
TD37	Information on the costs related to each component should be available from the model in a disaggregated form.	(✓)	The Technical Products are used as building block components in the model. These cost components are composed from a disaggregated Network Element level in the model. Cost data per component is not available within the model. However, some disaggregated cost data can be extracted from the regulatory accounts.

TD38	The top-down model should identify those costs which can be directly attributed to services. Shared cost should be allocated to the different services at the most disaggregated level possible. Allocation keys should be clearly identifiable.	(?)	Where used, exogenous allocation keys are taken from the Regulatory Accounts. Endogenous allocations keys can be identified in the model.
			NITA does not think that allocation keys are clearly identifiable in the model.

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