ERHVERVSSTYRELSEN

August 5, 2014

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Consultation note regarding third draft of the LRAIC fixed model

DBA started the consultation on the third version of the draft LRAIC fixed model the 5th of June 2014. By the end of the consultation period, the 2th of July 2014, DBA had received consultation responses from Telenor, Telia, Concepy and TDC.

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Table of contents

General remarks

Pricing Issues

Telia and Telenor welcomes the opportunity to comment on pricing issues prior to the publication of the draft pricing decision in September. However, DBA should also be aware that there is still pending clarification of a number of factors which affect the assessment of the pricing implementation. Consequently, an opportunity to provide input on the pricing implementation after finalization of the costing model in July but prior to publication of the draft decision would be much appreciated.

DBA does not believe that there are significant pending factors which affect the assessment of the pricing implementation and prevent the industry from commenting on this issue. However, DBA welcomes comments on this matter until the 15th of August. These comments will not be treated as a formal consultation and there will be made no consultation note.

Risk premium

Telia and Telenor only find it relevant to consider a risk premium for "next generation" fibre access and not for "old generation" copper or coax based services.

Regarding fibre based access, DBA decided early in the LRAIC process that fibre was Modern Equivalent Asset (MEA) in the LRAIC model. Telia and Telenor agree with DBA that fibre is MEA. With fibre being the technology that any efficient and rational operator would build a network with today and most importantly with TDC at the same time enjoying full control on all old access forms, Telia and Telenor do not believe that the particular market situation in Denmark meets the requirements set out for applying an additional risk premium on this type of platform.

TDC states that in the previous model a risk premium of 2,3% was in practice incorporated via a method using customer estimates, see Appendix 1, sec. 3.4. TDC requests DBA to sustain this level in the draft model on the top of the WACC calculation.

DBA notes TDC's and Telia/Telenor's comments. Even if the risk is lower for an operator like TDC, who has the ability to migrate its customer base to the NGA infrastructure, it is DBA's preliminary view that a risk premium could be justified for fibre. DBA will as part of the draft price decision analyse the need for a risk premium and - if a risk premium is justified - the level of the risk premium. When assessing the risk premium, DBA will take into consideration TDC's current practice

of gradually upgrading the copper and coax networks with fibre optic cables.

Risk free interest rate

Telia and Telenor state that DBA in the cover letter, that it is being considered whether the risk free interest rate should be calculated based on a longer time period than 2 years.

Telia and Telenor support in principle the aim of securing more stable LRAIC prices which will primarily benefits access seekers and not the vertically integrated infrastructure owner. However, the interest rate has been trending steadily down over the last several years and has currently reached an all-time low also for the government stock which incorporates the current economic outlook for the next 10 years.

If the period for calculating the risk free interest rate is prolonged in a backward looking manner by – say – using a 3 year interest time series spanning Nov 2011- Nov 2014 instead of a 2 year series spanning Nov 2012-Nov 2014 when setting prices for 2015, this will with almost certainty increase the 2015 prices. Furthermore if one agree that the best single indicator for the future interest rates is the rate today, in expectation such a procedure will also lead to higher prices beyond 2015.

A certain increase in prices in 2015 combined with higher prices in expectation for years beyond 2015 is not an attractive proposition to consider for Telia and Telenor. Consequently, Telia and Telenor cannot currently support to base the risk free interest rate calculation on a longer time period than 2 years.

In any case, before making a decision about prolonging the period, Telia and Telenor request DBA to make a sensitivity analysis of the effect on the LRAIC prices. If, despite the lack of support from Telia and Telenor, DBA should decide to prolong the period, Telia and Telenor suggest that it is done as a stepwise implementation with the start of the interest time series fixed at Nov 2012. When setting the prices for 2015 this means a 2 year time series is used and when setting the prices for 2016 a 3 year time series will be utilized and so on until the desired period has been reached.

Telia and Telenor believe such an implementation could present a compromise given that the insurance does come at a cost if the interest level stays at the current level but at the same time it is no longer illusionary that this could somewhat mitigate the negative effects of future increases in the interest level.

TDC notes that in the letter following the 3rd hearing DBA ask for views regarding the periode used for estimating the risk free interest rate, which is currently 2 years. TDC suggests DBA to consider a period of 3 years in order enhance stability. TDC finds in addition that a review of the equity risk premium and the debt risk premium is needed in the pricing hearing.

DBA understands that one of the objectives of the Commission's Recommendation[1] is to ensure stable prices. In the past, the access prices in Denmark have been fluctuating significantly with the yearly update of the risk free interest rate of return. DBA is therefore of the view that to ensure more stable prices, the risk free interest rate of return should be calculated over a longer period than the current 2 years. DBA believes that a longer period would better reflect a business cycle and lead to more stable prices. This is a practice that several other countries use.

DBA is aware that the industry has different interests on this topic but DBA finds it necessary to implement this in relation to this revision.

DBA does not believe that it is justified to do a stepwise implementation for the calculation of the risk free rate. Due to the revision of a number of parameters, prices set by the revised model are likely to change in any case compared to the former model but these changes are not implemented stepwise.

DBA does not believe that other WACC parameters should be revaluated.

DBA has for illustrative purposes used a WACC of 5.8 % in the final model which is corresponding to the risk free interest rate being calculated over a period of 5 years. DBA will assess the period that the risk free interest rate should be calculated over in relation to the pricing decision.

Differentiated prices

Telia and Telenor find that wholesale access product prices should not be differentiated between family houses and MDUs. Such a differentiation would lead to increasing wholesale costs of providing broadband to remote areas of Denmark, as these are dominated by single dwelling units. This will have an adverse effect on broadband supply and penetration in rural Denmark which is not desirable.

DBA notes the industry's comments and will make a decision on this issue for the draft price decision.

[1] COMMISSION RECOMMENDATION on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment C(2013)5761

Fees – colo and other services

Telia and Telenor would like to reiterate the importance of getting the calculation of fees – and in particular for installation and fault repair – thoroughly investigated and documented. As mentioned in the former consultation response, there are very good reasons to believe that the development of xDSL markets from immature to highly saturated have impacted the underlying costs of setting up new connections significantly and that this development needs to be better reflected in the model. Furthermore, the correlations and boundaries between fault repairs covered by general access network OPEX and fault repairs covered during line set-up through one-off installation fees need to be better addressed and accounted for. DBA is in particular encouraged to more explicitly delineate which activities TDC are justified to issue a separate fee for and which activities they are not. For instance, if assisted installation is required to get a new customer on-line and it turns out that an access line fault (including the drop wire) was to blame, the costs should be recovered through the line rental and not through an additional separate installation fee. If on the other hand, the new customer does not have a proper NTP-installed, a separate installation fee is well justified.

Concepy finds the modelling of migration to other platforms useful as it reflects the different tasks that TDC has to fulfill in a real life scenario. However Concepy does not directly find the same approach reflected in the installation prices, although most installations are actually "migrations" between different operators in a saturated market. Concepy would like Erhvervsstyrelsen to investigate whether this could be used when setting the installation prices.

TDC notes that on page 72 in the hearing note DBA does not find any differences between fault handling for LLU, BSA, PSTN and LL. TDC does not agree. TDC is currently investigating if time-measures are available. TDC will comment on the issue along with the reply on DBA's questions to be answered July 9.

DBA has in relation to the LRAIC process received several comments from Telia and Telenor regarding fees.

In general, DBA has not found it proportional at this stage to ask TDC for updated time consumption for all the fees that Telia/Telenor have requested. DBA has asked TDC for updated time consumption for some fees and asked TDC for explanation on the work carried out for other fees. TDC's answers to DBA have been sent to Telia/Telenor for commenting. DBA has assessed all information from the industry and the most important issues related to fees are described below.

Fault repairs in relation to fees
DBA agrees that it is likely that some faults can be repaired as part of the work carried out in relation to a new installation assisted by a technician. Based on the additional information received from TDC, it is

DBA's understanding that this would only be work carried out at the end users premises. DBA finds it unlikely that the alternative operators are paying for fault repairs to a significant extent as a part of any other fees.

DBA notes that Telia/Telenor have informed DBA that XX% of all new installations are with a technician. In addition, a fall back is performed in a small share of instances following an initial installation without a technician. TDC's description of the work carried at the end-users premises shows that in most of cases the work carried out is not already covered by the fault repair OPEX in the model. Furthermore, DBA notes that the amount of time spent by the technician at the end-user indicates that no major network faults could be repaired.

Based on the above, DBA does not believe that fault repair is a substantial part of the fees mentioned by Telia and Telenor. Therefore, DBA does not find it proportional to adjust the cost of the fees for fault repairs that are already covered by the OPEX in the LRAIC model.

BSA installation
DBA agrees with Telia/Telenor and Concepy that the market conditions have changed the work needed for setting up new BSA connections. DBA has asked TDC to update the resources needed for a BSA installation. TDC has not been able to provide updated information due to holiday. DBA will update the resources in relation to the price decision once TDC has provided the necessary information.

Unproductive fault handling PSTN and LL
DBA notes that TDC have not forwarded updated time-measures. DBA has reviewed TDC's comments regarding the different time consumption for 2 Mbps leased lines and PSTN. DBA agrees that the time consumption for leased lines can be higher than for PSTN. However, DBA still does not think that the time consumption for unproductive fault handling for LLU/BSA should be different from an unproductive fault handling of PSTN.

Therefore, DBA has set the time consumption for unproductive fault handling for PSTN at the same level as for LLU/BSA.

The time consumption for unproductive fault handling for 2 Mbps leased lines has been kept unchanged.

Unproductive visit (Technician) and Unproductive fault handling
Currently, an "Unproductive fault handling" takes 45 minutes whereas an "Unproductive visit (technician)" takes 120 minutes. DBA believes that time spent on "Unproductive visit (technician)" should be reduced to 35 minutes.

In case of an "Unproductive fault handling", the technician has entered the house, searched for a fault and concluded that the fault is not TDC's responsibility. Afterwards, the technician has to write a report on this. An "Unproductive visit (technician)" is charged when nobody is at

home when the technician arrives. That is, the technician does not enter house and no work is performed. Once again, the technician must write a report but this is much simpler compared to the "Unproductive fault handling".

On this basis, DBA finds it appropriate that "Unproductive visit (technician)" takes less time than "Unproductive fault handling". DBA has estimated the time needed for an "Unproductive visit (technician)" to be 35 minutes. This consists of 6 minutes for processing of order, 20 minutes of transport time to the end-user and 9 minutes to write the report.

The time consumption for "Unproductive visit (technician)" has been updated accordingly.

High-cost dual pair bonding products

In 2013 Telia and Telenor supported that dual pair bonded products were modeled with routing factors that reflected actual use of the network. However, already at that time Telia and Telenor foresaw that higher cost DPB products could lead to increased risk of margin squeezes initiated by TDC. Telia and Telenor stated in their hearing response of 8 April 2013 regarding pricing of DPB products that:

> *"Derudover oplever Telia og Telenor i dag, at det er vanskeligt at bygge en rentabel business case på baggrund af TDC's BSA-produkter. Telia og Telenor finder derfor, at DPB-engrosprodukterne – der forventeligt vil blive dyrere end "normale" kobberengrosprodukter – tilsvarende kan blive vanskelige at lave en sund forretning på, hvis de benyttes til sædvanlige slutbrugerprodukter til privatkunder. Telia og Telenor skal derfor opfordre Erhvervsstyrelsen til at sikre, at TDC's slutkundeprissætning af DPB-baserede produkter ikke leder til prisklemmer i markedet"."*

As Telia and Telenor have discussed with DBA, current TDC use of DPB products to residential customers indicate significant margin squeezes. As TDC is currently introducing DPB in the broadband market and expects DPB products to be able to cover 15 pct. of the market during the next 4-5 years the margin squeeze problems related to DPB can have a significant adverse effect on competition.

On Samtrafikforum in February 2013, TDC themselves, expressed concern that "correctly modeled" DPB products might result in margin squeezes. Nevertheless, it seems TDC has chosen to ignore this risk as they now price DPB-based products in the retail market at levels resulting in margin squeezes. In fact – market watch information suggest that TDC has chosen to price the DPB-based products at the exact same level as the

standard single-pair-based products in the retail market. TDC could solve this margin squeeze problem by offering DPB-based wholesale products to wholesale customers at prices below LRAIC level but have chosen not to do so.

Telia and Telenor urge DBA to address these margin squeezes as soon as possible. Telia and Telenor find that action from DBA cannot await finalization of next round of market analyses, as this will leave the DPB-based margin squeezes unattended in the market for several years to come.

DBA is aware of Telia's and Telenor's position on DPB and margin squeezes. However, DBA does not believe that this is a topic that should be discussed as a part of the LRAIC-revision.

DBA will look into to matter of DPB and margin squeezes. In this respect, DBA will assess whether the topic should be addressed as a part of the upcoming market analyses or beforehand.

NMS costs

Telia and Telenor find that 345 mill. DKK for Network Management Systems is a substantial amount. On page 21 of the consultation note DBA clarifies that part of the 345 mill. DKK is incurred by a system used for the access network inventory.

TDC's existing access network inventory system is notoriously unmaintained and flawed, which has been acknowledged by TDC on several occasions. For instance, TDC has very incomplete documentation of how the copper lines are connected in the last distributor. This means that the advice to wholesale customers in TDC's ordering systems on whether a GDS setup (no technician) or GIG setup (technician assisted) is needed is often wrong. In many cases this leads to extra costs for external wholesale customers who choose GDS setup based on TDC's advice but is then faced with Fallback fees and other extra costs, because the advice based on information in TDC's access network inventory system was wrong.

Telia and Telenor find that if AO's through LRAIC pricing are financing the costs of an efficient network access inventory system (holding correct information), then TDC should not be able to charge fees (such as Fallback) due to incorrect information stored in a highly unmaintained and inefficient access inventory system.

Alternatively, the costs for the flawed NMS systems should be removed from the NMS costs in the model.

First of all, DBA notes that the 345 million DKK is related to other systems than TDC's wholesale ordering system.

DBA does not agree that a new access network inventory system would always provide the correct ordering information. DBA notes that there could still be misleading information due to the end-user changing an installation or wrongly registration by a technician.

DBA agrees that it is likely that the information on ordering would be more correct in a new access network inventory system. However, DBA finds that this is very hard to investigate and the impact on cost relative insignificant.

Therefore, DBA finds that TDC should still be allowed to charge a fee for the "Fall back" service.

A "Fall back" is needed if a "New installation - Unassisted" (GDS) fails. Currently, the price for Fall back is the same as "New Installation - Engineer Assisted" (GIG). To DBA's understanding, the work already performed in relation to the initial GDS makes some of the work related to GIG redundant when a Fall back is performed. The tasks currently related to GDS and GIG/Fall back and the time used for each task are listed below:

Process	GDS (minutes)		GIG/Fall back (minutes)	
	Administrative	Technician	Administrative	Technician
Processing of order	6	-	6	-
Physical coupling in exchange	-	10	-	10
Transport time to exchange	-	8	-	8
Visit at local distribution frame	-	6	-	6
Transport time to local distribution frame	-	14	-	-
Fault handling due to line not measured	-	4	-	-
Visit at end-user	-	-	-	36
Transport time to end-user	-	-	-	20

Since the physical coupling at the exchange and the visit at the local distribution frame has already been performed in relation to the GDS, DBA does not believe that it is necessary to do so again when a Fall back is ordered. Therefore, DBA finds that the 10, 8 and 6 minutes used for respectively "Physical coupling at the exchange", "Transport time to exchange" and "Visit at local distribution frame" should not be included in the price for a Fall back.

The Fall back service has been adjusted accordingly in the LRAIC-model.

Calculation of Non network markup for access

Telia and Telenor state that the total yearly access network cost (e.g. cell H20 in "Non network mark-up") is used in calculating the proportional mark-up for access services. The total yearly access network cost does, however, only include CAPEX and not OPEX.

Telia and Telenor believe this is an error that should be corrected.

DBA agrees with Telia and Telenor that the figure used in cell H20 of the spreadsheet "Non network mark-up" is solely the depreciated CAPEX of the access network although it should be the total yearly cost of the access network, i.e. the depreciated CAPEX + the OPEX.

DBA has updated the access network cost model (cell H1301 of the spreadsheet "Export to Core Model") so that the figure that is exported to the core model includes the total yearly cost of the access network and not only the depreciated CAPEX of the access network. The label of the parameter has also been renamed to "CAPEX + OPEX for the access network" in order to avoid any confusion. Non network mark-ups that are assessed based on the access yearly costs will decrease by nearly 50%.

Increase of total corporate overhead costs

Telia and Telenor state that the on page 17-19 in the consultation note Telia's and Telenor's concerns about overhead is evaluated, and DBA concludes that it disagrees with Telia and Telenor that the overhead costs are too high. On that basis DBA concludes that no changes are needed. However, an error has occurred – the 90 mDKK of overhead has been changed to 100 mDKK in the 3rd draft model (non-network costs, cell H24).

DBA is asked to correct this error by changing the overhead back to 90 mDKK.

DBA would like to point out that the statement "no changes are needed" is solely related to Telia and Telenor's particular comment. Other comments (from Telia and Telenor or from any third party) may have led to changes of the overhead costs. In particular, following the comment "Corporate overhead mark-up" from TDC on page 61 of the second consultation note, DBA has updated the modelling approach of the overhead costs. This update has led DBA to increase the total corporate overhead costs included in the model from 90 mDKK at the end of the first consultation round to 100 mDKK at the end of the second consultation round. DBA would like to remind that the modelling of the corporate overhead costs has been updated in order to:

- Reflect TDC's regulatory accounts.

- Make it consistent with the approach followed for the allocation of all other non-network costs and in particular the allocation of the NMS costs.

DBA is therefore using the following approach:

- The cost of the corporate overhead is distributed asset by asset. This split is the split carried out in TDC's regulatory accounts;

- DBA has for each asset of TDC's regulatory accounts assessed whether the asset is relevant to the LRAIC cost models or not. If it is relevant to the LRAIC cost models, DBA has then assessed whether it is part of the core network or part of the access network. If it is part of the core network, DBA has then assessed whether it is part of the IP core network (relevant) or not. This whole assessment is exactly the same as the one carried out for the NMS.

- Having carried out these assessments, DBA has only included the overhead costs allocated to the assets that are relevant to the LRAIC cost models and part of the access network or part of the IP core network (as the core network being modelled is a full IP core network).

- This approach leads to an exclusion of 35.2% of the total overhead costs and the inclusion of 64.8%. This share is allocated to all LRAIC modelled services (access, core and colocation services).

- The total amount of overhead costs accounts for approximately 100 mDKK.

Prior to this update, the approach followed by DBA was the following one:

- TDC had provided DBA with the corporate overhead costs split by asset (same starting point as the updated approach);

- TDC had provided the analysis whether the asset was relevant or not to the LRAIC cost models. The relevant corporate overhead costs were representing 90 mDKK out of 100 mDKK;

- DBA had then used the allocation keys of the former model. These allocation keys led to the exclusion of 30% of the 90 mDKK. However, these allocation keys were not supported by any analysis made on TDC's accounts. This is why DBA had to review them.

The reason why the total amount shown in the model has increased at the end of the second consultation is that DBA has included all the corporate overhead costs in the model (even the share that was not relevant for LRAIC regulated services). This has been done in order to increase transparency and to show the industry that DBA is not

including the total amount of overhead costs but solely the relevant share.

Therefore, DBA does not believe that any changes are needed.

Allocation of corporate overhead costs

Telia and Telenor state that in the 3rd draft model, 64.8% of total corporate overhead is allocated to LRAIC regulated services and 35.2% is allocated to non LRAIC regulated services.

Telia and Telenor are puzzled by this allocation and DBA is therefore asked to elaborate further on this. According to DBA, cf. p 20 in consultation note:

"The overhead costs include all the cost (staff and material) related to the non-network teams. Typical costs that are included are the pay costs of the CEO, the CFO, the COO, the CTO, the finance team, the regulatory team, the legal team, the HR team etc. It would also include the headquarters of the company".

Telia and Telenor expect that the attention and efforts of top management, finance team, and legal team by a large margin will be mostly focused on commercial activities rather than regulatory activities and in particular the LRAIC subset of the regulatory activities which are access and price regulated by the Danish Business Authority.

Telia and Telenor would expect a significantly lower allocation than 64.8% to all regulated activities comprising both LRAIC and non-LRAIC regulated activities. Narrowing the allocation further down from all regulated activities to only LRAIC related activities, this allocation obviously becomes even more questionable.

Following comments of the industry and TDC's new submissions, DBA would like first to point out that the total overhead costs allocated to LRAIC modelled services accounts for 100 mDKK * 64.8% = 64.8 mDKK.

This is more than in the previous version of the model where 90 mDKK * 70% = 63 mDKK were allocated to the LRAIC modelled services. The impact of this increase is therefore quite limited as the total yearly cost of the network is almost equal to 1,800 mDKK: the mark-up has increased by less than 3% from 3.5% to 3.6%.

As stated in the second consultation note, this value is in line with the overhead costs included in the Swedish LRAIC model and with the overhead costs of TT-Netværket.

As explained in the second consultation note, this value and its allocation has been derived from TDC's regulatory accounts (which

already provides the allocation of costs to regulated elements) based on the following approach:

- The overhead costs are distributed over the different network assets in TDC's regulatory accounts. It should further be noted that less than XX% of TDC's total OPEX are allocated to network assets. The remaining part is not accounted for in the LRAIC models (not even in the category "non LRAIC regulated service");

- DBA has for each asset of TDC's regulatory accounts assessed whether it is relevant to the LRAIC cost models or not. E.g. the assets "IT for mobile platform", "Other data CPE" or "ADSL_Installation_Modem" are not relevant to the LRAIC cost models:

  - If the asset is relevant to the LRAIC cost models, then the overhead costs allocated to this asset have been accounted in the cost model;

  - If the asset is not relevant to the LRAIC cost models, then the overhead costs allocated to this asset have been discarded;

- This approach has led to a discard of 35.2% of the overhead costs and an allocation of the remaining 64.8% to all the services using the network assets, i.e. all the LRAIC modelled services. Among the LRAIC modelled services, some are regulated, such as the bitstream services (including TDC's self-supply), and some are not such as the different leased lines services.

- The analysis of the relevance of the different assets to the LRAIC models is the same for all non-network costs.

Therefore, the OPEX allocated to LRAIC modelled services accounts for approximately 64.8%*20% = 13% of TDC's total OPEX. This implies that the remaining 87% are covered by TDC's retail division and other non-LRAIC modelled services.

This approach has been chosen so the modelling of all non-network costs is consistent.

Therefore DBA does not believe that any changes are needed.

IC specific costs

Telia and Telenor notes that it is stated in the consultation note (page 24) that:

"TDC has submitted 183 mDKK of yearly cost (OPEX, depreciated CAPEX and cost of capital) related to interconnection. Out of these 182

mDKK, only 20% are due to the wholesale billing platforms. The rest is due to the wholesale team."

Telia and Telenor would like to point DBA's attention to the organization of TDC Wholesale. TDC Wholesale is organized in the following business areas:

Business Area	LRAIC relevance
Telephony	
- TeleConnect	÷
- SIP Gateway	÷
- SIP Connect	÷
- WLR	(√)
Mobile	
- Mobile	÷
- M2M	÷
- Push SMS	÷
- Mobile content	÷
- SIP MVNO	÷
- MVNO (incl. Norway)	÷
Broadband	
- Broadband Basic	÷
- Bitsteam Access	√
- LLU	√
- SLLU	√
- Co-location	√
Fibre & Infrastructure	
- Ethernet VPN	÷
- Leased lines	÷

- WDM	÷
- Dedicated fibre	÷
- Radio links	÷
- IP Peering/Transit	÷
- Co-location	÷
TV & Coax	
- BSA	√
- IP Transmission	÷

In the right hand side coloum Telia and Telenor has indicated whether ressources spent in the business area in its current form is relevant to attribute to LRAIC. As can be seen, the vast majority of TDC Wholesale's business areas are not LRAIC relevant.

DBA is asked to verify that resources spent on out of scope business areas in TDC Wholesale have been properly accounted for.

Following the data submitted by TDC during the second consultation round, DBA has included 183 mDKK of yearly cost related to wholesale. The data submitted by TDC was split between the following services:

- Telephony;
- Broadband;
- Raw copper/Fibre;
- Leased lines;
- International.

Following the comment of Telia and Telenor, DBA has asked TDC to split the yearly cost between the business areas corresponding to TDC's Wholesale organization. However, TDC has not been able to provide a more detailed split of its wholesale costs.

Given the lack of usable information to ensure that the scope of the interconnection costs included in the LRAIC model is relevant, the model has been updated using the following approach:

- "Telephony" includes 4 business areas of which only one (WLR) is relevant to the LRAIC cost models. Thus, 25% (=1/4) of the wholesale costs associated are allocated to LRAIC modelled voice

services. The remaining share is allocated to the category "non LRAIC regulated service".

- "Broadband" includes 5 business areas of which only one, "Broadband basic", is not relevant to the LRAIC cost models. This is a legacy service with almost no customer. The share of wholesale costs borne by this service is assumed not to be material. The wholesale costs allocated to Broadband are therefore left unchanged;

- The wholesale costs allocated to the other services ("Raw copper/fibre", "leased lines" and "international") are kept unchanged.

DBA has therefore updated the core network cost model by changing the share of "IC specific and commercial costs" allocated to voice services in the spreadsheet "Non-network costs" from 31.5% to 7.9% (=31.5%/4).

No traffic driven costs in DSLAM ->end user services

Telia and Telenor state that in the revised model, services covering the network level from DSLAM to end user are not priced based on traffic consumption. Instead the cost for these services are included in and covered by the cost per port in the DSLAM (ie. included in the line rental). Telia and Telenor support this design, as it can be very difficult to measure traffic consumption in the most decentralized part of the network (for instance for services like POI0 multicast or POI0 VOD).

DBA agrees with Telia and Telenor that by calculating a fixed price per port, issues related to traffic measuring of POI0-services will be solved.

Lifetime for copper and fibre

TDC states regarding lifetime of copper DBA concludes that 35 years is an appropriate value both for the economical and the technological lifetime and DBA justifies the conclusion that the same value should be applied for both technological and economical lifetime by a reference to the Recommendation[2] that states:

> *"... When setting the economic lifetime of the assets in a modelled FttC network NRAs should take into account the expected technological and network developments of the different network components*"

[2] COMMISSION RECOMMENDATION on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment C(2013)5761

However TDC suggests that DBA reconsiders this conclusion as it seems to be unfounded for the following reasons:

1) Reference to the Recommendation:
   The Recommendation as quoted by the DBA only states the obvious fact that technological development of a given technology needs to be taken into account when assessing its lifetime. The Recommendation does not thereby indicates that the economical and the technological lifetime thus should be the same. Technological development can prolong the technical capability of copper to produce certain services but nevertheless while technical feasible it may be economical inefficient to produce these services on the copper platform. As an example: while it may be possible to produce >100 Mb/s capacity on vectorised VDSL copper and/or to a more limited degree on pair-bonded copper and while this is the cost efficient way to meet today's demands it is unlikely it will continue to be the case.

   It can already be seen from the network strategies of other copper-based SMP operators[3] and also from the focus on FTTH in various national 2020 Broadband plans. E.g. the French authorities may offer public financial support also to FTTC but only if the network topology allows for a further transition to FTTH.

   Regarding the concern mentioned by the DBA that a shorter economical lifetime of copper possible could raise copper prices and this is not the intention of the Recommendation TDC can only agree. Certainty is a prerequisite for investment in network and TDC will thus recall that it is exactly why the Recommendation suggests a price band to prevent any drastic deviation in copper prices – both up and down. So if the Danish copper price should rise beyond 10€ e.g. due to a shorter economical lifetime of copper than the proposed 35 years, TDC agrees that 10€ should be the upper limit.

2) Lack of factual justification:
   The DBA does not provide any factual evidence concerning their change of copper lifetime and TDC finds it is particularly unacceptable that the far-reaching assumptions on lifetime are mainly documented by one fragmented quote by a previous TDC employer.

   By contrast TDC has during the process leading up to DBA Vectoring Decision in December 2013 explained that the although in a medium-term perspective vectorised and/or pair-bonding FTTC is the rational and cost-efficient NGA solution then in a long-term perspective, i.e. >10 years, the target platform FTTH is in combination with mobile

[3] Both Telia and Telenor abstain in their national home markets from investment in upgrading copper by vectoring and other advanced DSL technologies and move directly to FTTH as both companies are aware of the competitive pressure from roll-out of FTTH platform driven by public bodies, by public financing and/or by semi-public utility companies.

platforms (unless some disruptive technologies appear). Accordingly, the TDC network strategy is based on progressively pushing fibre forward to remote sites thus preparing for a final FTTH deployment.

3) Impact of market conditions:
Since the DBA does not accept the theoretical MEA assumptions on FTTH as an argument for reducing the economic lifetime of copper, then TDC expects that the actual and concrete market conditions will have to be taken into account when the factual lifetime of copper is assessed. As TDC is and increasingly will be exposed to a nation-wide competitive pressure from FTTH based companies which are based on a considerable flexibility concerning lifetime and viability of their business case TDC will have to increase investment in the transition to FTTH to meet this pressure. This means the market conditions will force TDC to make a platform shift even earlier than necessary from a technical viewpoint and thereby shorten the economical life of the copper platform.

With this in mind TDC suggests that a sustainable assumption concerning life of platform will need to:

- Distinguish between technological and economical lifetime for copper
- Will need to maintain the current 20/40 years economic lifetime for the copper platform as the most well-founded assumption based on the 3 points mentioned above.

DBA does not agree with TDC that it generally has been stated that the technological and economical lifetimes are the same. As is clearly stated in the consultation note of March 20, 2014, DBA distinguishes between these two principles.

Also, DBA would once more like to note that the price band of 8-10 euro in the Recommendation should only be seen as the Commission's expectation of the prices when the principles in the Recommendation are followed. However, since there can be national circumstances that lead to higher or lower prices, what is most important to the Commission is that the principles of the Recommendation are followed.

In this relation, DBA furthermore notes that the copper price today (before the Recommendation is implemented) is 8.2 euro. DBA finds it difficult to implement several new principles set out in the Recommendation if the price at the same time is not "allowed" to change.

In general, DBA believes that the lifetime of 20 years for copper cables, applied in the old LRAIC model, has been very conservative.

DBA believes the technical lifetime to be much longer (as has been explained earlier). DBA would again like to draw to attention that TDC very seldom exchanges full cables but only repairs the part of the cable that is malfunctioning. As stated earlier, DBA finds a technical lifetime – i.e. not economical – of 50 years reasonable for copper cables.

Regarding the economic lifetime, DBA would once more like to state that fibre is found to be MEA and that the modelling of CATV network and copper network should be seen as a way of converting the fibre price to a price for the actual demanded technology. This is a theoretical exercise to assess cost differences. In this context, DBA does not expect an efficient operator to build a copper network today and therefore it can be difficult to discuss lifetimes of copper actives in a purely forward looking perspective. That is, emphasis must also to some extend be given to historical usage. In this respect, DBA believes that large parts of both copper and coax cables have been in use much longer than 20 years. In this relation, DBA notes that the copper cables have been installed since the beginning of the 1900 and the coax cables have been installed since 1970. Therefore, DBA believes that the historical economic lifetime of these cables have been much longer than 20 years.

In addition to this, DBA finds that there are several new technological developments on the copper platform in Denmark that gives rise to the economic lifetime of copper cables being prolonged (pair bonding, phantom, G-fast, etc.). DBA is still of the view that DBA's assessment is in line with the Commission's Recommendation.

Lastly, DBA notes that the model dimensions the number of cables in the network (both copper, fibre and coax) based on the number of premises passed and not the number of active customers (only deployment of drop wires are dimensioned based on active customers). Therefore, when a customer switches away from the LRAIC modelled network, e.g. to mobile or alternative fixed infrastructure, total network costs are not affected significantly. This means that TDC is still getting the same costs recovered (excluding the cost of the drop wire) even though fewer customers are active. In this light, DBA believes that it is justified that the economic lifetime of the cables has been extended.

DBA does not believe that the analysis lacks factual justification. DBA would like to underline that DBA has asked TDC several questions regarding the lifetime of copper, fibre and coax cables without receiving factual information that can be used for analysis. DBA would have expected TDC to have data regarding the installation date for copper, coax and fibre cables but no information have been provided to DBA.

Lifetime of PDP-CO copper

TDC notes that on page 9 in the consultation note, DBA does not see how a potential shorter lifetime for copper on the PDP-CO distance can be

justified. In TDC's opinion, the calculation on the lifetime can be done by DBA given the current information:

As DBA knows, TDC has not a long term committed plan for the remote DSLAM rollout. However, one purpose of the current regulation is to promote future investments in NGA infrastructure and TDC's roll-out of remote DSLAMs is one way to establish NGA infrastructure. If DBA believes in their own regulation, DBA must thus expect a significant amount of remote DSLAM's to be established in the coming decades.

If, e.g. all TDC's PDP are upgraded within the next 20 years, an average lifetime of 10 years must be expected for PDP-CO copper.

It should be noted that DBA has no hesitations when forecasting FTTH customers 40 years ahead in the current LRAIC fibre model. TDC therefore find that DBA should forecast remote DSLAM roll out and on the basis of that forecast establish a lifetime for PDP-CO copper.

TDC requests DBA to establish a forecast in order to predict the PDP-CO copper lifetime. TDC finds an average lifetime of 10 years reasonable.

As stated in previous consultation notes, DBA agrees with TDC that the economic lifetime of copper cables and trench from the PDP to the CO is shorter than from the PDP to the end-user. Given the arguments from the previous consultation notes, DBA still believes that an economic lifetime of 35 years could be justified from the PDP to the end-user.

DBA does not agree on TDC's estimate of the lifetime of 10 years. Many uncertainties affect TDC's calculation and DBA has not seen any plans showing that TDC will actually upgrade all PDPs with active equipment. Secondly, as stated earlier, DBA does not believe that lifetimes for the copper network should be evaluated at a purely forward-looking basis. Therefore, DBA does not agree that the lifetime should be as low as 10 years.

For the sake of simplicity, DBA will use a common, average cable and trench lifetime for the entire access network. DBA still believes that the economic lifetime for PDP to end-user could be 35 years. For PDP-CO, the lifetime should be lower than 35 years but above 20 years.

On this basis, an average economical lifetime of 30 years for the copper access network has been implemented in the model.

Footprint – definition of demand

TDC does not find DBA is using a consisting definition of demand. On one hand all copper lines are included in the copper scenario thus respecting that e.g. a customer need a second line for a fax machine. On the other hand DBA is not respecting the demanded bandwidth on the access lines since DBA reject to ensure adequate bandwidth for the

CATV customers included in the copper scenario (by using remote DSLAMs consequently for CATV customers).

TDC requests DBA to use a consistent approach in the demand of the network in order to avoid future misinterpretations and disputes in the sector of what is actually modelled.

DBA addresses the combination of customers from different technologies in the model documentation page 20:

> *In particular, 2 questions would need to be addressed:*
>
> > *1. would an active customer having multiple copper accesses have multiple accesses with the network modelled?*
> >
> > *2. would an active customer having a combination of different access technologies have multiple accesses with the network modelled?*
>
> *As regards the first question on multiple copper connections, multiple copper accesses (i.e. a customer having two active copper lines in the same building) should be modelled by multiple accesses in the BU model for copper.*
>
> *As regards the second question on combination of several access technologies, DBA considers that an active customer having multiple accesses based on different access technologies in the real life would more likely have a unique active line in the context of a unique access platform.*

TDC agrees of the approach of questioning how many connections a subscriber would need in a national footprint of *one* technology. TDC does however not see any arguments leading to answers of the two questions. Instead, DBA jumps to the conclusions as it can be seen in the above quoted text.

DBA should further be aware of differentiating between technologies. If several copper pairs are needed for customers demanding this today, this will not necessary be the case in a fibre scenario where capacity limitation is not an issue.

TDC requests DBA to establish solid arguments for the demand definition in the national footprint, or – if this is not possible – model technology specific demands like in the previous model.

According to the model reference paper, the access network modelled aims at handling the aggregated demand of all existing access platforms (copper, fibre and CATV). In particular, Criterion BU 22 states:

"The LRAIC model should assume that each access network technology supports 100% of TDC's local fixed network demand in terms of active subscriptions (i.e. 100% of the "copper + cable TV + fibre" demand)".

This is DBA's interpretation for the Commission's Recommendation and this is further explained in the section "Footprint - Cost causality".

In the precedent consultation, DBA has answered the two questions quoted by TDC regarding the number of active copper pairs per premises in the context of a unique access platform.

TDC is concerned by the capacity of the copper network to provide an equivalent level of service as the one provided to CATV customers.

DBA is aware that the service provided by the CATV network in some cases is superior to the services that can be provided by the copper network deployed.

However, DBA notes that the aim of the copper network modelling is to perform a cost adjustment on the fibre-based MEA network to price copper based services to reflect different performances; this practice is in line with the European Commission recommendation of September 2013:

"When determining the access prices of services that are entirely based on copper, NRAs should adjust the cost calculated for the modeled NGA network to reflect the different features of wholesale access services that are based entirely on copper. For this purpose, the NRAs should estimate the cost difference between an access product based on for example FttC/FttH and an access product based entirely on copper by replacing the optical elements with efficiently priced copper elements, where appropriate, in the NGA engineering model."

In that context, DBA would find it irrelevant to take into account "fictive" enhanced network capabilities in the copper network to reflect CATV performances to price a copper network which currently does not have the same capabilities. In order to capture the right level of economies of scope, the question is whether the CATV customer would subscribe to a copper service in the case of only a single copper platform being available.

In that specific scenario, DBA finds that customers would choose a copper based broadband subscription in the vast majority of cases, even if the service provided may be slightly inferior.

In the case of CATV TV-only customers, DBA believes that the copper network is able to provide the CATV customers with a TV-connection. DBA has observed that on TDC's website (tdc.dk), TDC proposes a nationwide TV offer and states that the TV-service uses between 2-4.5 Mbps and that the minimum speed needed is 3.6 Mbps. DBA also notes that in France, an operator has launched IPTV services even for DSL

lines having only 2 Mbps capabilities[4]. DBA will therefore assume that all CATV lines integrated into the modelled nationwide copper network will be able to support the IPTV service.

In the context of the 2nd round consultation note, DBA has stated that "*As regards the first question on multiple copper connections, multiple copper accesses (i.e. a customer having two active copper lines in the same building) should be modelled by multiple accesses in the BU model for copper.*"

The modelling aims at providing a copper access to all potential customers of the modelled platform when this platform can supply the customers' needs. DBA takes the view that in an identical configuration, a customer would use the same number of connections (e.g. in a configuration of a copper, a customer having two connections to provide an ISDN2 service would in a copper-only context use the same connections to cover its requirements).

DBA has also stated that "*DBA considers that an active customer having multiple accesses based on different access technologies in the real life would more likely have a unique active line in the context of a unique access platform.*".

It has to be noted that the objective of the modelling is to evaluate the cost of deploying a copper network and all copper-related services. All CATV customers being considered as voice and/or broadband and/or TV customers, contribute to economies of scale of the access network.

The question raised here is how would a copper- and CATV-customer behave in a copper-only context and whether this customer would use one or many copper connections in the context of this copper-only deployment. It seems to be a reasonable assumption that if a customer already has a copper access, but is not able to get a CATV access anymore, he would most likely cover his needs through its existing copper access rather than opening a second copper line. DBA believes that this is a conservative approach, since including the extra copper lines would increase the economies of scale.

DBA see therefore no reason to change the principle for calculating the number of active customers in the copper scenario.

Predictability of copper prices

TDC states that the current 3rd draft model is implemented this will imply a dramatic decrease of wholesale prices. It is not clear if this is intentional or not but the significant price decrease that will be the outcome will be

[4] http://www.clubic.com/connexion-internet/fai-numericable-numeribox/actualite-579834-numericable-adsl-tevolution-tv-zone-non-degroupee.html

in contrast with the goals of the Recommendation and the intention to promote investment in NGA in order to comply with the Digital Agenda goals.

When Commissioner Kroes launched the Recommendation and was addressing the alternative operators in ECTA the goal of price stability was clearly stated:

> *On the issue of copper prices, in particular, I know there is a vigorous debate; often quite polarised. Your members arguing for decreasing copper prices and others for the opposite.*
>
> *However, the clearest message I got from investors and potential investors was the need for predict-able and stable rules. And that's what we are doing. The proposed method should not lead to an increase of the average copper price; but equally, it will not artificially force copper prices down. It is about consistency and stability. This framework will last until at least 2020, giving you the long term perspective you need.*[5]

This goal is then to be achieved by application of the Recommendation's cost methodology which in some instances in countries less advanced than Denmark could lead to undesirable changes in wholesale prices and to avoid this the Commission therefore accompanied the methodology by the price band of 8-10€.

TDC agrees with DBA that an increase in wholesale access prices will be as problematic in relation to price stability as a decrease and therefore the Recommendation's price band could be applied as a 'safety' net also if such a price increase should be the case.

However, as explained by the DBA the Danish regulation already has been at the forefront since the DBA already has implemented and applied the recommended price model of the Recommendation for years:

> *DBA would also like to remind TDC that DBA is one of the first countries in the European Union to build a LRAIC model for the fixed network following the issuing of the costing and non-discrimination Recommendation. Comparisons with prices in countries that does not yet follow the Recommendation is in DBA's view not of much use.*

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[5] Neelie Kroes, Vice-President of the European Commission responsible for the Digital Agenda:

Balancing investment and competition in European broadband market

SPEECH/12/870 27/11/2012

TDC therefore assumes that the Danish wholesale price level as calculated by the current LRAIC model already for the period 12-14 has achieved the level which is foreseen in the Recommendation and thus the current challenge is to ensure that these prices also forward looking remain stable.

This assumption is substantiated by the 2012 Impact Assessment[6] of the Recommendation which:

a) States that the objective of the preferred Option 3 leading up to the Recommendation is to:

   Ensure predictability of access prices to promote investments in NGA… This option suggests an economics-based approach which considers the competitive process for each asset individually and constructs the costing methodology for each access service on the basis of the recommended valuation methods for the assets that it comprises. Whilst setting prices at an efficient level, valuation methods and wholesale price setting would be favouring stability and predictability over time of access prices. Convergence of prices in Europe will also be facilitated.

b) Mentions specifically that the current Danish approach i.e. the outcome of the LRAIC model now under revision has so far been contributing to the stability:

   Secondly, option 3 is geared towards current practice of those NRAs, which have a good track record in unlocking investments in NGA networks. The Swedish NRA has adopted the Modern Equivalent Asset (MEA) approach, and the French, UK, Danish and (at proposal stage for the time being) Belgian authorities are already today differentiating asset valuation methods to reflect competitive dynamics, which has resulted in a stable access price without causing a drastic decline in access prices

TDC will therefore suggest that the DBA reconsiders the proposed changes of key parameters (notably lifetime, footprints and use of ducts) also to ensure the stability of wholesale prices in line with the observation by the Commission as well as the statement of the DBA (cf. Above).

DBA notes TDC comments, but does not see any conflict in relation to Commissioner Kroes' speech as DBA:

- is not artificially forcing copper prices down

[6] SWD(2013) 329 final COMMISSION STAFF WORKING DOCUMENT IMPACT ASSESSMENT Accompanying the document COMMISSION RECOMMENDATION on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment, 11.9.2013

- is ensuring stable prices once the Recommendation is implemented

DBA would like to underline that the Commission's Recommendation sets out a number of principles that should be followed and not a price band that should be reached. DBA would like to refer to the DBA's comments regarding the price band stated in section "Lifetime for copper and fibre".

As TDC is aware, one of the principles in the Recommendation is that all of the incumbent's demand should be modelled on one single platform. The fact that TDC owns the largest cable-TV-operator in Denmark is a national circumstance that must be taken into account when implementing the Recommendation. This will give rise to higher demand and thereby lower unit cost.

It is evident to DBA that the old LRAIC-model, which was build several years before the Recommendation was issued, does not follow the Commission's Recommendation.

As TDC is aware, the Recommendation will be implemented as part of the ongoing revision of the LRAIC-model. Prices will be based on the new model from the first of January 2015.

DBA acknowledges that the prices have to be stable once the Recommendation has been implemented. But it is obvious that prices may change when several new cost principles have to be followed. The principle of stability going forward is very important and is highlighted in many instances in the September 2013 Recommendation. DBA notes that if only the actual copper or CATV or FTTH demand of TDC rather than the aggregated demand was considered, the risk of having significant fluctuations could be high because of migrations from one platform to another. That is, considering an aggregated demand solves this issue and provides more stability looking forward (as the choice on the WACC as explained earlier).

Footprint – counting demand

TDC states that in the 3rd draft model, DBA has defined further 100.477 lines and added these to the national footprint. The majority of these lines seems to be ISDN2 and ISDN30 lines. These lines are however already in the model where the use of copper lines for ISDN2 (one line) and ISDN30 (two lines) are included in the copper lines base of 1.997.196, see 'A4_I_Network demand' cell F18:F19 in the previous access model.

TDC requests DBA to remove the double counted ISDN lines in the footprint calculation.

In the 3rd draft model, DBA moved the active lines calculation from the historical inputs spreadsheet to the parameters spreadsheet. Four categories had been identified:

- Total active first line for local loops (number of local loop customers)
- Total active first line for sub-loops (number of sub loop customers)
- Total active second lines for local loop (number of local loop pair bonding + ISDN customers)
- Total active second lines for sub loop (number of sub loop pair bonding customers)

The number of active local loops is defined as the number of first lines + the number of second lines.

TDC argues that the number of first line for local loops includes twice the number of ISDN customers.

Following the calculation flow, DBA confirms that the number of lines taken into account in the cost allocation double counts the ISDN customers.

Lines 78 to 90 of the "parameter" spreadsheet have been updated in order to clearly identify the number of active customers and active lines to avoid any confusion. The copper network modelled counts 2,755,669 customers for a number of 2,856,146 active lines.

Footprint - Cost causality

TDC notes that on page 13/14 DBA states that TDC's proposal of assuming only one copper line per address contradicts with the fundamental principle of cost causation.

TDC agrees it will be a change in principles. It is however DBA that has decouple the relation between number of lines and the unit price per line. TDC proposal is just a way to make DBA's method more consistent.

DBA contradicts the cost causality with its use of national footprint and separate scenarios. In the draft model, copper prices - but not fibre and coax prices – is calculated in the copper scenario. In this scenario coax and fibre customers are used to dimension network and in the denominator to calculate copper unit costs. Similar, in the coax scenario a fraction of copper customers (already used in the copper scenario) is used in the denominator to calculate the unit cost. The same approach is used in the fibre scenario. Consequently, a copper customer is used up to three times in the unit cost calculations. This indeed contradicts the cost causality.

Given that DBA states it intends to align with the well-established cost causality principles, TDC requests DBA not to use national footprint in independent scenarios.

DBA does not agree that TDC's suggested approach would make the method more consistent. DBA has in the consultation note of the 5th of June described the method applied and DBA finds that the method is in line with the Commission's Recommendation.

TDC states that DBA contradicts the cost causality with its use of national footprint and separate scenarios and that, consequently, a copper customer is used up to three times in the unit cost calculations. Contrary to TDC, DBA finds this an obvious outcome seeing that three different stand-alone networks, covering a similar group of customers, are modelled. Also, DBA is of the view that the fact that a copper customer is used three times in the unit cost calculation has nothing to do with the cost causation principle but only with the fact that an efficient operator would maximise economies of scale by having a single platform, not three.

DBA finds that this follows directly from the Recommendation where it is stated that:

"Active copper lines are decreasing due to customers migrating to cable, fibre and/or mobile networks. Modelling a single efficient NGA network for copper and NGA access products neutralises the inflationary volume effect that arises when modelling a copper network, where fixed network costs are distributed over a decreasing number of active copper lines. It allows for progressively transferring the traffic volume from copper to NGA with deployment of and switching to NGA. Only traffic volume moving to other infrastructures (for example cable, mobile), which are not included in the cost model, will entail a rise in unit costs."

For the specific Danish case, DBA has taken into account that TDC owns the largest cable-TV network (the YouSee network) and this has an impact on the number of active customers in the modelled network.

If coax and fibre customers are not included in the copper scenario, the copper price will be inflated as the customers switch to e.g. TDC's coax or fibre platform. This is clearly not in line with the Recommendation.

DBA therefore finds it obvious that the total demand should be included on each individual modelled platform.

Shapley-Shubik

TDC has 14. May submitted a memorandum describing TDC's reservations regarding use of Shapley-Shubik. TDC has re-submitted the referendum as appendix 2.

TDC's consultants have analysed the Shapley Shubik cost allocation approach implemented in the LRAIC cost model. In total, 8 types of critics can be identified and some errors have been listed.

First, TDC's consultants indicate that the application of the Shapley-Shubik cost allocation approach is not widespread and it does not represent common practice in cost models for regulatory purposes. DBA agrees that the traditional approach is the capacity-based allocation approach. However, DBA believes that it useful to consider innovative cost allocation approaches like this one as they provide better outcomes for the market (as a second best approach compared to the optimal Ramsey pricing approach). Also, DBA is aware that several regulatory authorities have introduced this methodology in their cost models (not necessarily in order to set prices but at least to assess the impact of this methodology): this is the case of ARCEP (France), ComReg (Ireland), OUR (Jamaica) and TRA Bahraïn.

Second, TDC's consultants state that Shapley-Shubik cost allocation approach requires calculating the standalone cost of each service but that the LRAIC model is not fit for purpose to calculate the standalone cost of each service because it is designed to reflect an integrated operator. While DBA agrees that the LRAIC core model is not initially designed to calculate the standalone cost of each service separately, it is important to remind that for each service to be individually provided over the whole territory of Denmark, it is necessary to deploy network that goes up to the end user and therefore the standalone cost of the services will not differ significantly. To provide voice, a full NGN IP network would probably be deployed (TDC's consultants state that an efficient approach would be to rent the necessary Mbps of bandwidths instead of building a full network for voice, however, this is very theoretical and if we assume the operator rents capacity, this must be rented from an existing operator and this operator would use the Shapley-Shubik cost allocation approach to set its prices so this would provide similar outcomes). Same for broadband, multicast and leased lines. For leased lines, DBA however believes that the network could be less capillary (because leased lines are traditionally provided over a smaller number of sites). But DBA notes that 82% of the COs have leased lines and there could be new ones to the 18% remaining in the future with the increase in business requirements. As a consequence, DBA believes the critic is not valid.

Third, TDC's consultants-argue that "it is not realistic to assume that these services would be consumed in any order". DBA believes this is true but this is a misunderstanding of the Shapley Shubik cost allocation approach. Assuming that services would be consumed in any order is inherent to the Shapley Shubik cost allocation. This is the basis of this approach. Therefore the point is not relevant.

Fourth, TDC's consultants criticise the choice of the increments. DBA believes that the choice of the definition of the increments can only be a

subjective exercise and notes that no further proposals are made. However, DBA is of the view that it makes sense to consider the increments it has defined as they could correspond to different business models for operators as these are different types of services provided in the end (DBA notes that broadband, voice and leased lines are generally regulated in different markets and that it makes sense to subdivide broadband between prioritised traffic and residential traffic as they correspond to different needs).

Fifth, TDC's consultants claim that the Shapley-Shubik cost allocation approach makes the model more complex and less transparent as it requires the model to run several times with a macro. DBA reminds that "pure LRIC" calculations are generally also based on a macro (including in TDC's consultants models) and that the "Shapley Shubik" makes almost the same type of calculations as the "pure LRIC" approach. As a consequence, DBA does not believe this adds significant complexity. The macro does not include any complex calculation but only set at zero some types of traffic.

Sixth, a further critic made on the Shapley-Shubik cost allocation approach is the fact that the model produces a number of counterintuitive outcomes. TDC's consultants have conducted several analyses showing that the costs allocated to services is very different with the Shapley-Shubik than with the capacity-based allocation approach and that some services like voice use a small proportion of traffic at peak hour but are being allocated a lot of costs. DBA notes that TDC's consultants' analyses are not surprising. The Shapley-Shubik cost allocation approach is indeed a different cost allocation approach compared to the capacity-based allocation approach. Therefore it would be on the contrary very striking to observe similar outcomes. DBA would like to highlight that this is not because the traditional capacity based allocation approach has been used for ever that this is the only valid allocation approach. There are many allocation approaches that can be envisaged and DBA believes that it is worth testing the results of other allocation approaches that can be implemented. DBA believes it is useful to test innovative approaches. Especially when the allocation approach has advantages (at least from a theoretical point of view) like the Shapley-Shubik cost allocation approach. DBA remind for example that the European Commission has recommended for MTR and FTR the pure LRIC approach which allocates to MTR and FTR services only the pure incremental cost of the MTR and FTR and which has been adopted by many regulatory authorities in Europe. This approach is not a capacity based allocation approach. However, this has been used often over the last few years.

Seventh, DBA notes that TDC's consultants are surprised by the large amount of costs being allocated to voice. However, one may say that the capacity-based allocation approach is on the contrary allocating too less cost to voice, especially compared to the value that customers attribute to this service. DBA does not believe the results are counter-intuitive

once the objective and fundamentals of the Shapley-Shubik cost allocation methodology are properly understood. However, more generally, speaking DBA agrees that the results are very different compared to the traditional approach (capacity-based allocation approach) and that therefore this approach must be carefully considered.

Eighth, TDC's consultants also analyse the standalone costs produced by the model and conclude the model essentially assumes the vast majority of costs are fixed costs irrespective of traffic or service requirements. DBA believes indeed that the vast majority of costs are fixed in a core network. This is due to the fact that the main driver of costs in an all IP-NGN network is the need to connect all COs in the country which implies that core network costs are largely made of fibre and trench costs and to the fact that capacities in an IP-NGN network are significant.

Finally, TDC's consultants list some errors in the implementation of the Shapley-Shubik approach. DBA would like to point out that the second consultation note was addressing the errors that have been found by TDC regarding the Shapley-Shubik implementation. DBA answers are located in the "Shapley-Shubik" section starting page 123 of the second consultation note.

Specific comments on access model

Two different access models

Telia and Telenor state that in this third consultation, DBA has sent two versions of the Access model out for consultation (marked “National CATV” and “SQL”). Telia and Telenor request DBA to develop one model which can cover all the relevant scenarios, so that the final access model (and core model) only exists in one version. The existing LRAIC model with different versions for “Dong” and “Resten af landet” is a confusing setup. Therefore Telia and Telenor would appreciate if the new final model is released in only one version.

DBA has for the first two consultation rounds provided one public access model.

The SQL part of this model is identical for all scenarios except for the CATV. The public database of the CATV is focused on one area in order to let the alternative operators run the model and understand how the results are calculated but without the information at a national level that cannot be disclosed for confidentiality reasons.

Telia and Telenor have requested a model that calculates results that are in line with confidential model used for pricing.

On this basis, DBA has provided the alternative operators with a new version of the access LRAIC model. This model ("National CATV") lets alternative operators have a view on the inventory and the costs of the network calculated at a national level. In order to avoid the confidentiality issues, the geographical information has been erased and the whole national inventory has been attributed to the first CO.

DBA does not see that the confidentiality issue can be solved in any other way. DBA would like to underline that the "SQL" version has only been provided to the alternative operators for them to understand the functioning of the model and the model will not be used for pricing.

DBA notes that it is not possible to produce a single public model that provides the alternative operators with all the functionalities requested.

OPEX level for access model

Telia and Telenor find that the calculation of OPEX in the Access model is non-transparent as the LFI analysis and TDC data is kept confidential. As Telia and Telenor understand it, the number of errors in TDCs copper network is close to 4%. DBA has collected information indicating that an efficient new copper network would have a LFI of 4%, and therefore DBA concludes that TDC’s OPEX figures do not require adjustments.

Telia and Telenor would like DBA to clarify which investigations have been done to conclude that faults in TDC's network and the faults in the new copper network are comparable. Is the definition of a fault identical in the two sets of data? Telia and Telenor would like DBA to describe the most common types of faults.

Furthermore, it is unclear to Telia and Telenor, if DBA in its analysis compared the event costs in the two different networks. If the faults are comparable, it would be reasonable to believe that the costs are comparable as well.

When studying the Access model, Network OPEX, cell J65, it can be seen that the number of "events" for every 1.000 connections is 74, i.e. 7.4%. This seems too high, since the LFI analysis – apparently – shows that it is 4% in TDC's copper network as well as in a new copper network. Telia and Telenor request DBA to change the number of faults in cell J65 from 74 to 40 in order to reflect the LFI analysis carried out by DBA.

Furthermore, Telia and Telenor encourage DBA to increase the transparency regarding OPEX in the access model.

DBA notes Telia and Telenors comments. In other countries, DBA has observed that the level of faults in a new underground copper-access network is 4 %. This figure was observed 2 to 3 years after the network was deployed (after stabilisation). The level of faults is calculated as the total number of physical faults observed on the copper local loop divided by the number of active lines. These faults mainly concerns cables cut, electromagnetic interference or damaged cables due to climatic conditions (water, frost, etc.) but do not include active equipment faults such as DSLAM or CPE related faults. To answer Telias and Telenors question, DBA can confirm that the faults are comparable. However, no comparison has been made in relation to the level of cost associated with correcting these faults.

The key findings of the OPEX maintenance analysis in the second draft of the LRAIC model was:

- 4 % is an efficient level of LFI

- TDC has an LFI of 4 %

- The number of faults where set to 7.4 % to reach TDC's level of OPEX

DBA has reviewed this approach based on Telia and Telenors comments. The total cost of maintenance is driven by the number of faults in the network and the cost of repairing the faults. DBA still finds that an efficient level of LFI is 4 %. However, DBA does not necessarily believe that TDC's unit cost for repairing faults is efficient. Therefore,

DBA does not necessarily believe that TDC's OPEX should be reflected in the LRAIC model.

In the final model, DBA has set the LFI at 4% and used a bottom-up cost calculation for a fault in the model (4 hours of technician time). Based on this approach, the maintenance costs are now 234 mDKK. This is slightly below the cost of XX mDKK in TDC's account.

DBA has kept the LFI at 4 % and calculated the unit cost of these events bottom-up. This gives an OPEX level of 234 mDKK for maintenance for the copper network.

For the fibre network, there is reason to believe that the level of faults is lower than for the copper network.

Ericsson, one of the biggest providers of telecommunications equipment in the world, emphasizes that the absence of active equipment in an FTTH network will lead to a lower level of OPEX compared to copper/FTTN and HFC networks:

"Compared to copper and hybrid fibre-coax (HFC) networks, OPEX will be considerably lower as P2P fibre provides the best distance-bandwidth solution with lower number of active elements required in the network. This reduction in active elements in the OSP also results in a lower OPEX."[7]

The FTTH Council Europe also explains that the level of OPEX for FTTH will be lower than for copper/FTTN networks and lists the potential saving opportunities:

"An additional motivator for service providers is that FTTH networks have lower operating costs (OPEX) than existing copper or coaxial cable networks. FTTH networks consume less electricity with some reports putting the figure at 20 times less than HFC or VDSL. Network operation and maintenance is simplified using full automation and software control, requiring fewer staff. Maintenance costs are also reduced as there is no active equipment in the field to maintain, and optical components are extremely reliable. Optical fibre is not affected by electromagnetic interference, which is a source of downtime in copper networks."[8]

Finally, in a presentation on next generation networks, the Italian NRA AGCOM compares copper and fibre networks and states that the fibre OPEX saving as compared to copper is circa 50%:

[7] Source: Ericsson, Point-to-point deep fiber access, 2010

[8] Source: FTTH Council web site

"NTT / Verizon: 40-60% OpEx decrease with FTTH networks w.r.t. copper local loop"[9].

As a consequence, a LFI of 4% x ½ could be justified for FTTH based on the statements from AGCOM and NTT/Verizon.

To be conservative and considering the possible uncertainties around the appropriate level for LFI for FTTH networks in Denmark, DBA has set the LFI at 3% for the fibre PON and PTP network.

Design and Planning and Support/Overhead costs

TDC has made a breakdown of the cost categories with regards the Design and Planning, both for access and core, please refer to the file attached file for cost breakdown and descriptions. For Design and Planning there are no cost included in Corporate Overheads.

With regards to Support/Overhead there are some overhead costs that occur in Corporate overhead. If DBA had chosen a method of subtracting the Corporate Overhead costs from the total cost base these cost should remain in Support and Overhead as inputted from TDC. However, given DBA's approach TDC is identifying costs in Corporate Overhead that should be excluded from Support/Overhead in order to make consistency with DBA's approach.

During the previous round of the consultation, DBA asked TDC to provide more details regarding two OPEX costs categories in order to assess whether they should be taken into account: Design and Planning costs and Support/Overhead costs. TDC has provided DBA with a breakdown of these two cost categories and an analysis for a more relevant scope for Support/Overhead costs. This work has been carried out for both the access and the core part.

DBA has analysed these breakdowns further.

Core support and overhead costs

TDC has carried out the analysis regarding the "support/overhead" OPEX relevant to the core network. Out of the initial XX mDKK, TDC has identified XX mDKK that were already accounted in the IT costs and in corporate overhead costs. Therefore, TDC states that XX mDKK should be included in the core network cost model.

[9] Source: AGCOM (Italian NRA), Challenges in moving towards the Next Generation of Fixed and Mobile Networks, January 2010

DBA is, however, of the view that some of the initial XX mDKK are not relevant to the IP core network. TDC has computed these XX mDKK by selecting the "support/overhead" OPEX related to the assets relevant to the IP core network. DBA has reviewed the list of assets selected by TDC and has updated it in order to make it consistent with the list used to compute all other non-network costs. Some assets selected by TDC have therefore been excluded by DBA. E.g. the network element "Dedicated IP setup for mobile core" has been excluded from the list of network assets relevant to the LRAIC cost model. Following DBA's revision, only XX out of the XX mDKK OPEX for "support/overhead" have been deemed relevant. Given the lack of data provided by TDC, it is not possible for DBA to track back the XX mDKK identified by TDC as being already accounted for elsewhere. DBA is therefore using the EPMU approach to compute the relevant level of "support/overhead" OPEX that should be included in the model. The relevant share of "support/overhead" OPEX is therefore XX * XX / XX = XX mDKK, i.e. the relevant share represents XX% of XX mDKK.

Core design and planning cost
In relation to the "Design and Planning" costs relevant to the core model, TDC has carried out the same analysis as for the "support/overhead". That is, TDC has identified the list of relevant assets to the IP core network and has added the "Design and Planning" costs and identified that XX mDKK should be included in the core network cost model. These XX mDKK have then been split between different tasks and processes relevant to the core network in order to provide a description of the origin of these costs.

DBA has first reviewed the list of assets relevant to the IP core network. Following the exact same approach as for the "support/overhead" OPEX, DBA has decreased the relevant "Design and Planning" costs from XX mDKK to XX mDKK.

DBA has then analyzed the breakdown carried out by analysis to assess whether each task and process was relevant or not to a new full IP core network. DBA has found that 8 categories are not relevant:

Capacity	Productdevelopment	Non capitalized support for product development projects, Optimizationprojects regarding the build- and capacity-processes, Production of Norms and guidelines for registration in inventory systems, Data extract from various inventory systems. Project management of Local IT tasks.	XX
Tecnology	Productdevelopment	NON capitalized part of the product developement proces, and optimazation project regarding core platforms	XX
Tecnology	Project management	Project managers for different internal optimization projects	XX

Maintenance	Customer handling	Handling of customers from remote site, eg. New configuration, project management of complex orders	XX
Capacity	Customer order handling	Task driven by customers orders, eg. Fall out from automated processes, special orders eg. Special requirement in single orders. Rerouting of connection path in the core network	XX
Tecnology	Costumers solutions	Support regarding design and cost calculation for special bid orders. Handling of fall outs on customer orders from automated processes	XX
power	Power and cooling technical buildings	Power and cooling technical buildings	XX
International transmission	International transmission	International transmission cost. Payments to other operators, for capacity used by TDC internal core platforms	XX

DBA has excluded all categories related to optimization as the modeled core network is a new and efficient network which therefore does not need any optimization.

Similarly, DBA has excluded categories related to order falling out of automated processes. The network modelled is a new and efficient network with a new and efficient IT system that matches the products sold, even the most complex orders. Therefore, no extra cost should be accounted for.

International costs have also been excluded as they are not relevant to the LRAIC regulated products and finally the costs related to power and cooling have also been excluded as they are already accounted for in the core network cost model.

This analysis leads to the exclusion of XX mDKK out of the XX mDKK. Simarly, as for the “support/overhead” OPEX relevant to the core network, TDC did not provide enough data to track back the breakdown by categories to the network elements of the regulatory accounts. DBA has therefore used the same approach to compute the share of “Design and Planning” costs that should be included in the core network cost model. This leads to the inclusion of XX mDKK, i.e. the relevant share of “design and planning” costs is XX % of the XX mDKK submitted by TDC.

As both the “support and overhead” and the “design and planning” cost categories are derived top down from TDC’s regulatory accounts, DBA has applied the reduction on wages described in the second consultation note. As described in the comment “Reduction in pay cost”, only 76% of the costs are kept. This implies that the initial XX mDKK for “Support and Overhead” and XX mDKK for “Design and Planning” have been scaled down to respectively XX mDKK and and XX mDKK.

DBA has updated the core network cost model by including XX% of the XX mDKK due to OPEX related to "Support and Overhead" and XX% of the XX mDKK due to OPEX related to "Design and Planning" in the spreadsheet "Non-network costs". This has led to increase the price of the layer 2 BSA product by 10%.

Access design and planning costs
Regarding the Design and Planning costs, TDC has provided a breakdown of the OPEX category. DBA has analysed this breakdown and used the same approach as specified above for the core costs. Based on this analysis, the three categories below have been excluded:

Capacity	Product developme nt	Non capitalized support for product development projects, Optimizationprojects regarding the build- and capacity-processes, Systemresponsibility for varous Inventory systems (primarily GIS), Production of Norms and guidelines for registration in inventory systems, Data extract from various inventory systems. Project management of Local IT tasks	XX
Capacity	Customer order handling	Task driven by customers' orders, e.g. Fall-out from automated processes, special orders e.g. Special requirement in single orders. Rerouting of connection path in the copper network	XX
Technol ogy	Costumers solutions	Support regarding design and cost calculation for special bid orders. Handling of fall outs on customer orders from automated processes	XX

Therefore, out of the initial amount of XX mDKK, XX mDKK are relevant for the scope of the Access LRAIC model and have therefore been included. As explained above, only XX% of these costs will be considered in the LRAIC model and therefore a level of XX will be used for this cost category.

Access support and overhead costs
Regarding the support and overhead costs, TDC has provided a breakdown of the OPEX category. DBA has analysed this breakdown and used the same approach as specified above for the core costs. Based on this analysis, DBA does not find that more cost should be excluded than TDC have already done. Over the initial costs of XX mDKK, TDC has marked XX mDKK as relevant and DBA agrees on this initial amount. As for the other categories, XX% of these costs will be considered in the LRAIC model and therefore a level of XX mDKK will be used for this cost category.

DBA has included XX mDKK for the design and planning costs and XX mDKK for support and overhead costs. These two OPEX

categories have been included lines 16-26 of the Parameter spreadsheet.

CATV

Regarding the CATV network, the design and planning costs have been adjusted in order to match the level of XX mDKK provided by YouSee. A value of XX mDKK have been used for Design and Planning for the CATV scenario.

The model has been updated accordingly.

Fibre

The level of Design and Planning and support and overhead costs for fibre network has been based on the cost level of the copper network. For the Dong scenario the cost has been based on the level of OPEX for the FTTH P2P scenario and adjusted by the number of premises passed.

The model has been updated accordingly.

Trenching

In the third draft version of the model, Telia and Telenor discovered doubtful result of the SQL trenching calculation of additional width and depth. Telia and Telenor have been in dialog with DBA and TERA about this, and DBA and TERA informed that errors were found in the SQL calculation of additional width and depth. DBA and TERA informed us, that after the errors were corrected the results were quite different:

For the copper network: 978 cm.km additional width, and 9,000 cm.km additional depth. For the FTTH P2P network: 316 cm.km additional width, and 3,750 cm.km additional depth.

With this error correction, and the corresponding results, Telia and Telenor have no further comments regarding the calculation of additional width and depth.

Telia and Telenor have reported an error in the 3rd draft version of the LRAIC model. The amount of additional trenches depth and width dug appeared to be very high and seemed to be miscalculated. After further investigation it appeared that unit mismatch was the cause of this miscalculation (millimeters for cables/ducts vs cm for trenches).

DBA has therefore adjusted the SQL calculation: the procedure A01b_FillAssetsTable is adjusted in order to keep a consistent unit (cm) in all calculations, and the procedure B08c_TrenchesSize that calculates

the trenches additional depth and width has also been adjusted. For the copper network, the result is that 9,000cm.km[10] of additional depth and 977cm.km of width is required. The impact of this is a decrease of 40 DKK/year for the local loop cost.

Discount on large scale trenching

Telia and Telenor has noted that the decision on applying trenching discounts to reflect large scale projects is still pending. Telia and Telenor do expect that it reflects a misprint when DBA states on page 88 in the consultation note, that:

"TDC will ask TDC for more information regarding the level of discount in parallel with the third consultation period."

Nevertheless, we would like to emphasize the importance of this aspect of the modelling and remind DBA to address this following the final round of consultation.

In TDC's answer to DBA, TDC argue that:

1) Since all projects for a contractor is done within the same area, each contractor achieves an optimal level of work from TDC. Therefore, the contractors can offer the best possible price.

2) Contracts are renegotiated bi-annually and compared to benchmark prices from tenders. This ensures that a sufficient discount is already included in the prices presented by TDC.

First of all, it is correct that there is a misprint on page 88 of the consultation note. DBA has asked TDC for more information.

Overall, DBA is not convinced that the arguments brought forward by TDC are sufficient to justify that a proper level of discount is already included in the model.

Even though all work for a contractor is performed within the same area, the work performed is likely to be patchy and small scale in many instances. DBA is convinced that a contractor, who was given a project covering a larger and less patchy area, would be able to use resources much more efficient. Thereby, lower prices could clearly be offered. In this matter, DBA think it is relevant to notice that the XX DKKm spent by TDC on trenching services is a limited amount compared to the trenching costs of a nationwide network.

[10] 1 cm.km means that an additional cm is dug on 1km (1km trench of 61cm depth instead of 60cm depth). For a 500m trench at 65cm of depth, it would result on 5cm x 500m = 2,500 cm.m = 2.5 cm.km of additional depth.

TDC's second comment only ensures that TDC's receives low prices given the average size of TDC projects. As stated above, DBA is convinced that lower prices would be obtained for larger projects.

Further, DBA is not convinced that price examples presented by TDC thus far reflect prices for projects of a larger size.

Finally, DBA notes that ComReg, in its decision D01/10, has used a similar approach: *"Subsequent to ComReg Document No. 09/39, Eircom submitted, on a confidential basis, the revised contractor rates, based on recently re-negotiated contracts. The model was subsequently updated with this more recent information. In addition to the updated contractor rates, ComReg has adjusted the contractor rates for economies of scale to account for the benefits that might arise from deploying a new and larger network."*

All in all, DBA believes that substantial discount could be obtained for full national deployment. However, as this is a very difficult matter to assess DBA has chosen to only implement a discount on trenching costs of 5%.

Trench sharing

DBA has received information from TDC regarding the level of trench sharing with other telecom companies. In TDC's answer to DBA, they argue that:

1) It is not interesting for other operators to share trench with TDC on small projects (below 500 meters) in patchy areas.

2) The actual amount received from third parties is around 1 % of yearly trenching cost. In addition some payments are made directly to the contractor from third party.

To DBA's understanding, trench sharing for several projects of 500 meters or above could be offered in case of a nationwide deployment. Especially seeing that the deployment would cover entire continuous areas, the trench sharing would become even more interesting for third parties deploying infrastructure. Therefore, DBA does not believe that TDC's account could be used directly to assess the trench sharing in the LRAIC-model.

From other parts of the industry, DBA has received indications that trench sharing could be relevant in up to 20 % of projects (sharing costs evenly). When trenches are shared, additional trenching is needed for the extra cables. DBA has estimated that an additional 20 % of trenching is needed in case of trench sharing. That is, trenching costs are reduced by (100 % - 120 % / 2 =) 40 % for each party. This implies that trench sharing could reduce costs by 8 %.

All in all, DBA finds that a trench sharing of 10 % is appropriate. In the LRAIC-model, this corresponds to a reduction of trenching costs of 4 %.

Trenching analysis – Geotypes

In TDC's trenching analysis that was submitted in the second hearing phase, TDC stated that the original classification of CO-areas had been used. TDC is convinced that DBA is in possession of the information, since it was in consensus with both DBA and the LRAIC-forum how the line density interval was defined. To support TDC's calculation TDC is happy to submit the original excel sheets. The sheet is submitted along with TDC's reply to DBA's questions of 3. June.

TDC requests DBA to alter the way the national digging cost is calculated, by using more refined information regarding the Surface-profiles for the different geotypes. If DBA still refuses to alter the calculation, TDC finds this will be out of line with the detailed level in other parts of the model where it has been of high importance to TERA/DBA to work with an extreme level of detail (e.g. SQL coding).

In its answer to the 2nd round of the consultation, TDC has proposed a more refined way of calculating localized trench unit costs using a classification of each CO per geotype. This classification makes it possible to determine a distribution of type of soil on a per-CO basis instead of using a national distribution. In its answer to the 2nd round of the consultation comments, DBA has asked TDC to provide detailed calculations of the classification of COs. TDC has provided this classification (based on an analysis carried out in 2001).

In light of this new information, DBA finds TDC's suggested calculation methodology of trench unit costs more precise than the one currently implemented.

In addition, in its answer dated 22nd April 2014, TDC has asked DBA to take into account the distance of road crossing as calculated by the model:

"TDC suggests that the amount of road crossing is calculated directly from the SQL-data instead of using a percentage from the previous model."

Therefore, DBA has for each CO calculated the tunneling distance required (the total road crossing distance) and has adjusted the soil distribution for each CO by using the new value of tunneling proportion. Following, the distribution of the others types of soil have been adjusted proportionally.

DBA has therefore implemented this calculation methodology to determine the type of soil present in each CO in the offline calculation of trenches unit costs and then derive the trenches unit costs accordingly that is used in the model in the Assets spreadsheet, lines 31 to 40. This raises the costs of the local loop by 25 DKK/year.

Trenching cost – price trend

TDC notes that DBA has agreed that the price trend for trenching should be based on the statistical material from "Danmark statistik" rather than old international references. Having said so TDC note that DBA has based the price trend on several categories from the index material (Asfalt-arbejde, Jord-arbejde and Veje). This approach is a misinterpretation of the data since the two categories "Asfalt" and "Veje" does not refer to trenching work in specific surfaces as presumed by DBA. Instead "asphalt" refers to work regarding laying new asphalt layers on road e.g. Renewal of old asphalt road surfaces, and "veje" refers to work regarding building new roads, e.g. building round-a-abouts. Therefore these categories are not related to trench work, and should be disregarded when evaluating the price trend.

The category "jord-arbejde" is a common index for all trench-work across all different surface types, and is therefore the index used by TDC and the contractors when regulating prices for trenching.

Furthermore, TDC notes that DBA has disregarded the fact that TDC, as one of the largest trenching "customers" in DK via its contracts (as documented in the 2. Hearing answer) obtain "rebates" on the weight of the index.

Therefore TDC finds that using the relevant index only and respecting the bargain power of TDC, the price trend should be settled at 2.5 %.

If DBA ignores the contractual setup and the bargain power of TDC the price trend should be settled at maximum 3.11%, using the "jordarbejde" index only

During the second round of the consultation, TDC has provided price trends for several categories of work on roads. As stated by TDC, DBA had based the price trend on several categories from the index material.

TDC argues that "Veje" and "Asfalt-arbejde" do not refer to trenching work, and that only "Jord-arbejde" is a relevant category.

TDC also argues that when revising their prices list, TDC was using a price trend of 2.5% instead of 3.11% of the "Jord-arbejde" category, because of its bargain power.

However the price trend used for the modelling should be a long-term price trend. The price trend of 2.5% proposed by TDC is a short-term

price trend that runs between two invitations to tenders. This price trend cannot be used in the LRAIC model as it could not be supported on a long-term run by digging companies.

In order to illustrate this statement, the table below details the impact of the price trend after 30 years. It represents a 16% discount over an already bargained offer which seems difficult to support by an industry mainly cost-driven by man-work.

Table 1 - Trenches index

Base index	Price trend	Period (years)	Index after the period
100	2.50%	30	210
100	3.11%	30	251

Source: DBA

Therefore DBA will use the "Jord-arbejde" index of 3.11% as the long term price trend for trenches (lines 54 to 63 of the Assets spreadsheet). It raises the costs of the copper local loop by 11 DKK/year.

Holes for joints

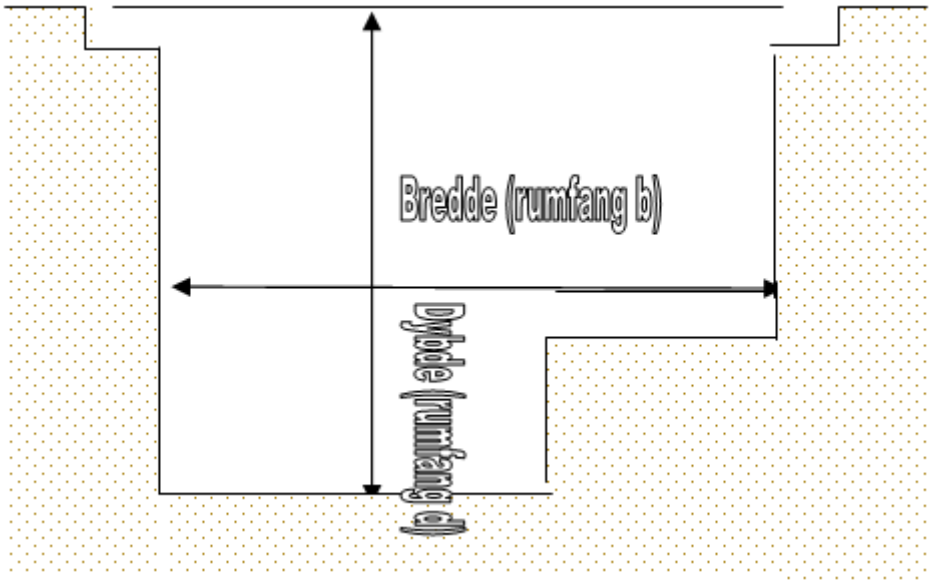
TDC finds it questionable that DBA put a great weight to the statement of Global Connect, a fiber network only provider, when it comes to production of joints in the copper net. Benchmark exercises done on copper network deployment should be done with copper network experts.

Jointing copper and fiber is technically and methodically two very different working processes.

While it makes sense to consider the optimal use of jointing holes for the network, it is unrealistic to remove then completely.

Jointing of copper cables is typical done with no cable extra lengths since the cables are very rigid and difficult to bend, especially for cables with high dimensions. That means there are two options when it comes to jointing copper in a new network deployment:

a) Deployment of a jointing hole that allows the technician to work with the cables at the joint location,



The above drawing show the joint hole structure that allows the technician to sit in the hole working with the cables on his knees.

b) Above-trench cable jointing and successively sliding the cables and joint in to the open trench.

While method ‘b’ is doable in theory it seldom applies in the real world, partly because of safety regulations and partly because of coordination and timing. Digging regulations dictate that only 50-100 meter trench is open at a time. This means for the digging crew not to have any waste time, they have to continuously cover up the trench while digging further along. That does not allow waiting for jointing to be done. Hence method ‘b’ is out of the question, since jointing of copper cables is very time consuming (for example 6 hours for jointing two 200p cables). That means that if DBA wishes to exclude jointing holes from the model, the submitted cost of digging does not apply since the contractors digging crew would be very ineffective and very expensive. Even if method b) was used, extra cost should be incurred, since the joint closure has greater dimensions than the cable, and trench should be enlarged accordingly

TDC always use method ‘a’ for cables with more than10 pair as it is cost optimal. That means that trench is covered up and a jointing hole is dug at the point of intersection. For small cables (10 pair and the drop cable) the option to skip the jointing hole and only do trench enlargement (width) on about one meter trench since these cables are not as rigid could be valid.

TDC requests that DBA include jointing holes into the model for each jointing location (at least for joint on cables with more than 10 pairs) or update the model to capture a large amount of waste time for the contractor.

DBA notes that TDC now accepts that jointing above ground is a possibility. DBA has evaluated TDC's new statement regarding waste time with internal engineers. DBA finds that it is possible to join the cables without any significant waist time.

Finally, DBA notes that the old model did not include the cost of joint holes.

Use of cable Trays

TDC notes that DBA has chosen not to incorporate any cost for cable trays, shafts or other means to hide away or secure cables in MDU in the copper scenario. TDC strongly disagree in this method, and finds DBA interpretation and use of the MEA highly questionable and inconsequent.

TDC agrees that not all current MDU's uses trays, and that in some situations cables are mounted outside on the building walls. Nevertheless it is with no doubt that the modern deployment method is use of trays. This for the following reasons:

1. No building owner will allow "naked" cables to hang in the stairways,
2. Compliance to national building regulations (e.g. fire prevention)
3. To secure cables against vandalism and fraud.

TDC understand that DBA is of the opinion that all MDUs would have shafts or trays paid by the building owner and that TDC can use these free of charge. This is not the case. That might be in new buildings, but in large part of the MDU mass in Denmark, no useable shaft or trays are available, and has to be build if a cable network were to be installed. The reason for the missing shaft/trays, is that the MDU mass, is old (50-200 years), and the design of such is not optimize for modern cable infrastructure.

TDC believes that for several other areas DBA claims the overnight rebuild argument, and TDC finds that this should be use on the trays issue also.

In the hearing note DBA states that invoices and documentation has been requested DBA several times. On this very issue TDC has explained to what extend TDC has list prices with contactors on this asset-type, shown example of this service being used and documented the material cost of

trays. As explained several times TDC build trays for copper network by its own technicians, i.e. time usage is not booked on separate line, but follows the rest of the deployment time, cable jointing, termination etc, due to this it cannot be isolated from accounts.

Instead, TDC has attached examples of project description where it is clearly stated that the trays are to be build by TDC, see appendix 3.

Furthermore TDC has attached documentation from the warehouse information, stating how much tray material that is drawn from stock, see appendix 4.

Therefore TDC finds that it is documented and valid that TDC uses trays for the copper network and that DBA should reintroduce cable trays in the MDU part of the copper network again, at least for a fraction of the MDU's to reflect that a large part of the MDU mass is old.

In addition to DBA's comments in previous consultation notes, DBA is still not convinced that the use of cable trays could be seen as MEA in all instances. Based on discussions with relevant authorities and the industry, DBA finds that there are several efficient ways of installing cables in buildings. These methods include trays, cable shaft and cables mounted directly on the inside of the wall. The choice of a method is highly dependent on the end-user wishes, building owner wishes, availability of shafts etc. No matter what method is used, cables and the installation hereof could be paid for by the operator, the end-user or the building owner.

If cables are deployed in shafts or mounted to the wall, this does definitely not imply that cables are "flying around in the stairways" as described by TDC. In relation to the second point, DBA has been in contact with "Sikkerhedsstyrelsen" and "Energistyrelsen" who have informed DBA that there is no regulation in relation to cabling in telecommunication services. Finally, DBA does not believe that this setup – e.g. with cables being placed in shafts inside the wall of the building – is more sensitive to fraud than when cables are in trays.

All in all, DBA finds that an efficient operator would use trays in some but not all buildings. When trays are installed, TDC would only pay for these in some instances. On this basis, DBA has estimated that trays are used and paid for by TDC in 30 percent of installations in multi-storey buildings for all technologies.

Comments on the SQL-code

Calculation of length of road crossing

TDC notes that DBA writes on page 116 in the hearing note that the total length of road crossing amounts to 1.681 km. TDC understands on DBA that this length for some reasons is a part of 'Trenches_SecondSide length". However this length sums to 1.828 km leaving only (1828-1681=) 147 km to lengths along the roads on the second side.

According to the table "Sections_Premises" 788.000 out of 3.388.000 premises are placed on the second side. When correcting for premises linked by road crossing (app. 7 premises per parcel/MDU) the average distance from one parcel to the next is only few meters on the second side if the 147 km are valid. This seems not realistic.

DBA is requested to further explain how sufficient length of second side trenching/road crossing is secured in the model.

In the previous round of the consultation, TDC has asked details regarding the length of road crossing. As the information is not required for the Excel modelling, it has not been extracted automatically in order to keep a model that is reasonably quick and light. However, DBA has extracted and provided statistics regarding the length of road crossing. This resulted that off the total of 144,344 km of trenches, 1,681 km were to be classified as road-crossing (1.16%). These road-crossing trenches are always counted in the 'Trenches_SecondSide_Length' category in the SQL model.

TDC answers that this 'Trenches_SecondSide_Length' category sums up to 1,828 km, letting only 147 km of road side trench for the second side.

However, after few adjustments required by TDC in the previous round regarding the cost ratio of tunneling versus classical trenches (See part "Trenching strategy - road crossings" page 93 of the second consultation note), the number of kilometers has slightly changed. The total length of road crossing is now 1,472 km of trenches and the total length of second side trenches is 2,854 km[11]. This implies that the roadside trenches on the second side account for (2854-1472=) 1026 km.

[11] The total length of road crossing can be estimated by executing the SQL command: "`EXEC dbo.Tests_RoadCrossingLength`". The total length of second side trenches can be obtained by executing the following command: "`SELECT SUM(Trenches_SecondSide_Length) FROM [dbo].[Results_Trenches]`" after runnin the SQL model in the copper scenario.

In order to support this figure, DBA has analysed the composition of second side constructions at a national level. The results of this analysis are presented in the table below. It appears that there is only one building on the second side for 60% of sections. Therefore, for 60% of buildings, road crossing is automatically used. This percentage increases to 95% if we consider sections with up to 5 buildings on their second side. These buildings are then separated by an average distance of 33 m (calculated as the section length divided by the number of buildings + 1). 33 m is above the average width of the road times the 'cost factor ratio for tunnelling', therefore in most of these cases there would not be any roadside trenches, but only road crossing. Roadside trenches are dug when buildings are very close to each other, concentrated on a portion of the road section, and therefore when the 'real' distance between buildings is much lower than this theoretical average distance between buildings.

In the light of these figures, it seems reasonable to think that the second side roadside trenches should be low, and not superior to the total road crossing distance.

DBA therefore believes that the current modelling does not require any adjustment.

Table 2 – Analysis of second road side constructions

Number of buildings on second side	Number of sections	Average length of section	Average distance between buildings	Cumulated % of second side buildings
0	1,058,913	92		0%
1	139,356	95		60%
Between 2 and 5	81,753	123	33	95%
Between 6 and 10	10,164	204	25	99.2%
Between 11 and 15	1,523	280	21	99.8%
Between 16 and 20	301	320	17	100%
More than 20	75	372	15	100%

Source: DBA

Distance to pedestrian

TDC accepts the SQL approach of using the middle of the way as a SQL-input, described in the consultation note, page 119. However, this approach implies that trenches are made exactly on the boundary between the private property and the road on one of the sides of the road. This is not the case in reality, where cables are deployed under the pedestrian or similar – i.e. ½-1 meter from the boundary.

TDC requests DBA to introduce further ½-1 meter drop wire trenching from the boundary to the road trench unde the pedestrian. Alternatively DBA has to explain how trenches are made without removal of fences, hedges etc. that are placed on the boundary.

DBA does not agree with TDC that this is necessary. In the SQL-code, the edge of the private property is defined as being two meters from the center of the road. This implies that, on average, the trench is dug in the pavement right next to the side of the road. Seeing that the pavement is sufficiently wide, the trench is dug far away from fences, hedges etc. as mentioned by TDC.

On the opposite, it could be argued that trenches should be moved further away from the side of the road and closer to the buildings. Thereby, less trenching and cabling would be needed to reach the buildings. However, this would also require additional tunneling for properties on the second side of the road (in case of road crossings). Since the major part of buildings is located in the primary side of the road, this would decrease the total length of cabling and trenching. Given that tunneling is approximately five times more expensive than normal trenching it is, however, unlikely that this change would have any impact on the total cost level.

On this basis, DBA does not find that any changes are needed.

Use of excel tables in price decision

TDC has suggested DBA to include all regulated prices in standard excel tables. This will ease TDC in implementing the large amount of prices that are settled in December to be used in January.

TDC recognize that 3rd draft not yet is in a state where prices can easily be retrieved.

DBA will include all regulated prices in a sheet in the core model.

BSA copper bandwidth differentiation

TDC finds that the current bandwidth differentiation method should sustain since this reflects some cost causality between higher demand and higher cost.

DBA agrees with TDC that the prices should be differentiated based on bandwidth, but is not sure that the current mathematical function be used. DBA will in relation to the price decision asses how differentiation should be carried out.

BSA coax bandwidth differentiation

TDC finds that the current bandwidth differentiation method should sustain since this allows to aligning the coax pricing with the BSA copper bandwidth pricing.

The amount of bandwidth specific prices for various BSA products has increased dramatically the last couple of years. DBA should consider a simplification of the pricing structure of BSA prices.

DBA agrees with TDC that coax prices should also be differentiated based on bandwidth.

Historically, the different wholesales BSA products have followed TDC's retail supply of broadband products. DBA will consider a simplification of the pricing structure.

Family houses/MDU

TDC finds that the current average price for FTTH do not reflect the underlying cost characteristics, hence disturbing the build-buy signal and investment incentives. TDC suggests DBA to consider differentiated prices for family houses and MDUs in the FTTH pricing.

TDC does not find that same investment incentives in infrastructure roll out (in terms of cabling new areas) is relevant for copper and coax. The average prices may therefore sustain for these technologies.

DBA notes TDC's comment. DBA will consider this issue in relation to the price decision.

Mounting of NTP at GIG installation

TDC finds mounting and installation of NTP should be included with a share of NTP installation events. In reality there is no big difference in the time used if the technician has to connect the cabling to an existing

NTP or has to setup a new NTP. An average price will simplify the pricing and invoicing and enhance transparency.

TDC have brought forward that the model lacks cost on terminating the access network at the customer's premises.

DBA notes that there that the cost of the installation of a NTP have historically been captured by the fees "Engineer assisted installation" and "Installation of NTP". DBA does not see any reason to change the principle.

DBA has assessed the new information related to the cost of the installation of a NTP provided by TDC. DBA believes that the only activity that could be argued not to be captured in the two mentioned fees is the work related to drilling through the wall, deployment of cable through the wall and sealing of the hole.

As some customers (both on the fiber and copper network) have paid upfront for the installation of a NTP, DBA believes that this new fee should only be paid in the cases that the drilling and cable deployment is actually needed.

Therefore, DBA has added a new fee "Installation of NTP (incl. drilling)" that includes these three additional activities. DBA has assessed that an extra 45 minutes are needed for these activities. Hereby, the total cost of "Engineer assisted installation" and "Installation of NTP (incl. drilling)" is similar to the DKK XX presented by TDC.

VULA uncontended price independently of point of interconnection

TDC finds that since operators cannot choose whether to connect to a remote DSLAM or to the CO but has to connect in accordance with TDC roll-out, TDC suggests calculating an average price for VULA UC weighted with the actual demand.

DBA notes TDC's comment, and will consider this issue in relation to the price decision.

VDSL additional fee

TDC finds that customers can today only to a limited degree decide whether the BSA should be produces via ADSL or VDSL. TDC therefore suggests calculating an average cost to be used in pricing.

DBA notes TDC's comment and will consider this issue in relation to the price decision.

New setup

TDC finds that coupling in distribution points between the subscriber and the relevant node is at present priced as a separate service. Historically this made sense since – back in time – this was an uninterrupted connection. This is however not the case any longer. It is not possible for the subscriber or for the operator to know, if the work to make a new setup will include coupling at distribution point– in TDC terms 'trækning af krydstråd'. In order to simplify order processes, TDC suggest to include a ratio of couplings in an average pricing.

DBA notes that the issue of new setup was discussed in the consultation note of 20 March 2014. Here DBA stated that:

"In general, DBA agrees with the comment brought forward by Telia and Telenor. Further, DBA would like to note that in the LRAIC-model sufficient copper pairs are deployed from the SDP to the CO to support all homes passed. Therefore, DBA believes that any costs TDC might have in relation to the coupling of copper in the access network is already covered by the recurring LLU fee. Consequently, the fee for coupling has been set to zero in the model."

DBA does not believe that TDC has presented any information to change this conclusion. On this basis the fee for new setup is taken out of the model.

Specific comments on Core model

Number of vectorised sites modeled

Telia and Telenor state that the in the third version of the model the number of vectorised sites is set at 1.000 (cell L981 in sheet "Historical inputs" in the core model).

As stated in Telia's consultation answer of 16 October 2013 regarding implementation of vectoring costs, Telia finds that the modeling of the number of vectorised sites should follow the LRAIC practice regarding yearly updates. This means that cost of vectoring should enter into the model at the same pace as vectoring is actually implemented in TDC's network. This is the principle that has been used for all other services in the LRAIC model for years.

For new products a dummy demand of one has typically been used. For instance, in the current final model setting prices for 2014, a demand of one dual pair bonding line for each of the six dual pair bonding products has been modeled (even though a higher actual demand for DPB products could be expected in 2014).This means that a number of 1 vectorised sites should be used in the revised model, as vectoring is a new product. Alternatively, as TDC has implemented vectoring pilot tests in two nodes (Hc16 and Øbr5) in 2014, the number in cell L981 in sheet "Historical inputs" for 2014 should be 2. But definitely not 1,000.

DBA would like to point out that the number of vectorised sites that is currently in the model is a dummy value as the number of vectorised sites has not been provided by TDC at this stage.

DBA intends to update this number based on the actual number of sites offering vectoring services. The number of vectorised sites is part of the yearly update data that is requested from TDC. This is why the number of vectorised sites is an input located in the spreadsheet "Historical inputs" (TDC is asked to update on a yearly basis all the inputs located in this spreadsheet). This value will therefore be updated when TDC provides the actual value in August 2014.

Therefore, DBA does not believe that any changes are needed.

MDF cables

Telia and Telenor welcome that DBA uses alternative operators' unit prices of MDF cables, but it does not seem optimal to use TDC's actual length on cables used in 2013. In our hearing response from February we stressed that *"As LRIC models mimic how an efficient operator would build the network today, it seems fair to assume that the MDF and the MSAN are located close to each other"*

We do not doubt TDC actual lengths used in 2013, but we doubt that an efficient operator with newly built central offices would need cables with a length corresponding to TDC's actual sizes.

As we understand the consultation note, TDC's actual MDF cable lengths range from 20 to 75 meters. If TDC's shortest distance from MDF to rack requires a 20 meter cable, then the efficient operator would be able to build all central offices with a maximum cabling distance of 20 meters from MDF to the closest rack. We believe that an efficient operator could improve these distances, but in this argument the point of departure is TDC's minimal distance from MDF to rack. Let us use the map of Byen as example, (Appendix 1 confidential – Rack space Byen). The first two racks (marked A and B) can be reached with 20 meter cables as they stand back to back and share the cable tray (kabelbakke). The rack next to the closest rack can be reached with a 20.6 meter cable, as the rack is 60 cm wide, i.e. the 4 racks (marked C, D,E and F) standing next to the "closest" racks can be reached with 20.6 meter cables. The next 4 racks can be reached with 21.2 meter cables etc. This means that 25 meter cables are sufficient for sites up to 34 racks (5 meter extra length can reach 16 racks to each side). In the Core model 1.026 sites with MSAN racks have only 1 or 2 racks (i.e. 20 meter cable), and 158 sites have at least 3 racks but less than 34 racks (can be reached with 25 meter cables). Only one of the 1.185 sites has more than 34 racks and requires a cable length of more than 25 meters. On this basis Telia and Telenor suggest that the weighted price average shall be based on 86.6% (1.026/1.185) of the 20 meter cable price, 13.3% (158/1.185) of the 25 meter cable price, and 0.1% (1/1.185) of the 30 meter cable price.

As stated by Telia and Telenor, DBA has updated the length of the MDF cables based on the length used by TDC.

DBA would like first to point out that even the most efficient operator is not able to scale the surface of its building to the exact space needed to host all its assets. The surface needed is indeed evolving with:

- the space needed for each asset which has changed over the years;

- the additional space for future roll-outs due to the increasing traffic;

- the space saved for alternative operators.

This is why DBA is of the view that the length of the MDF cables provided by TDC is relevant for the core network cost model.

DBA would then like to stress out that the MDF cables represents solely 0.6% of the total yearly cost of the core network. Decreasing the average length of the MDF cables will therefore have no material impact on the prices.

Based on above DBA does not believe that any changes are needed.

Fibre price calculation non-intuitive (DONG vs. rest of country)

It is Telia and Telenor's understanding that if FTTHP2P prices for the non-DONG area are to be calculated in the LRAIC model then the following steps should be taken:

1) The access model is run with "FTTHP2P" selected in cell G10 in sheet "Dashboard"
2) The contents of sheet "Export to Core Model" in the access model is copied to sheet "Import from Access model" in the core model
3) The core model is run with "Fibre – PTP" selected in cell G13 in sheet "Dashboard"

If these steps are carried out, fibre prices can be seen in rows 65-69 in sheet "Pricing". There are, however, two price columns: "DONG" and "Rest of Country". The prices are identical in the two columns. Telia and Telenor find it confusing that DONG prices (apparently) are calculated when rest of the country is selected.

Correspondingly, Telia and Telenor find it confusing that there is a "Rest of Country" price column in the core model pricing sheet when scenario "DONG" is selected in cell G10 in Dashboard in the access model.

Telia and Telenor requests DBA to streamline the DONG vs. "rest of country" fibre calculations in the Excel model in order to remove any confusion about how the correct prices are obtained.

DBA agrees with Telia and Telenor that the model may lead to some confusion.

The core network cost model includes solely one point-to-point scenario whereas the access network cost model includes two different scenarios for the point-to-point roll-out: one corresponding to the DONG area roll-out and one corresponding to a nationwide roll-out.

The selection of the scenario in the access network cost model tells which price is computed. In order to avoid any confusion, DBA has updated the core network cost model so that:

- When the scenario "FTTHP2P" is selected in the access model, solely the "rest of country" prices will appear and the DONG prices will be hidden.

- When the scenario "DONG" is selected in the access model, solely the "DONG" prices will appear and the "rest of country" prices will be hidden.

DBA has updated the "Pricing" spreadsheet in order to avoid any confusion on which prices are computed when the point-to-point scenario is selected.

MDF space requirement

Telia and Telenor state that in the consultation response dated April 2014, Telia and Telenor gave an example of a small LSA block holding 150 pairs to show that the space requirement for a 250 pair MDF was too high in the model. We appreciate that DBA used the input for adjusting the MDF space requirement for the smallest MDF's in the model. But Telia and Telenor do not find it correct to use these 150 pair MDF's when calculating the space requirement for the MDF's with a high capacity, as the density (measured as "pairs per RU") to some extend increases with the capacity of the MDF. Appendix 2 is a MDF product specification from ADC Krone. On page 21 it is illustrated that a 220 cm standard rack can hold a capacity of 7.200 pairs on the line side, and 6.272 on the active side, i.e. one MDF rack, 40 RU, can hold 6.272 subscribers (or 7.200/2=3.600 subscribers, if 2 pairs is needed on the passive part – please see below). Telia and Telenor request DBA to adjust the space requirement for MDFs for more than 250 subscribers based on the specifications from the ADC Krone appendix. Before making the adjustments, Telia and Telenor request DBA to consider if some of the higher racks (with higher capacity) from ADC Krone could be used in the model, e.g. the 320 cm rack. Furthermore DBA is asked to reconsider the 70% utilization rate which isn't mentioned in the ADC Krone product specification.

DBA writes in the consultation note that each subscriber needs 2 pairs on the passive part. It is Telia's and Telenor's understanding that only one pair on the passive part is needed. Telia and Telenor request DBA to change the model accordingly.

Following the comments received from Telia, Telenor and TDC during the second round of consultation, DBA has updated the space needed per MDF and ODF.

DBA has updated the space needed based on the following assumptions:

- Maximum 2,000 pairs per MDF;

- 70% utilisation rate of the MDF due to the lower part been never used and the upper part been used solely to store over length;

- 3 pairs per customer (2 on the passive part and 1 towards the active equipment).

However, given the vendors specifications sent by Telia and Telenor regarding MDF, it seems that the assumptions used by DBA were too conservative as a single rack (45 RU) can hold:

- 7,200 pairs on the line side;

- 6,272 pairs on the system side.

DBA understands from the documentation provided by Telia and Telenor that only the maximum capacity is provided. However, as explained during the second consultation, the whole rack is not used in a real life deployment. Telia and Telenor have not provided any new data allowing DBA to adjust the utilisation rate of the MDF. DBA will therefore maintain it to 70%.

DBA agrees with Telia and Telenor that at the MDF level, there are less than 2 pairs per line rolled-out: given the engineering rules provided by TDC, the number of pairs per line rolled-out should be 2 * 0.7 * 0.75 = 1.05 instead of 2. There are indeed 2 pairs rolled-out for every line, out of which 70% are kept between the SDP and the PDP, of which 75% are kept between the PDP and the CO.

Given the 70% utilisation rate and 2 pairs being needed per customer, a single rack can hold up to 7,200*70%/1.05 = 4,800 customers.

DBA has therefore updated the spreadsheet "Network assets and costs" of the core network cost model by updating the space required of the assets 5 to 9.

The impact on Layer 2 BSA product of this change is a price decrease of 1.2%

Number of cards per sub-rack

Telia and Telenor state that as illustrated in the attached Alcatel documentation (Appendix 3 - ISAM 7302) the MSAN has 18 slots which can be used for VDSL and ADSL line cards, which gives a capacity of 48x18 = 864 xDSL ports in a sub-rack.

One of these 18 slots can be used for a NTI/O card instead, which is the card used for POI0 links. The NTI/O card has 8 ports, and thus can give 8 other operators access to the DSLAM. This leaves 17 slots for line cards which should be reflected in the model. If TDC wants to reserve 2 slots for POI0 access on NTI/O they need to argue that more than 8 operators will buy access to the MSAN. There is no capacity issue since TDC has stated several times that a 1G uplink to an MSAN is sufficient in their network structure.

Following the comment from TDC on the number of cards per subrack during the second consultation, DBA has decreased the capacity from

17 to 16 line cards. DBA would like to highlight that this change was due to a technical constraint: the MSANs software allows the use of either 2 POI0 cards or 2 LT cards in the two extension slots (slots 17 and 18). This means that you cannot have one of each card in slots 17 and 18. Hence, the reservation of two slots for POI0 cards is not necessarily due to the fact that more than 8 operators will buy access to the MSAN or due to a capacity issue. It is merely a technical constraint.

Having set the capacity of the subrack to 16 is in line with the former model.

DBA would furthermore like to point out that this change would have no material impact on the prices. E.g. the BSA Layer 2 product would decrease by less than 0.25%.

Based on above, DBA does not believe that any change is needed.

SFP modules

Telia and Telenor state that in the second consultation, Telia supplied DBA with prices for SFP modules. DBA writes in the consultation note, that Telia's input will not be used in the model, because it does not seem to reflect original parts.

However, Telia's price inputs do indeed reflect original Alcatel SFP parts. Telia will send invoice copies to DBA in a separate mail, as the prices are confidential (see appendix 4, 5 and 6). This is clear evidence that the prices supplied by Telia reflect original spare parts.

It is Telia's and Telenor's experience that SFP's is one of the spare parts with a high degree of price competition, as non-original parts are produced and sold at very low cost. That forces the suppliers of original parts to adjust the prices to an acceptable level.

As the supplied prices do reflect original SFP's, Telia and Telenor request DBA to use the documented price level in the final version of the model.

DBA rejected during the second consultation the prices submitted by Telia and Telenor for the SFP modules arguing they did not seem to reflect original parts.

However, given the new data submitted by Telia and Telenor including invoices, DBA will update the prices of the different SFP modules based on the prices experienced by Telia and Telenor.

DBA has updated in the spreadsheet "Network assets and costs" the cost of assets 24, 32, 158 and 159 from XX DKK to XX DKK, the cost of assets 60 and 74 from respectively XX DKK and XX DKK to

XX DKK and the cost of assets 59, 73, 86 and 98 from respectively XX DKK, XX DKK, XX DKK and XX DKK to XX DKK.

This change is decreasing the layer 2 BSA price by less than 0.2%.

Resilience issues

Telia and Telenor notes that on p 75-76 in the consultation note, DBA states that the switch design rules suggested by Telia and Telenor are reflected in the model. DBA refers to an email of 5 March 2014 sent by Telia to DBA. Telia and Telenor is not sure that DBA has evaluated the input sent by Telia to DBA on 5 May 2014 regarding a reasonable SPOF norm. In this email Telia argues that a SPOF limit of 7.500 customers is efficient, whereas the current limit of 1.536 is not. Telia and Telenor request DBA to change the limit to 7.500 based on the facts presented in Telia's email of 5 May 2014.

Telia will resend the email of 5 May 2014 to DBA in a separate email (Appendix 7 Confidential - email of 5 May 2014 from Telia to DBA).

DBA has during the second consultation received a document describing Telia and Telenor switching design rules. DBA has reviewed this document during the second consultation and has concluded that:

- The way the switches should be connected is the way they are connected in the model;

- The number of customers affected by a single point of failure (SPOF) is not the same as the design rules provided by Telia and Telenor and in the model.

DBA disagrees with Telia and Telenor that it should be increased to 7,500 as it would not reflect the level of resiliency offered by TDC's network. This would not be in line with criterion 38 and criterion 39 of the MRP.

DBA has therefore used the same switches design rules except for the number of customers affected by a SPOF.

Therefore DBA does not believe that any changes are needed.

Type of core router

Telia and Telenor see no problem in DBA disclosing the type of core router being modeled/the type of core router used in Telia's network (as described earlier by Telia to DBA). Prices listed by Telia should, however, be treated confidentially and should not be disclosed.

Furthermore, as Telia has stressed earlier when looking at router prices, it is important to keep the network design in mind. When using an MPLS core instead of a routed core, as Telia does, less expensive routers (in terms of licenses) can be used.

DBA notes that Telia and Telenor agree to disclose, if needed, the type of core router being modelled in order to ease discussions with the industry.

As no further comment has been made by the industry regarding which core router should be modelled, it is pointless to disclose this information.

Therefore, DBA does not believe that any changes are needed.

Power supply lifetime

Telia and Telenor notes that DBA has requested further information on the economic lifetime of power supply units.

Telenor's oldest core sites was established during the 1990's and early 2000's and part of the power supply units originally installed are still in operation today. Telenor's asset register shows that more than half of the power supply asset base on core sites currently in operation stems from the 1992-2001 period.

Investments in power supply units (capacity and upgrading) have however also taken place after 2001 - and in particular during 2006 and 2007.

Overall, the current modeled lifetime of 15 years for power supply units is considered a conservative estimate, and the actual economic lifetime could very well be longer.

Concepy has mentioned before that the applied lifetime of 15 years is too low. We have attached a document from "Statens Byggeforskningsinstitut" that describes the average functional lifetime of different installations in buildings. It indicates that a more correct lifetime of power utilities should be 25-50 years. Other installations such as Backup site power, Air conditioning, Heat exchanger, security system and physical site also seem to be underestimated in the current LRAIC model, with reference to the estimated lifetimes of installations in the document from SBI.

DBA does not find that Telia/Telenor have provide valid information to document that the lifetime of power supply is longer than 15 years. It is unclear to DBA what asset lifetimes Concepy refers to.

On this basis DBA does not believe that the lifetime should be changed.

Tilted annuity calculation

TDC states that for the formulae in this section, we assume that I = investment, WACC = weighted average cost of capital, p = price trend, n = asset lifetime and T = time to build an asset.

The formula below is that documented by DBA in their previous model (last documented for the v3.1[12] model, but still used for Fv4.22 for 2014 pricing).

$$I \times \frac{(WACC - p)}{1 - (\frac{1+p}{1+WACC})^n}$$

In the third draft of the DBA model (Excel file) [13] the following formula is used:

$$\frac{I}{(1+WACC)^{\frac{1}{2}}} \times \frac{(WACC - p)}{1 - (\frac{1+p}{1+WACC})^n}$$

Equivalent to

$$\frac{I}{(1+WACC)^{\frac{1}{2}}} \times \frac{(WACC - p)}{1 - (\frac{1+p}{1+WACC})^n}$$

With T=0 (as used in the third draft of the DBA model), this is equivalent to:

$$\frac{I}{(1+WACC)^{\frac{1}{2}}} \times \frac{(WACC - p)}{1 - (\frac{1+p}{1+WACC})^n}$$

[12] Page 33 of http://erhvervsstyrelsen.dk/file/233044/lraic_report_on_the_hybrid_model_version_3_1_pdf.pdf

[13] 2012-55-DB-DBA-Fixed LRAIC-Core Cost Model - v20131220 - Public.xlsb, Network costing' worksheet

This has an additional factor compared to the DBA's previous model.

TDC finds that this new formula is equivalent to assuming that:

- The network is built, activated and starts generating revenues at the start of the year
- The network investment is also paid at the start of the year
- The annuity charge is incurred at mid-year.

Although this formula is implemented correctly in the DBA's model for these assumptions, this is the most extremely efficient deployment possible.

TDC requests DBA to remove the additional factor of in order to make the assumptions reasonable.

DBA acknowledges that the tilted annuity formula used in the model is reflecting the assumptions described by TDC.

DBA, however, disagrees with TDC that the tilted annuity formula should be updated as it is in line with the bottom-up assumptions that the network is entirely rebuilt overnight.

DBA would like to point out that TDC has provided no material to support that the payment term (the 'T' quoted by TDC) should be increased.

DBA would furthermore like to state that operators are not paying the investment to build a whole network at once but are paying it progressively so that their annuities matches their revenues curve. There can also be some payment facilities with suppliers so that the operators start to pay for their assets when the assets start to generate revenues.

Therefore, DBA does not believe that any changes are needed.

Operators using backhaul from remote DSLAM

TDC notes that given Telia's and Telenor's comments regarding demand for POI0 on page 30, TDC finds that DBA should reconsider the average numbers of operators using POI0. For the time being 3 operators in average are assumed to use POI0 per remote DSLAM, which is far too high.

DBA has in the VULA POI0 decision of November 29, 2013, estimated the average number of operators per remote DSLAM that are assumed to use POI0. DBA does not believe that there is a need to review this estimate purely based on the statement provided by Telia and Telenor

Traffic forecast

TDC states that the traffic forecast is used to ensure network capacity within the period it takes to upgrade the network. With the large increase in IP traffic the network dimensioning must be ahead of the actual capacity. TDC finds that for IP based services a half years growth in traffic should be included in the allowance for traffic growth in 'Network dimensioning rules' table 2. The growth rates used could be the growth between the two half years traffic submitted by TDC in the yearly update.

TDC requests DBA to update the 'Allowance for growth' table with regards to the IP/data services.

Overall, DBA agrees with TDC that the modeled network should be able to handle traffic growth.

TDC's suggestion to use the growth rate between two half years would imply that the allowance for growth should be set to around 15 percent. In relation to the discussion on peak mean ratios in 2012, DBA asked TDC for dimensioning rules. TDC did not provide any specific rules back then and has not provided specific dimensioning rules during the ongoing revision. Therefore, DBA finds it hard to verify if the approach suggested by TDC is appropriate.

Since dimensioning rules in the model include spare capacity, DBA believes that the modeled network already allows for traffic growth. If the model parameters are changed such that no spare capacity is installed, total network costs decrease by 0.7 %. On the other hand, if a traffic growth of 15% is included in the model, total network costs increase by 1.2%. Therefore, it could be argued that the modeled network already accounts for 2/3 of a 15% traffic growth.

On this basis, DBA has found it appropriate to upgrade the "Allowance for growth" table with regards to the IP/data services to 5 %.

Multicast calculation

TDC notes that DBA has altered the calculation of MC load. TDC finds that the changes made upon comment by Telia and Telenor are consistent with the modelled network. However, TDC finds that there is still a change to made. The two MC-services: *Prioritised - Multicast - uplink - Distr-Edge* and *Prioritised - Multicast - uplink - POI2-POI1* were introduced to capture the fact that the YouSee based multicast in contrast to the TDC TV based doesn't affect a given network layer to full extend since The YouSee footprint is not nationwide. As a consequence hereof the traffic calculated on the services : *Prioritised - Multicast - uplink - Distr-Edge* and *Prioritised - Multicast - uplink - POI2-POI1* should only

capture YouSee multicast traffic. TDC finds that the current model ensures this.

But the traffic calculated on these to services, should then be deducted from the corresponding services: *Prioritised - Multicast - Distr-Edge* and *Prioritised - Multicast - POI2-POI,* or otherwise there must be two distinct multipliers, one for TDC TV and one for YouSee. TDC finds that for at least the service *Prioritised - Multicast - Distr-Edge,* this is not the case.

TDC request DBA to ensure that that the YouSee multicast load in the network is scaled to the fact that YouSee doesn't have at national footprint.

Following comments from Telia and Telenor during the second consultation, DBA has updated the computation of the multicast traffic in the network so that it reflects the topology of the network modelled. The approach that has been implemented is the following one:

- It has been assumed that the multicast does not need to be duplicated in a ring;

- TDC's multicast traffic flows through all the network;

- YouSee's traffic flows only through the relevant nodes, i.e. a ring that contains no MPEG station will not get any traffic from YouSee:

  - The download traffic is sent to all core sites, then to all distribution sites and then to all edge sites. The download traffic is then solely sent to the required rings, i.e. those that contain a MPEG station. The analysis of the network topology located in the spreadsheet "Network topology" shows that out of the 21 edge rings, the traffic is only sent to 18.

  - The upload traffic is sent by the MPEG stations. It should therefore feed solely the rings where these MPEG stations are located and the parent sites. The MPEG stations are located in 18 out of the 21 edge rings. The parent distribution sites of the MPEG stations represent 12 of the 13 distribution sites.

Whereas the computation of the traffic of the service "Prioritised - Multicast - uplink - POI2-POI1" is correct, the model was computing the traffic of the service "Prioritised - Multicast - uplink - Distr-Edge" by multiplying YouSee's traffic by the total number of distribution sites instead of the number of relevant distribution sites (i.e. the number of parent distribution sites).

DBA has therefore updated the spreadsheet "BH Traffic" so that the traffic of the service "Prioritised - Multicast - uplink - Distr-Edge" so that it is based on the number of parent distribution sites.

The impact of this change is not material.

MSAN cost - cabling

TDC has noted that DBA has changed the cost for MSAN cabling, using the copper-network input provided by TDC during the data submission phase in 2013. TDC understands that it for DBA seems obvious to do so. But this is not so, primarily due to the fact that a large part of the DSLAM cabling cost is cabling-pull inside the CO (E.g. through floors, walls etc) in cable trays (not to compare with trays in MDU). This process is not covered by the data used by DBA in the alternative approach suggested. Furthermore TDC has a special group of DSLAM deployment technicians, who are specialized in DSLAM cabling and deployment.

TDC request that DBA reintroduce the time usage provided by TDC since this reflects a DSLAM productions performed by specialised technicians.

DBA acknowledges that following the second consultation, the number of hours needed to install a MSAN has been decreased. This installation time has been established based on the data provided by the industry to patch 10 copper pairs.

DBA is of the view that the cost driver when installing a new MSAN is the number of cards needed. It is therefore relevant to assess the installation time of a MSAN based on the number of pairs that need to be patched.

The inside cabling of the CO is part of the site preparation. When preparing its sites, TDC is estimating the amount of cables needed and rolls them out. New cables are thus not rolled-out each time a new customer is connected. Inside cabling should therefore not be accounted for in the installation cost of the MSANs.

Therefore, DBA does not believe that any changes are needed.

MSAN – number of subracks

TDC notes that DBA has as default introduced two MSAN subracks per MSAN rack. TDC acknowledge that this is a correct driver, even though it doesn't reflect TDC deployment due to TDC's use of splitter boards.

Changing the driver TDC finds that an error is introduced:

Since the number of SFP's (and thereby the number of ports in the aggregation routers) is defined by racks, the model calculates a too low

figure for MSAN SFPs and MSAN driven routerports.TDC finds that the following changed should be made to the sheet *'traffic driven assets':*

The formula in cells O199:DEN199:

=SUM.HVIS('Lines driven assets'!$O$11:$DEN$11;'Traffic driven assets'!O$193;'Lines driven assets'!$O$85:$DEN$85)+SUM.HVIS('Lines driven assets'!$O$11:$DEN$11;'Traffic driven assets'!O$193;'Lines driven assets'!$O$86:$DEN$86)+SUM.HVIS('Lines driven assets'!$O$11:$DEN$11;'Traffic driven assets'!O$193;**'Lines driven assets'!$O$92:$DEN$92**)+SUM.HVIS('Lines driven assets'!$O$11:$DEN$11;'Traffic driven assets'!O$193;'Lines driven assets'!$O$100:$DEN$100)+SUM.HVIS('Lines driven assets'!$O$11:$DEN$11;'Traffic driven assets'!O$193;'Lines driven assets'!$O$108:$DEN$108)

Should be changed to:

=SUM.HVIS('Lines driven assets'!$O$11:$DEN$11;'Traffic driven assets'!O$193;'Lines driven assets'!$O$85:$DEN$85)+SUM.HVIS('Lines driven assets'!$O$11:$DEN$11;'Traffic driven assets'!O$193;'Lines driven assets'!$O$86:$DEN$86)+SUM.HVIS('Lines driven assets'!$O$11:$DEN$11;'Traffic driven assets'!O$193;**'Lines driven assets'!$O$93:$DEN$93**)+SUM.HVIS('Lines driven assets'!$O$11:$DEN$11;'Traffic driven assets'!O$193;'Lines driven assets'!$O$100:$DEN$100)+SUM.HVIS('Lines driven assets'!$O$11:$DEN$11;'Traffic driven assets'!O$193;'Lines driven assets'!$O$108:$DEN$108)

And furthermore to capture the correct number of SFP's the formula in the sheet: *line driven assets* cells O95:DEN95:

=**O92***$J95*$I95

Should be changed to:

=**O93***$J95*$I95

Following the comments received from the industry during the second round of consultation, DBA has updated the model so that each rack could support two subracks. The number of SFP modules should therefore be based on the number of subracks instead of the number of racks.

DBA therefore agrees with TDC that both formulas should be updated according to the formulas suggested by TDC.

DBA has updated the model by correcting the formula in cells O199:ATA199 in the spreadsheet "Traffic driven assets" and the formula in cells O95 to DEN95 with the formulas provided by TDC.

This change decreases the layer 2 BSA price by 0.1%.

MSAN – lifetimes

TDC notes that DBA has changed the lifetime for MSAN from 5 to 8 years. TDC disagree in the this change. In TDC's accounts a 5 year lifetime is use for DSLAMs, this lifetime has been used since the first deployment of DSLAMs.

One reason that this lifetime is seen as valid is that when looking upon the technical development in the field of DSL based broadband, a new technology implementation is seen every 2-4 years.

Below TDC has stated the introduction year for the various standards and technical features which has been introduced to support the growing demand for higher bandwidth.

1999: ADSL-PSTN, ADSL-ISDN

2003: SHDSL

2005: ADSL2-PSTN ADSL2-ISDN

2006: ADSL2+PSTN ADSL2+ISDN

2008: VDSL (u PB)

2011: G.SHDSL

2012: VDSL (m PB)

2014: VDSL (vectoring)

In this perspective TDC finds that in a forward looking model which is build on a MEA approach, a 5 years lifetime would be a fair settlement when taking technology changes into account.

At least TDC find that for line cards the 8 years lifetime is inappropriate, since many of the technology development is connected to the line cards. On line cards a maximum of 5 years should be implemented.

DBA does not agree with TDC that the technology changes can be used to estimate the lifetime of MSANs. These technologies do not replace each other but are in many cases run in parallel. For example, SHDSL and G.SHDSL are for leased lines services and therefore, they are not relevant here, PB is also very specifically used – also, ADSL2 and ADSL 2+ have been launched with only one year difference. In total, 3 important technological dates are important: 1999, for ADSL-PSTN, 2005/2006 for ADSL2//ADSL2+-PSTN and 2014 for VDSL vectoring, and there are indeed 8 years between each. Furthermore, a lot of the equipment does support the use of these different new standards. That is, all equipment must not necessarily be replaced in all the instances mentioned by TDC.

Lastly, DBA notes that TDC has chosen not to supply actual data on the lifetimes of DSLAMs. However, in relation to the work on vectoring, TDC has sent DBA a list of deployment dates for DSLAMs.

Based on the above, DBA does not agree with TDC that the 5 years lifetime should be implemented in the model.

Active equipment lifetime

Concepy still believes that 5 years lifetime on aggregation-, edge-, distribution and core routers is too low. Being a recently started company we are not in a position to support this with documentation from own equipment, however Concepy would like to make a note of the fact that TDC in prior discussions regarding the VULA product has stated that a replacement of aggregation routers in order to generate a truly transparent VULA product, would take approximately 8 years.

A practical way to get comfort in regard to the estimated lifetimes, is to have TDC generate a list of the installed router equipment, the installation date and the estimated replacement date. This information would give a good indication of the lifetime of the equipment. The same list could then be used and updated when the LRAIC numbers needs to be revised in a couple of years.

Following the comments received from the industry during the first and the second consultation rounds, DBA has updated the asset life of the MSANs from 5 years to 8 years.

The core network architecture being modelled is TDC's target architecture. TDC has stated that it would take them approximately 8 years to achieve it. It is therefore expected that the assets being currently rolled-out by TDC will not be outdated when the target architecture will be fully rolled out.

DBA therefore agrees with Concepy that the asset life of the switches, routers and the related assets should be increased from 5 years to 8 years.

This is consistent with the asset life of the MSAN.

DBA has updated the core model by setting, in the spreadsheet "Network assets and costs" the asset life to 8 years of the assets 56 to 60, assets 70 to 74, assets 84 to 86, assets 96 to 98 and assets 155 to 156.

This change decreases the layer 2 BSA price by 3.5%.

MSAN – 8 card remote MSAN asset

TDC notes that DBA has introduced an 8 line card version of the MSAN. TDC disagree in this, for two reasons:

1. In the current setup the cabinet that holds the DSLAM cannot hold cabling to more than 4 cards
2. The heat-exchanger unit cannot support cooling for in heat produced by more than 6 cards.

Therefore TDC believes that the 8 card assets should be removed from the model, or if not, the cabinets that holds that MSAN should have a higher cost than the one for 4 cards, as well as the Heat-exchanger unit should be more costly.

Following comments received during the second consultation, DBA has introduced a second rack, asset 157, that can hold up to 8 cards.

DBA agrees with TDC that this second rack is then installed in the same type of cabinet than the other rack (asset 22). The cost of the cabinet should therefore reflect that a larger cabinet is needed to hold all the cabling.

DBA also agrees that the heat exchanger used for the second type of rack is the same as for the first type of rack. As the heat exchanger can support cooling for a maximum a 6 cards, DBA agrees with TDC that another type of heat exchanger should be used when 7 or 8 cards are rolled-out.

DBA has requested further information from the industry regarding the cost levels of the larger cabinet and of the more powerful heat exchanger. However, no data has been provided by the industry. DBA is of the view that these assets are not significantly more expensive than the assets used in the model.

Increasing the cost of the cabinet and of the heat exchanger unit for all remote MSAN by 10% would lead to a price increase of the Layer 2 BSA product by 0.05%. Therefore, increasing the cost of the cabinet and the heat exchanger unit only for the remote MSAN with 7 or 8 line cards would have very limited impact on the prices.

Therefore, DBA does not believe that any changes are needed.

Changes to the core modelling

TDC notes that DBA has conducted several changes to the core model in order to reflect SPOF – norm, integration of redundancy routers, support of 10 G customers etc. Having reviewed this TDC finds that there is still a number of issues to be corrected:

A)

DBA states that the SPOF norm regarding DSLAM now has been implemented. TDC believes that the norm has not been implemented correctly. To fulfil the norm no line card in the aggregation routers is allowed to hold more than 1536 DSL customers, that is for all practical use two fully loaded MSANs. On site “ABR there is 1961 active line meaning at least 3 MSANs. To fulfil the norm only two full MSANs can be terminated on the same 1 G line card, meaning at least 2 1 G line cards are needed. The model calculates one. DBA is requested to insure that the calculation of these assets is aligned with the quality norms of TDC.

B)

In the calculation of ring-facing interfaces TDC notes that the traffic is only supported in one direction. That is, e.g. site ABR is part of a ring with a traffic load of 19.657 mbps. The model calculates 3 10 G port to support this. But these ports only cope for one direction away from ABR. The number should obviously be multiplied by 2 to capture both traffic directions from the site. When correcting this issue the associated SFP modelling should be aligned also.

The issue could be solved by changing the formulas in row 201-202, by multiplying the expression in the formula by 2: e.g.:

=HVIS(ELLER(O200>=$I202;O198>0);RUND.OP(O200/$I202;0);0)***2**

C)

Furthermore it must be ensured that when calculation ring facing ports (and associated SFP’s as well) the model must calculate the need for each rack in ring separately, i.e. if there are two MX104 racks in one site to ensure compliance to SPOF norm, each of those two MX104 is part of the ring and each rack must have adequate number of ring facing ports and SFP’s.

This can be assured by multiplying the ring facing ports and SFPs by the figures in row 210. This same evaluation should be performed every time there are multiple racks in same network layer at one site that are assumed connected into one ring

D)

When evaluating whether to deploy a small or large router as aggregation router on aggregation sites the model only consider the number of customer/user facing ports. With the heavy traffic load in some aggregation rings this evaluation should be expanded to also consider the number of ring facing ports in the aggregation router. If the need for 10 G ring facing ports exceeds 4 (that is 2*10 G in each direction) the choice of a MX104 is not right since it will mean that non-build-in ports would be used for ring facing purposed. TDC would not introduce a MX104 at any site if more than the build-in-ports were needed for ring capacity.

From TDC perspective there are 362 sites where the aggregation router should be changed to MX960 due to heavy ring traffic load and thereby 4+ ring facing 10 G ports.

TDC requests DBA to alter the choice of aggregation router to match the ring traffic load.

E)

When calculating the need for MPC customer the MSAN should be taking into account, that is that the formula regarding MPC customer in row 223 should be changed to:

=HVIS(SUM(O224:O225)=0;0;RUND.OP((RUND.OP(O198/$I224;0)+ RUND.OP(**sum(O197: O198)**/$I225;0))/$I223;0))

F)

Site KD is a edge site, but the model doesn't calculate any edge facing interfaces on the aggregations router.

G)

Calculation of 10G cards (asset 57) in row 217 is not correct. There are no 10G cards in the MX104 bundle, which is in conflict with sheet "network dimensioning rules" I245, these input cell should be change to 0.

DBA has updated the LRAIC core network cost model in order to reflect TDC's SPOF norm following the comments received from TDC during the second consultation.

Based on the asset description located in the spreadsheet 'Network assets and costs', each MSAN can hold up to 1,536 customers. According to the data provided by TDC during the data collection phase, there are 1,195 active lines in the 'ABR' site. Therefore, the MSAN configuration required is 1 rack and 2 subracks which is the configuration computed by the core network cost model (see spreadsheet "Lines driven assets", cells AE92 and AE93).

The model calculates that the number of 1G card needed is 1. This computation is only based on the number of ports needed. However, the computation does not include a maximum number of MSAN per card. DBA has therefore updated the model to include this design rule.

DBA has updated the model by including a maximum of 2 MSAN (i.e. 2 subracks) per card. The spreadsheet "Network dimensioning rules" has been updated on cell I230 by including this design rule and the spreadsheet "Traffic driven assets" has been updated on line 212 by applying this new design rule.

DBA agrees with TDC that ports are required to carry out the traffic in both directions of each ring, therefore the number of ports computed should be multiplied by 2 as suggested by TDC.

DBA has updated the model by multiplying by 2 the number of ports needed for the ring traffic in the spreadsheet "Traffic driven assets" on lines 201 and 202 as suggested by TDC.

DBA agrees with TDC that all switches and routers should be fully connected in order to ensure compliance with the SPOF norm. When multiple switches or routers are located on the same sites, the model currently does not assess properly the number of ports needed in the ring.

DBA has updated the model by computing the number of ports needed in the ring taking into account the sites where multiple switches or routers are rolled-out. The spreadsheet "Traffic driven assets" has been updated on lines 217 to 220 and on lines 232 to 237 and line 260.

DBA agrees with TDC that the number of ring facing ports should also be considered when selecting which type of router is rolled-out at the aggregation level.

DBA has updated the model by including a parameter in the spreadsheet "Network dimensioning rules" on line 235 and the by changing the trigger computation in the spreadsheet "Traffic driven assets" on line 207.

DBA agrees with TDC that the number of MSAN should be taken into account when assessing the number of MPC customers.

DBA has updated the model by changing the formula in the spreadsheet "Traffic driven assets" with the formula suggested by TDC.

DBA agrees with TDC that the model computes that no edge facing interface is needed on the edge site Kd. This is the case because the Kd site is the parent site of no aggregation ring as it can be seen in the data provided by TDC in the spreadsheet "Network topology".

Therefore DBA does not believe that any changes are needed.

DBA agrees that the MX104 bundle does not contain any 10G card.

DBA has updated the spreadsheet "Network dimensioning rules" on line 224 by setting to 0 the number of 10G cards included in the bundle.

ODFs for Core/BTO fibre purposes

TDC notes that the model doesn't calculate any ODFs when in copper mode, and no MDFs when in fibre mode. That seems obvious for the access part of the network. However the model misses to calculate ODFs for incoming core network fibre cables, as well as BTO network cables. These cables are present in all scenarios, and assets to terminate these fibres (and patch towards them) must be included.

TDC requests DBA to add assets to reflect ODFs for core cable termination.

DBA agrees with TDC that no ODFs have been modelled for the core network fibre cables although they are required. ODFs are also needed for fibre access leased lines (BTO). In fact, any fibre cables entering a site should be terminated on an ODF before being connected to other equipment.

DBA also agrees that MDFs are needed to terminate the copper leased lines even in the fibre scenarios.

DBA has therefore updated the core network cost model by changing the spreadsheet "Import from Access model" between lines 101 and 1285 in order to include ODFs for core cables and BTO cables termination.

DBA has also updated the spreadsheet "Lines driven assets" on line 34 so that MDFs are needed to terminate copper leased lines in all scenarios.

Rack space requirement

TDC has noted that DBA has change the space requirement for rack from 1.5 to 0.675 sqm. TDC has reviewed the material regarding co-location on BYEN, and believes that the following thing should be taken into account:

1. The number of rack units in the observed area is not 20 but 10, since the operator gets access to the full 60*60 rack space when acquiring colo-rackspace
2. The model uses equipment that is way over 30 cm in depth, and assumes full depth on the counted racks
3. Even if using 30 cm equipment, installing this back to back lead to troubles accessing the backside, as well as heat concentration would tend to increase to a non acceptable level
4. The area observed in the materiel, does not include parts of hall way, doors stairways etc
5. The observed area, is measured in a way that has such a consequence that the access to parts of the racks is impossible for technicians

6. If the full colo room on BYEN is divided by the number of full racks that it is designed for it is very close to 1,5, taking hall ways doors etc. into account
7. Since it is not possible to rearrange walls etc. some spare rack unit should enter the calculation
8. When determining the need for space between rack, working regulations, need for lifts (heavy routers) etc should be taken into account.
9. The space pr rack in the model should reflect the data provided by TDC on cooling equipment. If less space is assumed pr rack, more active cooling equipment would be needed

Taking the above given facts, TDC request DBA to reintroduce a space requirement of at least 1.5 m^2 pr rack

Following the comments submitted during the second round of consultation, DBA has updated the space per rack to 0.675m². This update was carried out based on the analysis of the colocation space rented by an alternative operator in the BYEN site.

DBA agrees that this analysis should not be made solely based on the space rented by an alternative operator but based on the total space of the colocation room. This approach takes into account all the extra space needed to give access to the alternative operators to its rack (e.g. the door and the corridors that are needed to have access to their racks).

DBA therefore agrees with TDC that the space per rack should be changed to 1.5m.

DBA has updated the core network cost model by changing the value of the space per rack to 1.5 in the spreadsheet "Network dimensioning rules" (cell I138).

This change is increasing the layer 2 BSA price by 1.6%.

Routing factors for BSA

TDC notes that DBA has removed Edge equipment from the POI2 BSA. This has the future consequence that a point of interconnect has to be established by the operator for each aggregation ring. Today *one* POI is sufficient for several aggregation rings if these are connected to the same Edge site, since the traffic can be collected on the Edge.

If the network modelled was TDC's actual network, DBA would agree with TDC that a point of interconnection has to be established for each aggregation ring or at the edge router to collect the traffic from several rings terminating at the same edge site. Such a network requires indeed a separation between the rings due to the limitations of the numbers of VLAN in each aggregation ring.

However, the core network being model is an IP/MPLS core network. This network is not TDC's actual network but TDC's target architecture. Such a network offers more functionality at the lower levels of the network as cleverer (and more expensive) routers are being deployed at the aggregation and the edge layers.

Such an IP/MPLS network does not require such a separation of the rings, since the VLAN restrictions are not relevant in IP/MPLS networks. The VLAN limitation been gone, there is no need to separate the rings, and thus there is no reason not to collect traffic from several rings on one aggregation node, especially since it will reduce the number of interfaces needed for POI connections.

DBA therefore does not agree that a POI2 is needed for each aggregation ring in an IP/MPLS network. When several rings terminate at the same edge site, only one POI2 is needed.

Therefore, DBA does not believe that any changes are needed.

Mark-up for extra work

TDC finds no update of the so called 'Mark-up for extra work', which is applied to the hourly pay cost, which are used for fees. This mark-up covers overheads etc. needed for managing the working staff.

TDC finds that fees like other regulated services should carry a part of the overhead cost and requests DBA to set the mark-up to 25% like in the current model.

DBA agrees that a mark-up for extra work should be included in the model. DBA has introduced a mark-up of 25 pct. that covers overheads needed for managing the working staff, facilities, material etc.

Reduction in pay cost

TDC cannot follow DBA's argument in reducing pay cost on page 22 and 25 in the hearing note. According to DBA these should be reduced since these pay cost includes overhead cost, which is not included in the LRAIC pay cost.

TDC disputes this correction of pay cost. TDC has delivered the total cost for the network to DBA, where the various overhead cost is included only ones. If DBA for some reasons wish to reduce the specified pay cost in order to eliminate overheads, these overhead cost must then be add to the non-pay cost in order to ensure cost recovery, hence eliminating the effect of the overhead correction.

TDC requests DBA to ensure consistent OPEX in the model. This can be done by e.g. using the pay-cost provided by TDC.

DBA should have in mind that the former modelled includes management mark-up in the Functional Area calculation.

In the LRAIC model, DBA has calculated the direct salaries for administrative, technician and academic workers bottom up. The salaries are corrected for holiday, days of absence, etc. and do now include a mark-up of 25 % cf. the section above.

The hourly wages previously used to reduce the pay cost part of relevant non-network costs have been updated accordingly. Therefore, now 76 % of the costs are included instead of the previous 65 %.

OPEX in Core

TDC notes that on page 67-69 DBA totally rejects TDC analysis of remaining cost in a NGA network. DBA finds the additional XX mDKK OPEX undocumented a reject to include the cost since these cost comes from legacy platforms.

With DBA's rejection DBA settles an extreme approach of assuming the cost of TDC's IP platform (one out of nine platforms) constitutes a representative cost level when a full IP network is modelled. TDC find that DBA has the burden to explain how design, planning, customer provisioning etc. can be scaled to a full IP network without affecting the cost level. If DBA is not cable of finding/accepting supporting documentation, DBA has to make an estimate for the additional costs in order to obtain a balanced approach.

TDC requests DBA to estimate additional IP OPEX in a full IP network taking the origin in TDC's identified XX mDKK.

With regard to TDC analysis of remaining OPEX, the attention should be drawn to the OPEX of the transport fibre network where TDC's XX mDKK i significant higher than the 14 mDKK in the (2. Draft) of the model. TDC fibre transport network is relatively new and replicated in the model, thereby the OPEX should be equal to the experienced cost by TDC.

TDC requests DBA to include XX mDKK for the fibre transport network.

During the second consultation, DBA received an analysis from TDC assessing the level of OPEX of a full IP core network. For each of its legacy platforms, TDC has identified the activities that would remain in case a full IP core network would replace these legacy platforms. TDC has then added the OPEX related to these activities to show that XX mDKK were not accounted for in the core network cost model.

As stated during the second consultation round, DBA agrees with TDC that some network activities such as customer handling, network surveillance would increase with a full IP network. However, DBA

disagrees with TDC that the cost of e.g. monitoring a full IP network would be as expensive as the cost of monitoring six different legacy platforms at the same time. DBA is of the view that there are some economies of scale by having a single platform as compared to having 6 legacy platforms and an IP platform (i.e. a total of 7 platforms). DBA therefore disagrees that the OPEX of a full IP core network could be estimated by adding the OPEX of 7 different platforms.

According to TDC's regulatory accounts, the OPEX related to the transport fibre network accounts for XX mDKK of which XX mDKK are allocated to the IP core network and XX mDKK are allocated to the access network.

Out of the XX mDKK allocated to the IP core network, 9 mDKK are due to "Design and Planning", XX mDKK are due to "Corporate overhead" and 7 mDKK are due to "Support/overhead". Therefore, out of the XX mDKK, DBA believes that between XX mDKK and XX mDKK are double counted between the "Support/overhead" category and the other cost categories.

Therefore, the total network OPEX related to the transport fibre network accounts for between XX mDKK and XX mDKK.

The core network cost model includes XX mDKK OPEX related to the transport fibre network (see spreadsheet "Network costing", sum of cells P268 and P270) computed bottom-up using the design rules provided by TDC during the data collection. This amount is consistent with the analysis of TDC's regulatory accounts.

The non-network OPEX related to the transport fibre network are part of the non-network cost categories. DBA was already including the "corporate overhead" costs and following the comment "Design and Planning and Support/Overhead costs", DBA has updated the core network cost model to include these two last cost categories. They are all therefore accounted for in the spreadsheet "Non-network costs" of the core network cost model.

Therefore, DBA does not believe that any changes are needed.

PureLRIC mark-up

TDC According to the hearing response, page 63, DBA has applied a 30% mark-up. However, in the calculation a 23% mark-up is used.

TDC requests DBA to use 30% mark-up.

DBA agrees with TDC that on page 63 of the consultation it was stated that a 30% mark-up has been used in the pure LRIC calculation.

This value was hardcoded although it should have been dynamic. The model does not use a fixed mark-up as the consultation note could suggest. The mark-up used is computed as the share of interconnection specific and commercial costs incurred by the voice services divided by the share of yearly cost of the core network allocated to voice services.

The consultation note should therefore have stated that the mark-up used is 23%. The value has however changed following the updates made to the core network cost model.

Following the industry comments on the cost models, the mark-up is now 5.5%.

Calculation of non-network mark-up for unicast and multicast

'Share due to other services' in the sheet 'Non network mark-up' cell H18 is not used in pricing. This mark-up covers unicast and multicast services and should be marked-up on these.

TDC requests DBA to mark-up multicast and unicast services.

DBA agrees with TDC that the naming could lead to misunderstandings.

DBA has therefore updated in the spreadsheets "Non network mark-up" and "Non-network costs" the wording "All LRAIC regulated services" to "All LRAIC modelled services" as suggested by TDC.

Overhead allocation to platforms

TDC notes that in the core model sheet 'Non-network costs' non-network costs are allocated to platforms in the modelled network. TDC finds no description of these allocations and how they are derived and TDC is able to establish the allocation for 2'nd and 3'rd group of IT-platforms only.

Given TDC's submission of OPEX where LRAIC relevant net elements are marked, it can be seen that in total 87% of TDC's OPEX cost are relevant to LRAIC modelled services ('Historical network and wholesale cost for TDC 2012 v4' sheet Net cost' – the ratio between row 193 and 192). From the deduction of the total cost it can e.g. be seen that for IT-applications 65% is LRAIC-relevant and 87% for Corporate overhead.

TDC request DBA to use these ratios in the model.

As described in the second consultation note, the allocation of all non-network costs is based on TDC's accounts. However, DBA has reviewed TDC's assessment of which assets are relevant to the LRAIC cost models.

For each asset listed in TDC's regulatory accounts, DBA has assessed whether it is part of the access network or the core network. When part of the core network, DBA has assessed whether the asset is part of the IP core network or not.

As the network being modelled is an access network with a full IP core network, DBA has considered that the relevant assets are those part of the access network or part of the IP core network. All other assets are not relevant to the LRAIC cost models.

The updated analysis of LRAIC relevant assets has therefore led to an even larger share of all the non-network costs being excluded (as compared to first round). That is, the first assessment led to an exclusion of 13% of the corporate overhead costs whereas the model now excludes 35%.

Therefore, DBA does not agree with TDC's comment.

Non-network mark-up naming

TDC notes that in the 'Non network mark-up' sheet the wording '...LRAIC-regulated services' are used for the modelled services. All LRAIC-modelled services are however not LRAIC-regulated – e.g. Leased lines. DBA is requested to change the naming in order to avoid misunderstandings.

DBA agrees with TDC that the naming could lead to misunderstandings.

DBA has therefore updated in the spreadsheets "Non network mark-up" and "Non-network costs" the wording "All LRAIC regulated services" to "All LRAIC modelled services" as suggested by TDC.

Third party compensation

TDC states that DBA has reduced the OPEX level by 50 mDKK in sheet 'Non-network costs', cell H44. TDC finds this figure arbitrary and too high since costs related to 3rd party damages have not been included in the OPEX level in the model. The cost is specified in 'Historical network and wholesale cost for TDC 2012 (confidential) v4', sheet 'Net costs' cell G180 submitted to DBA.

TDC has in 2012 a net-revenue of XX mDKK for 3rd party compensations. These costs should be used in sheet 'Non-network costs', cell H44 in order to obtain model consistency. TDC requests DBA to alter the figure.

As described in the second consultation note, DBA has included the revenues perceived by TDC regarding the third party damages. The level has been set to the same level as in the previous model as TDC did not provide any data regarding this source of revenues.

In addition to this comment, TDC has however provided additional data showing that in 2012, they have perceived of total of XX mDKK for third party damages. These revenues are split between the following two categories:

- "Repair cost on 3rd party damages" which accounts for XX mDKK;
- "Additional cost of TDC work on 3rd party damages" which accounts for XX mDKK.

The first revenues category matches exactly one of the cost categories in TDC's regulatory accounts that has been assessed as not relevant to the LRAIC cost models. The first revenue category is therefore not included in the LRAIC cost models.

DBA therefore agrees with TDC that the third party damage should be decreased to XX mDKK.

DBA has updated the model by changing the value of the third party damage in the spreadsheet "Non-network costs" from 50 mDKK to XX mDKK.

Correction for maternity leave compensation

TDC notes that on page 79 in the hearing note, DBA adjusts the number of days of absence related to sickness, children's sickness, injury and maternity leave to 8 from 9 in the model.

TDC disagree in these changes since the OPEX delivered to DBA is already corrected for subsidies from the state.

DBA notes that the numbers of days of absence related to sickness, children's sickness, injury and maternity leave is used to calculate the bottom up wages. Therefore, DBA does not see that this should have any relation to the OPEX delivered by TDC to DBA.

DBA notes that TDC have not provided information on absence for the companies' staff. On this background, DBA will not change the number of days of absence.

Errors

Access model, Cost allocation

Telia and Telenor state that there is an error in the Access models Cost allocation sheet. Please see e.g. cell AT13. The formula shall be expanded with one extra row in the look up array.

The error line 16 of the spreadsheet 'Cost allocation' of the excel part of the LRAIC access model has been corrected.

It has no impact on the results of the model.

Average lines per PDP

TDC states that the calculation of number of lines in 'Results' cell H153 does not include active copper lines in the calculation.

The formula in the spreadsheet "Results" cell H153 did not compute the average number of active customers per PDP correctly as it did not include the number of active copper lines in the calculation.

The formula in cell H153 of the spreadsheet "Results" has been updated in order to take into account all the active customers.

The yearly price of the service "BTO costs per line at active PDPs" has decreased from 3.35 DKK to 1.42 DKK.

General comments on CATV (BSA and TV)

LRAIC regulation

TDC recognises DBA's need to include CATV-modelling in the LRAIC model in order to ensure cost allocation to different technologies. However, TDC does not find LRAIC appropriate for regulation and pricing of coax-based TV. TDC will substantiate this view point in the consultation response on DBA current consultation regarding market decision for TV on market 5, to be submitted Tuesday 8th of July.

TDC's comment will be handled in relation to the consultation regarding market decision for TV on market 5.

Second hearing

The current consultation is the first hearing where DBA has (almost) modelled the complete coax-TV in the LRAIC model. Given the short consultation period and the uncertainties regarding cost level and cost allocation, TDC finds that a second hearing is necessary. TDC suggests that an additional hearing is done in August or in September along with the pricing consultation for the remaining services (it is TDC understanding that coax-TV will not be a part of the September pricing consultation – thereby leaving time for a second model hearing).

DBA notes that the model has been in consultation several times and that TDC has had the opportunity to comment on missing cost elements in the model. DBA has held several meetings with TDC before the final model is sent out so DBA does not believe that an extra consultation round is necessary.

Specific comments on the CATV modelling

Allocation of frequency.

TDC states that in the Access cost model sheet "Historical inputs – Access" 594 MHz of frequency is allocated, but according to the sheet "Export to core model" only 570 MHz are allocated. The missing 24 MHz is labelled as "Other" – and is probably covering the FM radio spectrum, that should be allocated to the basic TV-package.

DBA agrees with TDC that the 24 MHz is labelled as "Other" is covering the FM radio spectrum and should be allocated to TV as the FM radio is part of the basic TV-package.

DBA has updated line 26 of the "Costs allocation CATV" spreadsheet of the access LRAIC model in order to take into account the missing 24MHz used by the radio service. These are now reflected in the cell I61 of the same spreadsheet and used to derive the unit cost by MHz of the network.

DBA has added a line to the "Export to core model" spreadsheet of the access LRAIC model in order to transfer the bandwidth allocated to the radio service to the core model in addition to the bandwidth used by TV, broadband and VoD services.

TDC cannot recognize the frequency allocation used in the model.

The table below compares the frequency allocation used in the model and TDC actual frequency allocation for 2014 and the planned allocation for 2015.

	LRAIC	TDC 2014		TDC 2015	
	Mhz	Kanaler	Mhz	Kanaler	Mhz
TV	408	68	544	68	544
BB US	48	7	42	7	42
BB DS	60	20	120	24	144
VOD	54	7	56	4	32
Radio	24	3	24	3	24
Total	**594**		**786**		**786**

Note: Channels used for TV, VOD and Radio are 8 MHz and channels used for broadband are 6 MHz.

In the TV-spectrum space is included for filters between TV-packages

TDC requests DBA to update the frequency allocation.

For the 2nd round of the consultation, DBA has decided to allocate part of the access costs based on the frequencies used by each service. In order to determine the frequencies used by each service in 2013, DBA has analysed the file "M5coaxNy2013_2_.pdf", extracted the number of channels used per service for a total of 99 channels and has considered that each channel was using 6MHz.

In its answers specific to CATV, TDC provides with a new split of channels and frequencies used by each service.

DBA has therefore updated the Yearly Update file (CATV spreadsheet) and the access LRAIC model (Spreadsheet Historical Input) in order to reflect the frequency plan for 2014 and 2015.

DBA has also updated 2013 values with the frequency plan used by TDC in 2014.

OPEX for CATV

OPEX level

In the Top Down data that TDC has submitted for OPEX, the direct network OPEX constitute XX mDKK/year for network OPEX and in total XX mDKK/year if common costs are allocated on the top.

In the model, XX mDKK is directly calculated in the access model based on undocumented OPEX mark-up. When including OPEX from rent of multicast services and from mark-ups in the core model, the total OPEX will still be less than XX mDKK/year (even if TDC suggestions are implemented). Thus, OPEX of app. XX mDKK/years is missing in the model.

TDC perceives YouSee as an efficient organisation using modern technology. TDC therefore requests DBA to include XX mDKK/year or to explain why these costs are missing.

During the 2nd round of the consultation, TDC has provided the OPEX related to YouSee. These OPEX are split in 17 different activities. For each of these activities, TDC has provided the following data:

- The name of the activity;

- The total costs between 2007 and 2012;

- The description of the allocation key, i.e. the description of how the costs have been allocated to the different activities;

- A description of the activity;

- An analysis whether the costs incurred are retail costs, technical costs or both.

Following additional questions asked by DBA regarding the latter category of activities, TDC has provided the share that is retail among the total cost.

This analysis carried out by TDC shows that out of the 17 activities:

- 8 are retail costs and should therefore be excluded of the LRAIC cost models. These include the following activities: CPE, bad debt, hotline, shops and web sale, customer care front office, customer care back office, sales organized customers and marketing;

- 5 are technical costs, i.e. network costs. These should be included in the LRAIC cost models (however, they could be allocated to regulated and non-regulated services). These include the following activities:

traffic costs, fault correction, other OPEX for technicians, Leased lines, Head end;

- 4 are both retail and technical costs. These should be partly included in the LRAIC cost models. These include the following activities: customer care organized customers, IT costs, Management, Product management.

The only category related to the access network is the activity “Fault correction”. DBA has asked further questions to TDC in order to understand the exact scope of these costs. It appears that 11% are related to set-top boxes and therefore should be excluded from the LRAIC cost models. DBA has therefore included 89% of the OPEX related to “Fault correction”, i.e. XX mDKK in the access network cost model.

The remaining relevant activities are included in the core network cost model except for the activity “Traffic cost” as the OPEX of this one are modelled bottom-up based on the engineering rules provided by TDC. Based on the share of wholesale costs provided by TDC regarding the activities related to retail and technical costs, the core model includes XX mDKK in the spreadsheet “Non-network costs”.

The LRAIC cost model includes therefore XX mDKK of OPEX related to the CATV network. This amount has been derived based on the accounts and the allocation keys provided by TDC.

TDC has provided no further data or costs.

Therefore, DBA does not believe that any change is needed.

Mark-up calculation

When calculating mark-ups in general in the sheet, the identified CATV OPEX (provided by TDC) is divided by the total yearly network cost which includes the IP network with routes transmission etc. see sheet ‘Non network mark-up’, cell H10. In the ‘TDC actual network’ scenario the ordinary TDC OPEX is however forced to zero by intention whereby CATV OPEX has to cover the support of the entire network (see cell H32, H49 and H60). TDC does not find this realistic and requests DBA to reduce the denominator in the mark-up calculation in a way that secures only relevant core-cost in the chosen scenario to be included.

The same issue occurs in the copper and fibre scenarios, where CATV equipment is included in the denominator even though this equipment is not used in the products to be priced. DBA is requested to correct in these scenarios as well.

The core network cost model makes it possible to recover the relevant non-network costs. These are computed as mark-ups over the cost of the network. There are two groups of mark-ups:

- The mark-ups that apply to the copper or the fibre network. These have been derived based on TDC's top down accounts.

- The mark-ups that apply to the CATV network. These have been derived based on YouSee's top down accounts.

The copper and fibre scenarios should therefore only recover the non-network costs relevant to the copper and the fibre networks and the "TDC actual network" scenario should recover only the non-network costs relevant to the CATV network.

In order to recover all the costs, the mark-ups should be computed as the non-network costs divided by the relevant cost base.

DBA agrees with TDC that the cost base should be solely the copper or the fibre network cost for the copper or the fibre scenarios and the cost base should be solely the CATV network cost for the "TDC actual network" scenario.

DBA has therefore updated the spreadsheet "Non network mark-up" by selecting solely the cost relevant to the CATV network in cell H14.

Allocation of IT-costs, Management and Product management

TDC finds no documentation of the 20% cost allocation to LRAIC services for the three categories *IT-costs*, *Management* and *Product management* in 'Non network mark-up' sheet, row 62-66. As a consequence, 80% of the costs are allocated to retail divisions.

According to TDC submission of YouSee Top Down costs, network OPEX costs sums to XX mDKK/year (including payment to traffic and leased lines which are 'leased' parts of the technical network), while retail specific cost constitute XX mDKK/year. In practice this leads to a 49% allocation to network costs for these three common cost categories.

TDC requests DBA to use 49% in allocation of the three cost categories.

During the second round of consultation, TDC has provided YouSee top down costs. These costs are split between 17 activities of which:

- 8 are retail costs and should therefore be excluded of the LRAIC cost models. These include the following activities: CPE, bad debt, hotline, shops and web sale, customer care front office, customer care back office, sales organized customers and marketing;

- 5 are technical costs, i.e. network costs. These should be included in the LRAIC cost models (however, they could be allocated to regulated and non-regulated services). These include the following activities: traffic costs, fault correction, other OPEX for technicians, Leased lines, Head end;

- 4 are both retail and technical costs. These should be partly included in the LRAIC cost models. These include the following activities: customer care organized customers, IT costs, Management, Product management.

DBA has sent TDC some clarification questions regarding the 4 activities that are shared between retail and technical.

TDC, in its answer to these questions on the 28th of April, has for these 4 activities provided the allocation keys between the wholesale part and the retail part:

- For the activity “Customer care organized customers”, 80% is allocated to wholesale and 20% to retail;

- For the activity “IT costs”, 20% is allocated to wholesale and 80% to retail;

- For the activity “Management”, 20% is allocated to wholesale and 80% to retail;

- For the activity “Product management”, 20% is allocated to wholesale and 80% to retail.

DBA sees no reason to use a less precise approach than the actual one.

Thus, DBA disagrees with TDC that the allocation key should be updated.

Therefore DBA does not believe that any change is needed.

Coax TV

Network asset-costs

In the Core model Sheet Network and Asset costs", the reported costs seems to have been multiplied by 0.45. This is probably related to at unclear statement in TDC's submission about LRAIC-modelling of Cable TV from May 28th 2014.
The reported costs in the submission are the actual costs except for the Layer 3 router, which was reported at list-price – with the remark, that a XX % discount should be applied. This was done in the submission sent to the DBA on June 13th.

TDC requests DBA to use the June 13th delivered prices in the model without correction for discounts, since these are already included.

DBA agrees with TDC that a XX% discount has been applied on all the costs submitted by TDC following the comment made by TDC in its submission.

Nevertheless, as the costs submitted by TDC are in fact the actual costs, DBA will remove the XX% discount except for the Layer 3 router.

DBA has updated in the spreadsheet "Network assets and costs" the costs of the CATV assets by removing the XX% discount for all the CATV assets except asset 178.

Lifetimes

DBA has arbitrarily assumed a 20 Years lifetime for all equipment in the CATV-network. This is not a realistic assumption. TDC suggests that DBA uses the corrected lifetimes that TDC uses in the accounts and for business planning, cf. the table below.

Network assets	Cost allocation driver	Equipment	Asset life	New Asset life
CATV Headends - servers				
	CATV	DHCP server	20	5
	CATV	DNS	20	5
CATV - MPEG station				
	CATV	L3 router	20	5
	CATV	L3 router line card	20	5
	CATV	Service Controle Engine	20	10
	CATV	CMTS rack	20	10
	CATV	CMTS line card	20	10
	CATV	CMTS line card		
	CATV	Timing Server	20	10
	CATV	Edge QAM	20	10
	CATV	Edge QAM line card	20	10
	CATV	EDFA	20	10
	CATV	Appear TV setup	20	10
	CATV	VOD server DVB (VOD and Catchup)	20	5
	CATV	VOD server DVB (Startover)	20	5
Headends - channel reception				
	All platforms	Satellite Dishes	20	20
	All platforms	Satellite reception equipment	20	10
	All platforms	Fiber termination	20	10
	All platforms	SDI-router	20	10
CATV Headends - routing infrastructure				
	All platforms	ASR	20	5
	All platforms	HE-network	20	5
	All platforms	Management systems	20	3
	All platforms	Rack and cabling	20	5
CATV Headends - Encoders and transcoders				
	CATV	DCM	20	10
	CATV	Encoders/Transcoders	20	10
CATV Headends - other systems				
	CATV	CAS	20	5
	CATV	SI insertion	20	5
	CATV	EPG generator	20	5
	CATV	Plus services	20	5
Headends - Redundant headend				
	All platforms	Satellite Dishes	20	20
	All platforms	Satellite reception equipment	20	10
	All platforms	Fiber termination	20	10
	All platforms	SDI-router	20	10
	CATV	ASR	20	5
	CATV	HE-network	20	5
	CATV	Encoders/Transcoders	20	10
	CATV	Management systems	20	3
	CATV	Rack and cabling	20	5
	CATV	DCM	20	10

DBA agrees with TDC that the asset lives have been set to an arbitrary value as TDC did not provide any input during the second consultation round.

DBA has therefore updated the asset lives of the CATV network assets. For most asset lives, DBA agrees with TDC's proposal. However, for electronic equipment, DBA does not agree with TDC.

DBA is of the view that the asset lives of the CATV electronic equipment should be consistent with the asset lives of the electronic equipment of the other platforms. DBA has thus increased the asset lives of all electronic equipment from 3 or 5 years as proposed by TDC to 8 years.

DBA has updated the core network cost model by changing the asset lives of all CATV assets in the spreadsheet "Network assets and costs".

Cost allocation between unicast and multicast

In 'Capacity based' row 109 and 116, 95% of head-end cost are allocated to unicast and 5% to broadcasts. TDC perceives this as an equation error since the large majority of cost at head-end is related to broadcast.

TDC requests DBA to revise the allocation.

In the "Capacity based" spreadsheet of the core network cost model, the cost allocation is carried out based on the network traffic.

Rows 109 and 116 are assets located at the core level of the core network that are shared between unicast and multicast services. The multicast traffic represents at this level of the network 1,673 Mbps whereas the unicast traffic represents 31,725 Mbps. This is why the share allocated to unicast is 1,673/(1,673+31,725) = 95% whereas the share allocated to multicast is 5%.

DBA therefore disagrees with TDC that the allocation key should be updated.

Therefore DBA does not believe that any change is needed.

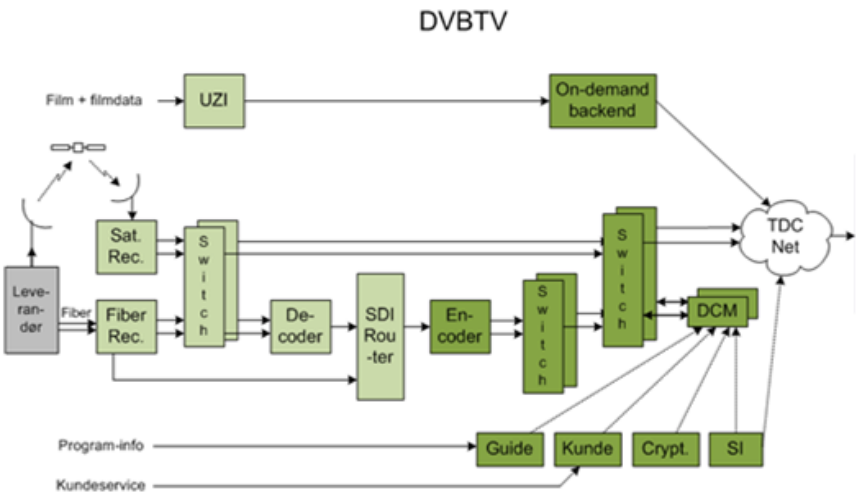
Distribution of Headend-costs

In the core model – sheet "Network Dimensioning rules" it says:

CATV traffic	Unit	Value	Source
Share of TV channels accessed by a DSLAM during peak hour	%	35%	TDC
Share of Head-ends cost allocated to copper and fibre platforms	%	50%	DBA

TDC does not agree that 50% of the cost of the head-end should be allocated to TV over copper and fiber.

- Only the shared part of the headend (parts in light green in the figure below) are shared between cable-TV and IPTV.



- The cost for the shared parts of the head-end should be distributed between the 2 platforms based factual distribution keys reflecting the usage of the platform – for example number of end-users.

Following TDC's submission regarding the CATV network and the head-end, DBA has included a number of new assets in the core network cost model in the spreadsheet "Network assets and costs".

Among these assets, there are:

- The assets located in the MPEG stations. These assets are dedicated to the CATV network (assets 178 to 210).

- The head-end assets. These assets are either dedicated to the CATV network or shared between all platforms. The identification of CATV dedicated assets and of shared assets has been made according to the engineering rules provided by TDC:

  - Assets 129, 132, 191 to 196 and 201 to 206 are dedicated to the CATV network;

  - Assets 160 to 163, 187 to 190 and 197 to 200 are shared between all platforms.

- 50% of the cost of the shared assets has been allocated to the CATV network and the remaining 50% to either the copper network (when the copper network is modelled) or the fibre network (when the fibre network is modelled).

TDC disagrees with the allocation key provided by DBA and states that the head-end should be allocated based on the number of end-users. DBA disagrees with TDC that the number of end-users of the head-end

should be used as the allocation key as the head-ends are not driven by the number of end-users.

TDC did not provide any data to support any change of the allocation key of the head-ends.

Therefore, DBA does not believe that any change is needed.

Unit prices

In the sheet ’Pricing’, DBA has attempted to calculated a ‘per channel per-customer’ cost by dividing the total cost allocated to TV with the number of customers and the bandwidth of channels.

TDC finds the attempt to model a ‘per channel per-customer’ cost useful for illustrative purposes even though it might not be the way the final pricing are carried out.

TDC, however, does not find the calculation is done correctly since the channel width used is the one taken from the copper multicast service and the total capacity used for channels are derived using YouSee use of backbone capacity produced on the core IP network. Furthermore the pricing assumes that all TV-subscribers demand all channels, which is a wrong assumption.

If DBA – for illustrative purposes – want to calculate a ‘per channel per-customer’ this should be done by dividing the total allocated TV cost by the number of customers (1,1 mill) and by the average demand pr. customer (XX channels).

TDC requests DBA to update the pricing calculation.

Following the second round of consultation, DBA has updated the core network cost model spreadsheet “Pricing” by including all the prices of the CATV products.

DBA agrees with TDC that the price of coax TV has been computed using the two following assumptions:

- YouSee’s TV channels have the same bandwidth as the channel of the copper based multicast service;

- All YouSee customers demand all the channels.

This approach has been followed by DBA as TDC did not provide the data required to compute the price of the coax TV products on a per channel basis.

TDC has however in its comment provided the average TV-channels demand per customer. This data is sufficient to replace the two assumptions made by DBA.

It should be noted that the average TV channels demand per customer is part of the data requested from TDC during the yearly update.

DBA has therefore updated the formulas located in the spreadsheet "Pricing" to compute the price of coax TV by using the average TV channels demand per customer instead of the two assumptions.

In relation to the above, DBA would like to clarify that the calculation is only made for illustrative purposes. DBA still has not decided how prices for individual TV-channels should be calculated. The issue will be discussed as a part of an upcoming pricing decision for TV-services in TDC's cable-TV-network.

DBA's intentional pricing

DBA has requested information concerning the actual bandwidth and actual number of subscribers per TV-channel. If DBA's intention with this request is to model the specific cost per user per channel and let that be the basis for pricing, TDC will already upfront warn against the use of this model. This model would lead to a situation, where channels in TDC's fixed packages would be relatively cheap because of the large number of customers. At the same time channels with a smaller number of users would be significantly more expensive.

This result would be in direct conflict with the general political desire to support customers' free choice of TV-channels – and undermine the existing migration towards more freedom of choice – as seen in YouSee's "Mix your own package"

DBA notes TDC's comment and agrees that this is a concern that should be considered. DBA will not at this stage make a decision on how to price the TV-channels

VOD

In the consultation regarding market 5 TV-regulation DBA describes several models for providing VOD to the operator's subscribers (e.g. use of operators VOD-servers or TDC's VOD-servers). DBA should ensure that the future VOD-service to be settled in the coming market decision is actually modelled.

With regards to the VOD calculation, DBA uses the total number of TV-subscribers (1,1 mill) when the service is priced. DBA should note that only a fraction of YouSee customers have access to VOD (XX customers).

TDC requests DBA to use the actual number of VOD-subscribers.

DBA agrees with TDC that all TV customers are not VOD customers. During the second round of consultation, DBA has used the number of TV subscribers instead of the actual number of VOD customers because TDC did not provide the data.

However, as TDC has provided the actual number of VOD subscribers in its comments to the second consultation note, DBA will update the figure.

It should be noted that the number of VOD subscribers is part of the data requested from TDC during the yearly update.

DBA has updated the model by including the number of VOD subscribers in the spreadsheets "Historical inputs" and "Data selected" and by updating the formulas in the spreadsheet "Pricing".

In relation to the above, DBA would like to clarify that the calculation is only made for illustrative purposes. DBA still has not decided how prices for VOD should be calculated. The issue will be discussed as a part of an upcoming pricing decision for TV-services in TDC's cable-TV-network.

IP based VOD setup

In addition to its consultation response, TDC has sent new design rules regarding the VOD setup.

Currently, the model uses a DVB based VOD setup. However, TDC is currently migrating towards a more modern setup, an IP based VOD setup.

Following the MEA approach, DBA agrees with TDC that the IP based VOD setup should be modelled instead of the DVB based VOD setup.

Therefore, DBA has updated the model by deleting the assets 209 and 210 in the spreadsheet "Network assets and costs" to reflect the IP based VOD setup and adding the assets 211, 213 and 214.