DANISH BUSINESS AUTHORITY

Case 2018-18085

/Telekonkurrence

Consultation note regarding the 3rd consultation on the Model

DBA started the 3rd consultation on the Model on the 1st of September. By the end of the consultation period on the 6th of October DBA had received consultation responses from Dansk Energi (DE), DI Digital, Fastspeed, Norlys, TDC, Telenor, and Telia.

This document includes a verbatim copy of the comments provided by the stakeholders, along with responses from DBA to each comment separately. The accepted feedback to the Model has been implemented into it.

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MINISTRY OF BUSINESS

Main Responses

General comments

Norlys

We find it crucial that the new LRAIC model supports a market-based return on investments made in fibre networks encouraging investments and the digitalization of Denmark.

In Norlys we are aiming to deploy fibre to all owners within 2023, given reasonable and fair investment conditions. In doing this, we take responsibility in the Danish community and help the Danish government financing the digital infrastructure in a large part of Denmark. This will be leveraging the digitalization of Denmark and it will support the agenda of being a front-runner.

We are concerned, that DBA will obstruct this commitment from Norlys, if they are not willing to secure investment incentives and full cost recovery. In the 3rd draft LRAIC model, DBA neglects full cost recovery, and the fact that Norlys are willing to deploy fibre to all homes in our owner geography, taking responsibility to cover even the outmost and very expensive homes. These homes will not be covered by operators with a clean commercial agenda, since they are too expensive. Taking this responsibility, it is essential for Norlys to obtain full cost

recovery in the LRAIC model. Unfortunately, this is not the case in the 3rd draft LRAIC model.

Norlys are "punished" for taking the responsibility, whereas operators with a clean commercial agenda are not. Specifically, Norlys costs are deemed inefficient by DBA and therefore DBA performs several adjustments in the model, to drive down cost recovery for Norlys:

1. **Efficiency adjustment**: First of all, DBA performs an efficiency adjustment of Norlys. This implies lowering the distances between PoP's and homes, by adding new PoP's and relocating existing PoP's in rural areas.
2. **Sharing with utilities**: Second of all after performing the efficiency adjustment in 1. above, DBA increases the co-digging percentage for Norlys from 10% to 20%, on top of the efficiency adjustment. Apparently, this is due to the fact, that the Norlys Group owns a power distribution company. DBA believes that it will be easier for the fibre company in the Norlys Group, to co-dig with the power distribution company, than it will be for external fibre operators. We strongly reject, that this can be true. There are effective Chinese walls between Norlys Tele (fibre operator) and N1 (power distribution), which are also legally determined. So, Norlys Tele has absolutely the same possibility to co-dig with N1 (power distribution) as all other fibre operators.
3. **Isolated homes**: Finally, DBA forces 100% co-digging to all homes in rural areas, that are located 7km or more from an existing PoP. This is done on top of the efficiency adjustment and the sharing with utilities, as described above. DBA believes that an efficient operator would never deploy fibre to these homes, without co-digging with another infrastructure company (i.e. power distribution, water company etc.). Norlys believes, that this assumption is very unrealistic, since there will be no other infrastructure company to co-dig with. All homes are already connected to water, power etc.

Point 1. to 3. Above punishes all operators, that deploys fibre to isolated homes in rural areas and thereby removes all incentives to take the responsibility to drive the digitalization of Denmark, including isolated homes. Norlys believes, that this should not be the aim of the LRAIC model.

We appreciate Norlys' feedback provided in this 3rd consultation round for the LRAIC model. DBA has built the model in a way so that it ensures full recovery

of the costs efficiently incurred, in line with the different recommendations from the European Commission on this matter.

Furthermore, DBA finds that the modelling of this new LRAIC model - to an even greater extent than previous models - supports fibre rollout by calculating higher cost for operators that plan to and do fibre rollout to households in more costly areas. This is supported by the fact that the model calculates a higher estimated cost for Norlys compared to TDC.

DBA's view on each of the main points raised by Norlys in the comment are presented below:

Efficiency adjustment (central offices deployment): The analysis carried out by DBA showed that there was a possible efficiency adjustment to the deployment of Norlys' central offices. As included in the MRP, the model should reflect an efficient operator, and therefore DBA has chosen to implement an efficiency adjustment for Norlys regarding the deployment of the central offices.

Sharing with utilities: The 20 percent co-deployment was based on the information that electricity companies were putting down fibre and replacing electricity cables at the same time. This led to the conclusion that electricity companies should have a higher co-deployment rate than TDC. DBA has investigated the issue by asking several operators about how much they co-deploy and in which situations. The investigation and documentation showed that there has been, there is presently and possibly in the future will be co-deployment of fibre and electricity, especially in urban and suburban areas where the cost of digging is high and municipalities are restricting how frequent the streets or roads can be dug up. However, DBA has not found that the possibility to and the degree of co-deployment vary sufficient enough between different operators and different type of operators to make a differentiation in the models, hence DBA has chosen to use the same co-deployment rate across all operators (10 percent co-deployment).

Isolated homes: As mentioned above there is variety in what extent the operators have co-deployed fibre and electricity cables. DBA has therefore chosen to remove this adjustment to Norlys (and other operators that are affiliated with utility operators). DI Digital

DI Digital supports in general the LRAIC process and the work done by the Business Agency and consultancy companies in this regard.

We feel however inclined to step into the process at this rather late stage since we believe the process a taking a wrong direction. Calculated levels seem to be exceeding what we believe is the normal commercial pricing.

DI Digital is rather worried that society stands to experience a significant welfare loss if this calculated scenario will be carried through, based on 3 accounts.

- Digital infrastructure rolled out at considerable costs by infrastructure owners stands to face the risk that wholesale take up by other operators will be low and hence in the long run under utilize the assets.
- Alternative operators will not be able to compete on reasonable terms, prices and conditions and hence will not be able to deliver effectively at competitive prices for customers.
- Take up of digital infrastructure services will risk being lower than the optimal slowing down the digital transformation of homes and businesses. Representing the general business community, this point is very important for DI to raise.

In other words, Denmark stands to jeopardize the favourable position we have internationally e.g. the DESI index where we obtain a 1st place on connectivity.

DBA notes DI's concern. DBA is to strike a balance between cost efficiency, giving competitive prices, and cost recovery for investments, such that operators have an incentive to invest in roll out. Competition and roll out have to go hand in hand - we both need take up and coverage which requires striking a balance on cost (pricing).

The cost calculated in the model will be used for maximum prices in case of a price obligation. In case a commercial price is lower than the cost calculated by LRAIC, then it is not in conflict with a (higher) regulated maximum price.

TDC

TDC NET is pleased to respond to DBA's third consultation regarding a new LRAIC model for fixed broadband access networks. We appreciate the changes DBA/Axon has implemented compared to second draft and we appreciate the detailed report from the second consultation explaining DBA/Axon's processing of earlier stakeholder comment. As discussed in the recent bilateral meeting, we still have suggestions for model changes in order to ensure the model properly reflects the cost of fibre deployment.

Given this consultation is the final consultation on the new model and that we in this response suggest further improvements to the model, we encourage DBA/Axon to ask TDC NET for clarification if our reply needs further detailing or information. In this way, we can avoid a situation where the final model has applied input data incorrectly due to misunderstandings.

We thank TDC for the comments. We have included responses below to the different comments presented by TDC.

Question 1: Do you agree with the demand considered in the Excel model?

Norlys

Norlys confirms that the overall historical fibre access demand levels (row 28 & 29 - "1A INP DEMAND" 2005-2018) used in the model are aligned with the input provided by Norlys. In the 3rd model draft we observe that the forecasted fibre access demand levels have been adjusted and now to a larger degree reflect the input provided by Norlys. Norlys can therefore agree to the overall fibre access demand used in the model.

Norlys recognizes the point estimates used to estimate the historical demand for the coax platform (both access, BB retail and TV retail) as well as the point estimates used to forecast levels until 2023. However, we do not agree with the forecast from 2024 and forward and believe that these forecast levels need to be changed in order to reflect a realistic scenario for the coax platform. See confidential information provided below.

- The TV retail demand level in the Norlys model in 2038 is [CONFIDENTIAL] from the forecasted level in 2023 of [CONFIDENTIAL]. Norlys believes that this decrease is too low. A decrease of at least [CONFIDENTIAL]in TV retail customers should be modelled over this period.
- The Retail coax broadband demand level in the Norlys model is assumed to increase with around [CONFIDENTIAL]from the 2023 forecast level to the 2038 forecast level. While Norlys believes that the coax network will be fully competitive with the fibre platform in the short run, over time this competitiveness will decrease. Therefore, we believe that the overall trend for the coax broadband customers over the period 2023 to 2038 will be decreasing. In 2038 we would expect a level of broadband retail customer that is around [CONFIDENTIAL] lower than the forecasted level in 2023 of [CONFIDENTIAL]. Until around the mid 20's it

seems reasonable to assume that the level of coax broadband customers will increase – but hereafter, a decreasing trend should be implemented in the model.

- The overall access coax demand should also be adjusted in order to reflect the changes above.

As we have mentioned earlier in the 2nd consultation response and on bilateral meetings, we underline that we find it crucial, that DBA/Axon makes a sanity check of the overall market demand.

DBA considers that the new forecasts reported by Norlys are reasonable. We observe that, previously, Norlys had not reported relevant information for TV subscription forecasts. Thus, we have adjusted these figures based on the numbers provided by the operator. In addition to this, we have adjusted the demand for the "TV.All.Retail.TV Traffic" and "TV.All.Retail.VoD Traffic" to include the demand from the coax services, which has to be accounted for in these services (which represent the total subscribers of video services across all networks).

Meanwhile, for broadband and access services, DBA has reviewed the demand forecasts included in the 3rd draft model to ensure its representativeness. As a result, DBA acknowledges that it is likely that there is a moderate decrease in the number of coax lines in the late part of the modelled period. Therefore, DBA has adjusted the demand forecasts for coax services (both, access, and broadband) considering the indications provided by Norlys.

With respect to sanity check of the overall market demand, DBA will refer to answers in previous consultation reports (mainly in the response to comment 2 from Norlys in question 1 in the second consultation report).

Question 2: Do you agree with the coverage levels considered in the Excel model?

Norlys

Norlys appreciate the changes implemented by DBA/Axon in the 3rd model draft. In the second consultation response we commented that the historical PON coverage for 2016 to 2019 were not aligned with the input provided by Norlys – as well as the historical PtP coverage levels for 2018 and 2019. In addition, the forecast level for coverage from 2020 to 2038 were not aligned with the data provided by Norlys. Norlys provided a confidential overview to DBA/Axon that outlined these differences.

We observe that most of the above-mentioned differences has been corrected in the 3rd draft of the model, although the input regarding future greenfield homes has not been used in the model. Norlys are "OK" with this approach and therefore – in overall terms – agrees with the coverage levels used in the model for Norlys. For the coax coverage – see confidential answer below.

Regarding coax, we observe that DBA/Axon uses a flat coverage level of around [CONFIDENTIAL] throughout the modelling period. This is above the coverage level of around [CONFIDENTIAL] coax homes passed that Norlys has provided during the consultation process.

The difference in terms of homes passed between Norlys' data and the figures included in the model are derived from inconsistencies between the data reported by the operator and the data included in the DAR database.

Mainly, the buildings included in the R model are extracted from the DAR database, while, the coverage for coax networks in Norlys model is defined based on the addresses (buildings) reported by Norlys. As clarified with the operator during the data request, a number of the covered addresses reported did not exist in the DAR database. For these non-existing buildings, alternative buildings within the same postal code in the database were selected to ensure consistency in the total number of buildings passed. These alternative buildings may not have the exact same number of homes as the building they replace, which leads to the observed differences in terms of the homes passed.

However, DBA would like to note that the differences in terms of homes passed has a negligible effect in the outputs of the model, given that the number of buildings passed remains the same as the ones reported by Norlys.

TDC

In Exhibit 3.2 in the consultation document a reduction in the copper cost of 100 DKK is shown. We understand form DBA that this effect is caused by an update of the coverage database, TjekDitNet.

We have checked the latest two submission of copper coverage to TjekDitNEt and cannot identify any larger changes. We therefore think that the database update has gone wrong.

We request DBA/Axon to check if the update has been done correctly.

DBA would like to clarify that in the database utilised in the 3rd draft model to populate the coverage inputs business addresses were not included. However, DBA considers that these addresses should also be included in the coverage inputs of the model. For this reason, DBA has updated the coverage database included in the final model to the latest version available to DBA. In the particular case of TDC, the database results in a total of [CONFIDENTIAL] homes covered for the copper network and a total of [CONFIDENTIAL] homes covered for the coax network.

Question 3: Do you agree with the broadband traffic inputs considered to characterize traffic requirements (i.e. broadband, multicast, etc.) in the Excel model?

Norlys

Unfortunately, we have identified a mistake in the 2019 coax input for average download traffic per line. We have reported a level of [CONFIDENTIAL]. This level is instead [CONFIDENTIAL], corresponding to an annual level of [CONFIDENTIAL]. We would like DBA/Axon to correct this baseline figure in the model and also the surrounding trends, both historically and in forecasts. The adjustments for coax should also have effect for the fibre estimates made by DBA/Axon with reference to our coax inputs. The reported Peak-to-Mean ration for coax of [CONFIDENTIAL]

After reviewing the new data reported by Norlys' DBA has updated the appropriate inputs for coax and fibre networks in the final model, as they are deemed to be likely more accurate of the actual traffic faced by the operator. These inputs are included in worksheet "1D INP NW EVO" of the model.

Question 4: Do you agree with the results of the R model for the access networks and their representativeness of your network KPIs?

Norlys

Even though improvements have been implemented in the 3rd draft model, Norlys still do not believe that the KPI's is representative for Norlys' network. Some of the criticisms mentioned in this consultation response affect the representativeness of the model. These elements will have to be adjusted before we can agree with this question.

DBA notes Norlys' comment. Responses to Norlys' specific questions are presented in the corresponding section(s) of the document.

Question 5: Do you agree with the fibre rollout algorithm implemented to determine the coverage levels of the modelled operator?

Norlys

We acknowledge, that DBA/Axon have used our detailed data delivery related to the fibre coverage. Norlys is "OK" with the fibre roll out algorithm used in our model – but we are concerned that the assumption of covering the cheapest household first – i.e. covering the houses closest to the central offices and then "moving out from there" can lead to an underestimation of the cost levels in the model compared to a "real life" situation. DBA/Axon has informed Norlys that using a different approach (e.g. covering the homes furthest away from the CO's first) have marginal impact on the modelling results. Can DBA/Axon confirm this?

DBA confirms that the order on which homes are covered has only a marginal impact in the results (all other things equal). During the preparation of the 2nd consultation materials DBA analysed this matter. The reason for the limited impact is the relative short roll out period and the economic depreciation methodology. At the same time other model assumptions will pull the cost result marginally in the opposite direction. DBA believe that all these marginal changes are too complex to model when taking into account the limited effect on the net result.

Question 6: Do you agree with the results of the R model for the transmission networks and their representativeness of your network KPIs?

Norlys

See response to Question 4.

DBA notes Norlys' comment. Responses to Norlys' specific questions are presented in the corresponding section(s) of the document.

Question 7: Do you agree with the unit costs and useful lives introduced in the worksheet '1F INP UNITARY COSTS' of the Excel Model?

Norlys

[CONFIDENTIAL]

First of all, DBA would like to point that most of the references presented in the table above are all within the ±30% of anonymisation utilised for these inputs.

Moreover, the unit costs inputs included in Norlys' and TDC's model are based on the actual data reported by each operator. Benchmark figures have only been used in the case that i) the operator did not provide figures or ii) the figures reported by the operator have been considered to be outside of the reasonable range identified by DBA and the operator has not provided sufficiently robust evidences to justify such a figure.

In the particular case of Norlys, benchmark references, figures based on other Danish operators, figures from existing LRAIC model (2017) and Axon estimations have only been used for 62 of the unit CapEx references. Out of these, Norlys did not report any figures in 54 of the cases, while the remaining 8 where discarded, mainly due to discrepancies between the data reported and other available figures. In preparation of the final model, we have reviewed the previously discarded figures with Norlys to get a better understanding of their context. As a result, the final model considers all unit cost input information from Norlys, where the operator has provided any input.

TDC

Comment 1

Functionality is not included in the Unit Cost for copper based MSANs. AXON/DBA has explained that even though the Vectoring processor card cost information was included in the material submitted by TDC, no one of the indicated configuration examples included vectoring line cards.

TDC Net must state that it at no time has been the intention of the submitted material that examples configs should act as direct and only input in the model, since it at the time for submission has not been possible to design whatever config could be feasible for the model developed by AXON.

Therefore TDC NET will stress that in order to obtain cost recovery of the MSAN assets deployed by TDC NET, vectoring processor card should be added to the Copper MSAN asset unit cost.

In order to emphasize this, it should be noted that the Deployment and enabling of vectoring was done in the period of 2015 to 2018 in coordination and

cooperation with both DBA and the alternative operators, and that the copper-based DSL services in TDC NET utilize this technology

TDC therefore expects that the vectoring processor card cost input (cost pr processor card [CONFIDENTIAL]. is added to the two assets:

- Access copper.MSAN - Rack (Remote).# of racks
- Access copper.MSAN - Rack (Central Office).# of racks

The cost per processor card is submitted in 2nd draft material unit cost file, sheet SPEC_NOKIA_ISAM line 19.

TDC NET has deployed Vectoring capability on [CONFIDENTIAL] of the COs and [CONFIDENTIAL] of the Remote MSAN sites. The inclusion of vectoring processor card cost should reflect this deployment.

Furthermore TDC NET has observed that the submitted civil works cost information related to connecting Remote DSLAM cabinets to the electricity/utility network has been ignored, with an argument that these cost are already covered by the cabinet asset. TDC find that this is not the case since the cabinet asset only account for the physical closure/cabinet and place of this. The cost for connection to the utility company alone is approx. [CONFIDENTIAL] pr remote DSLAM, and obviously cannot be included in an asset cost < [CONFIDENTIAL].

Therefore, TDC suggest that the utility company connection fee is added to either

"Access copper.MSAN - Rack (Remote).# of rack's, or to the assets "Access copper.Copper Street Cabinet - 192 subscribers.# of cabinets" and "Access copper.Copper Street Cabinet - 384 subscribers.# of cabinets", depending where AXON/DBA finds it most appropriate to include cost for utility company connection.

After reviewing the clarifications reported by TDC, we have proceeded to include the additional cost from the vectoring processors in the final model. These costs are included in the "Access copper.MSAN - Rack (Remote).# of racks" and "Access copper.MSAN - Rack (Central Office).# of racks" network elements, by adding to the unit cost of these network elements the proportional part of the vectoring processors used in each location.

Regarding the connection with the utility, after analysing these costs, we have proceeded to include these the clarifications reported by TDC in the unit costs associated to the cabinets.

Comment 2

[CONFIDENTIAL]

Regarding the costs associated to the installations, please find the response provided in Appendix 1, to question 14, comment 6 from TDC.

Regarding the costs associated to the distribution points, please find the response provided in Appendix 1, to question 12, comment 1 from TDC.

Regarding the costs associated to the fibre joints, after examination of the new data and clarifications provided by TDC, we have included the unit costs reported by TDC for the fibre joints of 2 and 12 strands. Mainly, now the model considers that these types of joints are installed above ground in a cabinet, and appropriately reflects these costs in the model.

Regarding the costs associated to the copper MSAN racks and cabinets, please find the response to comment 1 in question 7 from TDC.

Question 8: Do you agree with the inputs and methodology followed for the treatment of non-network overheads in the Excel model?

Norlys

Norlys notices that DBA/Axon has changed the methodology for the allocation of non-network cost in the 3rd draft model. The "Index for the allocation of the non-network overheads" has been removed and as we understand it – the non-network cost are now only allocated to wholesale products. Norlys agrees with this change in methodology implemented in the 3rd draft model for the allocation of non-network cost.

DBA/Axon states that they have "*recategorized some of the costs determined by Norlys as overheads as network costs. This implies that total amount of costs considered for the reconciliation process does not change, only the distribution between network and non-network costs*"

As Norlys reads the model – the network OPEX level modelled for Norlys in 2020 is around [CONFIDENTIAL]. – while the non-network cost is modelled at

~ [CONFIDENTIAL][1] i in 2020. I.e. a total level of [CONFIDENTIAL]. in 2020 in network OPEX and non-network cost. If the above is correct, Norlys can agree that the modelled level of the network OPEX and non-network cost seems reasonable in the 3rd draft model, when the model is run with a 2% in NGA risk premium.

Norlys' understanding for the treatment and calculation of the non-network overheads is correct.

TDC

In the model a 0,6% p.a. increase in salary is used. According to the sheet, cost input comes from Norlys. TDC NET cannot recognise this low increase. It should be noticed that the value used should be a cost trend before inflation.

In the current model a 2% p.a. is used and according to the Statistical Department – Danmarks Statistik – the average salary increases for relevant workers have been app. 2% the last four years. TDC NET therefore request DBA to sustain a 2% cost trend.

Reference to EXCEL model sheet 1E INP ANCILLARY SERV, cell E16:E17

The model consider inflation in Denmark as the best proxy to estimate the evolution of labour costs, following the same methodology employed in the old LRAIC model. In the final model, we have, however, adjusted the inflation factor included in the model and ensured further consistency by using the inflation factors included in worksheet "1D INP NW EVO" of the model, which are used in the costing of recurrent services.

Question 9: Do you agree with the inputs considered for the sharing with utility networks in the Excel model?

Norlys

No, we do not agree. Please see section regarding sharing with utilities.

[1] When the model is running with 2% in risk premium

Norlys' comment is noted. Please find the response to this matter in the appropriate section related to the sharing with utilities.

Question 10: Do you agree with the remaining inputs of the Excel model?

Norlys

No, Norlys does not agree with the remaining input of the excel model. Some of the criticism given in this hearing response affects the "remaining inputs". These elements will have to be adjusted before we can agree with this question.

DBA notes Norlys' comment. Responses to Norlys' specific questions are presented in the corresponding section(s) of the document.

TDC

Comment 1

At Sheet 1C at the 3rd excel draft model, Axon has assumed that [CONFIDENTIAL] drop cables may be handled by one duct. However, the price given for a duct for final drops can only contain [CONFIDENTIAL] Cable. The unit cost for ducts used at the CO-SDP and SDP-FDP network may contain [CONFIDENTIAL]. TDC NET suggest that you split the network element for ducts for final cables into a SDU and MDU-case. For the SDU-case the current unit price for ducts for final drops is used for each meter for ducts needed (when taking the average number of homes per building into consideration. Each of the final drop ducts could contain [CONFIDENTIAL]. For the MDU-case TDC NET suggest you to adjust sheet 1C, cell E78 to [CONFIDENTIAL] and use the unit price for ducts at the CO-SDP (=SDP-FDP)-level.

Please see appendix 2 slide 16 [appendix 2 is CONFIDENTIAL].

After assessment, DBA considers TDC's remarks to be reasonable. We have adjusted this feature in the final model, which now includes a the ducts required for MDU drop modelling in the regular drop network element ("Access fibre.Fibre duct - Standard (SDP-FDP).length"). Meanwhile, the ducts needed for SDU modelling have been maintained in the relevant asset for drops ("Access fibre.Fibre duct - Final SDU drop.length"). Furthermore, the maximum number of cables per duct deployed in the drop part of the network has been set at 7.

Comment 2

TDC Net has investigated the multicast calculation. In the draft model a wholesale multicast product is modelled by 6 separate services like in the current model. At the same time, a TV retail product ('TV.All.Retail.TV Traffic') is modelled where the cost of providing multicast to Nuuday is modelled, but this by using other drivers than the wholesale product. TDC NET finds the multicast modelling erroneous since:

- The wholesale product bears very low cost compared to the modelling in the current model [CONFIDENTIAL]
- [CONFIDENTIAL]
- [CONFIDENTIAL] Adjustment of the multicast is not simple. Given that an internal retail TV product is not used (Nuuday and third-party multicast seekers should use the same services in a non-discrimination approach). TDC NET suggests corrections that eliminate cost from the retail product and allocate cost to the wholesale product in accordance with the actual demand inputted to the model. The corrections are:
- Sheet '0A PAR SERVICES', cells G48:G51 is changed to 'Mbps'
- Sheet '1A INP DEMAND' row 56:59. All values set to '1'
- Sheet '1A INP DEMAND' row 63:68. Each row set to values like the row 20 in sheet '1D INP NW EVO' (the multicast capacity development over time)
- Sheet '1D INP NW EVO' row 20. All values set to '1'
- Sheet '3E MAP WEIGHTS' row 20. All values set to '1'

These correction 'empties' the cost in the retail service and increases cost on the wholesale service. Nuuday's use of wholesale services now ads to app. [CONFIDENTIAL] which is more in line with the current model and the Mbps cost in the draft model. TDC NET shall request Axon to verify if the proposed changes are adequate and implement these in the model.

We have reviewed the analysis carried out by TDC, which is, in our view, not completely correct. Mainly, the analysis misses to account for the fact that a relevant part of the costs associated to the core network (for instance, the core sites) are allocated based on the number of lines (broadband, TV) and not on the traffic. In our view the allocation of these costs based on lines and not traffic represents a more causal alternative. If this effect is considered, then the analysis carried out by TDC leads to the expected results of equivalence between multicast and retail TV products.

Comment 3

The parameter "*inp.nw.year.drop.limit*" is not used in the calculation. We suggest to implement year 2020 for the last year of drop line limit.

Please, see response provided to comment from DE in section "Aspects related to fibre installation" for the details on the final approach defined for the drop deployment.

Comment 4

"Trench costs borne by the coax network when a trench is shared with fibre."

The word does not seem to fit the allocation. The sentence "*Trench costs borne by the coax network when a trench is shared with fibre*" should be changed to "*Trench costs borne by the fibre network when a trench is shared with coax*"

Reference to EXCEL model sheet 1C INP NW, row 283

We have adjusted the reference in the model suggested by TDC to "*Trench costs borne by the fibre network when a trench is shared with coax*".

Question 11: Do you agree with the access and transmission network dimensioning algorithms implemented in the Excel model?

Norlys

No, Norlys does not agree. Some of the criticism given in this consultation response affects the results. These elements will have to be adjusted before we can agree with the results of the model.

DBA notes Norlys' comment. Responses to Norlys' specific questions are presented in the corresponding section(s) of the document.

Question 12: Do you agree with the number of network elements dimensioned by the Excel model?

Norlys

No, Norlys does not agree with the number of network elements dimensioned by the excel model. Some of the criticism given in this consultation response affects the results. These elements will have to be adjusted before we can agree with the results of the model.

DBA note Norlys' comment. Responses to Norlys' specific questions are presented in the corresponding section(s) of the document.

TDC

The calculation of trenches for MDU final drops incorporates the probability of a building being connected twice.

Please see appendix for specific suggestion slide 16-18 [slide 16-18 in appendix 2 are CONFIDENTIAL].

DBA has reviewed the corresponding calculations and we have not identified any double counting of the probability of connecting the building.

In this context, we note that the calculations for the final drops have been slightly changed in the final model. Please, see response provided to comment from DE in section "Aspects related to fibre installation" for the details on the final approach defined for the drop deployment.

Question 13: Do you agree that the total cost base calculated by the Excel model?

Norlys

Norlys is not in a position where we can verify the cost base output in the model. We believe that several changes, as addressed in the consultation responses, should be implemented in the model, before we can verify this.

DBA notes Norlys' comment.

TDC

From TDC NETs understanding AXON/DBA has made a change in the OPEX modelling, with the consequence that parts of the TDC submitted Group OH cost (Site Rental cost) has been disregarded and instead treated in a more bottom up approach, and specific to be covered by the "Site" assets in the model. TDC acknowledge that the total OPEX level across OH and Bottom driven OpEx is at the same level 2nd draft compared to 3rd. Having said so TDC must state concerns with OPEX modelling, since none of the Assets cost related to Sites have changed comparing the two drafts. This goes for capex level as well as OpEx level. TDC NET cannot recognize that yearly cost item such as Rental Cost, Power consumption cost, O&M on power supply equipment and Cooling

facilities as well as fee for insurance and public taxes can be covered by the suggested, number of sites*Capex Unit cost* OpEx mark-up%.

From TDC perspective rental cost, public taxes, insurance along with power consumption cost account for more than yearly [CONFIDENTIAL], and the model only generates app. [CONFIDENTIAL] on yearly basis when multiplying sites related assets with the number of such, and the OpEx mark up.

TDC NET finds that the model documentation should hold information on how OpEx items are treated in the model.

In DBA's view, the reconciliation of the total costs for the core sites should account for both, CapEx and OpEx costs. In this sense, it may be the case that the modelled operator considers a different ratio of sites owned by TDC to sites rented to third parties. In this way, while it may be true that the OpEx output in the model for the core sites may be lower than the actual costs borne by TDC, we consider that these costs are compensated by a greater CapEx than the one actually faced by the operator. All in all, we consider that the cost levels recovered by the modelled operator for the core sites is aligned with the overall data reported by TDC.

Question 14: Do you agree with the routing factors matrix defined in the Excel model?

Norlys

We observe that DBA/Axon has excluded the MSAN from the raw fibre product in the routing factor matrix. We agree on this change. However, we are concerned, that when the demand for MSAN drops, the corresponding unit cost does not increase, as we would expect. As Axon informed us on the bilateral meeting, the unit cost depends on the total demand, so making this change, the model should allocate the total MSAN cost only to the BSA product. Can DBA/Axon confirm that this is the case in the 3rd draft model?

Norlys' model includes no demand for raw fibre products, as indicated by the operator in the data request. For this reason, the "demand" for MSANs in the 3rd draft model was not affected compared to the 2nd draft model due to the lack of demand for raw fibre products. Thus, in our view, it is reasonable that the adjustment of the routing factors for raw fibre services in the Norlys model did not result in an impact for other services in the 3rd draft model.

Question 15: Do you agree with the results of the wholesale access services produced by the Excel model?

Norlys

We are not able to deliver any of the modelled access services. Therefore, we cannot verify any of the results.

DBA notes Norlys' comment.

Question 16: Do you agree with the results of the wholesale bitstream services produced by the Excel model?

Norlys

Norlys will not be able to verify the results for the wholesale BSA product before the changes addressed in the consultation responses are implemented in the model.

DBA notes Norlys' comment.

Question 17: Do you agree with the results obtained for the ancillary services?

Norlys

No, Norlys cannot agree with the result obtained for the ancillary services. Norlys has provided input for these elements (both cost input and time estimates), which has not been used by DBA. Until our input regarding cost level and time used for the different ancillary services is used – we cannot agree on the result.

We observe that DBA/Axon has cherry-picked time estimate-inputs from Norlys where these are lower than TDC-estimates and vice versa. This is only true in the Norlys model, i.e. in the TDC model, Norlys estimates are not used if these are lower than TDC estimates. So, DBA/Axon accepts TDC inputs without any adjustments, but this is not the case for Norlys inputs, where any inputs higher than TDC inputs are discarded. In our view this is a discrimination of Norlys compared to TDC. **We ask DBA/Axon to clarify their rationale for this discriminating approach**.

DBA has considered all the figures reported by Norlys. Upon reviewing the numbers, we have observed significant discrepancies between the figures reported by

Norlys and the figures included in TDC's cost model (which are aligned with the figures currently utilised to regulate these services in Denmark). Attempts at clarifications regarding Norlys' numbers have not been successful; hence, DBA has moved forward with figures similar to the ones from TDC's cost model (both minute usage and staff salaries) for the ancillary services.

The figures from TDC's cost model have been subject to several public consultations previously and are thus well-documented. Additionally, DBA does not see any reasons to why different operators should differ in the aspect of time usage for ancillary services, given that they are minimum requirements for delivering fibre connections.

Question 18: Do you agree, at a high level, with the inputs included in the Excel model?

DE

Most inputs look reasonable at a high level, but as many prices are anonymized it is difficult to comments on these. As DBA knows from the answers to the data requests, the fibre operators face different prices on equipment, so the input evaluation will have to be done for each single operator, at the point of time they are modelled (if they are modelled).

DBA notes DE's comment. We agree that whenever a new operator is modelled, information from that specific operator will be considered and included in the model if considered to be reasonable.

Telenor

Comment 1

As also stated previously, third-party model transparency is very limited. Non-confidential input values are allegedly based on a ±30% randomization which in effect makes a review next to impossible.

Telenor's best opportunity to evaluate inputs is therefore to take the more indirect approach via an evaluation of the resulting pricing outcomes. In Telenor's view there exist comprehensive and indisputable evidence that the outcome of the model overestimates true costs for fibre access and for access to Norlys' fibre in particular. This claim will be further substantiated in the response to question 23 and 24 below.

This observation clearly calls for DBA to undertake another systematic review of the confidential inputs received from TDC and Norlys and including a comparison with international benchmarks when relevant.

Demand and cost forecasts presented by Norlys in this LRAIC process could be further validated by a comparison with independent forecasts presented to e.g. Norlys' Board of Directors and to the Danish Competition and Consumer Authority during the SE/Eniig merger case. From Norlys' own press releases it is clear that detailed alternative plans do exist and that ambitions regarding rollout and future demand are indeed high, c.f.

https://via.ritzau.dk/pressemeddelelse/norlys-ruller-fiber-ud-til-50000-nye-adresser-i-2020?publisherId=13559467&releaseId=13585329.

It is also worth further investigating the congruence between LRAIC-model costing outcomes and public statements that the fibre investments have become highly profitable due to higher demand and more efficient digging, cf.

https://finans.dk/erhverv/ECE11391729/jyske-elkaemper-hiver-milliongevinster-hjem-paa-fibernettet-efter-10-aar-med-kaempe-underskud/?ctxref=ext.

Projected digging cost inputs should also be further validated by comparing with inputs from prior LRAIC processes and including adjustments for positive scale-effects and temporary pricing pressures from the recent economic expansion cycle.

DBA takes note of the difficulties faced by Telenor to review the inputs due to the procedures carried out to ensure the confidentiality of the inputs.

With regards to the potential overestimation of the costs faced by the fibre operators modelled, DBA would like to refer to the response provided to question 23.

With regards to the demand projections, DBA has analysed the long-term projections provided by the different operators and has concluded that they are reasonable and aligned with the expectations for the fibre market. Notably, DBA would like to highlight that the take-up projections provided by the different operators involved in the data request process are quite consistent between one another, and we have not identified relevant outliers in the data that would suggest an over or underestimation of the expected demand in the fibre market. Moreover, the evolution of the total number of fixed access lines (including copper, fibre and coax) also shows a reasonable trend, which is well aligned with historical patterns.

Finally, DBA has taken a very close look at the costs of digging reported by the different operators. In this analysis, DBA has contacted multiple operators, including wholesale only operators and operators that are not SMP-operators in this market or SMP in other telecom markets . The objective of this analysis has been to validate the unit costs reported by the modelled operators, and to understand whether costs could have been over or underestimated. After this thorough analysis, DBA has not found any reason to believe that the costs provided by the operators for digging were not representative of the current market situation, and thus, has kept these unit cost inputs in the updated versions of the model.

Comment 2

When signing up for fibre broadband, a significant proportion of the installation costs for the drop wire – and including digging – has been paid upfront by the customer. Practices has over time varied from a relatively small fee of e.g. DKK 1.000 and up to DKK 10.000 or more. To avoid over-recovery of costs the model needs to adjust for this. Please explain how this issue has being dealt with and including some relevant ranges for the impact of these adjustments.

DBA has included a new feature in the model so that the upfront payments from customers can be discounted from the final costs included in the model for fibre access. The inputs related to upfront payments are included in worksheet "1D INP NW EVO".

Comment 3

It is Telenor's understanding that it is assumed in the coax models that installation includes digging from the curb to the NTP. That is not the case in practice at least on TDC's coax network. The coax cable is left on the surface and it is up to the customers to dig the trench themselves or to pay separately for digging.

Based on the feedback provided DBA has investigated this issue. It is DBA's understanding that TDC has had this practice when connecting coax customers and still has. However, a major part of TDC coax network is network bought by TDC. DBA has no overview of the historical connection practice when connecting customers in those networks before TDC bought them and how that affected the purchase price. For now, DBA has chosen to show the part of the cost that has to do with the digging on private property. In case a price decision is made, DBA will take a stand on this issue.

Comment 4

A significant proportion of both Stofa's and TDC's coax networks are based on private access networks. In these cases, it is a common theme that the access costs are carried by the members of these private networks. TDC and Stofa do consequently not pay access fees to the owner of the private networks. Therefore, if a service provider pays TDC or Stofa for the access part, it becomes a pure windfall gain for these "aggregators". Including such a pure profit into the pricing is not compliant with the LRAIC principles.

Due to the comment provided by Telenor, DBA investigated and analysed this issue. Based on the information gathered and legal clarification, DBA concludes that taking the cost of private networks into account would be in cases where the access regulation of TDC or Norlys also covered private networks that has entered into a commercial agreement with TDC and Norlys. Whether a private network is covered by the access regulation has to be assessed on an individual basis (for each private access network). If at some point DBA finds that a private coax access network is covered by the coax access regulation of TDC and Norlys then one option that might be deemed relevant is to take into account the cost of TDC and Norlys for these private access networks. Based on the information provided, DBA understands that there are several possible costs for TDC and Norlys as these contracts entail different elements (discounts on retail services, upgrading of network, etc.)

Telia

Comment 1

Not with the NGA premium and the fifty-fifty split in relation to digging cost between fibre and energy as explained below.

DBA note Telia's comment. Responses to Telia's specific questions are presented in the corresponding section(s) of the document.

Question 19: Do you agree with the methodology followed for the treatment of non-network overheads in the Excel model?

DE

DE noticed that the differentiation between retail and wholesale has been removed, so that all the allocation goes to wholesale products. DE supports that change.

DE also noticed that some of the Norlys non-network costs has been changed from non-network costs to network costs. Due to confidentiality DE is not able to check if this re-categorization makes sense.

DBA notes DE's comment.

Telenor

While the methodology itself is not considered controversial – the application and the resulting outcome should be further verified by comparing with best practice benchmarks – both from international and from prior national practice.

DBA notes Telenor's comment.

Telia

Comment 1

No, Telia cannot see why overhead is relevant. If so, the marginal administration cost will drop significantly after the first alternative operator.

As explained in the MRP from October 2019, the inclusion of non-network overheads is necessary to accurately estimate the common costs associated to the provision of telecommunication services and ensure cost recovery. The consideration of non-network overheads is a standard practice in the development of bottom-up models for regulatory purposes.

Question 20: Do you agree with the access and transmission network dimensioning algorithms implemented in the Excel model?

DE

First, DE would like to state, that some algorithms are difficult to trace. So, there is a risk of undiscovered errors.

DBA notes DE's comment.

Telia

See Telia's earlier answer.

Responses to Telia's comment is presented in the earlier question.

Question 21: Do you agree with the dimensioning algorithms/scripts implemented in the R model?

DE

DE has not been able to perform a thorough review of the R model. Errors that may be found in the R model must be corrected in all R model versions, i.e. if errors are found in the TDC R model, they should be corrected in the fibre operator R model as well, and vice versa.

DBA notes DE's comment.

Telia

See Telia's earlier answer.

Responses to Telia's comment is presented in the earlier question.

Question 22: Do you agree with the routing factors matrix defined in the Excel model?

DE

DE has not found any errors in the routing factor matrix.

DBA notes DE's comment.

Telia

See Telia's earlier answer. Telia must trust DBA.

Responses to Telia's comment is presented in the earlier question.

Question 23: Do you agree with the results of the wholesale access services produced by the Excel model?

DE

DE does not agree in the results of the wholesale access services. Some of the criticisms mentioned in this hearing response affect the results. DE believes that these issues will have to be changed before we agree in the results of the model.

DBA notes DE's comment. Responses to DE's specific questions are presented in the corresponding section(s) of the document.

DI Digital

Comment 1

The LRAIC model is a normative model rather than a mirror to reflect actual cost. However, in the case of TDC who has done a great effort to reduce cost when deploying fibre, it appears that it is the historical cost rather than the actual new efficient cost which is included in the model. If this model should simulate a "build or buy decision" it should be the actual rather than historical cost of deploying fibre which should be included in the model.

The model estimates the current cost of building a network such as the one deployed by the modelled operator, ensuring the efficiency in the deployment. Historical costs are not considered in the model (with the exception of their utilisation for the estimation of the adjustment for fully depreciated assets in TDC's copper network).

Comment 2

It appears there is an overcompensation on the Coax platform based on two accounts:

The roll out of coax is traditionally done by excluding the cost for trenching and excavating. This cost is either left to the end user (building society) or an additional cost for the end user. Therefore, it should not be part of the model since the operator did not carry this cost.

Cost for access to the third-party coax networks should not be included in the model since the operator does not carry the cost. They are normally held by the third party.

Please, see the response provided to comment 3 and 4 from Telenor in question 18 above.

Telenor

Telenor and several other service providers has during the last couple of years been engaged in close commercial dialogue with several independent power/fibre companies in order to get access to their respective fibre networks. Numerous commercial contracts have been signed, and many of these regional power companies will soon open their fibre networks based on the commercially negotiated contractual framework.

Norlys is one of the power/fibre companies that has entered into commercial contracts on fibre access with Telenor and other service providers.

When comparing the commercially negotiated price levels with the latest draft LRAIC-model for Norlys, it becomes clear that the draft LRAIC modelling of Norlys has resulted in calculated costs significantly above the commercial price levels. Clearly, there exist a very strong presumption that Norlys would never engage in a commercial contract where prices do not fully recover true costs and including a reasonable return on the investment. That cost recovery will also include the full risk premium which Norlys considers appropriate for its internal business cases. Selling below true costs would have to be justified by either irrational cost ignorance or some novel predatory pricing strategy. Both justifications are very unlikely and should be immediately rejected. In particular, Norlys is a very large professional enterprise with extensive experience in this market. Of course, Norlys does fully understand their own true costs associated with wholesale fibre access.

Telenor finds it very problematic and misleading that the current draft LRAIC model results in cost-based prices that significantly exceeds commercial price levels – and especially if an NGA risk premium is being added to the already high LRAIC "base" level. As explained above, if LRAIC exceeds price levels in voluntary commercial agreements it is an extremely strong indicator that something is seriously wrong with the LRAIC model. Ignoring such evidence will erode all trust and legitimacy of the LRAIC process and damage future competition by squeezing out service providers.

Telenor highly recommends that the DBA – as part of the LRAIC-process – imposes on Norlys and other relevant utility companies an obligation to immediately submit commercially negotiated contracts in order for the DBA to avoid any risk

of imbalances and inconsistencies between the commercial levels and the inputs and outputs wrt. The final LRAIC.

- DBA's cost modelling is aiming to achieve an objective cost calculation and not a specific cost target. Commercial prices could deviate from the LRAIC calculated costs by being either higher or lower; hence, DBA has not requested the specific contracts mentioned by Telenor. However, based on the response from Telenor and other operators, DBA has performed a thorough analysis of inputs and assumptions in the model which has led to the adjustment of some parameters and approaches followed in the model, of which the one with the highest effect is the deployment of fibre distribution points and joints above ground. Instead of below the ground as done in previous models, –, which reduces the need to deploy manholes and jointholes.

Furthermore, the removal of the requirement to avoid homes passed with coax in the fibre rollout algorithm has decreased the fibre cost considerably for TDC fibre (not relevant due to specified input data from Norlys). Updating the WACC based on updated parameters from BEREC and in accordance with the new methodology from the European Commission has also had an effect, although limited.

In addition to these topics, DBA also looked at the digging costs, which is one of the most important parameters for the cost result. After thorough analysis, DBA has determined that the costs included in the model are reasonable. Please, find further details in the response provided to comment 1 from Telenor in question 18.

Telia

Comment 1

See Telia's earlier answer.

Please, see response to Telia's earlier comments.

Question 24: Do you agree with the results of the wholesale bitstream services produced by the Excel model?

DE

The issues raised by DE will have to be dealt with, before we agree with the model results.

DBA notes DE's comment.

Telenor

No. See answer to question 23.

Please, see the response to Telenor's comment in Question 23.

Telia

Comment 1

No. See also answer below.

Please, see the responses provided for these questions below.

Additional Questions

Aspects Related to the WACC

DE

DE understand that the setting of WACC risk premium on fibre networks is not part of the LRAIC process but will be settled in the commitment's procedure and/or consultations on draft price decisions.

DE's understanding is correct.

DI Digital

The NGA risk premium comes from the COMMISSION RECOMMENDATION of 20 September 2010 on regulated access to Next Generation Access Networks (NGA).

DI Digital underlines it is important to maintain incentive for building digital infrastructure.

A risk premium in the current Danish markets appears however to be an over-compensation. According to the recommendation a risk premium should be based on risks associated to demand, cost of deployment, technological progress, competition, and macroeconomic dynamics. While some of these reasons where relevant when the utilities initiated fibre deployment they are not anymore and has not been relevant in many years.

Fibre rolled out today is done in a manner to eliminate the above risks. For instance, customers are signing up before projects are decided upon. Cost of deploying infrastructure are well known etc.

It follows from the recommendation that "These factors [above] may change over time, in particular due to the progressive increase of retail and wholesale demand met. NRAs should therefore review the situation at regular intervals and adjust the risk premium over time, considering variations in the above factors."

Hence a NGA risk premium for access to all infrastructure would make no sense today.

Please, see the response presented to comment 3 from Telia in Question 24 above.

Fastspeed

In the 3rd draft of the LRAIC process, a risk premium of an additional 2% was included in the calculation of both TDC, and Norlys fiber networks. A NGA risk premium is defined as an additional risk related to cost of deployment, changes in demand, competition, technological progress and macroeconomic dynamics. Furthermore, the concept of using a NGA premium derives from a recommendation in 2010 (Commission Recommendation from September 20 2010 on regulated access to Next Generation Access Networks), and we believe that whilst the above-mentioned factors might have been relevant in 2010, they are not relevant anymore, 10 years later in present day.

Ultimately, we believe that fibre is the preferred network from a consumer perspective and is an infrastructure which will dominate the Danish households going forward. The NGA risk premium on Fiber networks is irrelevant in the present context and therefore should not be included in the modelling.

Please, see the response presented to comment 3 from Telia in Question 24 above.

Norlys

In our consultation response to the 1st and the 2nd consultation, we argued that the WACC in the LRAIC model should reflect historical levels. We are still convinced, that this should be the case, and therefore we argue for this in the 3rd consultation as well.

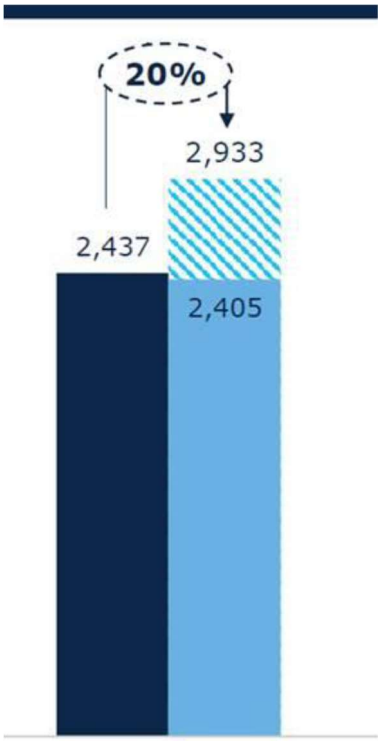
Our argumentation is fully in line with what Dansk Energi (DE) provided in their consultation response to the 2nd consultation and therefore our arguments can be found in the common consultation response from DE.

As presented in the appropriate response in the 2nd consultation report (See response to Aspects related to the WACC to comment 2 in Additional questions from DE), DBA considers that the model should not consider the historical WACC and should reflect only the most updated WACC figures approved by DBA.

Telia

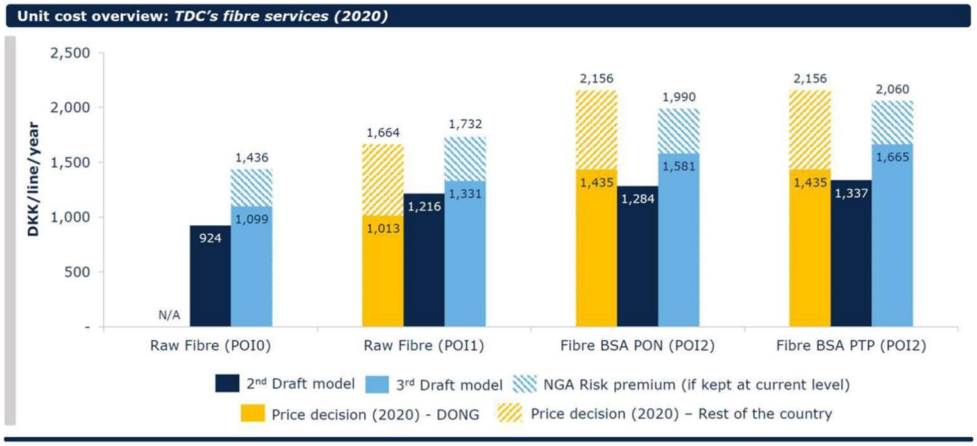
Telia has to raise its deep concerns in regard to the price level in the 3rd draft of both COAX and FIBER for both TDC NET and NORLYS. The current price level is far too high in relation to the price points on which the energy companies are willing to enter agreements.

The Danish Business Authority ends up with a price level that is significantly above previous year's level, leading to a risk of commercial agreements being disregarded. We are talking about commercial agreements that the energy companies have been able to see a good business in, otherwise they would not offer the agreements. The high price points are partly to do with the fact that the NGA's n RP consequence after WACC is over 20%. In addition, the incorrect split between the digging costs, cf. (comment on revenue distribution).



[CONFIDENTIAL]

TDC (Fibre) – Improvements implemented in the fibre network modelling provide results more aligned with current price decisions



In DONG area this means a price increase at 16%.

TDC DONG FIBER			
	Prissætning	Stigning	stigning i%
Nuværende niveau	1.435		
LRAIC 2020	1.665	230	16%

Telia does not understand that the price level increase DKK 1.337 to DKK 1.665 from draft 2 to draft 3. But Telia could understand from the draft 2 meeting that TDC would revisit its own figures after seeing what Norlys got included in their model, and Telia assumes that this may be the explanation for the large increase in price level.

TDC NET - does not seem to have suffered from previous calculations, and Telia cannot think of a market where the price is increasing/developing so rapidly. In fact, TDC has flattened prices at the higher speeds, thus offering prices below the existing LRAIC price. If DBA seriously intends to raise the LRAIC price the distance between market price and LRAIC price will distance even further.

As TDC's fibre network has been modelled previously, the Danish Business Authority is requested to inform why the prices in the new model are significantly higher than previous years' modelling / calculations.

In order not to ruin current contract negotiations and the commercial market in general, Telia recommends that the Danish Business Authority removes the NGA risk premium.

It should be noted that the NGA risk premium comes from the Commission's NGA recommendation from 2010. The Danish broadband market has changed significantly since then, and the uncertainty that prevailed at the time do no longer exist. Fiber is today a well-known and widespread technology and end-users demand for higher bandwidths has been increasing in recent years. A trend that must be expected to continue in the future. In addition, companies rarely roll out parallel infrastructure.

See also Telia's consultation response of 6 March 2020 on why a risk premium should not be added.

Regarding the results of the model, please, see the response provided to comment from Telenor in question 23 above.

Regarding the risk premium, as stated in previous consultations, it is a matter that will be finally decided in the case of pricing decisions. Therefore, the presentation of the final results from the LRAIC model is also done in a way so that operators can see the different cost elements.

Aspects related to fibre installation

DE

Comment 2

During the LRAIC modelling process different terms has been used to describe the addresses that is not connected from the beginning of the network roll out. Terms like 'delayed installations' and 'after connections' have been used. The characteristics for these installations are that they are done as a single installation. DE suggests that the model should use a more precise and less 'negative' term to describe this type of installation. DE therefore suggest that DBA use the term 'Single Installation' in the final LRAIC modelling.

DE supports that the model now covers an extra one-off fee reflecting the extra costs of doing single installations. With this implementation the model reflects a higher degree of reality. But DE request to make the calculation of the average installation cost transparent. In sheet 1B, cell D36, the weighted installation cost can be found as an entered number. DE suggest that the model contains the calculation of this number, including installation cost during roll out, single installation cost, and the percentage of single installations.

Furthermore, it is important to stress that the single installation percentage, and the costs of doing single installations are operator specific and should be defined for each operator. The calculation of the percentage of single installations should reflect the average share of single installation in the specific operator's fully deployed network in 2038.

With regards to the naming, DBA considers that changing the naming so far in the process may lead to confusion in the industry. However, DBA acknowledges that consistency in the terminology is key and thus, will ensure that, at all times, the name "delayed installations" is used. In addition, we will make sure that the characteristics of these installations are described in the documentation.

Furthermore, DBA notes DE's comment and agree that these inputs should be operator specific, given that the operators can provide such figures and figure seem reliable.

Comment 2

The monthly fee calculated in the model is based on drop wires up to 30 meters. The model calculates an additional one-off fee which can be charged for

customers with drop wires longer than 30 meters. It is DE's opinion, that the price decision shall reflect the actual operators pricing strategy. I.e. if the operator has chosen not to differentiate customers pricing according to the drop wire length, then it shall be possible to incorporate the +30 meters drop wire one-off fee, in the recurrent fee. This option is vital and necessary for the cooperative owned fibre companies as they treat all customers (owners) equally – independent of the location of address.

DBA has taken DE's comment into consideration and decided to include a series of changes in the cost model to reflect it. Mainly, we have included a series of options in the cover worksheet so that the actual deployment strategy followed by each operator can be followed in the model. The options included in the model are as follows:

- "*Include standard cost of installation in the recurrent fee?*": If this option is set as "Yes", then the model considers the cost associated to the installations (cables, trenches, NTP and drilling) in the recurrent fee for fibre services. If it is set as "No", then these costs are not included in the recurrent fee, and it is assumed that the operator would recover these costs through one-off payments. The model calculates the cost of installation separately if "No" is chosen,

- "*Include extra cost of delayed installation in the recurrent fee?*": If this option is set as "Yes", then the model considers the additional cost associated to the delayed installations in the recurrent fee for fibre services. If it is set as "No", then these costs are not included in the recurrent fee, and it is assumed that the operator would recover these costs through one-off payments. The model calculates the cost of installation separately if "No" is chosen,

- "*Limit delayed drop installation to 30m in the recurrent fee?*": If this option is set as "Yes", then the model considers that only the first 30m for each drop would be covered though the recurrent fee. The additional distance related to the last drop would be recovered through one-off payments. If this option is set as "No" then no distance limit is applied to the drop distances that can be recovered through the recurrent fee.

TDC

Axon has made substantial changes to the modelling of installation cost. The third draft model now includes the costs of installing fibre access up to and including the connection of individual premises for addresses where the premise is connected at the same time as the fibre is rolled out. The model also reflects correctly

that there is an extra cost associated with connecting premises that don't accept the opportunity to have the connection installed at the time of the stock rollout.

TDC NET supports the applied method where cost elements are separated into distance dependant and non-distance dependent cost. However, we do not see that the cost input used in the new method reflects the real cost in the fibre deployment. We have submitted Axon's calculation updated with the required cost from our previously submitted unit cost file where possible.

In order to establish a common understanding of the modelling and the cost applied we recommend a bilateral meeting regarding this issue with DBA and Axon.

For the premises that are connected at a later point in time, the model includes only costs up to 30m from the fibre distribution point. That means if a premise that is connected at a later point is for example 40m from the fibre distribution point, the costs of 10m of trench and cabling is not recovered in the LRAIC model.

We have two observations in this regard:

- The use of 30m as a factor must be rooted in the current regulatory obligations imposed on TDC based on DBA's 2017 Decision on the markets for broadband access. In the current set of regulatory obligations, TDC has an obligation to connect premises within 30m of its existing fibre access network where an SP customer wants to serve such a customer on the basis of fibre wholesale access from TDC. Hence the cost of this obligation is accounted for in the current LRAIC model used to set the maximum prices. This 30m connection obligation was imposed on TDC based on a concern that TDC could discriminate against external service providers by refusing to supply fibre wholesale access where the intention of the external service providers in buying such wholesale access would be to lure the retail customer typically served by TDC's internal service provider away from TDC's copper access network. However, the DBA has described no such competition concern in its draft decision on the delineation of market 3HC and SMP designation for the period from 2021 so we do not expect that the DBA would impose an obligation on TDC to connect homes within 30m of its fibre access network. The choice of 30m as an important parameter in the new LRAIC does not appear to have a firm basis on a forward-looking basis.

- If the costs of connecting homes after the initial rollout that are included in the LRAIC model were limited to 30m, TDC NET would only be able to recover such connection costs through a connection charge. If the DBA were to set regulated charges based on the new LRAIC model, it would effectively be encouraging TDC NET to introduce connection charges for premises that are not connected in the initial rollout. Whilst regulation may in some cases legitimately pursue cost-based charges, DBA should justify why it is also appropriate to push for this particular structure of charges.

We encourage Axon to abandon the 30m distinction and include the full connection costs for premises that are connected after the initial rollout in the model.

More generally, we note that the market for high capacity broadband access is dynamic and TDC NET is still learning and developing its commercial pricing policy. We currently have a policy of building homes connected and encouraging as many end users to accept a connection through the absence of a connection charge. However, this may change over the coming 3 to 5 years; neither TDC NET nor the DBA can know at this time what the efficient price structure will be in 5 years' time. This means that if the DBA were to set price obligations based on this LRAIC model, it would be important to include some flexibility to change the balance between access and connection charges over the coming period.

Given that DBA's considerations regarding the implementation and pricing of delayed installation and drop line obligation is not described in the consultation material, we recommend another meeting where DBA can elaborate on its initial position of these two issues.

Please, see the response provided in the comment from DE in this same section for the final approach followed for drop deployment.

Fully Depreciated Assets

TDC

Comment 1

TDC NET has noted that DBA continues to adjust copper LRAIC costs for fully depreciated assets. DBA has in the consultation report regarding the 2nd consultation stated that this is due to the objective of giving the correct build or buy

incentives for access seekers not being relevant for the copper network, with following argument:

"*As indicated in the draft market analysis recently issued by DBA, it considers that copper-based broadband falls into a different market compared to fibre and coax. Thus, DBA considers that in one market (copper) there is limited room for infrastructure-based competition, as data suggests and, therefore, objective #2 ("Avoid over-recovery of costs for the modelled operator") shall prevail. On the other hand, in the fibre-coax market, data suggested there is indeed room for infrastructure-based competition and, in this case, objective #1 ("Give the correct build or buy incentives for access seekers") prevails. DBA's observations are thus coherent with its findings from the market analysis.*"

It is TDC NET's clear opinion that DBA's assumptions about competition constraints in the markets for broadband access are not adequate and correct. Thus, an adjustment for fully depreciated assets in the LRAIC cost model for copper is not in line with the overall principle as set out in Article 74 of the Code[2] regarding price control and cost accounting obligations and is a misinterpretation and incorrect use of EC's 2013 Recommendation.

TDC NET notes that DBA's draft market analysis for the low capacity market is still subject to consultation and it is not in accordance with good governance for DBA to decide on model parameters that are based on the conclusions of the market analysis when the market analysis has not yet been completed.

As it will appear from TDC NET's response to the consultation on market analysis and SMP designation for the market for low capacity broadband (market 3LC), we do not agree that the DBA's draft analysis fully covers the competitive constraints in the market, i.e. that fibre and coax constitute a significant constraint for pricing of copper due to one-way substitution to fibre and coax. This constraint applies to virtually the entire cobber network, as 91% of the network is parallel covered with fibre or coax.[3] It is also indicated in TDC NET's

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[2] Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code

[3] Udkast til markedsanalyse af engrosmarkedet for netadgang til lavkapacitetsinfrastruktur på et fast sted (M3LC)

consultation response to the 2nd consultation on the LRAIC model[4] and supported by Dansk Energi Association,[5] that copper prices constitute a constraint for how fast deployment of fibre networks will occur or migration from copper to coax and fiber will happen. These factors do not change the fact that a separate market for low-capacity products can be defined, meaning customers who have first chosen a high-speed product do not switch back to a low-speed product even if the price of high speed were to rise, but it clearly indicates that it is still relevant to ensure that the prices on copper give the correct build or buy incentives for access seekers to foster the deployment and take-up of next generation networks.

It follows from the Code, art 74.1, that the NRA should only impose price control obligations "*in situations where a market analysis indicates that a lack of effective competition means that the undertaking concerned may sustain prices at an excessively high level or may apply a price squeeze, to the detriment of end-users.*" (TDC NET's added emphasis)

As stated above, due to one-way substitution from copper to fibre and coax, TDC NET will not be able to set excessively high prices and therefore DBA should already in the market decision be reluctant to impose an obligation on price control for copper products and even if DBA deems it necessary, this constraint from the high capacity market should be taken into account in the design of the imposed price control for copper. This is further supported by the Code art 74,2, where it is stated (TDC NET's added emphasis):

"*National regulatory authorities shall ensure that any cost recovery mechanism or pricing methodology that is mandated serves to promote the deployment of new and enhanced networks, efficiency and sustainable competition and maximizes sustainable end-user benefits. In this regard, national regulatory authorities may also take into account prices available in comparable competitive markets.*"

Hence, if the prices on the high capacity market (regardless of whether they are set as a result of price controls or commitments) are considered by DBA to promote competition, prices in this market may in accordance with Article 74.2 be used as relevant reference.

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[4] DBA's Consultation note regarding the 2nd consultation on the Model, 1st September 2020, page 54

[5] DBA's consultation note regarding Model Reference Paper, 23th October 2019, page 9

It appears further form article 74,1, that:

"*In determining whether price control obligations would be appropriate, national regulatory authorities shall take into account the need to promote competition and long-term end-user interests related to the deployment* *and take-up of next-generation networks*" (TDC NET's added emphasis)

This is supported by recital 192, which states that a price control obligation:

"*should be appropriate to the circumstances taking into account the need to promote efficiency, sustainable competition and deployment of very high capacity networks and thereby maximize end-user benefits , and should take into account the need to have predictable and stable wholesale prices for the benefit of all operators seeking to deploy new and enhanced networks, in accordance with Commission Recommendation 2013/466 / EU (1).*"

It follows that it is crucial that any price control ensures the deployment of new and enhanced networks. This applies regardless of whether the DBA considers copper and fibre to belong to separate markets. Thus, when regulating the price of copper, the DBA cannot ignore whether the pricing will have negative effects for the deployment of new and enhanced networks on the market for high capacity broadband.

The application of the cost principles of the 2013 Recommendation must therefore be interpreted within this overall aim. The 2013 Recommendation can thus not be used to support modelling of costs for a copper network that are not based on modern efficient NGA network, this is also reflected in the 2013 Recommendation, paragraphs 29-31.

When assessing whether a correction should be made for full depreciation for certain assets, the Recommendation (paragraphs 33-35) stipulates that it should be considered whether a network is reused for another NGA network or whether it is replicated by another NGA network. This applies regardless of whether there is replication of networks form the same or different markets (cf. The Recommendation paragraph 33). The relevant criterion is whether there is replication with an NGA network or whether an NGA network reuse asset from the copper network.

There can be no doubt, that DBA must make a proper assessment of whether copper is being replicated by NGA-networks, i.e. fibre.

If the DBA maintains that a correction for fully depreciated assets in the copper network should take place despite the copper network being replicated by NGA

networks, TDC NET must request that the DBA urgently involves the Commission with a view to achieving an EU compliant interpretation of Code and the Recommendation.

The reason behind using the FDA for copper is following the principles of the 2013 recommendation. However, DBA *supports* its use of the methodology on the fact that the draft market analysis divides the broadband market into a low capacity market (copper) and a high capacity market (coax and fibre). Unless substantial new evidence is put forward, the final analysis will conclude that there are the abovementioned two relevant markets, hence it is the most likely scenario. DBA does therefore not agree with TDC that it is not in accordance with good governance practice to take this most likely future scenario into account.

TDC quotes the EECC: "In determining whether price control obligations would be appropriate, national regulatory authorities shall take into account the need to promote competition and long-term end-user interests related to the deployment and take-up of next-generation networks" (TDC NET's added emphasis)". DBA agrees that take-up is relevant to investment and therefore important. However, DBA tries to strike a balance between the "promote competition and long-term end-user interest" also mentioned in the quote put forward by TDC, which leads to an objective to not induce over recovery of costs.

The arguments in the market analysis (also brought forward by TDC in the consultation on the market analysis) will be treated in the consultation report of the market analysis.

Comment 2

Notwithstanding our objection to the correction for fully depreciated assets in the copper LRAIC as being wrong in principle, we have also pointed out the high sensitivity of Axon's assumptions used for the calculation of the FDA adjustment percentage in previous consultation responses. In order to obtain a downward adjustment of 36%, Axon uses an asset life of 30 years to identify relevant asset to adjust in the asset register. We have argued that a regulatory lifetime of 35 years is applied in the draft LRAIC model for trenching and using this lifetime for FDA (which adjust the same asset) will make the lifetime assumptions internally consistent across the model. This alignment of assumptions would reduce the adjustment for FDA from 36% to 12.5%.

In the report for the second consultation, page 56, DBA writes:

"*...Finally, regarding the use of 30 years in the calculation of the Fully Depreciated Assets from TDC's information, this is based on the useful life used to set wholesale prices in Denmark in the past (i.e. in the old model). This aspect was decided because TDC has been recovering costs for their copper network based on this useful life (30 years). Thus, DBA considers that the only consistent approach would be to calculate the percentage of assets that are fully depreciated from a regulatory perspective using this useful life (30 years).*"

However, if the criteria for determining the asset life to be used in the FDA calculation is to be based on the regulatory lifetime used in the past, we dispute the use of 30 years. TDC's charges have been regulated on the basis of a LRAIC model since 2003:

- In the period 2003-2014, LRAIC models used an asset lifetime of 40 years for trenches and ducts, i.e. in this period an even lower cost recovery per year was obtained compared to a 30-year lifetime.
- In the period 2015-2020, 30-year asset lifetimes have been used.

As such, a 40-year asset life would be more representative to use in the FDA calculation to align to historic cost recovery. Alternatively, an average asset lifetime over the period of 37 years can be applied as a minimum in the FDA calculation.

Firstly, DBA would like to refer to the responses provided on this matter in the consultations for the model and the MRP, as well as on the final MRP published in October 2019.

With regards to the specific points raised by TDC in the response, we acknowledge that the useful lives utilised in the 2003-2014 models for civil infrastructure (40 years). However, we also note that in this same model, shorter useful lives were used for cabling elements (15-20 years).

Furthermore, following TDC's argumentation, the "effective useful lives" should also account for the fact that prior to 2003, TDC was not subject to LRAIC regulation (i.e. differentiation between the technical useful life of 40 years, which is used in the LRAIC model, and what is applied in TDC's financial statements). Instead, it can be argued that all years prior to 2003, the useful life should be based on the one used in TDC's financial statements, which is around 20 years. Following this, if the 20 years were considered for the period of 1982 (first year with data in the FAR) to 2002, the weighted average useful life for the period of 1982-2020 would be around 28 years. In addition to this, if the figures were adjusted to reflect the fact that most of TDC's deployment of

copper took place prior to 2005 (as it is reflected in the coverage data reported by TDC), the "effective useful life" would be even shorter. In this context, by following TDC's calculations, the percentage of fully depreciated assets would be 44.6%, based on an effective useful life of 28 years (61.3% if purely based on TDC's financial statements, i.e. 20-year of useful life).

Due to the abovementioned reasons, as well as the ones presented in previous responses, as well as the comparison with a net replacement cost approach presented in the 1st consultation document, DBA has decided to maintain the approach in the calculation for the percentage of fully depreciated assets.

Efficiency adjustments

DE

Comment 1

The LRAIC theory operates with different degrees of optimisation possibilities. LRAIC models shall model an efficient operator, but the degree of optimisation is subject to the operator's actual network. Basically, there are three different types of LRAIC models; scorched node models, modified scorched node models and scorched earth / greenfield models.

The difference in the three types of models, are the allowed degree of optimisation.

Scorched node is the model approach with the most limited optimisation possibilities of the three. Scorched node means that the optimisation is subject to the actual operator's network nodes. The model's optimal scenario under the scorched node assumption is subject to the number of sites and their existing location. The size and type of equipment at the sites can be optimized with modern technology, but the number of sites, and their location is fixed.

Models subject to modified scorched node will also be based on the modelled operators' sites, but the modified scorched node assumption allows that the location for some of the sites can be changed, if inefficiencies are identified.

Scorched earth / greenfield models do not have limitations regarding the operators actual site locations, and the number of locations.

The Model Reference Paper (MRP) states that the degree of optimisation in the model shall be based on the scorched node approach. Please see section 3.3.4. *Degree of optimisation*:

"Supporting criterion 12: The choice of technology and degree of optimisation is subject to the scorched-node assumption and the requirement that the modelled network as a minimum should be capable of providing comparable quality of service as currently available on the modelled operator's network, and be able to provide functionality comparable to that of the existing services".

In MRP section 5.3.1 The Scorched Node Assumption, it is written that:

"DBA interprets the Scorched Node constraint such that when modelling an "optimally structured network" under the scorched node assumption the locations for equipment are constrained by the existing number of sites and their existing locations. However, the scorched node assumption does not imply that the transport network - cables, duct/trench etc. - is fixed. Nor does the assumption imply that the same number and type of equipment should be placed at each of these geographical locations.

Supporting criterion 26: The LRAIC model should show the costs of a network with an efficient configuration operated by an efficient company, based on the latest proven technological solutions and an optimally structured organisation. However, the starting point should be the existing geographic network architecture in the modelled operator's network. This implies that equipment should be placed at the existing geographical locations of the modelled operator's network nodes (the scorched node assumption)".

The above-mentioned quote on the Scorched Node assumption is in line with the decisions taken in NRA's - Rapport om Hybridmodellen, December 2002.

DBA's efficiency adjustment in the Norlys model conflicts with supporting criteria 12. The performed optimisation (efficiency adjustment) adds nodes to the Norlys network, furthermore it changes the locations of Norlys' nodes. This is actually written by DBA in the 2nd Consultation report "*Further, this adjustment does not only mean that a few network nodes are added on top of the existing network nodes of Norlys. The adjustment also implies that the existing network nodes would be adjusted (moved) to consider a more efficient deployment overall.*" This means that the efficiency adjusted Norlys model is a mixture of the modified scorched node approach, and the greenfield approach, as the model disregards the location of all Norlys nodes.

In the 2nd Consultation report DBA writes that: *With regards to the validity of this adjustment in relation to the scorched node approach, we would like to note that such adjustments were already envisaged in the final MRP published in October 2019*:

"The LRAIC model should show the costs of a ***network with an efficient configuration operated by an efficient company****, based on the latest proven technological solutions and an optimally structured organisation. However, the starting point should be the existing geographic network architecture in the modelled operator's network. This implies that equipment should be placed at the existing geographical locations of the modelled operator's network nodes (the scorched node assumption)." (emphasis added by DBA)*

As DBA writes, it is true that the MRP mention that the model shall show the cost of a network with an efficient configuration operated by an efficient company. According to general LRAIC principles the optimisation possibilities are limited under a scorched node approach. As written above, the optimisation under a scorched node approach is subject to the number of sites and the location of sites. The optimisation can only be performed on the type of equipment, and on the size of the equipment placed on the sites. Furthermore, the cable routing between the sites can be optimised under the scorched node approach.

The limitation of optimisation under the scorched node approach should be well known by Axon. A description of the three LRAIC approaches can be found in earlier work performed by Axon.[6] In the description of scorched node, Axon writes:

Scorched node: this approach uses the location of existing network nodes. The equipment estimated in each node will be calculated based on demand and efficient use of the network. This option is relatively simple to implement but ***it may include potential inefficiencies in operators' networks****. (Emphasis done by DE)*

The scorched node assumption has been essential to DE from the preliminary phase of the LRAIC project. DE commented in the MRP hearing, that the

[6] Recommendations on new interconnection rates for ECTEL member states

Final guidelines report, 27 December 2016, Axon Partners Group Consulting

scorched node assumption should reflect the actual modelled operator. DBA confirmed in the MRP consultation report that:

"As reflected in the MRP, the model will, to the extent possible, be based on a scorched node assumption that considers the locations of the nodes of the modelled operator(s)."

As said, scorched node has been crucial for DE since the beginning of this LRAIC project. And DBA has previously confirmed the usage of the scorched node assumption for the modelled operator.

The conclusion about the scorched node topic is that the model does not meet the MRP supporting criteria 12 which says that the choice of technology and degree of optimisation is subject to the scorched node assumption. DE urge DBA to omit the performed efficiency adjustment, so that the model fulfils the MRP's supporting criteria 12.

In DBA's view, it could be looked at as a scorched node based on TDC's CO-locations. However, it is not important to DBA whether we label the applied method "Scorched Node" or "Modified Scorched Node" as we have made the adjustments based on what DBA finds to be reasonable costs – stemming from investigations and assessments made by DBA.

DBA would like to stress that the Model Reference Paper is not a legally binding document. In the TERA-model where the MRP also laid out the intention to use the Scorched Node-principle, modifications were made as some of TDC's central offices were removed from the model.

<u>*Comment 2*</u>

DE finds it irrelevant to comment on the transparency issue related to the efficiency adjustment, as the adjustment is not in line with the MRP as already covered in this response. Nevertheless, we will comment on the transparency issue even as we do not see any reason to keep the MRP conflicting adjustment in the model.

The efficiency adjustment is based on TDC figures compared to Norlys figures. DE/Norlys does not have access to the TDC Rmodel and the confidential TDC excel model. So, the calculated efficiency adjustment of 15 pct. Is a black box calculation, which DE/Norlys does not have any chance to validate.

In general, the LRAIC modelling performed by DBA is thorough and transparent, and operators are able check actual distances etc. in the R model. But when doing the efficiency adjustment, all distance calculations becomes a black box – conflicting with the aim of the model being as transparent as possible.

DBA appreciates that DE finds the LRAIC model and project thorough and transparent in general. DBA notes Norlys' comment regarding the black box. However, it is not possible for DBA to share this information as it is fundamentally confidential TDC information.

Comment 3

DBA introduce the concept "isolated homes" in the Norlys model. DBA states in the consultation note regarding 2nd consultation on the Model:

"Furthermore, in the case of Norlys, DBA identified that a relevant number of the homes covered by Norlys are located at a significant distance from the CO. Upon closer inspection, these homes are mostly isolated, requiring extensive network deployment to cover them. It is valid to expect that an efficient operator would only cover these homes if it is possible to codeploy (for instance, with its own electricity division). Thus, for these specific, isolated, homes, the 3rd draft model considers that the trenches necessary to cover these isolated homes would always be shared with utilities (Norlys electricity infrastructure), to avoid an uneconomic outcome."

DE have several comments on this topic.

More than 400,000 households lost electricity during the December storm in 1999 – the worst hurricane in Denmark of the century. The power outages were mainly due to damage to overhead cables by fallen trees and flying objects. In continuation of the storm it was politically decided to give the distribution system operators (DSO's) the possibility to finance an accelerated deploying of overhead lines into the ground to make the electricity distribution network more resistant to future storms. From year 2000 an onwards, the DSOs initiated an intensified

cabling of low-voltages cables (0,4 kV cables). Nearly 85% of the power cables were already deployed into the ground at the end of 2004.[7]

1. Considering that a very large part of the low voltage cables in Denmark, connecting homes to the power grid, was deployed prior the utility companies decision in the mid 2000's to enter the broadband market and deploy fibre cables to households and businesses in their respective supply area, DE does not find that DBA's model assumption regarding co-digging between fibre cables and electricity cables to isolated homes is valid.

   Considering that a very large part of the low voltage cables in Denmark, connecting homes to the power grid, was deployed prior the utility companies decision in the mid 2000's to enter the broadband market and deploy fibre cables to households and businesses in their respective supply area, DE does not find that DBA's model assumption regarding co-digging between fibre cables and electricity cables to isolated homes is valid.

2. The model clearly shows that DBA does not acknowledge the fact that fibre does not suffer from the limitations of copper: data signals over fibre can easily be transmitted more than 20 km from CO to the customers – reducing the number of needed CO's. The reach of data signals over copper is limited to about 3-4 km. demanding a higher number of CO's.[8] In this draft model, Norlys is penalized twice due to the longer distances on fibre between CO's and the customers.
   - DBA performs an efficiency adjustment, where Norlys' number of sites and their location mimics TDC's copper network, to reduce trenching distances
   - Secondly DBA introduce Isolated homes, where it is assumed, that all homes longer than 7 km from the CO always use co-digging

[7] https://www.kfst.dk/media/49587/elselskabernes-udrulning-af-fibernet-08092005-analyse.pdf

[8] DBA has described the different characteristics of copper and fiber in the current market decisions from 2017 https://erhvervsstyrelsen.dk/sites/default/files/2019-02/afgoerelse_paa_marked_3b_0.pdf - see section 1.5.1.2 regarding upgraded copper and section 1.5.2 regarding fiber access networks.

The efficiency adjustment mimics TDC's network nodes in the Norlys coverage area. The efficiency adjustment is kind of a black box calculation, so we do not know the actual locations of the nodes. But as the adjustment is based on TDC's copper network, there is probably no addresses located more than 7 km from the CO. I.e. if the efficiency adjustment is done, there will be no Isolated homes in the Norlys network.

As the efficiency adjustment makes the Norlys model mimic TDC's network, the number of isolated homes will be identical for both TDC and Norlys (when Norlys reach 100 pct. HC). How come that the two operators are treated differently, when it comes to isolated homes? The distance from the CO to end user will be the same for the two operators.

DBA thanks DE for this thorough input. Please, see the response provided to the comment from Norlys in the general comment section in the very beginning of this document.

DBA has not treated TDC and Norlys differently. The isolated homes efficiency adjustment is only used for the fibre technology as fibre is being rolled out at this stage. The model projects that TDC will not roll fibre out to isolated home (or very few at least) so these addresses would not have any significant effect on the result of TDC.s.

Norlys

Comment 1

Norlys does not agree with the efficiency adjustment and we believe it should be removed.

In our consultation response to the 2nd draft LRAIC model, we argued, that the efficiency adjustment was not implemented correct. We acknowledge, that DBA have implemented a more correct version of the adjustment – by actually adding more CO and moving existing CO's (in the 2nd draft model no extra CO was added to the Norlys – only extra active equipment on exiting sites were added).

HOWEVER, Norlys are convinced, that the new implementation of the efficiency adjustment is in breach with the Scorched node principle, as outlined in the MRP. As we stated in our latest response: "*Norlys do not believe that this efficiency adjustment should be implemented in the model – and do not believe, that this*

efficiency adjustment can be implemented correctly without breaking the "Scorched Node assumption"

In the final MRP, it is stated that:[9]

> **Supporting criterion 12**: The choice of technology and degree of optimisation is subject to the scorched-node assumption and the requirement that the modelled network as a minimum should be capable of providing comparable quality of service as currently available on the modelled operator's network, and be able to provide functionality comparable to that of the existing services.

In addition, DBA interprets the scorched-node assumption as stated in the MRP, section 5.3.1:
"*DBA interprets the Scorched Node constraint such that when modelling an "optimally structured network" under the scorched node assumption the locations for equipment are constrained by the existing number of sites and their existing locations. However, the scorched node assumption does not imply that the transport network - cables, duct/trench etc. - is fixed. Nor does the assumption imply that the same number and type of equipment should be placed at each of these geographical locations.*"
We have been looking into the definition of the scorched-node assumption, and we have come across a document[10] that we think describes the assumption very well. The document, describes 3 common approaches used for topology design in these types of models:

- **Scorched node**: this approach uses the location of existing network nodes. The equipment estimated in each node will be calculated based on demand and efficient use of the network. This option is relatively simple to implement but it may include potential inefficiencies in operators' networks.
- **Modified scorched node**: this is a variant of the scorched node approach. With this approach, the location of network nodes is not strictly equal to operators' networks but is based on the existing nodes. Under this methodology, locations may be modified in case any inefficiency is identified.

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[9] Development of the Danish LRAIC model for fixed networks – Model Reference Paper – 23 October 2019, page 31.

[10] Recommendations on new interconnection rates for ECTEL member states, Final guidelines report, 27 December 2016, Axon Partners Group.

The implementation complexity of this option is similar to the previous one but allows for the elimination of some inefficiency.

- **Scorched earth**: this approach estimates the locations of an optimised network without the restrictions of the existing network. This option allows the calculation of a theoretical efficient network, not relying on existing networks. However, this option is significantly more complex to implement.

It is clear, that the definition of the scorched-node assumption together with DBA's interpretation in the MRP section 5.3.1, as described above, implies that existing network nodes should be used, i.e. it is not allowed to add, remove or relocate the network nodes, that are present in the network.

The efficiency adjustment implemented in the 3rd draft LRAIC model, is adding and relocating network nodes to the Norlys network and thereby violating the scorched-node assumption.

Therefore, DBA needs to remove the efficiency adjustment to be compliant to the MRP.

Please, find DBA's position on the matter about the treatment of the scorched-node assumption in the response provided to comment 1 from TDC in this same section.

Comment 2

When DBA/Axon performs the efficiency adjustment to Norlys – they reduce the length of "distance related" assets in the access network and increase the amount of CO's deployed by Norlys (and also relocate the existing CO's of Norlys). All this is done in order to "replicate" the way TDC has build their copper infrastructure (in regards to distance between CO's and end-user and the amount of CO's) in the Norlys area. The TDC "copper way" is regarded as "more efficient" by DBA/Axon compared to the way that Norlys has deployed their fibre infrastructure.

While the above is done – Norlys is also "punished" for deploying fibre to "isolated homes" more than 7 km away from Norlys' original CO's" in rural areas - by not getting full cost recovery for these addresses. Norlys is assumed to have co-digging on 50% of the trenches in rural areas – due to the presence of these isolated homes more than 7 km way from Norlys' own central offices. In our view the above two adjustment cannot co-exist in the Norlys model. After Norlys

is efficiency adjusted it is not reasonable to assume that any homes in Norlys' area will by more than 7 km away from the adjusted level of central offices for Norlys. Why? Because DBA/Axon has adjusted the Norlys fibre infrastructure to replicate the "TDC copper topology" in regards to amount of CO's and distance between central offices and end-user. In our view: no homes in TDC XDSL copper infrastructure will be more than 5 km away from the central offices. This is further validated by the fact that this "forced" co-digging assumptions of isolated homes is not implemented in the TDC model for either of their networks (fibre, coax or copper). Therefore DBA/Axon must have analyzed that for none of TDC networks will there be more than 7 km between the CO and the end-user. Otherwise: why has this assumption not been implemented in the TDC copper model?

In conclusion: Norlys do not agree in either the efficiency adjustment or the assumption of co-digging in regards to isolated homes. Furthermore, we are fully convinced that it is not reasonable from a modelling-point-of-view to have both assumptions to co-exist in the model. When DBA/Axon make the efficiency adjustment for Norlys no homes will be more than 7 km away from the central office – and therefore it is not valid to afterwards deploy the "isolated home assumption" on Norlys.

As presented in the responses provided to the general comments submitted by Norlys, after a thorough analysis, DBA has concluded to remove the efficiency adjustment related to the isolated homes. Please, see the appropriate response to Norlys' comment in the section "General comments".

Sharing with utilities

DE

DE is pleased to see that DBA acknowledge that there are additional costs when sharing a trench with a utility operator compared to a normal trench. The model now reflects this to a certain extent, as the operator bears 60% (instead of 50%) of the costs compared to a normal (non-shared) trench.

In the 2nd Consultation report DBA writes that:

"DBA believes that an efficient telecom operator will, when possible, use co-digging (co-deployment) with not only other telecom operators but also with operators putting down other types of infrastructures in the ground such as electricity, water supply, gas supply, sewer, etc. At the same time DBA acknowledges that it can be difficult to co-dig with other operators. However, DBA believes it should

be easier to make co-deployment if the same operator has activities across different infrastructures in the ground. This is also supported by a recent public article of an electricity company that replace electricity cables when laying down fibre in the ground. As Norlys both has electricity and telecom infrastructure DBA therefore set the percent of co-deployment for Norlys to 20 percent which is higher than the 10 percent used for TDC as TDC is a telecom "standalone" operator."

DE do **not** agree with DBA that it is easier for Norlys (more precisely Norlys Tele) than it is for TDC to make co-deployment across different infrastructures in the ground.

All distribution system operators (DSO's), including the DSO at Norlys, are subject to monopoly regulation in accordance with the Danish Electricity Supply Act No. 119/2020, including §20a, §24 and §84a, in which the DSO-obligations in the Electricity Directive Article 35 are integrated. Together with executive order No. 933/2018 (compliance programme for DSO's, TSO's and Energinet) these legal acts define a number of obligations the DSOs have to fulfil to ensure that they will act unaffected by commercial interests of other vertically integrated associated companies. The DSOs are obliged to annually turn in a compliance program as well as a report describing the measures carried out to ensure their fulfilment of the compliance program

The provisions in the EU Broadband Cost Reduction Directive (2014/61/EU) on coordination of civil works (Art. 5), transparency concerning planned civil works (Art. 6) and permit granting procedure (Art. 7) was transposed into Danish Law in 2016 (Road Act – paragraph 74 and 75). From 1 July 2018, digging permits have been conditional on a prior documentation of the interest by other cable owners (telecom, electricity, local district heating, water supply etc.) to coordinate digging activities (co-digging) through the use of a co-digging module ("samgravning") in the Danish Register of Underground Cable Owners (LER) - securing a transparent and non-discriminatory process on co-digging activities.

DBA refers to a recent public article of an electricity company replacing electricity cables when laying down fibre in the ground – not mentioning the author of the article. We have become aware of, that DE is actually the author of the article describing the DSO – TREFOR Elnet's – replacement of 50-60 years old medium voltage power cables (10 kV cables) in the central parts of Kolding and Middelfart. TREFOR Elnet is interested in co-digging with other cable owners (telecom, district heating, water supply etc.) - mainly to reduce digging activities in city

areas, so that citizens are bothered as little as possible. TREFOR Elnet's call for co-digging is done through LER.[11] TREFOR Elnet completed the deployment of low power cables (0,4 kV cables) in 2008/2009.

DE therefore presupposes that the model assumption on co-digging will be aligned with Danish law and that Norlys Tele - and all other utility owned fibre operators – are considered "standalone" operators on equal terms as TDC.

DBA thanks DE for this thorough response. DBA can confirm that the article was the starting point for DBA's work on this and that DBA has been in contact with that specific operator among several others.

Regarding the sharing with utilities, please see the response provided to the comment from Norlys in the general comment section in the very beginning of this document.

Norlys

The new LRAIC model covers the period 2005-2038. As can be seen from previous data reported by Norlys, SE started its fibre deployment in 2006. Below we have inserted a table including public data from annual reports for Syd Energi Net (the electricity distribution company in SE) which shows that cabling of airborne power cables within the relevant period has primarily dealt with the "Medium voltage network" (mellemspændingsnettet), where the large amount has been put into the ground over the period 2003-2008 with approx. 300-400 km. in cabling per year. However, the table also shows that as much as ~ 80% of the Medium Voltage Network was already put into the ground at the beginning of 2006, when the SE Fiber began its fibre roll-out. At the same time, the low-voltage network was already 98% cabled (in the ground) when the fibre roll-out was started - so the possibility of co-digging has been very limited here. The same applies to high voltage where the amount of cabled (in the ground) high voltage cables has increased by ~ 80 km over the period 2005-2010, corresponding to 15 km / year - which also indicates that any co-digging with fibre has been marginal.

[11] https://www.danskenergi.dk/nyheder/fibernet-traekker-nye-elkabler-med-slipstroemmen

It is still our assessment that co-digging/sharing between electricity and fibre has only taken place to a very limited extent for Norlys.

Data fra årsrapport 2004-2010 - SYD ENERGI NET A/S

Element	2004	2005	2006	2007	2008	2009	2010
Kilometer luftledning							
Lavspænding	417	244	214	100	80	20	3
Mellemspænding	2.083	1.862	1.542	1.147	457	410	360
Højspænding	1.115	1.120	1.088	1.088	1.088	1.086	1.086
Kilometer jordledninger							
Lavspænding	9.572	9.765	9.834	9.936	10.038	10.138	10.233
Mellemspænding	6.554	6.973	7.394	7.843	8.340	8.377	8.457
Højspænding	213	230	232	285	306	308	308
Samlet antal ledninger	**19.954**	**20.194**	**20.304**	**20.399**	**20.309**	**20.339**	**20.447**
Andel kabellagt							
Lavspænding	96%	98%	98%	99%	99%	100%	100%
Mellemspænding	76%	79%	83%	87%	95%	95%	96%
Højspænding	16%	17%	18%	21%	22%	22%	22%

It is not clear to Norlys, why this data/input is not reflected in the Norlys draft LRAIC model. The inputs were already given after the 2nd consultation. We strongly advise DBA/Axon to use our specific inputs to develop the Norlys model. DBA should be very careful to make a proxy for Norlys, based on an arbitrary article about EWII.

DBA finds that there are two situations, which could lead to co-deployment: 1) putting air cables into the ground and 2) when replacement of electricity cables is needed due to the risk of malfunction (or it is economically efficient to replace electricity cables while digging for fibre anyway). The data provided by Norlys is regarding the first situation (air into ground) and indicates that some potential for co-deployment has been possible. However, the data provided by Norlys does not state anything regarding the second situation. DBA did therefore not remove the 20 percent co-deployment based on the aforementioned data provided by Norlys. Instead, the decision to use the 10 percent co-deployment for Norlys was based on findings from the investigations DBA made during the third consultation round.

Telia

Comment 1

http://dokument.eniig.dk/aarsrapport-2019/aarsrapport-2019/?page=72

Looking at Norlys' revenue divided between their activities, we can see that the majority of their revenue is on the energy part (page 72 in their annual report):

3. SEGMENTOPLYSNINGER / AKTIVITETER - PRIMÆRT SEGMENT T.KR.

	Energi/Forsyning	Tele/Digital	Øvrig omsætning	Koncern i alt
2019				
Nettoomsætning	4.379.498	2.065.794	25.880	6.471.172
2018				
Nettoomsætning	3.745.948	697.696	273.150	4.716.794

Nettoomsætningen vedrører hjemmemarkedet.

Also, the Danish Business Authority should look further into the resp. DKK 2,066 billion and DKK 0,7 billion., as part of these is the revenue from the subsidiaries, Tele / DIGITAL and relates to fibre, coax and tele:

(slide 14)

In order to achieve a fair result for covering digging costs, cost should be split between energy and fibre based on their actual share of revenue.

Here is a hypothetical example of Norlys' revenue share between business segments, "Tele / Digital" – (it is this box Telia asks the Danish Business Authority to get insight into at Norlys):

	2018	2019
Energi	3.745.948	4.379.498
(tænkt fordeling af den øvrige omsætning afventer ENS aktindsigt)		
Tele/DIGITAL		
STOFA	150.000	375.000
BOXER	100.000	325.000
ENIIG FIBER	80.000	300.000
SE FIBER	70.000	300.000
NORLYS TELE	100.000	240.000
RAH FIBERBREDBÅND	30.000	90.000
VERDO TELE	100.000	240.000
SEF FIBER	67.696	195.794
TOTAL	697.696	2.065.794
Fiber relateret	247.696	885.794
Coax relateret	250.000	700.000
Tele relateret	200.000	480.000
TOTAL	697.696	2.065.794
% fordeling af graveudgifter		
ENERGI	88,27%	73,42%
FIBER	5,84%	14,85%
COAX	4,77%	8,63%

Based on this, you get a completely different split between energy, fibre and coax. The Danish Business Authority should gain insight into Norlys' previous annual accountings, also so that a split can be made year by year. (The figures in 2019 are characterized by acquisitions of new companies, which in principle have nothing to do with the initial digging costs back in the 90s). But the numbers from Norlys at least tell us a story about where the original costs were covered - by Norlys' core business - energy.

It must be expected that the service life of resp. energy and fibre are the same.

DBA acknowledges that there are different ways to allocate costs. However, DBA has not previously allocated costs between telecom and other infrastructures based on retail revenues. This "retail revenue split" would presumably change over time as the telecom part is a growing business for operators (and for some operators, the telecom revenue may eventually even exceed the electricity revenue). Furthermore, DBA has been informed that the electricity operators are obliged to use an equal division of digging costs (between its divisions) when digging down fibre and electricity, hence DBA has maintained the equally split of cost in the model.

Comment 2

Telia finds it incorrect that Norlys' initial digging cost should be covered 50% by energy and 50% by fibre, respectively. Norlys original purpose was to supply their customers with energy back in the early' 90's. Norlys originally put fibre in

the ground, because they at the same time was laying down electricity cables to supply the respective areas with energy.

Norlys digging cost have already been covered by private households electricity bills over the last 30 years, which is why it seems strange that 50% of the initial digging costs must now again be covered by the retail stage/alternative operators and thus ultimately by the consumers, when consumers already has financed the digging costs once through their electricity bill.

Telia has previously mentioned that the Danish Business Authority instead should look at Norlys' revenue related to fiber compared to their revenue related to electricity and other business areas. This will give a much more valid picture of how much of the digging costs that should be covered by the fiber part of the energy company's business.

Please, see the response provided to the comment 1 above (this same section).

Costs related to end-user infrastructure

Fastspeed

Comment 1

It is worth noting that the cost of rolling out coax towards the end-user is not a cost solely impacting the infrastructure owner. When rolling out coax connections, the cost inflicted towards the infrastructure owner is mainly deploying the cables and **not** any excavation and digging of trenches on end-user premises. TDC and Stofa/Norlys have not historically (and still do not) uphold the cost for digging on the end-users premises, but leaves the coax cable above-ground. It is then up to the end-user to dig on own premises – or otherwise pay for TDC or Stofa/Norlys to do the excavation/digging. These excavations and digging costs should therefore be left out of the LRAIC cost calculation.

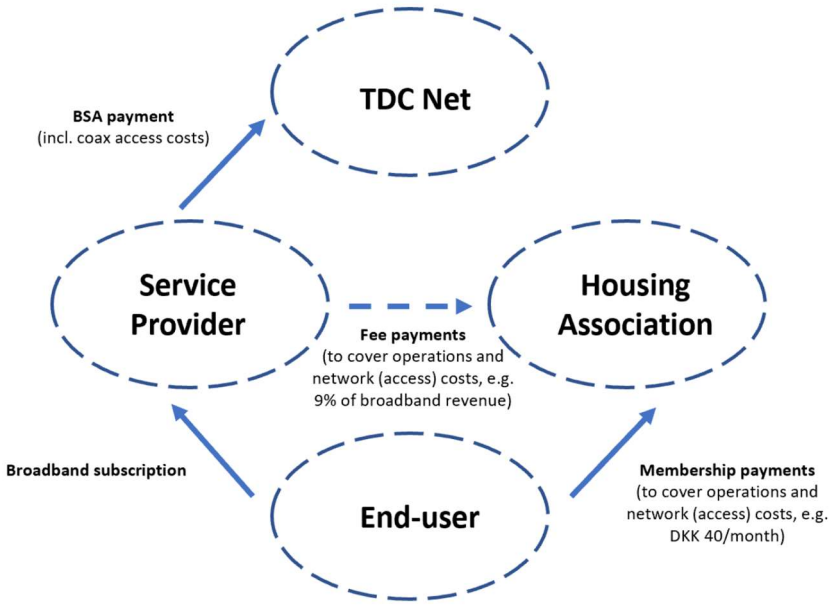
Please, see the response presented to comment 3 from Telenor in Question 18 above.

Comment 2

When BSA products are being offered on third party infrastructure, also known as privately owned networks, it is important to note that the access cost should not be included in the model. The reason for this being that the cost of access infrastructure on these networks are paid by the end-users via a membership fee (or

via housing rent) or sometimes even the service providers invoiced directly by the network association and not TDC (or Norlys) as BSA provider (see figure 1 below). The model should therefore distinguish between privately owned networks and infrastructure owned by e.g. TDC (or Norlys) and model costs accordingly.

Figure 1: Coax network access costs to be paid twice as costs for 3rd party network is incorrectly included in LRAIC round 3 model:



Please, see the response presented to comment 4 from Telenor in Question 18 above.

Comment 3

Aside from coax, historically on fibre, excavating and digging costs from fibre installations have partly been paid by end-users, and should also be corrected for in the historical prices. Additionally, one should take into consideration, that historically, the cost of excavating has partially or fully been imposed towards end-user and not effectively fully borne by the infrastructure provider. Presently, the price for fiber rollout offered by infrastructure providers typically only include a limited length of excavation (e.g. presently 30 meters with TDC Net). Every meter above this limit is charged to the service provider and therefore does not impose the infrastructure provider additional cost. The cost of excavation covered by the end user should therefore not be included in the model.

DBA agrees that for cost that are annualized (i.e. a part of the recurrent payment and not a one off fee) in the model, the model should take into account if the

operator has received or expect to receive any (one off fee) coverage of those cost. This is specifically related to the dropline cost and installation cost (and also cost covered by the state aid program). DBA has therefore implemented a possibility to take into account cost coverage for this and have the network operators submit figures for this.

Fibre rollout

Fastspeed

Comment 1

The LRAIC model bases its cost modelling on historical costs for deploying fibre connections. However, fibre infrastructure owners have undergone a significant development in deploying fibre, both volume-wise and from an efficiency perspective. For example, TDC have announced that their lean Fiber Factory setup has a goal of providing 1 million households with a fibre connection over the next handful of years. This ambition can allow one to believe that if TDC is deploying fibre in the volume needed in order to reach 1 million households, that they would obtain some sort of economies of scale, which as a result would decrease their costs. Furthermore, having a lean, dedicated setup, also in our opinion, argues towards further cost reductions. Therefore, cost modelling should take into account the cost improvements and economies of scale from present (2020) and future roll-out, instead of historical costs prior to 2019.

DBA agrees that the model should reflect the operations of an efficient operator. DBA agrees that operators should be able to increase their economies of scale when increasing roll out volume. However, operators have had significant roll out volume already before 2020 so a part of the economies of scale would probably be reached before 2020. Furthermore, when all operators increase their roll, the increase in general demand for roll out would expect price level for rolled out to go up. DBA has used as recent data as possible (mostly from 2019) when modelling Norlys and TDC.

Comment 2

Furthermore, an assumption has been included in the latest LRAIC round in the calculation of fibre costs based on the argument that infrastructure owners avoid rolling out fibre in locations with coax infrastructure already in place. We believe that this claim is contradicting reality in relation to where fibre is being rolled out. For example, we see in Taastrup (Tofterne), fiber is being rolled out by TDC Net,

even though TDC Net already has an existing and fully functional coax infrastructure. Another example is that TDC has been active in offering new fibre infrastructure towards housing associations where TDC Net already offers BSA based on existing coax infrastructure (Nyborgnet, cf. resume from their extraordinary General Assembly on 26 August 2020). We therefore believe that this LRAIC 3rd round adjustment should be reversed. Cost should be left out of the model, as TDC Net is not avoiding coax areas when choosing areas to deploy fibre.

After analysing the most recent development in fibre coverage and based on new updated information from operators, DBA has chosen to roll back this feature in the algorithm. The algorithm will therefore no longer avoid rolling out fibre in coax area (only relevant for TDC roll out presently as they have not submitted coverage data at address level).

TDC

Comment 1

On the bilateral meeting DBA mentioned that overbuilding of coax net with fibre can be seen in TjekDitNet. DBA asked TDC NET to comment on the findings. TDC NET notes that Axon is already aware of certain overbuilding of coax when defining the coverage algorithm, see consultation report page 14.

TDC NET agrees that TDC NET in certain areas have overlapping coax and fibre network. This happened when TDC bought the DONG fibre network back in 2009. In some of these fibre areas TDC already had coax network.

In the current fibre roll-out, TDC NET has in the period January 2019 to August 2020 deployed approximately [CONFIDENTIAL] homes passed. Of these [CONFIDENTIAL] were overbuild of TDC NETs own coax network. In the same period [CONFIDENTIAL] homes passed were deployed in competitors coax areas.

[CONFIDENTIAL]

Based on the coverage data from Energistyrelsens Tjekditnet-data, DBA as investigated TDC's recent fibre roll out compared to coax coverage. The analysis showed that at country level [CONFIDENTIAL] percent of TDC recent fibre roll out is overlapping with coax coverage. When looking at Radius area alone, it is [CONFIDENTIAL] percent. DBA has therefore looked into if it was possible to

find a more detailed algorithm for TDC fibre roll out-coax overlap. However, after consulting with TDC, DBA did not find such a solution and therefore chose to change the roll out algorithm back to the one from the second model where fibre does not avoid coax overlap when rolling out fibre. The model does still offer the possibility of supplying a list (file) of addresses (aaid) that is not expected to be covered and therefore avoided when rolling out fibre.

Comment 2

The draft models for Norlys and TDC NET model the expected future fibre footprint. In that sense, cost recovery can be said to be secured if the calculated annual cost can be charged from the beginning of the modelled period to the end.

At the industry meeting, DBA gave the impression that in DBA's view, the model ensured cost recovery if the fibre provider expands the footprint into more rural/costly areas. This is because an update of the footprint would ensure that the costs of these new areas are included in the modelled costs.

We do not agree with this conclusion, it is mathematically incorrect. An update of the footprint to include more 'costly' addresses would increase the costs in the entire modelling period (from year 2005 to 2038) due to the applied Economic Depreciation method. However, the fibre provider can only charge the additional cost in the years to come. For example, a decision of further investment in an expansion of the footprint – say – from year 2023 will model-wise distribute the additional costs from that investment over all model years 2005 – 2038 but the fibre providers can only charge their SP customers the higher costs from 2023 – 2038. As such, the model will only ensure partial cost recovery and thus make investments outside of the footprint modelled initially unprofitable.

This issue illustrates a fundamental and general challenge to the premise of modelling the costs of network footprints that are under construction and the need to think carefully about retaining the incentive for fibre providers to keep investing in network expansion. We believe this shows that the DBA must be very careful in regulating wholesale prices based on this model and at the very least assume conservative estimates of costs.

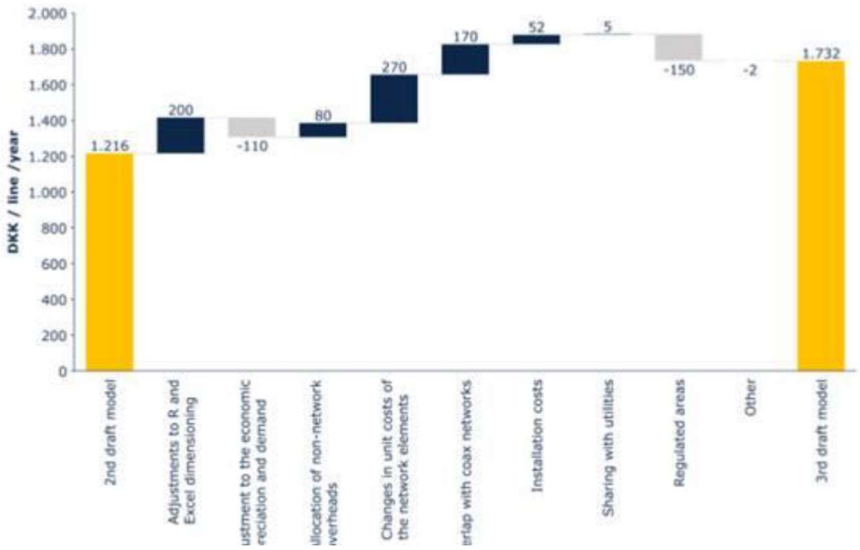
DBA acknowledges that due to the implementation of the economic depreciation methodology, changing the forecasts in the future will also have an effect on past costs. This is why DBA decided to promote operators' involvement in the provision of accurate forecasts from the very beginning of this project. The availability of operators' future deployment plans allows the model to perform all

calculations consistently with their own projections and, thus, the costs to be recovered over the years are consistent with the network footprint of the operator over the same years.

Furthermore, it could also be the case that an operator for some valid reason will cancel plans (projected in the LRAIC model) about covering more costly areas. In that case that operator will have had a higher maximum price for some years compared to the cost calculation based on the *actual* network build out. DBA has not built into the model that this higher revenue is subtracted (future) maximum prices (cost).

Telia

In the 3rd draft model, an overlap between coax access network is included. In the models this is 170 kr. or approx. 10% of the total price.



Telia has checked TDC's COAX and Fiber whitelists and only 4% correlate on possible accesses on to days market.

Total antal Coax adresser	995.408
Total antal fiber adresser	334.324
Antal Adresser med dobbelt dækning	54.148
Procenvis antal af adresser med dobbeltdækning	**4%**

Each percentage accounts for DKK 17, 17*6= DKK 102. So hence TDC should only get DKK 68 in overlap share, if included.

It should be noted that the response contains confidential information.

DBA does not have the complete understanding of Telia's calculations. However, the issue of coax overlap has been dealt with.

Please, see the response presented to comment 2 from Fastspeed in the section *Fibre rollout* above and the response presented to comment 1 from TDC in the section *Fibre rollout* above.

Other modelling comments

TDC

Comment 1

We acknowledge that various changes have been implemented in the R modelling. However, we still identify issues with erroneous calculations. Furthermore, several of the points we have explained in previous consultation responses have still not been addressed in the modelling or explicitly rejected by Axon. We have specified these issues separately in appendix 3 and request Axon to form an opinion on these issues.

The third draft of the model also runs more smoothly than previous versions. However, executing the full model still takes more than a week. The DBA and operators will have a model that in practice cannot be used in future regulatory work. We ask Axon to look at further options for optimising the R-model so the execution time of the full model can be reduced.

DBA notes TDC's comment. Please, find below the responses to the questions presented in Appendix 3.

Regarding the execution time it is correct that the initial step ("step zero") of the model takes a long time to run. This step was calculated outside the TERA model from 2014 and therefore was not possible for the industry to run at all. DBA believe it is more transparent for the industry that it is now in the model although it takes a long time to run. The step allocates geographical position to the nodes and the routes through the road network between the nodes, which is not something that should be done on a regular basis. Step 1-4 takes significantly shorter time dependent on the specifications of computer that is running the model.

Comment 2

During the three consultations the model has be subject of substantial changes. Given that Axons now is to finalise the model we shall encourage Axon to clean up functions and parameters that will not be used in the final model and to update the documentation for the R model and the Excel model accordingly.

DBA notes TDC's comment. We have prepared a final set of documentation and models considering the feedback received from the stakeholders in this 3rd consultation round.

Additional information provided by TDC

Appendix 1 – TDC NET open comments to 2nd consultation

The appendix 1 is partly confidential. A version of appendix 1 where confidential information has been removed, is annexed the consultation report.

Question 3, comment 1

The modelling of POI2/3 seems correct now. However, DBA should be aware, that illustration in the documentation etc. still compare to current prices in 2020 where the POI2/3 is erroneous shown.

Reference to EXCEL model sheet 3C routing factors, plus e.g. Fixed LRAIC model - Presentation of 2nd draft model" page 19

We have updated all documentation accompanying the models to ensure consistency in the approach presented regarding the different POI included in the model.

Question 12, comment 1

ERST answer to the first part of the question is accepted and TDC NET thanks for the clarification.

Regarding the second part, concerning the unit price of the DP, TDC NET understands already that the unit cost of the DP for 48 strands only covers costs of the DP. However, the point is, that the physical cabinet, which could be established for the given UC, is not able to contain splitters, as the cabinet does not have enough available space. Hence. TDC NET must adjust the unit price to

[CONFIDENTIAL], as this would cover a cabinet of 48 strands which is - beside the strands and splices also is able to contain splitters. The unit cost of the splitter is still add-on.

Please also see appendix slides 11-12. [the slides 11-12 in appendix 2 are CONFIDENTIAL]

After analysis of the additional information and clarifications provided by TDC, we have updated the modelling of the distribution points for fibre networks in the model to consider i) the new unit costs provided by TDC ii) consider that DPs are installed above ground.

Question 12, comment 3

TDC Net acknowledge if ERST intend not to model a PON- PON network. However, it neither described in the documentation nor ensured at the calculation of the need of fibres. Hence, we seek the answers of the following questions:

1. Please describe how the R model ensures a difference between fibres supplying a splitter and fibres directly supplying customers.
2. In order to avoid a PON-PON network a small ODF is needed at DPs having a splitter installed. Hence the unit cost of the splitter could either by raised by the cost of the ODF (but then the cost is doubled if more than one splitter is placed at the same DP) or raising the cost of the DP with the cost of ODF (but this would require, that the models explicites which DP is having a splitter installed).

The model calculates the number of fibres from the end user reaching the splitters and then calculates the number of fibres that need to be installed on the backside of the router in script '0P_FUN_KPIS_SUBFUNCTIONS.R' of the R model. Regarding the cost of the DPs, please find in the response above (Question 12, comment 1) the final approach determined for the unit cost of these assets.

Question 14, comment 6

Based on our understanding of the 3rd draft model, TDC NET does not recognize the current unit cost of DKK 829 per installation. TDC NET has given a new unit cost for this element, which is in line with the current model setup.

See appendix slides 4-6 [The appendix 2 slides 4-6 are CONFIDENTIAL:]

DBA takes note of the new information provided by TDC regarding the NTP installation. In order to validate the data, DBA has reached out to other operators to perform a benchmark on this matter. As a result, DBA has concluded that, for the modelled operator it would be reasonable to assume that, on average, a technician would need 2,5 hours to complete the installation. As a result, the updated models for TDC and Norlys include updated unit costs for the installation of the NTP and the drilling, considering the new volume of man-hours and the unit cost of technician work, which are aligned with the findings identified by DBA.

Question 14, comment 8

At the 3rd excel draft model, the ducts for "Standard (SDP-FDP)" is estimated at sheet 5B, line 976 for the PON-case. The formulae behind the estimate is based on a factor for cables at CO-FDP in ducts (OK) multiplied by trench-length. The Trench -length is estimated in line 941 and does not include the road crossing. Please elaborate on how and where the ducts for road crossing is included in the model.

We have adjusted the cost model to ensure that ducts for road-crossings are accounted for.

Appendix 2 – TDC NET presentation regarding specific installation and unit costs

The appendix 2 is confidential. It was used for TDC's response to question 10.

Appendix 3 – Comments on R-modelling, PtP network and, final drop length and geotype costing

The said document provided by TDC includes several analyses and remarks relative to the R model. The complete answer submitted by TDC is provided in document "A Appendix 3 - TDC NET - Comments on R-modelling, PtP network, final drop length and geotype costing - Public" annexed to this consultation report. This section provides an overview of the main points treated in the document along with DBA's responses.

2.1 Network calculation in the R model – Trench network

Following TDC's comment, we have updated the calculation of the network trenches in the R model to capture some road crossings and parallel trenches that were previously missing.

2.2 Network calculation in the R model – Cable network

Based on TDC's comments, we have updated the width of the road in function "cable_Copper_last()", to ensure consistency in the treatment of this input across the R model.

Additionally, we have included a modification in the node splitting calculation, to correct the calculation related to the cables in the layer between the SDP and the PDP, as previously the calculation did not correctly consider the appropriate sections when calculating the route followed by the cable.

3.1 Review of the PTP fibre calculation in the R model – Trench network

Please, see the response provided in section "2.1 Network calculation in the R model – Trench network" above.

3.2 Review of the PTP fibre calculation in the R model – Cable network (FDP to SDP)

Please, see the response provided in section 2.2 Network calculation in the R model – Cable network above.

4.1 Issues in the Excel model – Final drop inputs

We have reviewed the figures included in the old LRAIC model utilised to populate the drop length inputs in the cost model. After analysis, we have observed that the inputs included in the model were calculated at premise level, whereas the input utilised in the model should be populated at building level. Thus, we have adjusted this input in the model to ensure consistency.

Additionally, we have also adjusted the non-optimal factor for drop lines from 20% as the figures considered from the old LRAIC model did not take this factor into account.

4.2 Issues in the Excel model – Costing calculations by geotype

We have included in the model a feature to estimate the costs of providing access services in each geotype in a more accurate manner, by considering the economic depreciation at geotype level. To access this feature, the user has to select execution mode "All geotype scenarios" in the "COVER" worksheet. The results of this type of execution are presented in sheet "SCENARIO CHART". To avoid any confusion, we have removed the option to disaggregate the results into geotypes in the "COVER" worksheet.

Appendix 4 – R-modelling – Response to 3rd draft

Technical issues

TDC NET has tested the LRAIC model - 3rd draft R model (TDC - Internal) using the minimum recommended technical requirements reported by AXON. The documentation recommends 64 GB RAM to run the R Model with at least 20 GB free space. We experienced that a server having 64 GB RAM, well above 20 GB of disk space and running Execution Mode: 5. Full Execution for days would crash likely due to memory issues.

During the bilateral meeting, AXON mentioned that they were using 128 GB RAM and was able to complete the Full Execution within 60 hours, where the documentation states that the Full Execution takes more than 24 hours.

After increasing our server to 128 GB RAM and running the R model for over 140 hours, we were able to successfully execute the mode: Full Execution. The model was executed via RStudio, as AXON recommends. We believe that there is an unreasonable gap between documented runtimes and the actual runtimes when it comes to executing the entire model. We ask AXON to update the execution times to show a more accurate estimation.

Whilst executing the full model for 140 hours we experienced the poor UX design that the current application possesses. Users should be informed of the progress as waiting for 140 hours without any knowledge of

• How much time has the model been running for?

• How much time is left?

• Which Execution Mode is running?

• Which Execution Modes have been executed?

creates a negative and confusing experience. We acknowledge that the execution of the R model is computationally intensive and requires time to complete, but we ask Axon to show more transparency whilst using the application, such that future uses of the model show visibility of the progress.

We observe that DBA has been able to run the model successfully with 64 GB of RAM. However, we acknowledge that the R model (specifically "Step zero" for TDC's model) is heavily computationally intensive and would benefit from additional capacity. With regards to the execution timings, the figures included in the 3rd draft model documentation refer to the test times obtained in Axon's computers in a predefined environment. We have, however included additional remarks in the documentation to outline potential reasons why the model may take more time than usual.

Furthermore, we have included some adjustments to the R model to provide further feedback in the execution phase so that the user can keep track of the execution status and progress.

Review of 'Degree of urbanisation'

In section 6.1. of the R model manual – 3rd version Axon describes the levels of disaggregation of the results from the R model before being exported to Excel.

Axon has classified all CO coverage areas into three different geotypes; Urban, Suburban and Rural.

The geotype classification is performed through the "k-means" algorithm using the two variables

• Number of buildings per CO (buildings/per CO)

• Area per CO Coverage area (km^2)

Leading to the following characterization of COs

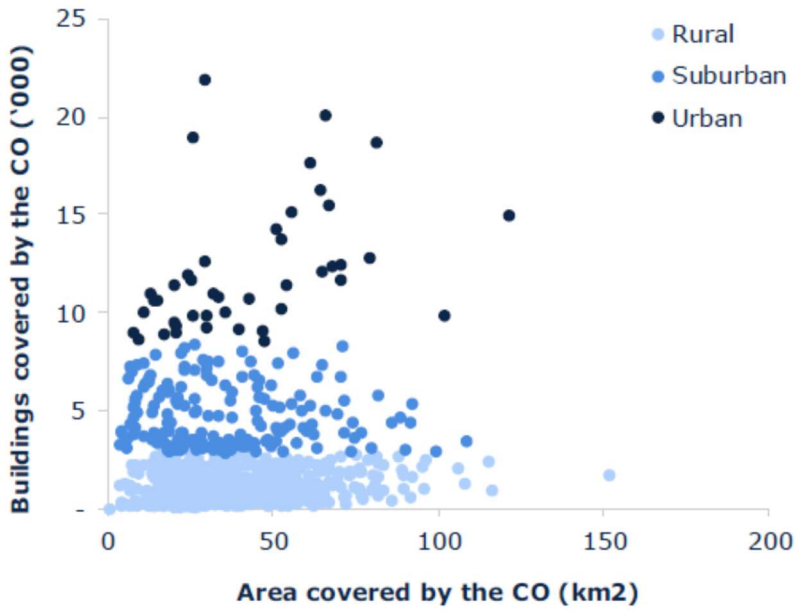


Figure 1: Characterisation of TDCs central offices into geotypes [Source: Exhibit 6.1 of R model manual 3rd draft - Axon Consulting.]

Based on Figure 1, it is clear that 'Area covered by CO' is effectively ignored, hence ignoring the density of a given CO. One will obtain almost identical results using 'Buildings covered by the CO' only to determine geotype using 'K-means'.

By examining the Geotype classification contained in the dataframe T_Buildings, less than 2% of all COs are categorized as Urban and less than 7% are categorized as Suburban (see Table 1). In Figure 2, a replication of Exhibit 6.1 from R Model 3rd draft version is shown. To validate the replication, we have cross-referenced the geotypes found in the input file CO_Cover_Order.xslx. We conclude that the number of Urban and Suburban COs are significantly lower than what is reported by Axon in Exhibit 6.1.

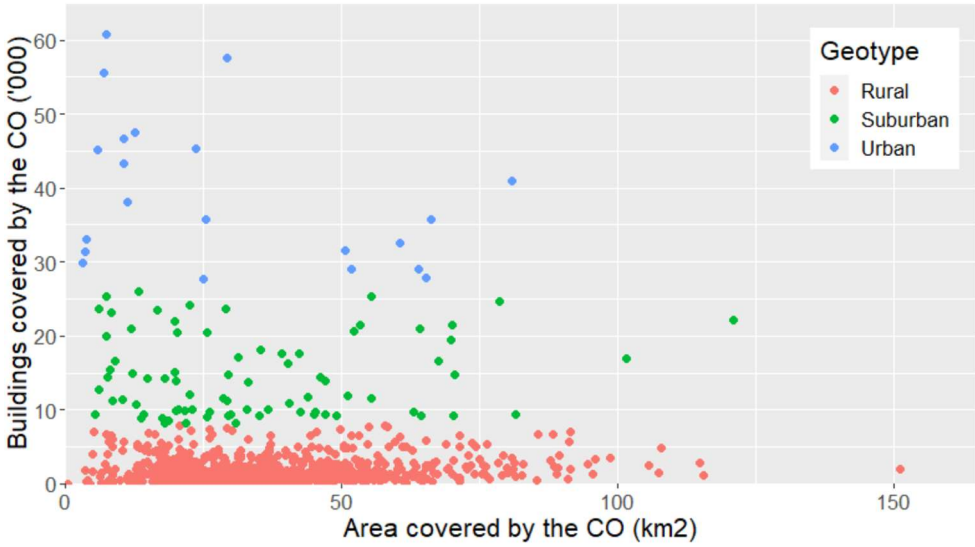


Figure 2: Replication of Exhibit 6.1 – R model 3rd draft [Source: TDC Net, 2020]

Table 1: Replication of exhibited 6.1 – R Model 3rd draft. Distribution of geotypes [Source: TDC NET, 2020]

	Number	**Percentage**
Urban	21	1.8
Suburban	79	6.7
Rural	1083	91.5

We ask AXON and DBA to revise the current method for clustering geotypes as it seems unreasonable that more than 91.5% of all COs are considered as Rural areas. Additional COs should be considered as Urban and Suburban.

DBA would like to point out that the distribution of central offices into geotypes was already presented to the operators in earlier stages of the modelling process (including the 1st draft model), without major comments from operators so far in the process. Nonetheless, DBA has reviewed this matter considering the feed-back received by TDC. The analyses conducted by DBA with the model data shows that, while there is indeed a greater number of COs in rural areas, COs in urban areas are indeed much larger (in terms of homes in an area). Additionally, we would like to note that the methodology followed to define the geotypes relies mostly on the size of the COs (in terms of homes) and not so much on the size in terms of areas of these COs. This classification results on the fact that 22% of the homes in the model lie in urban areas and 31% of the homes are located in suburban areas. We note that in the calculation of the unit costs for digging included in the model. TDC utilised the definition of the geotypes utilised

by DBA, which ensures consistency between the geotypes and the calculation of the unit costs.

Furthermore, DBA would like to note that the image presented in the documentation was not accurately updated, as it was presenting the distribution of the COs based on the number of buildings and not on the number of houses (the latter is the metric utilised to aggregate the houses). We have now updated the documentation to reflect the actual distribution of the COs in terms of the number of homes.