

Report on consultation regarding the 1st draft of the Revised Hybrid LRAIC model.

By its letter dated 19 January 2009, the National IT and Telecom Agency (NITA) invited the industry to comment on the 1st draft of the Revised Hybrid LRAIC model. The 1st draft of the model was also presented to the industry on workshops ultimo January.

Enclosed to the letter dated 19 January 2009 was besides the 1st draft of the model a Report on the Revision of the Hybrid LRAIC Model, dated 13 January 2009 and “Notat vedrørende høring over kortlægning af andre tjenester i LRAIC modellen”, dated 14 January 2009. In the following the comments from the industry related to the 1st draft of the model are addressed while comments from the industry to the two other papers will be incorporated in the resulting version of these two papers.

Before expiry of the consultation deadline on 27 February 2009, the Agency had received responses from the LRAIC Forum (A+, Cybercity, Fullrate, Global Connect, and Telia Danmark), the Danish Energy Association (DE) and TDC.

In the following the responses are divided into general comments to the revised Hybrid LRAIC Model, the specific comments in relation to the single model of the LRAIC model and comments to the single product.

Please note that in the following, information in the responses which the respondent believes to be confidential, has been deleted and instead marked “**XXX**”.

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1 General comments to the 1st draft of the revised Hybrid LRAIC Model

1.1 The proces

1.1.1 Documentation and transparency in the model

TDC notes that during the model review TDC has lacked a thorough documentation and explanation of the implemented changes in the model. In TDC's opinion the model and the documentation should be understandable for people with telecommunication and Excel skills without any knowledge of the historical modeling of LRAIC. This is far from the case with the provided documentation.

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TDC finds a number of calculations implemented in the model, which has no end use. TDC requests NITA to colour-mark these areas if they for some reason are not to be removed for the time being.

LRAIC-arbejdsgruppen har i sit høringssvar generelt bemærket, at ambitionsniveauet for den reviderede model er noget lavere end hvad LRAIC-arbejdsgruppen havde forventet af processen. LRAIC-arbejdsgruppen fandt det positivt, at IT- og Telestyrelsen allerede i 2007 tog de første tiltag i forbindelse med udarbejdelsen af en revideret model, der skulle træde i kraft 1. januar 2010. Vi har imidlertid desværre måttet konstatere, at LRAIC-modellen i praksis ikke har gennemgået den gennemgribende revision, som der er behov for.

Den reviderede model fremstår fortsat i stor udstrækning som den oprindelige 2002-model blot tilføjet en række lappeløsninger de steder, hvor IT- og Telestyrelsen har skønnet, at behovet er allerstørst. Det betyder, at der ikke én gang for alle er blevet foretaget en grundig oprydning og revision af gamle udokumenterede antagelser og modelparametre. Dette omfatter bl.a. den ikke-eksisterende dokumentation for de 20 stikprøver, der reelt er de vigtigste omkostningsdrivere for hele kobbernettet.

LRAIC-arbejdsgruppen finder det samtidig bekymrende, når IT- og Telestyrelsen i forhold til modellens manglende dokumentation - som det var tilfældet ved workshoppen d. 30. januar 2009 - blot henviser til, at det pågældende modelindhold er en historisk arv fra den oprindelige modelkonstruktion og at der i øvrigt ikke er udsigt til, at der foretages nye detaljerede vurderinger heraf med mindre styrelsen modtager nye informationer fra parterne på frivillig basis. En sådan indstilling er særligt bekymrende når det drejer sig om vurderinger af antagelser vedrørende indregnede driftsomkostninger, hvor TDC i sagens natur reelt besidder et vidensmonopol, som selskabet selv sagt kun vil være interesseret i at dele

ud af i nøje afmålte doser - og kun når dokumentationen kan drejes i en retning, som er i selskabets interesse.

I forhold til de foretagne modelændringer i version 2.5 finder LRAIC-arbejdsgruppen det også uheldigt, at dokumentationen herfor foreløbigt lader meget tilbage at ønske. I den fremsendte Report on the Revision of the Hybrid LRAIC Model er der alene gengivet en helt overordnet beskrivelse af de foretagne ændringer, hvor der bl.a. mangler konkrete oplysninger om hvor og hvorfor de foretagne ændringer er sket. LRAIC-arbejdsgruppen har også forgæves ledt efter forklaringer og kildeangivelser til en række nye eksogene input i modellen.

LRAIC-arbejdsgruppen finder, at disse mangler har medført, at det har været unødigt vanskeligt at afgive kvalificerede bemærkninger til modelrevisionen i nærværende høringsrunde over første udkast til revideret LRAIC-prisfastsættelsesmodel.

På denne baggrund tager LRAIC-arbejdsgruppen ekstra forbehold for at afgive bemærkninger til samtlige ændringer i den reviderede model, når den detaljerede modeldokumentation foreligger. LRAIC-arbejdsgruppen forventer, at dette senest vil være tilfældet ved påbegyndelsen af 2. høringsrunde primo april.

LRAIC-arbejdsgruppen skal i øvrigt bemærke, at det ville have været en naturlig og konstruktiv del af høringsprocessen såfremt IT- og Telestyrelsen i forbindelse med nærværende høring havde valgt at forestå en detaljeret gennemgang og forklaring af Excelmodellen og dens ændringer i detaljer.

På trods af positive tilkendegivelser herom fra styrelsen på mødet den 30. januar måtte LRAIC-arbejdsgruppen efterfølgende konstatere, at dette ikke i praksis var muligt at gennemføre fordi styrelsens initiale tilsagn tilsyneladende havde været betinget af, at konsulenterne var indstillet på at foretage denne gennemgang for egen regning.

LRAIC-arbejdsgruppens indstilling hertil er, at det alene påhviler IT- og Telestyrelsen at sikre den fornødne transparens i processen. Og på baggrund af modellens kompleksitet sammenholdt med den for nuværende utilstrækkelige dokumentation for de foretagne ændringer mener LRAIC-arbejdsgruppen, at der fortsat eksisterer et klart behov for, at IT- og Telestyrelsen sikrer, at der på et senere branchemøde kan ske en detaljeret gennemgang af modellen som beskrevet ovenfor.

Med hensyn til TDC's top-down model og hvordan IT- og Telestyrelsen påtænker at anvende denne i konsolideringsfasen, skal LRAIC-arbejdsgruppen tilkendegive, at processen herfor indtil videre har været for mørkelagt. LRAIC-arbejdsgruppen har således ikke kendskab til hvorledes denne konsolidering er planlagt at skulle foregå samt hvilken effekt den måtte få på udarbejdelsen af hybridmodellen. LRAIC-arbejdsgruppen forventer snarest muligt at blive grundigt informeret om denne igangværende proces.

LRAIC arbejdsgruppen finder det endvidere i forhold til de foretagne modelændringer i version 2.5 det uheldigt, at dokumentationen herfor foreløbigt lader me-

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get tilbage at ønske. I den fremsendte Report on the Revision of the Hybrid LRAIC Model er der alene gengivet en helt overordnet beskrivelse af de foretagne ændringer, hvor der bl.a. mangler konkrete oplysninger om hvor og hvorfor de foretagne ændringer er sket. LRAIC-arbejdsgruppen har også forgæves ledt efter forklaringer og kildeangivelser til en række nye eksogene input i modellen.

LRAIC-arbejdsgruppen finder, at disse mangler har medført, at det har været unødigt vanskeligt at afgive kvalificerede bemærkninger til modelrevisionen i nærværende høringsrunde over første udkast til revideret LRAIC-prisfastsættelsesmodel.

På denne baggrund tager LRAIC-arbejdsgruppen ekstra forbehold for at afgive bemærkninger til samtlige ændringer i den reviderede model, når den detaljerede modeldokumentation foreligger. LRAIC-arbejdsgruppen forventer, at dette senest vil være tilfældet ved påbegyndelsen af 2. høringsrunde primo april.

DE notes that overall, DE finds it unclear what each of the model consultations will contain. DE would therefore like to have a more detailed plan covering the rest of the revision of the model. Our understanding is that all issues, except from WACC and volumes, are subject for consultation in this consultation. A revised detailed project plan should specify when the volumes will be adjusted, and when a thorough WACC consultation will take place. As DE stated in the hearing answer regarding the 2009 price setting, several factors in the WACC calculation, such as cost of debt and market risk premium, needs an update.

DE finds it hard to review the model changes, as they are not described in an updated edition of the model documentation. It is likely that DE will come with additional comments to the model changes when the model documentation is updated. DE will urge NITA to update the model documentation, so that it can be part of the second draft model hearing in April.

NITA has in the current process taken many steps to ensure a transparent process. As mentioned above, apart from making the model itself and accompanying documentation of the changes made available for consultation, NITA has in several instances and meetings informed about the model changes and the current time schedule.

Regarding the comments made by the various operators regarding the formal model documentation: The main reason for only including a report with the first draft release was that it was too early in the process to undertake a formal revision of the documentation as the model would still undergo significant changes prior to the final release (which would have required a second substantive revision to the documentation to be made). NITA would also make the point that, since it is not practical to document every single calculation step within a complex Excel model, there will always be a need on the user to spend a significant amount of time studying the model if they are to appreciate fully the calculation steps involved.

Having said the above, a formal revision of the model documentation has now been carried out and is included as part of this second draft release of the model. NITA will clearly welcome constructive suggestions as to how this documentation might be improved as part of the final release of the revised model.

NITA has in the process of changing the model aimed towards simplifying the model and removing unnecessary calculation steps. With regard to the comments about there being various calculations within the model “which has no end use” NITA would need to understand the precise calculations that is being referred to before being able to judge whether or not they were suitable for removal. NITA would therefore suggest the operators to prepare a list of specific calculations they feel ripe for removal as part of the next consultation round.

Concerning TDC’s top-down model NITA plans to release a review of the model in April and invite the industry to send in their comments to the review along with their comments to the second draft of the model.

1.2 General comments to the model

1.2.1 Modelling in general

1.2.2 IP-net

TDC maintains the view that a full IP-based network is not capable of producing TDC’s existing services including services laid down by the regulatory obligations. Especially regarding production of TDM based leased lines, ISDN and PSTN compatible services such as pulse-coding, the technology for producing these services in an IP network does not exist. Even where such services in general are replaced by new services, TDC is, by market decisions, prevented from enforcing a replacement in relation to existing costumers. TDC finds that the network modelled should be a combined network that allows migration to IP over a period of time, just like TDC’s current network.

As NITA has stressed several times, the LRAIC model should reflect modern technology, and not necessarily TDC’s actual network.

NITA notes that there is a significant move by many incumbents and other operators across Europe to implement full IP-based core networks and to retire legacy TDM-based networks, and is aware that much of this is being driven by the equipment manufacturers themselves who have indicated that ongoing support and maintenance is likely to be withdrawn within the next five to ten years.

NITA remains of the firm view that no operator today would build a new network of the scale of TDC’s based on legacy TDM- based technology. Since the MRP calls for the model to be based on so-called modern equivalent technology, NITA believes it is appropriate to concentrate on an all-IP solution, at least within the core network.

NITA also disagrees with TDC’s assertion that the technology for providing equivalent services to TDM-based leased lines, PSTN and ISDN services in an all-IP network does not exist. As an example, NITA would cite BT’s continued migration to its “21CN” as clear evidence that equivalents to such services can indeed be provided over an all-IP core.

1.2.3 Modelling of local interconnect

TDC is obliged to offer operators a local interconnect interface, meaning that the operator's traffic from a geographically limited area can be exchanged with the operator on the local premises. No matter the technology used in the transportation network, the operator must see the same interface as today. This is not the case in the draft version of the hybrid model. Here, the traffic from a local area is not identified and exchanged separately from other local areas.

NITA notes and accepts TDC's comments that the model should provide an equivalent service to local interconnect and has modified the model accordingly.

1.2.4 Modelling of services

TDC notes that a number of new services and the modelling of a full IP network means the attention must be given to the specification of the routing factors for each service, thereby respecting new network elements currently included. TDC has not been able to find consistency in routing factors between the services. TDC finds the issue complex and suggests a meeting with NITA to clarify the interpretation of the services, the network elements and the routing factors.

The per-customer use of new services as well as the busy hour calculation differs significantly from TDC's inputs. Additional inputs are given later in this response. TDC will update the demand sheet with measured use.

A meeting concerning routing factors has been held between NITA and TDC.

NITA has now updated the various routing factors and is of the opinion that they much better reflect the underlying usage of the network. Having said this, NITA is aware that there are some quite considerable changes that have been made to these routing factors as part of the second draft release of the revised model and would encourage all operators to review the changes that have been made.

1.2.5 Geo differentiation of raw copper

TDC notes that in the draft version, the raw copper cost in each geotype is identified and the resulting national raw copper price is calculated as a weighted average of the current (external) raw copper demand in each of the four geotypes. This is in contrast to the present method where the raw copper price is based on a national average of copper volume independently of end use.

Correspondingly, the BSA price contains a raw copper part, which is calculated as a weighted average of the current BSA demand in each geo type (giving another raw copper price than for the raw copper product, since the geographical demand is displaced between the two services).

TDC finds NITA's method inconsistent with the value chain approach since the core part of the BSA price is not calculated per geotype (which will e.g. influence the utilisation of the equipment). The approach in the draft model will therefore not give correct build-buy incentives.

In addition, NITA will be creating a situation where competition in the rural areas will be limited because the average BSA price increases due to the geographical distribution of BSA purchased by other operators, and because raw copper competition is limited due to lacking economics of scale. This has previously been NITA's main reason for removing the geographical differentiation of the current Bit Stream Access pricing.

The approach furthermore compromises TDC's Regulatory Accounts and compliance with competition legislation regarding margin squeeze, because TDC will be obligated to use the average LRAIC-pricing which does not correspond with TDC's own geographical distribution. It thereby also states that TDC's internal use of raw copper and Bit Stream Access does differ from the external use.

TDC therefore recommends that no geographical differentiation is introduced.

If NITA insists on geographical differentiation, this should be implemented directly in the offered prices – not just in the calculation of an average cost - and those services that include a raw copper component should be differentiated accordingly. In this case NITA should also implement geographical differentiation of the DSLAM-component of BSA-cost. This has the effect that four separate prices are settled for raw copper and four separate prices are settled for BSA based on the specific conditions in each geo type.

The LRAIC Forum notes that to secure a more correct and causal costing of the raw copper, NITA has estimated a distribution for the existing demand in four different geo-types.

NITA is asked to elaborate on the background for this estimate. Is it based on TDC input or are there other sources?

DE has noticed the change of the structure in the Access model, so that individual costs for raw copper in each geotype are calculated. As far as DE understand the modelling of the core network, there are no such differentiation on geotypes, for example will the utilisation factors on BSA differ in the four geotypes. This means that the first draft model is an inconsistent approach in which some copper access products are based on geotype calculations, while others are based on a country-based calculation. This inconsistency must be eliminated.

DE is puzzled with the background that leads to this change in the calculation method. The change does not happen as a result of new or amended criteria in the Model Reference Paper. DE will therefore request a change of the Access model to its original form so long as it is to be used for calculation of prices that are valid for the entire country.

In the access model, costs related to the four different geotypes has been calculated since the first release of the LRAIC model in 2002. This was necessary to ensure a reasonable calculation of the access costs, as the access costs is likely to vary considerably depending on the line density in the area. The same difference is not likely to be present in the core network. In the previous model versions, however,

the costs split by geotype were not brought forward from the access model to the consolidation model – this was only done for the national average.

In the model revision made in 2006, the issue of geographical deaveraging of the bit stream access and raw copper prices was discussed. It was at that stage decided to have nationally averaged prices, but to consider the issue again in this model revision process.

NITA believes that the growing competition in the access market makes it increasingly important to calculate the cost for access that reflects the underlying cost for different areas in Denmark.

In the preparation of the 1st draft model, the raw copper costs split by geotype were therefore brought forward from the access model all the way to the consolidation model. As NITA still believes it important to have a national averaged prices, but acknowledged that different services has a different geographical profile of copper usage, the access costs for the different geotypes were weighted together according to the geographical profile for each geotype. In the released version of the model, the weights applied were based on previously supplied information from TDC.

NITA has noted the comments from TDC and DE that this approach would lead to inconsistencies when also applying this principle for bit stream access. NITA has therefore changed the weighting principle, so this covers all access lines.

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1.2.6 Economic depreciation and annualisation

TDC notes that traditionally, NITA's LRAIC models are appended with an approach to capture economic depreciation. This time - according to the documentation - some corrections should be done to the price trend. However, no reference to literature or the theory behind is given. TDC does not see how price trend corrections are sufficient and adequate to proxy economic depreciations or how the parameters can be empirically estimated. TDC expects further documentation before the suggested method can be substantially commented.

TDC suggests NITA to use tilted annuity as it is has been done since 2003.

The LRAIC Forum notes that in model version 2.5 all network elements are annualised by use of the tilted annuity method cf. I_Parameters row 336-347. It is not clear to the LRAIC Forum whether or not this is caused by the fact that data on e.g. output trends has not yet been put into the model or whether NITA in fact finds that the tilted annuity is the correct method of depreciation for all network elements. However, as a result of this, the method of depreciation has at this point de facto not been changed in model version 2.5 compared to model version 2.4.

In the *Report on the Revision of the Hybrid LRAIC Model*, NITA states that when certain criteria regarding output trends, price constraints and the characteristic of the purchase price (fixed or variable) are met, the normal tilted annuity formula can be used as a proxy for economic depreciation. If these criteria are not met NITA makes an adjustment of the price trend in the tilted annuity formula. However, NITA has not produced any kind of documentation on the adjusted formula.

Therefore, the LRAIC Forum request NITA to clarify how the adjusted tilted annuity fulfils all of the necessary criteria for economic depreciation (i.e. the criteria specified on page 28-29 in the *Report on the Revision of the Hybrid LRAIC Model*).

Furthermore, the LRAIC Forum finds that when introducing an adjustment to the normal tilted annuity formula, NITA should present a thorough documentation for the quality and characteristics of this adjustment. This includes e.g. numerical examples of the effect of the formula compared to both the regular tilted annuity and other types of depreciation methods. Likewise, the LRAIC Forum finds that NITA should provide detailed information on e.g. the cost recovery profile of the adjusted annuity formula compared to other well-known types of depreciation.

In the *Report on the Revision of the Hybrid LRAIC Model*, NITA briefly describes an approach for adjusting for changes in the operating costs. However, the documentation for the method is non-existing. Therefore, the LRAIC Forum requests NITA to provide detailed information on the profile and the effect of the opex adjustment.

Finally, in the *Report on the Revision of the Hybrid LRAIC Model* NITA also describes the modelled procedure for adjusting for changes in operating costs along with changes in output. However, again NITA has provided no documentation on the adjusted formula itself as well as how it affects the model calculations. Furthermore, NITA has not documented how the adjustment on the price trend correlates with the model approach adapted in the revised model regarding the adjustment for operating changes.

In summary, the LRAIC Forum finds that the level of documentation on the method of depreciation is insufficient. The LRAIC Forum wants to make a general reservation of submitting further comments on the depreciation methodology when NITA provides detailed information on the specific method of depreciation chosen for each network element in the model.

DE has noticed, that economic depreciation has been used as the default approach in the draft model (Consolidation model, I_Parameters, cell D333). This is contrary to the Model reference papers common criteria CG 14, which states that:

“The revised hybrid model should have the flexibility to use both straight-line depreciation and (tilted) annuities, with the latter being the default approach.”

DE assumes that the use of economic depreciation as default in the model is due to a typing error, and that tilted annuities will be used as the default approach in the subsequent model versions.

DE agrees that economic depreciation in theory is a good method for annualising investments. But when it comes to practical implementation the method got a lot of risks. Who can for example predict the demand for the different services in the future? The result of using economic depreciation will highly depend on expectations about the future. It will become a risky game, if economic depreciation is

used to calculate coming years LRAIC based prices. DE believe that the implementation of economic depreciation, in a forward looking model (i.e. the past is ignored) and where the demand decreases will lead to higher prices on copper access. Although it readily will be to our advantage, DE will, because of the uncertainty of the method, recommend caution with being a pioneer in this field in fixed LRAIC models.

If economic depreciation still is part of the second draft revised model, DE would propose a workshop combined with detailed documentation about the chosen method on implementation of economic depreciation. The documentation should among others contain the theoretical background for the selected method.

NITA believes using the concept of economic depreciation is the theoretically preferred approach. But the approach may not always be tractable, so simpler approaches are often used.

As NITA announced in the hearing over the model reference paper, NITA has explored how best to use economic depreciation in a forward looking model.

In the 1st draft version of the model, a forward looking economic depreciation approach was included. As explained in the report, the approach implemented represents a practical implementation of annualisation that meets the necessary economic depreciation criteria. The annualisation method essentially is a modified version of the previously used tilted annuity approach.

The intention was to make it possible for the operators to explore the effect of this approach. However, given the insufficient data available in order to fully implement this approach, the additional data required to use this approach was not put into the model. The effect was that the calculations in the model were based on a tilted annuity approach. Given the comments received, NITA will use the previous default annualisation method in the model (tilted annuities).

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1.2.7 Data confidentiality

TDC notes that TDC has on NITA's request submitted detailed information on capacities, per user demands etc. TDC finds such data for growing services to be business critical and expects NITA to camouflage these before use in the model.

NITA has considered TDC's concerns on this issue and has agreed to extend the input areas subject to camouflage. The additional areas are:

VoD demand assumptions

POTS and xDSL subscriber numbers for each scorched node

The areas affected have been coloured blue in line with the convention used in previous years. NITA would point out that changes to the above inputs incorporate updates to account for rolling-forward of the year modelled from 2008 to 2009 in addition to the mentioned camouflaging.

2 Specific comments to the Core model

2.1.1 General comments regarding interconnect

TDC finds the way local interconnect is modelled to be inconsistent with the principles by which TDC is obliged to offer local interconnect to a confined local geographical area. The way it is currently modelled shows no relation to specific geographical areas. To adequately model local interconnect it is necessary to make local interconnect to the 108 edge node sites. To secure the possibility for operators to connect via the same interface (2 Mbps E1 interface) as today, each of these nodes must have a local MGW with an SDH ADM and a local SBC. Operators can in this way connect exactly as they do today where the real local interconnect is done to all Local Exchanges (roughly 120 exchanges).

TDC requests NITA to alter the model so local interconnect is provided at the 108 edge node sites each with its own MGW with an SDH ADM and a local SBC.

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To secure local interconnect it shall be possible for all operators to use the general interconnect either using the IC own area or IC other area if the MGW used for Local IC is down or/and as overflow from the local interconnect trunks. This requires spare capacity on the general IC MGW and SBC capacity to secure other operators enough capacity.

Furthermore there is a demand for redundant MGW setup for general IC. It is not acceptable that a breakdown on one MGW can stop the exchange of traffic between operators and TDC. This will as well apply for the SDH ADM and the SBC. In general this shall be on two geographically sites.

Therefore it is necessary to double the number of MGWs and SDH ADMs for general interconnect.

TDC can not find costs for connections and MDF for SDH ADM and MGW.

NITA is requested to update required equipment for interconnect services.

Independent of the interconnect services all operators use existing interfaces based on 2 Mbps (E1) and thereby the ISUP protocol. In light of this, TDC lacks to see the necessary SS7 net with interfaces, signalling terminals, belonging SW and licenses.

TDC requests NITA to include this and relate the cost to call setup.

In general NITA lacks to implement SS7 in the model. Many services are not implemented on the all IP platform itself but realized on other platforms e.g. IN services, the IN/Number portability service, international services, emergence services etc.

TDC requests NITA to include all costs for a complete SS7 net to secure a workable setup. Costs for SS7 shall be included as a core network element and be related to call setup.

NITA acknowledges the comments made by TDC regarding the availability of interconnect in confined local geographic areas. The model has now been adapted to incorporate this. However, NITA remains unconvinced that providing such a level of interconnect means that “these nodes must have a local MGW with an SDH ADM and a local SBC”.

NITA can appreciate the need for a local MGW but is of the view that it could quite readily be installed with 2Mbps E1 line cards, negating the need for an SDH ADM. Furthermore, NITA is of the view that (based on the costs presented by TDC) installing a separate SBC at each site would not be cost efficient. Instead, either calls could be routed via the SBC at the relevant distribution node site, or an MGW could be installed that is also capable of handling the SBC functionality.

For the purposes of this draft release of the model, NITA has elected to adopt the former position (use the distribution node SBC) but would welcome substantiated comments from the industry on this point.

NITA also acknowledges TDC’s comments regarding the need for SS7 signalling at the media gateways and has now adapted the model to include costs for SS7 specific gateways. This has been incorporated into the model by increasing the cost of the media gateways to include an allowance for SS7 signalling variants. As such, the relevant costs are allocated to call minutes rather than call set up. NITA would welcome substantiated comments from the operators on this regard – both in terms of the principle adopted of including SS7 signalling media gateways and whether they would prefer to see the costs here isolated from call minute related costs and allocated specifically to call set up.

With specific regard to TDC’s request that the number of MGWs (we assume just at the distribution nodes) be doubled, NITA remains unconvinced that this would be necessary/required. Should other operators require such resilience, we would have expected them to arrange for specific additional E1 links to be installed at distant sites with traffic, under fault conditions, routed accordingly. We would however welcome substantiated comments from the operators on this issue.

With specific regard to TDC’s comment about “costs for connections and MDF for SDH ADM and MGW” NITA is of the opinion that the costs already in the model (including the 17.5% installation “uplift”) would be sufficient to cover such matters. NITA would however welcome substantiated comments from the operators on this issue.

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2.1.2 General comments regarding voice modelling

TDC notes that when calculating the number of business customers, a value of 10% is used in the model. This is however not sufficient when calculating the total number of business users, as every business customer normally has multiple extensions. On the average, the total number of business users can be found by

multiplying the number of business customers by a factor of XXX (TDC experience). The total number of users is therefore approximately XXX and this number should be used when calculating the HW costs and licenses required for business users.

To define the right cost for business users one should bear in mind that this will add cost for servers and licenses for business users. These licenses secure the operation and functions implemented for business customers and users on the all VoIP platforms.

To add an overall Centrex functionality to these business customers it is necessary to have this as a separate functionality with its own HW and SW realized by adding licenses.

NITA should reflect this in the model and include the necessary cost categories.

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NITA's assumption on the number of business customers is calculated in the following manner:

ISDN 2+D is assumed to have 2 business customers
ISDN 30B+D is assumed to have 30 business customers

When applied to the projected total number of ISDN lines for 2009, this equates to circa 620,000 business subscriber RTU, which NITA considers not unreasonable. Please refer to cell H289 in sheet C_Equipment of the Core model to find this number.

It is with specific regard to Centrex functionality that the model currently assumes a 10% figure (that is, 10% of business subscribers). NITA does not consider this to be an unreasonable assumption and notes that TDC has not provided specific figures in this regard. NITA would in any event point out that in its opinion the cost of providing Centrex functionality is most definitely subscriber related and thus any changes here would not impact on regulated services within the model.

NITA therefore currently sees no reason to change the assumptions in the model.

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2.1.3 DSLAM chassis filling factor

The LRAIC Forum notes that in the modelling of BSA, NITA is assuming that the maximum line card filling factor in the DSLAM chassis is 90 per cent, cf. I_technical row 102. For a standard sized DSLAM with 16 line card slot this amount to assuming that the last two slots will never be utilized. No broadband provider would ever operate a business in such a highly inefficient manner.

It makes sense to assume that an additional DSLAM needs to be installed when a certain utilisation threshold is reached. Similarly some planning flexibility is obviously needed, which is a good argument for using a maximum filling factor for the last line card in every DSLAM deployed. But what would be the point of having a general planning rule that cuts off any possibility to ever utilize the last two slots in the DSLAM?

According to the table in I_Node_Equipment, TDC has 168 sites with at least 3 large DSLAM's and 68 sites with at least 5 large DSLAM's. Leaving 2 slots empty on all of these DSLAM's, is equivalent to leaving money on the table which by no means is in accordance with the LRAIC modelling principles.

Consequently NITA should change this planning rule significantly in the second draft version of the model.

In this second draft of the model, the maximum utilisation has been raised to 100% on the basis that, since each site is considered individually within the model, the views of the LRAIC Forum are not unreasonable.

2.1.4 Modelling of IPTV

The LRAIC Forum notes that clarifications on this part of the modelling are needed. In this process it should also be made clear what the relationship is with the modelling of a wholesale multicast service.

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A specific comment at this stage is that the bit rate for TDC's IPTV per channel is around 3.1 mbps and not 2.6 mbps as assumed in the model. The LRAIC Forum also finds it relevant to consider allocating a share of the DSLAM costs to this service due to the fact that the multicast functionality is an important part of the overall functionality of a DSLAM.

With specific regard to the bit rate per channel, NITA would require a worked example of how the 3.1 Mbps is arrived at, since this is in contrast to the information already provided by TDC. NITA would then need to obtain TDC's reaction to the arguments made by the LRAIC Forum in order to allow NITA to arrive at an informed opinion on whether or not the 2.6 Mbps already in the model should be updated.

With specific regard to the allocation of a share of the costs of the DSLAM to the IPTV service, NITA would state that the model has now been updated to allocate a portion of the common DSLAM costs to traffic. Since IPTV accounts for a considerable amount of traffic at the DSLAMs it will therefore attract what is in NITA's current opinion a not unreasonable portion of the traffic related costs.

2.1.5 BSA – Layer 3 access vs. national access

The LRAIC Forum has noticed that contrary to earlier there is now a significant cost differential between BSA at a layer 3 router location and BSA – national.

NITA is asked to explain the difference between these two products.

In version 2.4 of the model BSA was only actually modelled up to and including the Layer 3 node as that was all that was required from the model at that time. BSA National was included so as to ensure that the relevant network demand up to the Layer 3 node was addressed within the model. Thus the core backhaul costs (from the Layer 3 node to the Point of Interconnect (POI) with the other operator)

was not addressed. For this reason, the cost shown in worksheet C_Services for BSA Layer 3 and BSA National were the same. The “product” BSA National was not included in O_Results sheet because of this.

In the revised version of the model (with an all-IP core network) it is necessary to include the BSA National traffic from the Layer 3 node to the POI, and indeed the traffic arising from TDC’s own retail xDSL offerings, so as to be able to cost the voice interconnect products properly. This in turn has allowed NITA to show a more fully costed BSA National product in worksheet O_Output.

The product (transport from layer 3 node to the POI) is now included within worksheet O_Results.

2.1.6 Separate costing of VDSL services

The **LRAIC Forum** notes that according to I_Technical, the model assumes one VDSL card for every eight total line cards. This assumption is carried over to the service costing for xDSL and BSA in such a way that the outcome of the model for xDSL and BSA in effect is a blended ADSL/VDSL service.

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This is, however, not a viable approach. According to the TDC reference offers, VDSL and ADSL are separate services – and VDSL is in fact currently priced much higher than ADSL. Thus, the price for BSA, which is an ADSL product, should not in any way include the additional costs of a VDSL line card.

This is also not consistent with the calculation of a separate fee for use of a VDSL line card in the consolidation model.

NITA acknowledges the comments made by the LRAIC Forum and has decided to include specific BSA products utilising VDSL line cards in addition to those requiring ADSL line cards. These new products have been included in the second draft release.

2.1.7 Routing factors

As a general comment, the **LRAIC Forum** would like to point out that it is very challenging to decipher the terminology used in the routing table for the core net. Further transparency both with respect to the network element terminology and service terminology is therefore needed before the LRAIC Forum can comment in full detail on this part of the model.

The LRAIC Forum expects that the forthcoming model documentation will address this current challenge.

NITA acknowledges the comments made by the LRAIC Forum in this regard. In order to try and assist the user in understanding the routings better, a new worksheet has been added to the model that gives a more graphical indication of what Network Elements the specific routings comprise. Note that this worksheet only provides an overall indication, since it relies on conditional formatting within Excel and it is not practical to address every possible permutation. Having said that,

NITA would welcome constructive comments on how this worksheet might be improved.

With regard to the model documentation, NITA has included a number of worked examples to illustrate how the various product routes are constructed. Once again, NITA would welcome constructive comments on how these examples (and the surrounding text) might be improved.

2.1.8 Main Distribution Frame

The **LRAIC Forum** finds that for undisclosed reasons NITA has decided to move the MDF network element from the access model to the core model. In this process a number of errors in the routing table have however occurred.

First, the relative weights attributed to the different services should not be identical for PSTN-, ISDN-, BSA- and ULL-services on the same grounds that these were not identical in model version 2.4.

Second, NITA has apparently forgotten to take into account that other copper based services like leased lines and data services should also be allocated a fair share of these common MDF costs.

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The MDF network element was moved from the access model to the core model in order to allow a more specific treatment of it (since each core node is now separately identified in the core model). However, going through the model calculations in this respect, NITA has found that the routing table would need to be changed to the previous values.

The LRAIC Forum's comments regarding MDF has therefore been addressed in this second draft release, where the routing table has been changed in accordance with the comments.

2.1.9 Pricing in the Core model

DE finds that the prices in the Core model seem to be really low. Prices of 1 øre and lower for termination in fixed networks are much lower than one could imagine. DE has not had the resources to work with the Core model in detail, but we have found some result that indicates errors in the calculations and/or routing tables:

- How can the cost of transit within area be more expensive than transit between areas?
- How can the per call rate on traffic be more expensive (0,88) than IC other areas (0,80)? Put simply the IC other area consist of the two sub products "transit" and "local termination".

NITA has taken the opportunity to work closely with TDC in understanding better the routing factors that would apply in an all-IP scenario. The result of this analysis has been reflected in this second draft release.

The cost of transit within area is now cheaper than the cost of transit between areas for both the component call set up and per minute charges. However, the average per minute charge for transit within area is still slightly higher than transit between areas due to the significantly different average call durations.

With specific regard to the per call rate on “traffic” (we assume this was meant to read “transit”), the rate for transit other area is still higher than IC other area. This is due to routing factor differences since a transit call uses two instances of a Media Gateway Controller whereas IC other area only uses one instance of that network element.

2.1.10 Comments to the sheet *I_Product_demand*

Ref 1: I_Product_demand

TDC find it difficult to see how the four tables in the I_product_demand sheet concerning minutes and calls are used in the model. TDC lacks a description explaining the overall idea. In Previous models one table covered the model.

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TDC has tried to view the model from the fact that the values in O_Results seem to originate from using the Total VoIP Exchange figures which in turn originate from the traditional telephony traffic input. TDC is however uncertain as to whether this is NITA’s intention. TDC therefore reserves the right to review the model further should this not be the fact.

Furthermore, TDC does not understand how figures from the VoIP telephony tables, which originate from traditional telephony, are used in the model.

Ref 2: I_Product_demand

TDC notes that the busy hour BHE calculation for traditional telephony in I_Product_Demand has been altered since the previous model with a new formula using new figures defined as Busy days per week and Busy hours per day (columns W and X). TDC finds it strange that a new way of calculating BHE is introduced without a proper definition and an explanation of how exactly the figure 7 used in Busy days per week and 7.6153 in Busy hours per day was chosen. In TDC’s opinion there can not be 7 busy days and 7.6 busy hours a day.

However, TDC accepts using the current figures since they result is the same figures as if we were using the formula from the previous model.

Ref 3: I_Product_demand

TDC points at all cells in columns K, L, M, N, and P shall not be stated in percent. For % Calls Unsuccessful (Column P) this leads to wrong figures for BHC uplift in column U.

Ref 4: I_product_demand

TDC notes that **XXX XXX** (with regard to appointed day and year), but the ratio between busy hour traffic and mean traffic is 6 in the model. This is in no way

realistic and causes the peak traffic to be much too high. TDC experience suggests that peak to mean ratio should be in the range **XXX**.

Below we provide further information regarding peak and mean traffic intensity.

For DSL traffic volume during peak hour is **XXX** downstream per customer, which is significantly lower than the 91 kbps suggested by the current model. From the figures below the following graph samples showing weekly as well as daily DSL traffic pattern, it can be seen that the ratio between peak and mean traffic is **XXX**. In the current version of the model, this would correspond to having **XXX** y hours per day.

Figure 1. Daily traffic profile.

XXX

Figure 2. Hourly traffic profile.

XXX

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For IP via Fibre, TDC input from fall 2008 suggested a ratio between peak traffic (downstream) and mean traffic (mean of up- and downstream) of **XXX**. As can be seen from the following graph showing the total traffic from fibre customers connected to the multimedia ethernet aggregation network (i.e. legacy aggregation network not included), the peak ratio on downstream traffic is **XXX**. This corresponds to having **XXX** busy hours during the day.

Figure 3. Up- and downstream distribution.

XXX

As indicated by TDC input fall 2008, TDC have no tools/data to analyse the ratio between peak and mean traffic for IP via LL. However, the best guess is that this ratio resembles the one seen for IP via Fibre.

NITA is requested to update the peak traffic accordingly.

Ref 5: I_product_demand

TDC finds that VoD traffic is dimensioned too high in the model. VoD bitrate is 1.8 Mbps and hence peak traffic at 36.75 Gbps suggests that 117% of VoD customers are active during busy hour! TDC experience suggests that less than **XXX** of VoD customers are active during busy hour. Also, as described in the input provided fall 2008, the VoD server setup is prepared for full distribution of servers and hence only little volume can be expected in the IP network even in case of an unforeseen change in customer behaviour.

XXX XXX

NITA is requested to update the mean traffic accordingly.

Ref 6: I_product_demand

TDC finds that the traffic volume for NON-PSTN is both incorrectly measured and incorrectly incorporated in an All-IP context.

The traffic types and volumes for NON-PSTN are directly inherited from the 2.4 version of the Hybrid model, which was based on a traditional SDH transportation-layer. This does not make sense, since a rather large part of the NON-PSTN traffic in the 2.4 model was backbone capacity of different transmission platforms (IP, ATM, xDSL) and therefore already are encountered for in the new version of the model. The remaining part of the NON-PSTN traffic (leased line based) are incorporated incorrect, since this type of traffic in a packet-switch network never would have the traffic intensity like the bandwidth of a traditional leased line product.

TDC therefore suggests that leased line based products are incorporated in the model as IP-VPN connections, with an average utilisation, and a peak-mean factor for network dimensioning. This method reflects the way that leased line based connections would be produced and priced in an all IP network.

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In the table below the aggregated capacity, resilience capacity inclusive, for the leased line based traffic types (Leased Line, Mobile, WIN, C-TV, Interconnect, and Leased line < 2 Mbps/s) from the former NON-PSTN table are shown, (with endpoints translated into site types of the new model):

Table 1. End point capacity on network levels.

Mbps	Site type										
	L2 agg. site- L2 agg. site	L2 agg. site - L3 Edge site	L2 agg. site - Dis- tribu- tion site	L2 agg. site - Core site	L3 Edge site - L3 Edge site	L3 Edge site - Distri- bution site	L3 Edge site - Core site	Distribu- tion site - Distribu- tion site	Distri- bution site - Core si- te	Core si- te - Co- re site	Total
Leased lines >= 2 mb	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Mobile	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
WIN	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
CableTV	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Interconnect	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
DXX (LL < 2 mbps)	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Total	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx

When IP connections from one lower-level site to another lower-level site are configured in the network it will in some cases (i.e. when the L2 sites are not placed on the same ring or in the same region) use resources from a higher level in the network. To illustrate this, TDC has routed the leased line based NON-PSTN traffic from the table above, in the TDC IP network. The table below shows the aggregated traffic load in different layers of the network (Aggregation, Edge, Distribution and Core) when counting the capacity of the Leased line products.

Table 2. Aggregated capacity on network levels.

Mbps	Network layer			
	L2 aggregation	L3 Edge	Distribution	Core
Leased lines >= 2 mbps	XXX	XXX	XXX	XXX
Mobile	XXX	XXX	XXX	XXX
WIN	XXX	XXX	XXX	XXX
CableTV	XXX	XXX	XXX	XXX
Interconnect	XXX	XXX	XXX	XXX
DXX (LL<2 mbps)	XXX	XXX	XXX	XXX
Total	XXX	XXX	XXX	XXX

As mentioned above the modern production method of legacy leased line product in an all IP network would depend on average utilisation and peak mean factors. In the table below TDC suggests average utilisation and peak mean factors for the different traffic types, based on experiences with TDC IP-VPN commercial products.

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Table 3. Leased line utilisation ration for core services.

	Ave. Utili- sation	Peak factor	Resulting dimen- sioning factor	To use in Hy- brid model
Leased lines >= 2 mbps	XXX	XXX	XXX	XXX
Mobile	XXX	XXX	XXX	XXX
WIN	XXX	XXX	XXX	XXX
CableTV	XXX	XXX	XXX	XXX
Interconnect	XXX	XXX	XXX	XXX
DXX (LL<2 mbps)	XXX	XXX	XXX	XXX

As seen above a rather large “on the safe side” spare are added to the dimensioning factor, since this is not a highly experienced area in TDC. Taking these parameters into account, the resulting traffic load from NON-PSTN leased line based products in different parts of the network is:

Table 4. Total BH load.

Network layer	Traffic load BH – Mbps
L2 aggregation	XXX
L3 Edge	XXX
Distribution	XXX
Core	XXX
Total	XXX

In addition to the leased line based products, the remaining part of the traffic through the ATM network, mainly UMTS traffic should be included as well. TDC have estimated the peak hour traffic load XXX for this as XXX (mid 2008). Since almost all of ATM traffic traverses from the edge of the network to the core it would be fair to include the traffic load in all four network layers.

NITA is requested to update the model with this input on NON-PSTN traffic.

TDC recommends that the old NON-PSTN traffic table henceforth is replaced by tables 2 and 3 whereby the resulting total traffic load of different segments of the network (Table 4) can easily be derived.

Below we summarize the modifications that should be implemented in order for the model to reflect TDC experience on traffic volumes. Also, specific cell references to the excel work sheets are given to ease the modifications.

As mentioned above, the peak factors for DSL traffic, IP via Fibre and IP via LL are by no means realistic and should be updated accordingly.

For DSL, the peak factor experienced by TDC of XXX and the derived XXX busy hours per day should be implemented altering the value of cells P106-108 in the sheet "I_Product_Demand" to XXX.

TDC suggests use of same peak factors for BSA traffic. Hence, XXX busy hours per day should be implemented altering the value of cells P119-130 in the sheet "I_Product_Demand" to XXX.

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For IP via Fibre and IP via LL, the peak factor experienced by TDC of XXX and the derived XXX busy hours per day should be implemented altering the value of cells P109-114 in the sheet "I_Product_Demand" to XXX.

As stated above, the applied mean VoD traffic per customers suggests 117% of the customers to be active during busy hour, were TDC experience suggests this number to be less than XXX. To obtain this, the value of the cell I157 in the sheet "I_Product_Demand", should be no higher than XXX.

Given that pure downstream traffic is used for dimensioning the network and allocating costs among services, the VoIP bandwidth should be updated to 96.8 kbps. In particular cell J294 in the sheet "I_Technical" of the core model should be updated to 96.8. If total traffic volume is used for dimensioning, the value of the same cell should be changed to 193.6 kbps.

TDC has changed the 'blue table' to fit into the IP-setup. TDC suggests NITA to implement the above table 4 in "I_Product_Demand" table 6 and update the links accordingly. Alternatively the above table 4 with utilisation ratio adjustments can be implemented.

Ref 1

The reason that there are four tables to cover voice products is as follows. TDC currently provides both a traditional PSTN-based voice service and also an IP-based VoIP service. Even though the network modelled has an all-IP core, these two product sets will take slightly different routes through the network since the "PSTN" products will be routed through POTS line cards in the DSLAMs/MSANs whereas the VoIP products will be routed through the relevant xDSL line card in the DSLAMs/MSANs.

So as to allow the model to address a Next Generation Access network, it was decided that the model needed the flexibility to combine the PSTN-based voice products with the VoIP products through a single routing assumption. This was on the basis that with an NGA (essentially fibre to the home) there would not be the possibility to retain POTS line cards at the DSLAMs. This is the reason that there are two input tables followed by two calculated tables.

Ref 2

The main reason for the change in approach was that the original calculation for BHE was hard coded and NITA wished to make it more explicit by using specific input parameters. The parameters were chosen so as not to impact on the effect of the original hard coded formulae.

Ref 3

The error has been corrected in this release of the revised model.

Ref 4

NITA have updated the assumed busy hours per day for DSL, IP via fibre/LL and BSA to take account of the evidence provided by TDC.

Ref 5

The error has been corrected in this release of the revised model.

Ref 6

NITA have analysed the additional data provided by TDC for the residual non-PSTN services and have had difficulty aligning it with the required inputs for the model. NITA have therefore estimated how the data should be interpreted and fed that in as inputs into this second draft release of the revised model.

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2.1.11 Comments to the sheet *I_Technical*

Ref 1: I_Technical

TDC finds that the load on the IMS and application servers depends on the functions used as well as the number of users. Permission to use these resources is solely dependent on the number of licenses acquired. As indicated earlier the total number of users is not always related to the number of accesses, for example a business access may have multiple extensions. Therefore the costs for licenses should be allocated to the core IMS expenses, where the call and traffic functionality resides, and not to the access. This has also been the normal calculation method used in earlier models.

TDC requests NITA to allocate license costs to core IMS and thereby to call setup.

Ref 2: I_Technical

TDC notes that in row 241,242 spares for MGW is set to 1%. For other equipment this is 5% and TDC finds that 1% is not in accordance with what is practically possible and usable in planning the network. A 5% spare as seen for other equipment is more realistic.

TDC finds that allowance for spares for the IMT platform is missing. IN row 124 spares for POTS cards is set to 5%. TDC finds that 7.5% is more realistic. This was an acceptable and realistic figure seen in the earlier models.

Ref 3: I_Technical

TDC has noticed that the model does not include a complete test setup including all components and software comparable to the operational production net. It is vital for TDC to have the possibility to test new functions, test with other operators, test with the OSS systems before launching new functionality and afterwards be able to reconstruct the live network to find faults and secure an all time operational network.

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TDC purchases equipment and software from different vendors that have no relations to each other and therefore unable to secure a fault free introduction of new services and products. Before launch it is therefore TDC's own responsibility and in TDC's own interest to test these functions which have to work across the network platform.

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NITA is requested to include test platforms for all core network elements.

Ref 4: I-Technical, 4.11 VoIP conversion

TDC uses as default G.711, Payload 20ms (50 pps), No compressed RTP (cRTP) and No VAD. In the L2 Ethernet aggregation network this results in a bandwidth requirement of 96.8 kbps in each direction or a total of 193.6 kbps. This is very different from the 67.6 kbps used in the model.

The calculation of bandwidth includes the following:

Ethernet Preamble	8 Octets
Ethernet Header	14 Octets
Ethernet CRC	4 Octets
Ethernet VLAN Tag	4 Octets
Ethernet Frame Gap	12 Octets
IP Header	20 Octets
UDP Header	8 Octets
RTP Header	12 Octets
Voice Payload	160 Octets
Sum	242 Octets

Bandwidth = (242x8) bits x 50pps = 96.8 kbps in each direction or 193.6 kbps in total.¹

¹ Refer to the following document which however does not include the VLAN tag of 4 bytes that we use.

<http://www.newport-networks.com/pages/voip-bandwidth-calculator.html>

NITA is requested to update the model accordingly.

The LRAIC model does not take into consideration the VoIP bandwidth requirements for non-voice related protocols.

To establish calls IMS uses SIP, Diameter, H.248 and SS7 signalling as well as DNS lookup signalling. VoIP terminals must also register periodically, for a business customer, registration of the terminal happens every 30 seconds. Allocation of the IP address uses DHCP signalling. For maintenance and QOS, SNMP and RTCP are used while TFTP is used for terminal configuration.

Depending on the terminals used, the bandwidth required for non-voice related protocols can result in over 5% higher total bandwidth usage.

NITA is requested to update the model accordingly.

Choice of RTP compression (cRTP) comes at a price i.e. higher router load. The terminals used by TDC do not support cRTP. Due to the processor load, **XXX** warns against the use of cRTP and suggests its use only where the bandwidth is critical i.e. lines with a bandwidth capacity lower than 768 kbps. TDC does not have transmission lines with such a low bandwidth and therefore does not use cRTP. Although the parameter for compression indicates “NO” in the model, the value for bandwidth used, indicates that compression is used.

NITA is requested to implement a bandwidth without the use of cRTP as indicated by the correct parameter setting.

Ref 5: I_tehcnical

XXX XXX. For processor selection in L2 aggregation, however, an important specification is missing, since use of 10GE modules should only be possible with processor type 2.

NITA is requested to update the model accordingly.

Ref 6: I_Technical

In the model 24 fibre cables are deployed. According to TDC policies fibre cables of **XXX** fibres are deployed to ensure future usage.

NITA is requested to use **XXX** fibre cables as a minimum.

Ref 7: I_Technical and I_Cost

Compared with earlier models the MSAN to a certain extent can be seen as comparable with a subscriber stage except the MSAN only support POTS customers.

IN the MSAN there will be technical functions supporting the line and other technical functions related to call setup and signalling with the IMT platform. E.g. the ATA (Analogue Telephony Adapter) function is part of the technical functionality entirely related to the support of call setup.

As TDC sees it the, unit cost of the MSAN in the model shall be divided into cost related to the Access and to the Core part of the network as done with the ASM in earlier models. When looking in I_Tecnical this seems as well to be the intention. In row 7 there is a split of the MSAN to Access 73% and Core 27%. In C_equipment, however, MSAN cost is allocated only to processor and line cards (i.e. access), whereas no cost is allocated to MSAN uplink (i.e. core).

TDC would appreciate a thorough investigation of the MSAN to get the right functionality for all parts in the MSAN.

Ref 1

NITA is of the view that the basic test as to whether a cost should be allocated to subscribers or to traffic is whether or not that cost rises/falls in relation to the number of subscribers (regardless of how much traffic they generate) or the amount of traffic (regardless of how many subscribers are involved in generating that traffic). Right to Use (RTU) licences are typically purchased on the basis of the number of subscribers wishing to use a particular service – regardless of how many times they actually do use that service. It was with this in mind that the first draft release of the revised model allocated all of the RTU licence fees to subscribers and none to traffic.

Having said the above, NITA is willing to consider whether it might be appropriate to allocate some of the RTU licence fees to traffic – perhaps those related to basic call handling. On that basis, NITA has adapted the model so as to allow a portion of the RTU fees to be allocated to subscribers and a portion to traffic. For this second draft release, 25 DKK has been allocated to calls, for both residential customers and business customers, and the remainder to subscribers. NITA would welcome substantiated comments from operators as to whether this is an appropriate compromise.

NITA would like to emphasise that the cost of the softswitch hardware has been allocated fully to call set up. For other applications, such as Centrex, then NITA does not consider that the hardware is necessary for basic call functionality (as regards to interconnect call origination and termination) but is an advanced feature, the cost of which should be allocated to the relevant customer groups. For this reason, the cost of such server hardware has been allocated away from call set up and instead allocated to subscribers.

Ref 2

NITA would point out that the general approach taken to spares is that a figure of 1% is used for general items and 5% for line cards etc. This is in line with version 2.4 of the model.

With specific regard to the Media Gateways, the model adheres to the above approach.

With specific regards to the IMS, NITA acknowledges that the first draft release did not take account of spares and that this has been corrected in this second release.

Ref 3

NITA would point out that TDC has put forward similar arguments regarding a complete test set-up previously.

Although NITA acknowledges that a real operator is likely to have test equipment, the agency believes that costs related to gradual changes to the network are difficult to reconcile with the concept of an optimal operator, where the costs for only one year is calculated. This is also the reason for not including migration costs in the access network. Furthermore, NITA is not aware of any inclusion of test sites in other regulatory LRAIC bottom-up models.

NITA therefore believes that the approach taken in the 2005-review of the model² (cf. section 4.5), where NITA concluded that given the fact that the equipment used to a very large extent is standard equipment that does not use operator specific software, it is reasonable to assume that the vendor makes the final testing of the network before delivering the software

Therefore no explicit costs for a complete test set up have been included.

Ref 4

NITA acknowledges the various comments and suggestions made by TDC. Modifications have been included in this second draft release of the model. In particular (a) traffic flows in both directions are now considered within the model (both in terms of bits per second and packets per second), (b) errors in the model (resulting in lost calculation steps) have been corrected, (c) an allowance has been added for "background" traffic to account for non voice related protocols, (d) RTP compression has been assumed disabled.

NITA notes that the bandwidth calculation submitted by TDC differs slightly in the resultant number of bits per second that results (96.8 compared to 82.8 in this second draft release) and would welcome substantiated comments from the operators on which figure should be used in the final model release.

Ref 5

This has been corrected in this release of the revised model.

Ref 6

Whilst accepting that TDC might, for its own internal reasons, adopt a higher minimum fibre count than that currently in the model, NITA is of the view that 24 fibres is a suitable minimum to use in order to provide the regulated services. Any additional cost of a higher default fibre count should not be borne by regulated services and thus NITA has not modified that input in this current release of the model.

² http://www.itst.dk/samtrafikregulering/telepriser-pa-engrosniveau/filarkiv-engrospriser/lraic/lraic-priser/2006/Horningsnotat_over_afgorelsesudkast_221205.pdf

Ref 7

The 73%/27% referred to by TDC was erroneously left in the model during the development of the initial draft release. It has now been removed for this second draft release.

NITA is of the view that the basic test as to whether a cost should be allocated to subscribers or to traffic is whether or not that cost rises/falls in relation to the number of subscribers (regardless of how much traffic they generate) or the amount of traffic (regardless of how many subscribers are involved in generating that traffic). For MSANs used solely for POTS customers, it would be impossible in the view of NITA for the data carrying requirement of the MSAN to be beyond that which would be available by default within the MSAN – even if every single customer used their telephone at the same time. It was with this in mind that the first draft release of the revised model allocated all of the RTU licence fees to subscribers and none to traffic.

Having said the above, NITA is willing to consider whether it might be appropriate to allocate some of the common MSAN costs to traffic. On that basis, NITA has adapted the model so as to allow a portion of the common MSAN costs are be allocated to subscribers and a portion to traffic. For this second draft release, 10 percent has been allocated to traffic and the remainder to subscribers. NITA would welcome substantiated comments from operators as to whether this is an appropriate compromise.

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2.1.12 Comments to the sheet *I_Cost*

Ref 1: I_Cost

In general TDC finds it odd that the model does not allocate costs to a network element for IN exchanges since the several IN call products are calculated. In all IP network these services will be allocated to applications layer and therefore the cost for these services should be calculated in the same manner as the Centrex service.

Ref 2: I_Cost

In general TDC finds it odd that the model does not allocate cost to a network element for an operator service exchange since the product “Dir enq & emerg calls (operator services)” is calculated.

Ref 3: I-Costs, 5.09 IMS

TDC notes that today their IMT only supports PSTN simulating and not the normal PSTN and ISDN services. As examples of missing services, the handling of overlap sending, categories, unknown number length, and carrier preselect is not supported. ISDN can not be supported, this includes, user-to-user signalling, AOC, partial rerouting, sub addressing, and the exchange of high layer compatibility. For PSTN, pulse dialling and the use of metering pulses are not supported.

To support PSTN/ISDN emulation through the use of MSANs, the IMT must be upgraded with:

- new application servers for PSTN/ISDN emulation

- addition of an Access Gateway Control Function (AGCF) to support I-SIP and H.248 signalling
- an on-line charging system to provide charging pulses for PSTN and AOC for ISDN
- new test and monitoring equipment for handling the new signalling methods.

A critical issue in connection with the introduction of MSANs is the ability to support the line testing capability of our existing PSTN exchanges.

NITA is requested to update the model accordingly.

Ref 4: I-Costs 5.09 IMS

TDC finds that the description of the following components in the model is unclear. Therefore, NITA is requested to specify the content of the three following components:

- Softswitching 825,000 DKK
- Fixed per IMS 825,000 DKK
- Application Service - VoIP 250,000 DKK

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TDC interprets the components as follows:

Softswitching: The IMS core includes softswitching capability for the maximum number of subscribers/users.

Fixed per IMS: The price of an IMS core (excluding SBC) is as follows. Note that the input provided by TDC fall 2008 is slightly modified here, due to the fact that our upgrading of the voice platform has provided new insights to the setup (and hence prices). :

Table 5. IMS core costs.

#		€ per unit	€ total	Dkk. total
2	NSP 5.0 Opti Configuration - Production	xxx	xxx	xxx
1	Emergency calling geographic location based routing (per system)	xxx	xxx	xxx
	Total Core system		xxx	xxx

As a core system also includes diverse servers including application servers for xxx private VoIP subscribers and xxx business users (extensions), the total price for the core system is xxx kr.

Licenses for VoIP subscribers, business users and Centrex are not included in the core cost.

Application Service – VoIP: For every xxx subscriber/users the price of xxx servers xxx must be added to the additional licenses. To reflect the real world

the “Application Service – VoIP” should be split up into a residential and a business application service.

Application Service – Centrex: Corresponds to our Corporate Mobility Manager (CMM) used to provide FMC for some of our business users.

Fault tolerance:

TDC has implemented a fail safe strategy that protects the network against failure. This is accomplished in 2 levels:

- To secure against e.g. fire and total system breakdown etc. a new geographical site must be established with a complete redundant emergency IMS platform. In case of fire customers and traffic can be transferred to this system within hours. TDC has implemented this strategy since it not acceptable to have up to **XXX** customers without services for longer periods.
- To secure a fail safe strategy for each IMT system, internal redundancy is accomplished by placing the two sides of the IMT equipment in 2 complete separated rooms. This means that on each of the 13 sites in the model, preparation should be made for two rooms; power must be divided into two separate systems with backup etc. This also regards all IP backbone equipment used for voice traffic and signalling.

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The above considerations are not taken into account in the present version of the model.

NITA is requested to update the model accordingly.

Ref 5: I-Costs, 5,10 Other Servers/GW

TDC finds that in connection with VoIP the following support systems should be included:

- DHCP servers (IP address allocation)
- TFTP servers (terminal configuration)
- DNS servers (conversion of URL to IP address)
- NTP servers (In our PSTN network today, synchronisation in the network is maintained using a master slave setup. A very accurate clock is used as master and propagated via our SDH network throughout the net. In an all IP network without synchronisation, jitter and delay will result in packet loss and even worse lost calls. In addition CDR's can not be delivered with the required precision. In order to adjust the internal clocks residing in the IP routers, MGW's, servers and for providing a clocking input to the SDH ADM equipment, TDC uses a number of NTP servers that all relevant components can synchronise towards).
- Diverse support systems (fault finding and monitoring etc.).

Prices for the above-mentioned servers can be obtained from the input provided by TDC fall 2008.

NITA is requested to add the costs for the above servers to the model.

Ref 6: I-Costs

TDC finds that the core model does not seem to include a setup for backdoor access to active equipment in the network. Such a setup is essential for efficient network operations and hence either a backdoor setup must be included in line with the input provided by TDC fall 2008, or, alternatively, operating costs must be raised considerably.

NITA is requested to include a setup for backdoor access in the model.

Ref 7: I-Costs

TDC cannot recognize the price level for power in the model. The unit cost pr. kWh is set at 0.60 DKK. **TDC** find this price far from updated and suggests a level for power cost aligned with the price level from the major Danish utility companies:

Table 6. Power costs.

Supplier	Price (DKK/kWh)
SEAS	XXX
DONG	XXX
Østjydske Energi	XXX
Energi Nord	XXX

A weighted average unit cost of **XXX** DKK is hence appropriate for power.

NITA is requested to update the model on power cost.

Ref 8: I_costs

TDC finds that evidently supplier annual support is missing for DSLAMs, L2, L3 and WDM equipment. In the **TDC** datainput in fall 2008, relevant input on these support contracts were stated (6,2).

NITA is requested to update the model with relevant cost for Supplier support.

Ref 9: I_costs

TDC finds that DSLAM cable costs are missing. These prices have been delivered to NITA in the fall 2008. Also, DSLAM installation cost in the model (17.5% of equipment price) is far from realistic, cf. the input provided fall 2008 (**XXX** for small DSLAM, **XXX** for large DSLAM, including DSLAM, line cards, and cabling).

NITA is requested to use **TDC** input

Ref 10: I_cost (O22:O40)

TDC finds that it is evidently that values for parameters for installation of power supplies, Air conditioning, and security system are missing, except for the smallest category of power supply. Further more the level of installation cost suggested (2 percent) are heavily underestimated.

TDC expects that the Installation cost cells are altered to a positive value and that this value is set at a realistic level, i.e. in line with installation of other equipment types: **XXX** %

Ref 11: I_costs

TDC finds that the hybrid model estimates the asset lifetime of trench and duct to be twice the lifetime of fibre cable. TDC agrees on the lifetime of fibre cables. A lifetime of 40 years of trench and duct is however only possible if the duct is re-used after 20 years, where the obsolete fibre is pulled out and the new fibre is blown in. TDC finds that costs should be included to account for later reuse. The cost of removing obsolete fibre is estimated to **XXX** DKK/m.

If the cost of duct reuse is not included, TDC finds that the lifetime of trench and duct must be adjusted to equal the lifetime of fibre cable.

Ref 12: I_costs

TDC finds that in the cost calculation of trench no installation costs are included. In planning and designing a network substantial manpower is needed. The design of a fibre (or copper) network consists of: designing the trench, communication with local authority and application for permission to place cabinets and digging along the road, ordering of material (ex. Ducts), booking manpower and coordinating with local engineers and digging contractors. In TDC experience with designing new links in the core network is approximately **XXX** DKK/m, alternatively **XXX** of the cost of trench digging.

NITA is requested to update costs for trenching accordingly.

Ref 13: I_costs

TDC finds that in the modelling of the core network fairly long links are assumed. As a consequence it is necessary to length splice between POPs (typically each 4 km). Splicing costs is estimated to be **XXX** DKK (96 fibre cable) and **XXX** DKK (192 fibre cable).

NITA is requested to update cable costs accordingly.

Ref 1

The costs, and their recovery, of the IN platform has remained the same as in version 2.4 of the model. The inclusion of specific IN-based Network Elements was to have them available in case it became feasible to handle IN costs via that route rather than maintaining the approach adopted in version 2.4. Since the approach has not changed, for this release of the model NITA has decided to remove the IN-based Network Elements from the Network Element list to avoid further confusion.

NITA has also realised that the GRC for the IN/NP platform had remained unchanged since the release of the model at the end of 2005, even though there is a price trend of -8% specified. In order to correct for this, the GRC has been updated to account for four years of the price trend.

Ref 2

As far as NITA is aware, the model treats operator services calls in the same manner as version 2.4 did. Since such calls do not constitute a regulated service, NITA does not believe it is either appropriate or necessary to include costs for network elements that are specific to such services.

Ref 3

Regarding comments made by TDC with regard to a possible need to upgrade the assumptions of the IMT to account for PSTN/ISDN emulation rather than simulation, NITA notes that TDC has not provided any specific indications of what the upgrades alluded to would cost and therefore remains unconvinced that such an upgrade, if necessary, would amount to a significant increase in the cost base allocated to regulated services. On that basis, NITA is inclined to retain the existing cost assumptions. NITA would, however, welcome further substantiated comments from operators on this topic.

Ref 4

NITA would point out that the costs, and the structure of those costs, included within the revised model is not intended to precisely mirror the structure and cost levels incurred by TDC, although they are heavily influenced by the information that TDC provided. NITA has considered the information provided by TDC in the consultation response but does not find that it differs significantly from the information provided on previous occasions. On that basis, NITA is inclined to retain the existing structure and costings in the previous draft release of the model into this second draft release. NITA would, however, welcome further substantiated comments from operators on this topic.

Ref 5

NITA acknowledges the comments made by TDC with regard to a possible need to incorporate additional costs for other servers (such as DHCP, DNS and NTP servers). NITA has considered the information provided by TDC but remains of the opinion that sufficient costs have been included within the IMS section of the model to address these requirements. On that basis, NITA is inclined to retain the existing structure and costings in the previous draft release of the model into this second draft release. NITA would, however, welcome further substantiated comments from operators on this topic.

Ref 6

NITA acknowledges the comments made by TDC with regard to a possible need to incorporate additional costs for backdoor access to active equipment in the network. NITA has considered the information provided by TDC but remains of the opinion that the cost of implementing such access would be minimal compared to the cost of the active equipment itself. On that basis, NITA is inclined to retain the existing structure and costings in the previous draft release of the model into this second draft release. NITA would, however, welcome further substantiated comments from operators on this topic.

Ref 7

NITA has noted that TDC has not supplied information on the actual prices for power that TDC pays, but has only provided information on general power prices. NITA believes that a company of the size of the modelled operator would be able to get substantial discounts from its power supplier, as it is possible to have one power supplier in the liberalised power market.

NITA has however updated the power cost used in the model, increasing the cost to 0,80 DKK/kWh, which is based on an indexation of the previous cost used in the 2002- and 2005 hybridmodel, where the price development for private households has been used. NITA believes this to be a conservative assumption due to the increased competition in the power market in the period.

Ref 8

NITA has included support costs for DSLAMs, Layer 2 and Layer 3 devices and also for DWDM equipment in this second draft release of the revised model.

Ref 9

NITA acknowledges the comments made by TDC with regard to the installation costs for DSLAMs. NITA has considered the information provided by TDC but remains of the opinion that the installation costs currently in the model are not unreasonable based on the information provided by the various operators and on NITA's own research. On that basis, NITA is inclined to retain the existing structure and costings in the previous draft release of the model into this second draft release. NITA would, however, welcome further substantiated comments from operators on this topic.

Ref 10

As far as NITA is aware, the model treats the installation of power supplies, air conditioning and security systems in the same manner as version 2.4 did in that the costs are assumed to include the necessary installation.

Ref 11

NITA acknowledges the comments made by TDC with regard to a possible need to remove "old" fibre during the assumed 40 year lifetime of the duct. NITA would point out that it would not always be necessary to remove the existing fibre if sufficient space was available in the ducts to allow new fibres to be installed. Furthermore, NITA finds the estimated cost by TDC for the removal of obsolete fibre very high. On that basis, NITA is inclined to retain the existing costings in the previous draft release of the model into this second draft release.

Ref 12

NITA acknowledges the comments made by TDC with regard to a possible need to account for the costs of other activities when developing new trench networks. NITA has included an allowance in the second draft release of the revised model

allow for this and would welcome further substantiated comments for operators on whether the amount included is appropriate.

Ref 13

NITA acknowledges the comments made by TDC with regard to a possible need to account for the costs of splicing fibre cables on long routes. NITA has included an allowance in the second draft release of the revised model allow for this and would welcome further substantiated comments for operators on whether the amount included is appropriate.

2.1.13 Comments to the sheet *I_Node Equipment*

Ref 1: I_Node Equipment

The dimensioning of POTS cards seems to originate from the number of PSTN subscribers from another input than the one used in I_Interface. Row 27-29. To be correct ISDN2 and ISDN30 shall be taken into account as well, if it shall be possible to produce the same number of customers.

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TDC requests NITA to secure consistency throughout the model when using data concerning PSTN, ISDN2 and ISDN30 as well as POTS.

Ref 2: I_node_equipement

TDC agrees that all L2 rings and shared uplinks should be 10GE. With current parameters for demand, however, the L2 rings must be redesigned as some have close to or even more than 10 Gbps traffic. This seems particularly concerning since traffic is split evenly among L2 rings connected at a L3 site which will obviously not be the case in practice.

NITA is requested to implement a threshold for maximum utilisation in the rings.

Ref 3: I_node_equipement

L2 rings are modelled as single-homed to a single parent node. TDC finds that L2 rings should be connected to two distinct L3 nodes for redundancy as described also in the 'Report on the Revision of the Hybrid LRAIC Model.pdf'. The model does include two uplinks from the L2 ring, but from a single chassis at the parent L3 node. To correct the model, 305 additional L2 switches should be included for uplink redundancy at secondary L3 nodes, and the fibre rings must be redesigned to ensure that they all pass two distinct L3 nodes.

NITA is requested to update with additional L2 switches for redundancy purpose.

Ref 4: I_node_equipement

The model includes too few L2 switches. There is a maximum of 5 modules per L2 switch but this is not incorporated in the dimensioning. Furthermore, no modules for fibre customer access are included even though their traffic pulls cost from the L2 switches – this will imply an even larger need for L2 switches.

NITA is requested to actually implement the restriction on the amount of L2 switch modules and include modules for fibre customers.

Ref 5: I_node_equipment

All switches at L3 sites have at least three active 10GE ports (uplink+2*ring) and hence they should use processor type 2.

NITA is requested to ensure adequate processor type.

Ref 1

Since line rental is not regulated according to LRAIC there is no specific need for the model to incorporate the precise costs related to ISDN2 and ISDN30 line cards. This is consistent with the approach taken to other products not regulated according to LRAIC such as leased lines, IPTV and VoD.

Ref 2

This has been implemented in the second draft release of the revised model.

Ref 3

Additional equipment has now been included to account for dual-homing of rings.

Ref 4

A maximum number of modules per L2 switch has now been implemented in this release. However, NITA does not see a specific need to include additional modules for fibre customer access on the basis that only two of the slots in the GBIC modules are assumed to be used for DSLAMs, thus leaving four available slots for other use.

Ref 5

This has been implemented in the second draft release of the revised model.

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2.1.14 Comments to the sheet *I_Network_elements*

Ref 1: I_network_elements

TDC finds that it is very hard to find consistency between network elements describing the interface between L2 and L3. The L3 interface toward L2 includes four network elements:

Layer 3 Edge: Line Card: Layer 2 Agg – Gbps

Layer 3 Edge: Line Card: Layer 2 Agg – Mpps

Layer 3 Edge: Line Card: Layer 2 Bitstream – Gbps

Layer 3 Edge: Line Card: Layer 2 Bitstream – Mpps

TDC assumes that 'Layer 3 Edge: Line Card: Layer 2 Bitstream' refers to uplinks dedicated to a POI connection, whereas 'Layer 3 Edge: Line Card : Layer 2 Agg' refers to shared uplinks (for DSL, VoIP, IP via fibre, IPTV, VoD etc.)

The L2 interface toward L3, on the other hand, only seems to include two network elements:

Layer 2 Aggregation: Line Card: L3 Uplink – Gbps

Layer 2 Aggregation: Line Card: L3 Uplink – Mbps

It seems obvious that there should be consistency between L2 and L3 - if L3 uplinks from L2 are split in shared uplinks and dedicated POI uplinks then the same should apply to L2 uplinks to L3. There are, however, two other L2 network elements for which the interpretation is unclear:

Layer 2 Aggregation: Line Card: DSLAM - Bitstream – Gbps

Layer 2 Aggregation: Line Card: DSLAM - Bitstream – Mpps

The names of these network elements suggest that they refer to connections between DSLAMs and L2 switches, dedicated to bitstream traffic. Such dedicated connections are not employed by TDC, and looking into the calculation of GRC on the network elements they actually seem to be related to the POI connections, and hence could be the “missing” L2 network elements corresponding to the dedicated L3 uplink elements. This seems to be confirmed by the ‘Routing diagram.xls’ provided subsequently by NITA, and hence is the working assumption employed by TDC throughout the remainder of this document.

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TDC strongly suggests that the naming of the network elements is reconsidered, and wishes to stress the need of proper documentation of the model in the validation phase. If the assumption is incorrect, TDC naturally has to take reservations for the case that comments that are not present in this document will be raised in subsequent hearings.

Ref 2: I_route_table

The model seems to follow a very simple approach for modelling voice products. In general TDC finds it odd that the model maintains the modelling of existing products that are not relevant in an all IP setup.

In general voice products need to be modelled for both calls and minutes. This is to secure the correct load on the relevant networks elements. This is especially relevant for the IP part where there is no separation of networks elements used for calls and minutes.

Even though separation to call and minutes is not complete, for all voice products the network element “DSLAM/MSAN: Processor : All – POTS” shall be included for call setup, since part of the processor is used for setting up the call. This network element can in no way be related to PSTN, ISDN2 and ISDN30 as done. This have to be seen in relation to the missing split of the MSAN argued elsewhere.

TDC must emphasize that the IMT in general will not work and be able to handle traffic if there are no licenses installed. In the route factor sheet, costs for this are wrongly allocated to the access. To be correct all cost for licenses shall be allocated to the voice product and not to PSTN, ISDN2 or ISDN30.

TDC sees this as an essential fault in the routing table in general and shall request that IMS Core: Subscriber Related and Application Service - VoIP: Subscriber Related are allocated to voice products in the route table.

Internet call:

It could be argued that this product is not relevant in an all IP network. But as long as it is included networks elements and cost for transmission to the Internet pool must be included.

IN Basic @ Internet:

TDC finds that this product is not relevant in an all IP network and should be excluded. But as long as it is included, networks elements and cost for transmission to the Internet Pool shall be included as well the Cost for IN exchanges which in general is a missing network element.

IN Basic other:

“IN basic calls” are defined as calls where it is necessary to use the IN SCP functionality, which means that at call setup signalling will be relevant through the TDM Gateway controller and the TDM network. This is not shown. Again the IN network element is not included.

IN advanced:

“IN advanced calls” are defined as calls where it is necessary to use both the IN SSP and SCP functionality, which means both call setup signalling and voice traffic will be relevant through the TDM Gateway controller and the TDM network. This is not shown. Once more IN network elements for call or traffic is not included.

Duet to fixed, Duet to Mobile, Duet to VMS.

TDC continues to wonder why these products are relevant in the model, since they are for receiving B subscriber TDC internal service.

In general there is a misunderstanding about these products which also was the case in earlier models.

For “Duet to fixed” and “Duet to mobile” it is only the Duet call setup handling signalling from the receiving B subscriber to IN that should be included. Both the actual call/traffic from A subscriber to the B subscriber and from the B subscriber to mobile are included in relevant products e.g. fixed call, interconnect call. Therefore no “call traffic” should be included in the I_Product_Demand only calls.

For Duet to VMS both the actual signalling to IN as well as the actual call/traffic to the voice mail platform should be included. No network elements for voice mail are included in the Model. The IMT platform itself does not include this functionality.

Ref 3: I_route_table

The methodology used for setting routing factors is generally hard to conceive, and TDC finds that the route_table is in a state that requires a complete work through because of errors and inconsistencies. Hence it does not make sense at this point to comment on individual values in the route_table, and only general comments are included below.

Ref 4: I_route_table

The model seems to follow a very simple approach, considering only one generic traffic flow for each product. TDC finds that a more correct model would take into account the fact that each product might have sources and destinations at different levels of the network, and incorporate some traffic matrix (at least assume gravitation) to calculate average load on network elements based on the different traffic flows. Below, TDC has described some of the inconsistencies:

- Comparing the products 'DSL.product1' and 'HOME.International in', for example, TDC would expect almost identical route factors since traffic in both cases flows between the customer connection and an exchange point in the core network. Hence more than **XXX** of DSL-traffic enters the network through peering or transit connections in the core network, and likewise international calls are assumed to enter the network through a media gateway next to an international exchange. Yet, route factors for the product 'HOME.International in' all equal 1, whereas route factors for 'DSL.product1' includes a number of 2's. In fact, since the media gateway is connected to either a L2 switch, a L3 router or a distribution router at the core node (not clear from the model), whereas peering routers and connections to the international IP network are connected directly on the core router, TDC might expect a few route factors for the product 'HOME.International in' to be equal to 2, but certainly none of the route factors for 'DSL.product1'.
- The model employs dedicated uplinks for Bitstream between L2 and L3. Hence, 'DSL.Product1' should not use the network elements 'Layer 2 Aggregation: Line Card : DSLAM – Bitstream – Gbps[Mbps]' and 'Layer 3 Edge : Line Card : Layer 2 Bitstream – Gbps[Mbps]'. Likewise the products 'BIT.xxx' should not use the network elements 'Layer 2 Aggregation: Line Card : L3 Uplink – Gbps[Mpps]' and 'Layer 3 Edge : Line Card : Layer 2 Agg – Gbps[Mpps]'.
- Route factors for IPTV are not consistent with the rest of the route_table. A unit of flow in the product 'EXCH.Local call', for example, may pass ten or more L2 sites on its way through the network, but only loads the corresponding network elements with a route factor of 2. The IPTV product, on the other hand, loads these network elements with a route factor of 1730 equal to the total number of L2 sites.
- The route table does not reflect the different service levels of the individual products. In particular, resilience capacity is applied for some products and not for others in the dimensioning of the network, yet route factors does not seem to reflect the need for resilience capacity in any way.

NITA is asked to rethink the routing factor table in order to ensure consistency between services.

Following on from a subsequent meeting between TDC and NITA, the various routing factors and the naming convention have now been updated. NITA would welcome substantiated comments from the operators on whether further improvements to the routing factors can be made.

2.1.15 Comments to the sheet *I_trenching_transit*

Ref 1: I_trenching_transit

TDC notes that the model employs up to 10 parallel links for scaling of capacity. In reality this is not an option.

First, because of the way that algorithms for load sharing are implemented in IP routers, the number of parallel links should be a power of 2 (i.e. 1, 2, 4, ...) in order to obtain a reasonable load sharing. Three parallel links, for example, will in practice not provide significantly more capacity than two parallel links.

Second, since perfect load balancing is not possible with 10 gigabit ethernet, for each new parallel link the effective usage of the aggregated bandwidth is reduced. TDC assumes 10% loss in effective usage of bandwidth with two parallel links (i.e. two parallel 10G links will only provide 18G capacity effectively), and 20% loss in effective usage with four parallel links (i.e. four parallel 10G links will only provide 32G capacity effectively).

As a result, TDC only considers 1, 2 or 4 parallel links an option, a capacity need of more than 32 Gbps implies the need for a 40 Gbps link.

To achieve (close to) perfect load balancing among parallel links, the only option is to use the ~~XXX XXX~~, on which inverse multiplexing is implemented, and hence an upper limit of four parallel links still prevails.

Ref 2: I_trenching_transit

TDC notes that the model assumes perfect load distribution, e.g. of traffic on two links from a distribution site to core. In practice a 60/40 distribution can at best be assumed. Since both links should have equal capacity to ensure proper service in case of failures, for products for which no resilience capacity is applied in the model, the assumption of perfect load distribution will tend to underestimate the actual need for capacity.

TDC requests NITA to update whit adequate capacity.

Ref 3: I_trenching_transit

TDC notes that aggregate traffic at a distribution site is split evenly among a number of PE routers at the site. Hence a partitioning of the network into a number of regions to control and scale IP routing tables (as described in input provided fall 2008) is not possible without assigning each distribution site to more than one region. This would mean that customers may not be able to keep a fixed IP address even if they move within a small geographic area covered by a distribution site. ~~XXX XXX~~. Hence TDC finds that the model underestimates the capacity need between L3 and distribution.

NITA is requested to update the capacity accordingly.

Ref 4: I_trenching_transit

TDC notes that the formulas for selecting interfaces optics are faulty. For example cell Q471, 10GE EX optics cannot reach 74,8km. Furthermore, the choice of interface optics is not reflected in the interface cost used for GRC calculations.

NITA is requested to update the model accordingly.

Ref 5: I_trenching_transit

TDC notes that the dimensioning of connections between L3 and L2 (U653:W795) does not include redundant capacity for any types of traffic. In the TDC network, xDSL, VoiP, IPTV and VoD are protected by VRRP, and many fibre customers have alternative physical access, and hence redundant capacity should be included for these types of traffic. However, since the model assumes all existing leased line customers migrated to IP, TDC finds that 10G should be the smallest capacity considered within the network because of the high peak bandwidth requirement from single customers (cf. the existing modelling of L2 in 'I_node_equipment').

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NITA is requested to use 10G as the minimum capacity.

Ref 6: I_trenching_transit

TDC finds that the entire L3 network (L3 rings, distribution and core) uses relatively few fibre routes. Hence several L3 rings are in fact parallel, only collecting alternating sites. Because of this the L3 rings become very long (max. 471km, mean 237km). Also, several links (L3 edge links, distribution-core links, and core-core links) share the same route. This has strong implications on redundancy and the effect of fibre cuts. Hence, a single fibre cut causing multiple links failures may cause the aggregate traffic load at a distribution or core node to increase (because of failures in L3 rings), while at the same cutting off one of the core links from that node. From an operational point of view, this is far from satisfactory, and implies that the need for resilience capacity may be underestimated in the model.

TDC suggests that the calculations be based on a more meshed fibre network.

Ref 7: I_Trenching_Transit

TDC: Error in cell P9:P143. The reference to row 286 must be replaced by a reference to row 287. As an example the formula SUMPRODUKT(\$V151:\$AC151;\$M\$286:\$T\$286) in cell P9 is to be replaced with SUMPRODUKT(\$V151:\$AC151;\$M\$287:\$T\$287)

Ref 8: I_Trenching_Local & I_Trenching_Transit

TDC is concerned about relying on the AutoRoute tool for calculating trenching length. TDC finds that this can result in super optimal trenching. TDC has used the crow flight distance for the first ten route distances in the 'C_Trenching_Transit' sheet in order to compare with distances used in the model. In the below table it can be seen that the average ratio is 1.15. In version

2.4 of the core model an empirical based ration of 1.38 is used (I_Technical, H105).

Table 7. Route ratios for ten transit routes.

Route	Crow flight distance	Model distance	Ratio
Route 1: Kolding to Fredericia	19,75	22,70	1,15
Route 2: Fredericia to Middelfart	7,58	12,10	1,60
Route 3: Middelfart to Otterup	40,81	47,20	1,16
Route 4: Otterup to Bolbro	14,10	16,60	1,18
Route 5: Bolbro to Odense	2,73	2,92	1,07
Route 6: Odense to Rosengården	3,15	4,00	1,27
Route 7: Rosengården to Svendborg	37,50	40,90	1,09
Route 8: Odense to Korsør	n.a	56,20	n.a
Route 9: Korsør to Slagelse	15,79	17,10	1,08
Route 10: Slagelse to Sorø	13,70	15,30	1,12
Weigthd average			1,15

The resulting trenching length in version 2.4 is 14.4 tkm. In comparison TDC has in the TD-model optimised the trenching from app. XXX to app. XXX.

TDC request NITA to use a mark-up of (XXX =>) 1.11 on the trench length in order to capture for physical obstacles along the roads.

Ref 1

The second draft of the revised model now incorporates “powers of two” in the dimensioning of such links. With the current traffic levels, there only seems to be one instance where the aggregate peak traffic exceeds 32 Gbps and that is on one of the Core-Core links. On that basis, NITA is of the opinion that it is not necessary to incorporate 40 Gbps line cards, although clearly this will need to be kept under review in future years. Conditional formatting has been applied to the relevant cells in the model to alert the user where the required peak capacity exceeds 32 Gbps.

Ref 2

The second draft of the revised model now incorporates an allowance to cater for a 60/40 distribution in links from distribution sites to core sites in the dimensioning of such links.

Ref 3

NITA remains unconvinced that a possible need to allocate a different IP address should a customer move location is a major issue. Furthermore, NITA would point out that the revised model is just that – a model – and it is very likely that the actual network implemented by an operator would be able to reduce such occurrences to an acceptable level. On that basis, NITA is inclined not to make any changes in this draft release.

Ref 4

This has been corrected in this release of the revised model.

Ref 5

This has been corrected in this release of the revised model.

Ref 6

NITA would point out that redundancy/resilience has been built in to the network modelled by means of a ring structure at the Layer 3 Edge level and dual links at higher levels. Rings etc have also been dual-homed. NITA thus remains unconvinced that (a) that from an operational point of view this is "far from satisfactory" and (b) the amount of resilient capacity needed may be underestimated.

Ref 7

This has been corrected in this release of the revised model.

Ref 8

NITA remains unconvinced by the arguments made. Previous Autoroute analysis has shown that the margin of error over route distances is very low – and could just as easily be negative as well as positive. Furthermore, NITA would point out that the ratio used in version 2.4 did not take account of the detailed level of trench route analysis that has now been performed.

NITA therefore is of the view that the difference between the overall trench length in the model and the “optimised” length in the TD-model merely reflects the different approach used and not that the TD-model “optimised“ distance is correct. If however, TDC is able to show specific instances where the Autoroute calculations are in error, then NITA will be pleased to correct them.

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2.1.16 Comments to the sheet *C_equipment*

Re 1f: C_equipment

TDC notes that there is no consistency in the connection between L2 and L3. L2 is equipped with 610 shared 10GE uplinks and 458 GE uplinks dedicated for Bitstream (+ spares). L3 is equipped with only 100 shared 10GE uplinks, 77 shared GE uplinks and 432 GE uplinks dedicated to Bitstream (+ spares). Part of the reason is that dimensioning of L3 uplinks only considers aggregate traffic at each L3 site, not the actual number of L2 rings connected.

NITA is requested to respect the number and capacity of L2 rings connected, in the calculation of L3 equipment cost.

Ref 2: C_equipment

TDC notes that the sum in cell L50 is incorrect, correct formula is ' $=SUM(L45:L49)$ '. Implication seems however minimal, as GRC for individual network elements is transferred to Consolidation model.

Ref 1

This has been corrected in this release of the revised model.

Ref 2

This has been corrected in this release of the revised model.

2.1.17 Comments to the sheet *C_route_table*

Ref 1: C_route_table

TDC notes that according to note in cell CG5 values 'to use' are used for network dimensioning, but this does not seem to be the case. Hence cells BV193:BY199 which feed into the 'I_trenching_transit' sheet is calculated based on values 'actuals'

NITA is requested to correct the calculation

Ref 2: C_Route_Table column CF & I_Product_Demand column U

TDC: Errors in calculations due to percentage formatting. In current calculation the mark-ups are 0.

NITA is requested to correct the above errors.

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Ref 1

This has been corrected in this release of the revised model.

Ref 2

This has been corrected in this release of the revised model.

3 Specific comments to the Access model

3.1.1 General comments regarding backhaul service calculation

TDC doubts the modelling approach to backhaul services. TDC is especially concerned with the sensitivity of the unit costs to the number of street cabinets, where backhaul services are demanded (“I_Network demand” D31:D33). It is TDC’s opinion that the unit costs are insensitive to the number of street cabinets where e.g. a backhaul fibre is demanded, since no cost sharing/ scale economy can be obtained between geographically distributed sites.

TDC requests NITA to remodel the backhaul services.

The LRAIC Forum finds that additional model documentation is needed to enable the LRAIC Forum to comment on backhaul services from the street cabinets in detail.

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The LRAIC Forum expects that model documentation will be available at the very latest when the second model version is released early April.

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Regarding the comments made by TDC regarding the modelling approach to backhaul services. The reason that the unit costs are sensitive to the number of street cabinets backhauled for other operators is due to the way the Access model functions and also that the products themselves do not exist at present and hence formal definitions have not been agreed with NITA and/or the industry.

The Street Cabinet backhaul products represent very different usage of the access network infrastructure than the copper-based products (such as PSTN and Raw Copper) do. One “instance” of a copper-based product reflects, in general, a single pair of copper wires in an overall copper cable within a duct. The Street Cabinet backhaul products reflect either the dedicated use of a sub-duct or a fibre within such a sub-duct.

Having said the above, the routing factors used for the street cabinet backhaul products have now been adapted to reduce, if not eliminate, the sensitivity to the number of street cabinets where backhaul for other operators is required.

With specific regard to the comments made by the LRAIC Forum, NITA has included a description of the way that the street cabinet backhaul products have been modelled in the documentation included with this second draft release of the model.

3.1.2 Operating expenses

Opex per unit

The LRAIC Forum has calculated the level of opex per unit in the revised model and compared it with the same figure in the previous model. The comparison is showed in the table below.

Note that in model version 2.5, NITA has excluded the line card and MDF from the access model. For comparison reasons, the line card and MDF has therefore also been excluded in the calculation of opex per unit in model version 2.4 in the table below.

Model version 2.4	Access Service						
	Raw Copper	Shared raw copper	BSA - national access	xDSL	PSTN	ISDN	Sum
Opex - total (excl line card and MDF), mDKK	19.7	4.8	18.1	172.0	157.1	47.9	419.7
Yearly opex pr. unit, mDKK	100.6	50.3	187.1	189.8	86.5	216.3	125.9

Model version 2.5	Access Service						
	Raw Copper	Shared raw copper	BSA - national access	xDSL	PSTN	ISDN	Sum
Opex - total (excl line card and MDF), mDKK	20.6	5.1	20.6	195.8	192.1	54.4	488.5
Yearly opex pr. unit, mDKK	105.3	52.7	212.8	216.1	105.7	245.5	146.6

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As the table shows, yearly opex per unit has increased for all services and especially for BSA. The LRAIC Forum has not been able to conclude exactly what is the cause for this development. One suspicion is that the increasing opex per unit is caused by the removal of line card and MDF from the access model because NITA has failed to implement the proper countervailing measures in order to complete this model change correctly.

The LRAIC Forum requests NITA to clarify this matter.

NITA has reviewed the allocation inputs in worksheet C_FA_Costs and has, as the LRAIC Forum suggested, found that the line cards were indeed treated differently. The second draft release of the revised model has this error corrected.

With regard to the specific increases in opex per unit “BSA national access” product, NITA would point out that in version 2.4 this product did not include all necessary costs from the core network (since the core IP network was not modelled in that version).

Over recovery of opex

As the LRAIC Forum has previously stated, it is of greatest importance that NITA makes sure that TDC’s opex are not over recovered. So far NITA has not been able to assure the LRAIC Forum that this has not been the case in the LRAIC model.

A substantial amount of the operating network expenses (e.g. fault repair or customer installations) are recovered through separate fees (wholesale or retail) or third party damage compensation.

The LRAIC Forum has calculated opex split by services and by network elements. The most remarkable result is that more than 60 per cent of opex is due to the network element “acc. NTP. Operating costs”. This can be seen in the table below.

Model version 2.5	Access Service							
Opex classes	Raw Copper	Shared raw copper	BSA - national access	xDSL	PSTN	ISDN	Sum	Sum (%)
acc. NTP. Operating costs	7.8	1.9	16.6	155.5	88.2	37.1	307.0	63%
Acc. TnD. Trench, Duct, ASM- PDP, copper	0.1	0.0	0.1	0.5	1.2	0.2	2.2	0%
Acc. TnD. mini duct from street to NTP	0.3	0.1	0.1	1.2	3.0	0.5	5.2	1%
Acc. Cable. Copper, ASM- PDP	5.0	1.2	1.3	13.4	36.5	6.3	63.7	13%
Acc. SDPs and PDPs. circuit board + jointing, PDPs, Copper	0.2	0.0	0.1	0.5	1.4	0.2	2.5	1%
Acc. DP. Cabinet, PDP copper	0.1	0.0	0.0	0.4	0.9	0.2	1.6	0%
Acc. TnD. Trench, Duct, PDP- SDP- NTP	2.9	0.7	1.0	10.3	25.5	4.2	44.6	9%
Acc. Cable. Copper, PDP- SDP	2.9	0.7	1.0	10.2	25.3	4.1	44.2	9%
Acc. SDPs and PDPs. circuit board + jointing, SDPs, Copper	0.5	0.1	0.2	1.6	4.3	0.7	7.4	2%
Acc. DP. Cabinet, SDP, Copper	0.8	0.2	0.2	2.1	5.8	1.0	10.1	2%
Opex - total (mDKK)	20.6	5.1	20.6	195.8	192.1	54.4	488.5	100%
Demand (line units)	195,643	96,357	96,907	905,812	1,817,316	221,633	3,333,668	-
Yearly opex pr. unit	105.3	52.7	212.8	216.1	105.7	245.5	146.6	-

In the hearing note of 20 October 2006, NITA stated that “NITA is of the opinion that the operating costs (“Acc. NTP – operating costs xDSL/ISDN” and “Acc. NTP – operating costs PSTN”) reflect the costs of an engineer visiting the relevant customer.”

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However, these exact costs are already to a very significant extent covered by separate fees paid by the customer which means that the current modelling clearly results in over-recovery of these opex. Therefore, the LRAIC Forum strongly urges NITA to investigate this matter further and adjust the model in accordance herewith.

Regarding fault repair, according to Ritzau 3 June 2005³, TDC stated that the company had put more focus on securing that contractors were made economically responsible for the damages when causing a fault repair. In the article TDC states that in 2004 there were more than 10,000 cases of fault repair where the contractor were liable to pay for the damages – a number which was almost topped during the first four months of 2005 alone. The LRAIC Forum is not aware how the number of contractor caused fault repairs has evolved since, but sees no reason for the development to have changed dramatically. According to TDC the cost of damages covered by the contractor in some cases can be millions of Danish kroner.

The LRAIC Forum requests NITA to clarify how the proven substantial amount of third party damage compensation has been adjusted for in the calculated opex in the revised model.

At the NITA work shop 30 January 2009, the LRAIC Forum was given the impression that NITA would secure the preparation of a list of activities included in the TDC opex statement. The LRAIC Forum welcomes this initiative as such a list potentially could help to ensure that fees are not charged for activities already covered elsewhere.

³ <http://mediawatch.dk/artikel/flere-kabelbrud-som-foelge-af-gravearbejde>

Furthermore, the LRAIC Forum wants to stress that when reconciling opex against the TDC top-down model, NITA has to be consistent with the LRAIC principle of forward-looking costs of an efficient network. If the copper access network was indeed brand new, the expenses spent on operation and maintenance would be of a completely different magnitude than TDC's current level with an old worn down copper access network.

As NITA stated in the hearing regarding the mapping of other services of 14 November 2008, a direct consequence of the above is that a certain level of fault repair must be expected to be included in the regular price on raw copper. As the prices are modelled through a brand new copper network, the MEA-modelled costs of fault repair has to be significantly lower than the current level which corresponds to TDC's current operation and maintenance costs.

All of the above should cause NITA to perform a very thorough investigation of the TDC opex statement.

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In connection to this it is also very important to note that TDC's annual report for 2008 reveals that opex in the "Fixnet Nordic" division has decreased by more than 20 pct. from 2007 to 2008. The LRAIC Forum expects this development to be reflected in the LRAIC model when NITA has reconciled with the TDC top-down model.

With specific regard to the expenses potentially recovered from third party damage compensation, NITA has now incorporated a specific input adjustment in worksheet I_FA_Costs to account for such receipts and has included an initial estimate for the amount. NITA would welcome substantiated comments from all operators on the reasonableness of this initial estimate.

With specific regard to the Network Elements "Acc.NTP – operating costs PSTN" and "Acc.NTP – operating costs xDSL/ISDN", as stated in the hearing note of 20 October 2006, it is in the opinion of NITA that these costs reflect the costs of an engineer visiting the relevant customer. NITA does not agree with the LRAIC Forum's unsubstantiated assertion that these costs are "to a very significant extent covered by separate fees paid by the customer". NITA in contrast considers that these costs are related to network fault events requiring an engineer visit to the customer's premises and/or to the access network infrastructure between the customer's premises and the exchange. NITA is not therefore of the opinion that the model needs to be adjusted.

NITA would like to take this opportunity to remind the LRAIC Forum that the operating costs in the model do not directly reflect those existing in TDC's actual network. Rather they were arrived at via a previous study in 2005/6 which resulted in the introduction of the Functional Area method of opex cost calculations. Since those costs are not based totally on the costs in TDC's accounts at the time, it is incorrect to expect that efficiency improvements in TDC's business will "automatically" get reflected in the model.

3.1.3 Cost of trench digging

Due to confidentiality issues, NITA has already been informed that **the LRAIC Forum** will make a separate submission including detailed information on the costs of trench digging.

NITA would like to thank the LRAIC Forum for the additional information provided on the costs of trench digging in Denmark. The second draft release of the revised model has had the trench digging costs updated to reflect the variety of inputs now provided by the various operators (TDC, the LRAIC Forum and DE).

DE notes that as written in DE's submission of data in September, there are a big difference between the bottom up approach and the actual project costs when calculation digging costs. The LRAIC model should therefore be adjusted so that the costs of trench (in Access model, I_Cost of Links, cell F10..F18), covers all the costs related to trenching.

DE showed in its data submission that the LRAIC models digging prices are lower than the actual price level for pure digging. The big difference occurs when the related costs are taken into account. The cost of trench in the model seems only to cover the digging, and not all the extra costs that are unavoidable when digging. Examples of those additional, unavoidable costs are:

- Replacement of clay with sand and gravel cannot be avoided for some types of digging (sometimes it's even a requirement from the public authorities). There are huge costs related to that; transportation, deposit, possible treatment of contaminated soil, sand and gravel, etc.
- Sign posting and shutoff are other costs that is unavoidable in most situations.
- The weather conditions will in some cases cause extra costs, e.g. in case of thunderstorm rinse, high water level and frost in the ground.
- Change the planned trace route, e.g. due to incorrect registrations of other infrastructure in LER (Ledningsejerregisteret). Especially old installations lack of correct registration.
- Costs related to documentation.
- There may well be more cables in the same cable trench and at different depths. This is almost always the case when deploying cables in residential areas - even when copper access network is "excluded" from the landscape.

In residential areas there is a dense deployment of district heating pipelines and/or gas pipelines, electricity cables, sewer and water infrastructure and cable-TV networks. Careful digging is therefore often required in these areas, to avoid damage on existing infrastructure.

Requirements include respectful distance to other cable infrastructure - as regulated in the Danish DS 475 guidelines. The guidelines include different types of minimum distance to existing infrastructure, e.g. gas, district heating (fjernvarme), electricity (el) and telecom infrastructure like cable-TV networks (kommunikation). A copy of the DS 475 requirements

on respectful distance to existing infrastructure is attached.

Within the respectful distance, digging must always be done carefully, in some cases by using a shovel, or even by hand. In other cases it is necessary to disengage the existing infrastructure – lift it up from the trench – place the new cables deeper than the existing ones. When that’s done the existing infrastructure is put back to its original position.

Finally, in a rising number of cases it is necessary to shift sidewalk or find an alternative trench, due to insufficient space in cable trenches. This often requires new project planning and additional digging and drilling.

The above mentioned requirements to secure respectful distance to existing infrastructure, allowing infrastructure owners access to repair and upgrade pipes and cables, and to prevent damage on existing infrastructure, often result in significant costs – in addition to the agreed digging costs, based on the contractors price lists for digging, deploying cables and re-establishment of surface.

- Additional charges due to requirement that the work is done at night, e.g. in city centers.
- Concrete under slaps will lead to additional costs, etc.

The bottom up approach used in the access model are only calculating a part of the trenching costs as it neglect that trenching involves more activities than just digging. The problem can be solved in two ways – develop a more detailed model that includes all the extra costs that the operators face when constructing access network, or calculate the necessary mark up to the digging prices. On the meeting 29th January 2009, NITA/BWCS stated that mark up scenario will be preferred. The necessary mark up has been calculated by DE. These, and the actual digging prices, can be found along with documentation in DE’s data submission of 19th September 2008.

The price study that was done by DE in the data collection phase showed that the prices in the Access model is far from covering the actual digging cost, including the related costs. The costs for each type of surface shall be updated to be in the below mentioned intervals. On top of those prices comes the internal project cost, which our members have estimated to be XXX % of the external costs.

Digging Costs, DKK/m	Lower range limit	Upper range limit
Earth	■	■
Large stones, eg. Slabs	■	■
Asphalt / tarmac	■	■
Tunneled, eg. under roads	■	■
Small stones	■	■
Soil, eg. Ploughed cable	■	■
mini-duct, street to NTP	■	■

As digging is the main cost in the access model, NITA and BWCS have to take the update of the digging cost serious. DE will urge NITA/BWCS to do a comprehensive study of the digging costs, and not just rely on pure digging pricelists as this will result in a huge underestimation of the cost. To increase the credibility of the access model, it is important to get an accurate picture of how much the model costs must be increased.

DE's members properly got the highest experience with establishing of trenched infrastructure in Denmark. Until now the members have deployed more than 30,000 km of fibre infrastructure within the last 5-6 years. Furthermore the members got a lot of trenching experience from their electricity infrastructure. DE believe that, when it comes to digging contracts, the members bargaining power is as strong as TDC's. DE's bargaining power is equal to TDC's because of the high activity level and because of the fact that no construction company got the resources to make a complete infrastructure covering whole Denmark within short time. Building a new access infrastructure, as done in the LRAIC model, can in reality only be done if the biggest construction companies in Denmark team up to do the work – exactly the same companies that DE's members use, when establishing new infrastructure.

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NITA acknowledges the comments made by DE in this regard, and the information provided. As stated above, the second draft release of the revised model has had the trench digging costs updated to reflect the variety of inputs now provided by the various operators (TDC, the LRAIC Forum and DE).

3.1.4 Fibre roll-out and shared routes in the access network

The LRAIC Forum is very surprised to see that the amount of shared routes in the revised access model is unchanged compared to model v2.4 or even v1.3 from 2002 for that matter. The only plausible explanation for this is that NITA simply has forgotten to reconsider this aspect of the model. This is indeed a very significant flaw.

Following the comprehensive fibre roll-out in particularly the past 5 years, the percentage of shared routes should of course be increased substantially in order to reflect the great potential for cost sharing caused by this.

Besides FTTH (business and private) and active street cabinet rollout, TDC's fibre rollout includes the rollout of UMTS, and especially HSDPA, where TDC establishes fibre all the way to the mobile base stations all over the country. Also the YouSee rollout of DOCSIS 3 has required additional fibre roll out implying a further substantial increase in the potential for cost sharing which yet has to be reflected in the draft model. Finally, the massive fibre roll-out by regional public utility companies also has to taken into account.

NITA acknowledges the comments made by the LRAIC Forum in regard to shared routes. NITA has now adapted the model to take more account of the scope for route sharing with other telecommunications networks in general and cable TV networks in particular. NITA would welcome further substantiated comments from the operators as to whether the revised assumptions on route

sharing are reasonable when modelling a network from a forward looking perspective.

3.1.5 Modelling of fibre demand in the access model

The LRAIC forum notes that according to www.business.dk on 11 February 2009⁴, TDC has 60,000 households connected via fibre. In the same article TDC also states that 10,000 business customers are connected via fibre and that 1,000 new fibre business customers are added each year. These figures do not seem to be reflected in the revised draft model as table 3.1 in I_Network_demand illustrates.

3.1 Number of fibre pairs in use by geo-type	
	Used fibre (pairs)
Storby	12,100
By	13,511
Land A	4,323
Land B	60
Total	29.994 '000 pairs
Dark fibre ('000 pairs)	0.004

The LRAIC Forum requests NITA to clarify in detail how the demand on fibre affects the cost calculations in the model. Also, NITA is requested to clarify how it is ensured that the model reflects the actual development on fibre demand and rollout.

As far as NITA is aware of the number of households (60.000) has to do with the number reached via cable that includes fibre (as well as copper) and not households being provided with services on fibre. The cable concerned is being installed by TDC in preparation for future use and the customers reached by this cable still have their services provided over copper lines.

As regards business customers, this number appears to match well with the amount of fibre access in the model.

3.1.6 Access capex and reductions in demand

The LRAIC Forum finds that the LRAIC model fails to adapt to the decreasing demand for copper. As the demand for copper decreases, the amount of inactive lines increases.

Costing wise this is not properly reflected in the model. Thus, in model version 2.5 the number of modelled copper lines that enters the costing base is the same as in the original LRAIC model from 2002. This results in a substantial decrease in the utilisation of the modelled copper network. This is illustrated in the table below.

⁴ <http://www.business.dk/article/20090211/techmobil/90211145/>

Year	2002	2009
Access model version	1.3	2.5
# of copper pairs in model (costing base)	3.519.824	3.519.824
# of active copper pairs (cost recovery base)	3.417.225	2.403.735 *
Utilisation of modelled copper network	97%	68%

Note*: Before update with new 2009 volumes

The LRAIC Forum finds that by including inactive copper lines in the cost base, the model deviates from the LRAIC principle of reflecting only efficient costs of a forward-looking network operator. An efficient operator would never establish copper lines to inactive end users.

The decrease in active copper lines has no real influence on the modelled number of trench and duct kilometres. In a (single year) forward-looking model it is, however, not justified to assume that trenching and ducting capex are invariant to changes in demand.

Changes in demand might not have a very significant impact on trenching and ducting capex close to the concentrator unit (ASM-PDP-SDP). However, from the SDP to the NTP and in particular for the drop wire part – it has to be considered highly inefficient not to scale down the roll out when demand decreases – and is expected to decrease further in the years to come.

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NITA would point out that, with respect to the copper cable, the model does indeed take account of the reduction in active lines. This is achieved by the scaling factor applied in worksheet C_Resources in the access model.

With specific regard to trenching and ducting, NITA believes that two significant factors need to be considered before implementing any reduction in trenching and ducting within the model.

The first of these is that in the more urban areas, the average number of copper lines per property is still significantly higher than 1 (even taking account of the reduction in demand). In such cases, it is still necessary to provide a trench/duct to that property.

The second factor relates to the fact that the assumed lifetime of the trench and duct is in general 40 years. Over such a long lifetime, it can be expected that the precise properties taking service will change considerably even if the overall total number is static or indeed falling. This “churn” is typical of competitive markets and might be expected to increase over time rather than decrease. If the trench and duct to “inactive” properties is to be excluded from the model, then there would be a need to significantly reduce the assumed lifetime of that trench and duct within the model.

3.1.7 Average copper length per pair

The LRAIC Forum is pleased to inform NITA that a very detailed and accurate analysis which measures the actual crow flight distance between approximately

180.000 DSL-customers and their corresponding co-location positions is expected to be finalized within few days. In our view this analysis should be considered a major progress in securing a correct calibration of the copper distance calculations in the LRAIC model - which are based on very “coarse” aggregations from an extremely small 20-area sample.

The LRAIC Forum will be happy to present this study for NITA whenever it is convenient to NITA.

The LRAIC Forum is, however, somewhat in doubt about how to calculate the implied average copper length per pair in the model. Based on input from C_Cables and Nodes the LRAIC Forum has made an attempt with the following results:

	Geo-type				Total
	1	2	3	4	
Copper pairs	949.144	1.421.490	1.102.215	46.975	3.519.824
Pair km	2.296.767	2.890.198	3.031.235	201.289	8.419.490
Average copper length per pair (km)	2,42	2,03	2,75	4,29	2,39

NITA is asked to confirm these calculations or alternatively to present the correct ones.

To enable a direct comparison with the actual data it would also be very useful if NITA could provide additional information regarding the average crow flight distance per copper pair in the model.

NITA would like to thank the Forum for the additional data it has provided regarding crow flight distances for its own customer base.

NITA is however of the opinion that the (above listed) table provided by the LRAIC Forum in its consultation response overstates considerably the actual average copper length per pair costed within the model. As stated previously, a scaling factor is applied in worksheet C_Resources which decreases considerably the total number of km of cable that are costed.

NITA would also point the LRAIC Forum to worksheet C_Cable_and_Nodes, section 19 which does indeed include average crow flight distances per copper pair for each of the 20 sample areas.

NITA has therefore not changed the model.

3.1.8 Total copper length, ASM-PDP

The LRAIC Forum notes that on page 13 in the NITA hearing note of 18 September 2008, NITA states, that as the rollout of active street cabinets continues, the length of the copper will be reduced. According to the hearing note NITA will make sure to include this exact coherence in the revised model. However, it is not clear to the LRAIC Forum how this has been done. Actually, the total km

of copper from ASM-PDP (i.e. the sum of cell S56-S79 in C_Resources) has increased by more than 300 km in model version 2.5 compared to version 2.4.

The LRAIC Forum requests NITA to clarify how the increasing total length of copper from ASM-PDP is consistent with the modelling of 20 active street cabinets in model version 2.5.

The reason that the total km of copper from ASM-PDP has increased is due to changes in the assumed number of PDP sites for geotype 1 locations. This was carried out to reduce the average number of copper pairs per PDP zone to around 500, which was understood by NITA to be the smallest viable size of PDP suitable for sub-loop unbundling (due to the need for an operator to have a viable number of customers at a site to justify the costs associated with sub-loop unbundling).

The effect of increasing the number of PDP sites is to increase the length of the associated ASM-PDP cabling but to decrease the average length of the sub-loops.

The revised assumptions on the number of PDP sites can be found in section 6.1 of worksheet I_GIS_zones in the access model. For this second draft release of the revised model, the revisions in the number of PDP sites have been extended to include geotype 2 also. Although these assumptions can be considered reasonably static, they will be reviewed from time to time during future model updates as the demand for copper access lines evolves.

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3.1.9 Next generation access

DE has decided not to comment on this part before it is finalized in the next model release. Before it is possible to comment on the NGA, we have to have a common understanding of the network structure that is modelled in the model. It is mentioned that each PDP is covering about 500 customers, but what is the design rules below that. How many customers are covered by each SDP, how often is the fibre spliced (dependent on the type of cables and the method for blowing fibre, etc.). The model documentation, that we expect will be part of the hearing of the next model release, should also specify the requirement to the different types of street cabinets and specify what the installation cost cover. The prices for these parts seem to be far from reality, but with a thorough documentation it will be possible to comment on these parts.

If NITA/BWCS find it useful, it will be possible to arrange a meeting with one of our fibre network specialists where design rules, etc. can be discussed.

NITA can inform DE that the second draft release of the revised model does now contain a functioning NGA scenario. However, NITA would point out that the purpose of including this scenario is not to implement something that will be used for price setting at this time. Instead, the intention is to help encourage the industry to engage on what a future NGA scenario might comprise in advance of any formal need to set prices based on such a scenario.

NITA envisages that there is likely to be a lively debate amongst the industry on the assumptions, parameters and costs of next generation access and is merely seeking, at this stage, to stimulate this debate. Thus, NITA will clearly welcome substantiated comments and suggestions on how the NGA scenario now included within the model might be improved.

NITA would also welcome the opportunity to have a specific meeting with one of DE's fibre network specialists in the near future.

3.1.10 Road lengths

Length of the Danish road network has been set to 112,708 km in every LRAIC-model since 2005. In fact the length of the Danish road network grows every year. TDC is committed to copper supply in every area where new housing is being built (thus new roads for new housing). According to 'Danmarks Statistik' the average yearly growth in local roads (kommunale veje) has been 147km since the year 2000. In 2008 TDC copper supplied around 28.000 new households.

NITA is requested to use the newest road data available and perform a complete rerun of the road classification algorithm using the newest data.

NITA has looked at the source data referred to by TDC, where it can be seen that there from 2000 has been a very small increase in the number of total roads. It can furthermore be seen that the main reason for the growth in local roads is due to conversion of regional roads to local roads due to the administrative reform (Strukturreformen) in 2007. Furthermore a large proportion of the yearly growth in local roads is likely to reflect the conversion of the status of "private" roads to "local" (public) roads. NITA is thus of the opinion that most of the apparent increase referred to by TDC mainly falls into this category and thus the actual construction of new roads will not be significant.

With specific regard to TDC's comment about connecting 28,000 new households with new copper during 2008, NITA would comment that TDC has not broken this down into households in new housing estates (thus increasing the amount of trench km) and households within existing conurbations (due to, for example, urban renewal projects).

Taking into account the above, NITA is of the opinion that it is not necessary to increase the assumed number of street km within the model.

3.1.11 Cost of Nodes

Ref 1: I_Cost of Nodes

TDC finds the prices in general too low and imbalanced material/installation-wise.

TDC expect prices to be updated due to the price input in fall 2008.

Ref 2: I_Cost of Nodes

At the moment TDC only uses two types of active street cabinets. Both of them holds a maximum of XXX existing costumers and would serve around a total of XXX potential costumers. The cost of each cabinet is XXX (cooling, racks etc included, DSLAM not included). Installation is XXX for each cabinet. Larger areas would start of with one active cabinet as well, and a second (identical) cabinet would be mounted next to it in case of more than XXX existing costumers.

Areas with more than XXX potential costumers would probably be served from a building (more comparable to a central office than a cabinet) rather than an active cabinet.

NITA is requested to use appropriate cabinet sizes and update cabinet prizes.

Ref 1

The prices for the Cost of Nodes section have now been updated to reflect the various input data now provided to NITA.

Ref 2

The size assumptions and price inputs have been updated in this second draft release to reflect the active street cabinet sizes currently being deployed by TDC.

NITA would also point out that the model currently assumes that an active street cabinet will be housed alongside a PDP and not replace it. NITA would further point out that active street cabinets are assumed in the model to connect all downstream customers since NITA is of the opinion that this is the correct approach to take in a forward looking model.

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3.1.12 Cost of links

Ref 1: I_Cost of Links

TDC finds that the prices in general are too low. Prices should include handling and should reflect that copper-cables are not available in all dimensions due to storage optimization- and waste minimization reasons (e.g.. a 1,600 pair cable would consist of two 800 pair cables or a 1,000 pair and a 600 pair cable. Hence two times the handling fee.). It should also be noted that there is a certain amount of waste.

TDC requests prices to be updated due to the price input in fall 2008.

Ref 2: I_Cost of Links

TDC notes that cost of trenching in general is too low.

TDC expects prices to be updated due to our price input in fall 2008.

NITA is requested to clarify which services are included in the prizes listed. In other words a break down into categories (e.g. digging, documentation, measuring, handling).

Ref 1

Prices for copper cables have now been updated to reflect current input data provided to NITA by the various operators and also the recent declines in the underlying price of copper.

With specific regard to cable sizes, NITA would point out that the model reflects the cost of a complete access network build and as such is not subject to the same constraints regarding storage optimisation and waste minimisation as with an operator only needing to implement small annual upgrades to an existing network.

Ref 2

Prices have been updated to reflect current input data provided to NITA by the various operators. A specific allowance has now also been included to cover associated administrative costs. NITA would welcome substantiated comments from operators as to the extent to which they consider the assumption on the administrative overhead to be reasonable.

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3.1.13 I_Interface

TDC remarks that when calculating the amount of trench sharing between access and core, directly buried cable is mistakenly included in the overall sum.

NITA is requested to correct the calculation.

NITA would point out that the issue is trench sharing and not duct sharing. There is thus no intrinsic reason why km related to directly buried cable could not be shared between access and core.

3.1.14 Ref 1: C_Cables and Node, line 776

TDC remarks that according to the cable management plan agreed upon by the telecom operators in Denmark, the active street cabinets should be at least 1.000m from central office (ASM). At this point the active street cabinets established by TDC have a **XXX** average straight line distance from ASM. It would be expected that this average distance will go up as time passes.

NITA is requested to correct these distances where the active street cabinets are used. The distance should be at least 1,000m and average **XXX**.

In the second draft of the revised model, the maximum average actual (not crow fly) distance of the ASM-PDP link for the 20 sample areas is only 2.14 km and that is for a sample in geotype 4. It is thus not practical to force an average of xxx km on active street cabinets. NITA has calculated that the current average distance across all geotypes for the 371 street cabinets now included is 1.06 km.

3.1.15 I_Access Routing Table

TDC believes that there should be allocation of costs for carrying the fibre and copper (trench, duct, cable) from TDC cabinet to ISP cabinet (cabinet owned by other operator). There seems to be no such cost in the access-model.

NITA is requested to include these services.

NITA would point out here that, to the best of its knowledge, there have yet been no cases of an ISP requiring such a cable between street cabinets and that the product(s) necessary for such cabling have not yet been defined and or agreed.

NITA is thus of the view that such products are best handled within the Co-location model as and when they are suitably defined and agreed and not within the Access model.

3.1.16 C_Trench by Zone, line 219 and line 282, 283

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TDC finds that it seems unreasonable to use such a small sample to determine backhaul prices. It is also an issue that these are 'urban' PDP's and hence is assumed to be around 800 meters from the switch. According to the cable management plan, active cabinets should be placed no less than 1,000m from central office. At this point the active streets cabinets established by TDC have **XXX** average straight line distance from ASM. It would be expected that this average distance will go up as time passes.

Further more TDC expects to establish street cabinets in other geo types. For the – in the future - first 400 street cabinets, TDC expects these to be distributed **XXX** in 'urban', **XXX** in 'suburban' and **XXX** in Land A. However the specific locations are to be decided.

NITA is requested to use an ASM-PDP distance of **XXX** meter for backhaul calculation and to make the model flexible to street cabinets in other geo types.

The second draft release of the revised model incorporates 371 active street cabinets across all four geotypes, in line with the information provided by TDC. Also, as mentioned above, the average distance from ASM to PDP is now just over 1 km.

3.1.17 Ref 1: I_Opex Costs, line 41

TDC finds that operating events are much more cost full than indicated. TDC spend around **XXX** a year on moving cables etc. as a result of road-replacement etc. A more proper input would be **XXX** events averaging **XXX** DKK per event.

TDC requests NITA to update the number of events and costs.

NITA has notes the comments made by TDC with respect to Opex. However, unless/until TDC is prepared to provide NITA with a detailed analysis of operating costs NITA is of the opinion that it is not appropriate to adjust a key input such as this in isolation.

NITA would also point out that, due to the FA approach currently used within the model, the impact of updating the assumption requested by TDC would not change the overall level of opex, but just its allocation across the various products.

3.1.18 Small updates to be done

TDC has found an error in Formula in cell AI16:

```
=HVIS( OG(ER.TAL(AG26);ER.TAL(AH16)); FORSKYDNING('I_Opex  
Costs'!$K$17;AB16;0)*AG26+FORSKYDNING('I_Opex  
Costs'!$P$17;AB16;0)*AH16; "not known")
```

AG26 in the formula should be replaced by AG16

NITA is requested to correct the error.

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This has been corrected in the second draft release of the revised model.

DE notes that the Overview sheet in the Access model needs some smaller updates. The look up functions are for example dependent of the spelling of “Copper” and “Node”. Until this correction is done the results in the Overview sheet will be incorrect.

NITA believes this has been corrected in the second draft release.

4 Specific comments to the Co-location model

4.1.1 Power units – changes in utilisation ratios

The LRAIC Forum notes that in model version 2.4 it was assumed, that the average power consumption from a 15A 48VDC unit is 350 W (excluding an AC/DC conversion loss of 13 per cent). That corresponds to an average utilisation factor of 0.49.

In model version 2.5 this utilisation assumption for 15A 48VDC has been changed to 0.65 implying an average consumption of 500W. For 30A 48VDC and 60A 48VDC a similar utilisation factor of 0.65 has also been applied. NITA has not provided any explanation for this significant change in assumptions.

The LRAIC Forum considers an average power utilisation factor of around 0.50 to be a valid assumption that also takes into proper account the actual filling factor for the DSLAM's employed. Furthermore, to the knowledge of the LRAIC Forum, this assumption has not been questioned by other parties.

Consequently, NITA should revise the assumption regarding the average utilisation ratio back to the original 0.50.

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NITA has noted the remarks for the LRAIC Forum in relation to the changes of the average utilisation factor from 0,49 to 0,65 in 1st draft of the revised model. Based on this, NITA has made changes to the calculation of power services 48 VDC 16 A, 30A, 60 A. The new results for 48 VDC correspond to a average utilisation factor that is of approximately 0,46.

4.1.2 Power units – Shift to another power-product

The LRAIC Forum notes that in the co-location model NITA has modelled a new product: “shift to another power-product”. This modelling does, however, not carry over to the output sheet in the consolidation model which should be corrected.

LRAIC Forum assumes that this new product is intended to cover shifts between 15A, 30A, and 60A power outlets where the task at hand boils down to shifting a fuse.

Currently the situation is such that e.g. Cybercity has a large number of active agreements that formally deploys 60A fuses but which in practice are identical with 30A power units due to a supplemental requirement from TDC regarding the actual allowed usage (1000W). The only reason for choosing 60A over 30A at the time was therefore that TDC offered identical prices.

If all 60A power units in the future are prices as suggested by NITA, i.e. as the double of a 30A unit, Cybercity would have to request a shift to 30A power units as this would still easily cover the actual demand.

While the LRAIC Forum supports NITA's new and more generic modelling approach for power units – it is important that such a scenario is taken care of in a proper manner. If the consequence is that Cybercity would have to pay as if it is a new power unit installation, this is clearly not acceptable. However, if the product “shift to another power product” is implemented correctly this could be an acceptable price to pay for improved transparency in the future.

The LRAIC Forum would like to have NITA's opinion on this.

NITA has noted the remarks from the LRAIC Forum in relation to the product “shift to another power-product”. NITA agree with the forum in that this new product is intended to cover shifts between 15A, 30A, and 60A power outlets where the task at hand boils down to shifting a fuse.

NITA in this way has incorporated the new product in to the co-location model and carried it over to the output sheet in the consolidation model.

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4.1.3 In span cabling

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The LRAIC Forum notes that the product “In span” has disappeared from the output sheet in the consolidation model. This should be corrected.

In this process, NITA should also reconsider the cost modelling due to the fact that several in-span cabling are normally carried out or at least prepared in the same process. At most large TDC exchanges several in-span connections share trench and duct – and consequently charging every single operator the full stand alone costs leads to significant over-recovery.

The product “300 pair trunk” has also disappeared from the output sheet in the consolidation model. This should be corrected.

NITA has noted the remarks from the LRAIC Forum concerning the potential for sharing trench and duct when cost modelling in-span cabling. NITA agrees with the forum that there would be potential for cost sharing here and has therefore made changes included a parameter for sharing in sheet I_Cost in the co-location model. In relation to this NITA has also included cost for duct in the calculation.

NITA has also altered the cost mix between outdoor cabling and indoor cabling. In earlier versions of the co-location model the assumption is that for 10 meter of in-span cabling 70% of the cost is made up from digging in asphalt and 30 % from cost for indoor cabling. NITA believes that digging in street is currently overestimated and has therefore changed these parameters to 25% (digging) and 75% (indoor cabling).

NITA is aware of that the calculation is very sensitive to the proportion of cabling done outside the building and that the significant cost difference between the “terrain types” might justify changes to how the in-span cabling is priced, i.e. having a separate price for indoor and outdoor in-span cabling.

By mistake, in-span cabling and 300 pair cable disappeared when introducing additional co-location services. They have now reappeared in the output sheet in the consolidation model.

4.1.4 Ancillary products

The LRAIC Forum notes that lately it has become increasingly clear that there exist an urgent need for a more detailed description of the different ancillary services that are included in the model.

Over and over again TDC demonstrates the ability and determination to exploit every possible loophole in the implementation of e.g. LRAIC regulated services.

One example of this is the so-called fall-back service. TDC has argued that it is a prerequisite for ordering the LRAIC regulated service "installation of NTP" that this order is made simultaneously with ordering the installation of the copper line. If this process is not followed, TDC instead forces the operators to order the fall back service if it should later turn out that similar technical assistance is needed. Not surprisingly, the fall back service is carrying a heavy price tag of DKK 1.008 which not only is almost twice the price of installation of NTP but is also significantly more expensive than ordering both a new line installation and installation of NTP.

Another example is related to the installation of BSA. In the LRAIC model, installation with or without technical assistance is currently priced at DKK 399 and 808 respectively. Furthermore, installation of NTP is separately priced at DKK 510.

The problem arises if an operator wants to order a basic end-to-end installation, i.e. an installation without assistance from a technician in implementing the routing equipment etc. at the customer premise. In the parallel scenario for solutions based on raw copper and shared raw copper this objective could be met by ordering a line installation and an installation of a NTP. In the BSA scenario this would amount to ordering an unassisted installation (DKK 399) and a separate installation of a new NTP (DKK 510) with a total cost of DKK 909.

This is, however, not possible in TDC's current regime. If installation of a new NTP is needed, it is a prerequisite that this order is combined with an assisted installation (DKK 808). That is, in practice the operators have to order and pay twice for what is basically the same technical assistance which leads to a total installation cost of DKK 1.318 instead of DKK 909. Indeed a very profitable business solution for TDC.

The LRAIC Forum expects that NITA can agree that this compulsory bundling implementation of the LRAIC decision represents a legal violation. Nevertheless, an effective ex ante regulation with a more detailed description/definition of the individual services is much to be preferred to the current situation where the operators can only hope to limit the losses through submissions of complaints to NITA and subsequent court cases.

NITA shall in that connection point at the paper “kortlægning af andre tjenester i LRAIC modellen” which should have the purpose to give a more detailed description/definition of the individual services. As mentioned in the start of this report the hearing comments from the IT industry to this paper will be incorporated in the resulting version of the paper, which NITA expect once more to send out in hearing in the industry during the month of May 2009 to obtain as detailed description/definition of the individual services as possible.

Regarding the fall-back product, NITA believes that fall back should be priced as a separate administrative fee in case of an installation without the visit from a technician is not sufficient, and a “normal installation” is needed instead. In this case, the other operators would have to be charged the separate administrative fee, an installation fee and an installation fee of the NTP. The separate fee, however, will not be modeled in the LRAIC model.

4.1.5 Migration to full loop

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The LRAIC Forum notes that for full raw copper and shared raw copper, NITA has introduced a new product: “Migration to full loop” priced at DKK 190 respectively DKK 198.

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The LRAIC Forum expects that migration to full loop is equivalent to the existing product “administrative raw kobber” which reflects an administrative change in the status of an active loop from being a shared loop to a full loop when the PSTN or (occasionally) the ISDN service is terminated by the customer.

In principle the migration of the active loop could of course also be the reverse – from full to shared. However, it will only happen very seldom in practice – and it would be more descriptive to name this product “Migration to shared loop”.

More importantly, the LRAIC Forum is somewhat puzzled by NITA’s actual cost modelling of this service.

Apparently NITA considers two activities to be cost relevant:

- Physical coupling in exchange (15-16 minutes)
- Transport time to exchange (10 minutes)

This is, however, not correct. As already explained in the LRAIC Forum’s response - and by the very definition of the product - the migration from a shared to a full loop is exclusively a simple administrative procedure and hence does not include any exchange work.

Processing of a new installation order is in the model assumed to take between 1 and 6 minutes - and an administrative migration obviously involves a change of a strict subset of the information that was to be entered in the first place.

NITA has noted the remarks from the LRAIC Forum, and has changed the model so that a migration from a shared to a full loop is exclusively a simple administrative procedure and therefore only includes the activity of processing the order.

4.1.6 BSA multi-channels

The LRAIC Forum notes that NITA has modelled installation of BSA multi-channels as a two-activity exercise:

- Processing of order (4.6 minutes)
- Switching in DSLAM etc. (6 minutes)

On that basis NITA ends up with a unit cost of DKK 67. In comparison TDC currently charges a price of 0 DKK for installation of a multi-channel if ordered simultaneously with a new BSA order and DKK 32 if ordered subsequently.

This better reflects reality – namely that multi-channel setup is implemented directly through administrative remote control – and that the administrative work in practice is undertaken by the operator through TDC's on-line ordering system Columbine.

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It is also important for NITA to pay attention to the fact that there currently are separate monthly charges for the use of different prioritized multi-channels. To avoid double recovery of transmission and DSLAM costs these monthly charges should also be determined within the model through an explicit allocation of parts of these costs.

In the light of the information provided by the forum NITA has revised the time estimates in sheet I_Resource so that installation of BSA multichannels is provisioned in an automated process.

4.1.7 BSA Multicast

The LRAIC Forum notes that based on the first draft of the revised model it is not clear to the LRAIC Forum whether NITA intends to include a separate cost calculation for implementing and using TDC's BSA multicast service.

In the core model some calculations for IPTV and VoD services are undertaken which also are carried through to the output sheet in the consolidation model. But the linkage between these services and the multicast service has not been revealed by NITA.

NITA is requested to clarify the modelling status for the multicast service which will become more and more important to have access to at regulated prices in the near future.

The calculations included within the first draft of the revised model for IPTV and VoD services were only included so as to ensure that the demand on the core network from those services was reflected in the per unit costs of regulated products that utilised shared/common network elements. It was not intended to produce a formal cost for IPTV and/or VoD services.

NITA has now included a new product “Multicast injected at Layer 3”. This product is defined as the injection of a single 2.6 Mbps multicast feed into a Layer 3 router, and thus available to all DSLAMs connected to that router via Layer 2 switches. The number of subscribers has been set at 1 (as has the number of “subscribers” for the original IPTV product for consistency).

4.1.8 BSA change of speed

The LRAIC Forum notes that NITA has modelled BSA change of speed as a two-activity exercise:

- Processing of order (2 minutes)
- Provisioning/calculation of attenuation on the line (6 minutes)

On that basis NITA ends up with a unit cost of DKK 55 which is more than double the current price TDC charges (DKK 25). It is hardly a very convincing hypothesis that TDC would voluntarily price below actual costs.

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In practice, change of speed is implemented automatically through TDC’s online ordering system Columbine - and hence the order processing is being done by the ordering operator.

Provisioning/calculation of attenuation on the line is, contrary to what TDC seems to have claimed, not undertaken regularly. With the new IPTV solutions that TDC are currently pushing it might very well be relevant to undertake a more regular attenuation calculation on the lines. For, say, 95 % of the regular “change of speed” orders this is, however, not the case.

NITA has noted that the forum does not see a need for any minutes in processing of order. At the same time the forum notes that provisioning /calculation of attenuation on the line is not undertaken regularly.

NITA has therefore incorporated in to the 2nd draft of the revised LRAIC-model an ordering processing, where a BSA change of speed is implemented automatically through TDC’s online ordering system Columbine. In relation to provisioning /calculation of attenuation on the line NITA will further assumes that this will only take place in half of the changes of speed.

4.1.9 Unproductive fault handling (forgæves fejlretning)

The LRAIC Forum notes that NITA has modelled “unproductive fault handling” as follows:

- Processing of order (10 minutes)
- Transport time to end user (50 minutes)

It is difficult to understand why order processing of a fault repair that never materializes should take so much longer than other more complicated orders, e.g. installation (1-6 minutes). Second, assuming a transport time to the end user that is

considerably longer than the average transportation time to the end user for all other services is obviously not justified.

An average transportation time of 20 minutes plus, say, 5-10 minutes to take into account the lost time on average due to rescheduling seems far more appropriate.

NITA has noted the remarks from the LRAIC Forum in relation to the modelled “unproductive fault handling” and also finds that the order processing of a fault repair should not take more minutes than e.g. installation.

Furthermore, NITA also agree with the LRAIC Forum concerning the transportation time has been set too high and therefore needs to be reduced with 20%. NITA has incorporated the changes above into the 2nd draft of the revised LRAIC-model.

4.1.10 Transport time

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The LRAIC Forum notes that in the model draft, estimated transport time to exchange is 10 min. per installation of raw copper (among other services). However, it would be very inefficient if the technician would go back and forth between the exchange and the customers. Thus, undoubtedly the technician will perform the physical coupling in the exchange for a whole series of customers before he visits each customer. In order to avoid including inefficient transport time, this should be reflected in the model by a more suitable lower transport time.

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For BSA services transport time to exchange and ATM network is 24.6 min., but for the same reason as above this transport time should also be lowered in accordance to the number of physical couplings per visit at the central.

NITA shall draw the attention to update of the LRAIC-model in 2005, where the transport time also was revised in relation to the different types of installations, and in this relation does not see any new information which is not handled via the use of the weight (35%) in the model. NITA has consequently not changed the model in this regard.

4.1.11 Multiplexing

The LRAIC Forum finds the hardware equipment price of 72,000 DKK for multiplexing 2Mbit/s to STM-1 to be much too high.

According to price lists, the equipment price for a multiplexer which can carry 8 x 63 2Mbit/s is ~~XX~~ DKK.

The price of XX DKK includes:

Alcatel 1662SMC basic STM-16 konfig

Fans Shelf

8 x Traffic card 63 x 2Mbps

3 x 8 x Access card 21 x 2Mbps ports

8 port STM-1 card

1 x STM-1 electric SFP
+ Additional 7 STM-1 SFP's

Thus, the equipment Capex in C_Cost cell I408 should be $\text{XX}/(8 \times 63 \times 0.85) = \text{YY}$ DKK instead of the current $72,000/(63 \times 0.85) = 1,345$ DKK.

Concerning the installation of multiplexing 2Mbit/s to STM-1, physical coupling in exchange is only needed when installing the multiplexer. When ordering a new 2Mbit/s, this will be installed from distance via the management system. Thus, physical coupling in exchange and transport time to exchange must be excluded from this service.

Ref: I_Cost, table, 6,3

TDC finds the utilisation rate pr. STM-1 (85 %), both undocumented and far from realistic, since this implies that each operator using multiplexing would have a average demand of 53 vc12 pr POI. TDC finds a level of XXX pr. STM-1 more relevant.

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NITA is requested to update utilisation rate for multiplexing.

NITA has reviewed the assumptions and believes that a 60 % utilisation rate is appropriate when using a multiplexor capable of multiplexing 8 STM1. In relation to this NITA would like to stress that the assumption is that the equipment will not only be used by external wholesale customers but also by TDC internal use. NITA has also altered the assumption on price of the equipment (which is including cost of installation).

Regarding the comment from the forum on installation of multiplexing, NITA agrees that there should not be any cost for coupling and transport time included in the provisioning of multiplexing. These assumptions have now been changed in the 2nd draft of the revised LRAIC-model.

4.1.12 Implementation of numbers in TDC's network

The LRAIC Forum notes that the draft modelling of implementation of numbers in TDC's network is very unspecified. The LRAIC Forum expects the modelling to concern the implementation of entire number series and not the implementation of a single number. The demand for resources is namely the same whether it involves the implementation of a single number or the implementation of 10,000 numbers.

According to the reference interconnect offer, TDC is offering implementation of number series free of charge twice a year. The charge for implementation of number series at other times is offer dependant. Based on this, NITA does not believe it is appropriate to have this calculated in the co-location model and therefore the service has been removed from the revised model.

4.1.13 Drift af lokale samtrafikpunkter

LRAIC-arbejdsgruppen henviser til, at IT- og Telestyrelsen sendte den 14. november 2008 udkast til notat om kortlagte andre tjenester i høring i branchen. Af dette notat fremgik på side 17 vedrørende drift af lokale samtrafikpunkter:

De årlige omkostninger til drift af et lokalt samtrafikpunkt er beregnet som:

- 1) "Samtrafikbundter" der indgår som et selvstændigt priselement i TDC's standardtilbud. Et samtrafikbundet er defineret som en gruppe af linier eller 30-grupper, der forbinder samme par af centraler og har ensartede tekniske vilkår såsom signalering og dirigering.*
- 2) En ikke-arbejdslønsbaseret driftsudgift til den nødvendige udvidelse af NMC systemet. Denne er beregnet som en årlig, direkte omkostning svarende til en løbende licensafgift af NMC systemet."*

LRAIC-arbejdsgruppen tolkede dette som om det var IT- og Telestyrelsen opfattelse, at "samtrafikbundter" og en driftsudgift til udvidelse af NMC systemet er de to relevante omkostningsdrivere.

På denne baggrund fandt LRAIC-arbejdsgruppen anledning til i høringssvaret af 12. december 2008, at tilbagevise at disse to omkostningstyper er relevante at indregne. Det blev i den forbindelse bl.a. fremhævet, at der siden 2005 ikke har været opkrævet særskilt betaling for samtrafikbundter samt, at det er helt uhenigtsmæssigt og utransparent at begynde særskilt at indregne en andel af fællesomkostningerne til driften af NMC i en sådan ydelse.

IT- og Telestyrelsen svarede hertil i notat af 14. januar, at

IT- og Telestyrelsen har noteret sig, at LRAIC arbejdsgruppen ikke finder behov for længere at have tjenesten Drift af lokale samtrafikpunkter (inkl. samtrafikbundter) indarbejdet i modellen. På den baggrund finder styrelsen hverken, at der er behov for at ændre i de fastlagte tidsestimaterne i bottom-up beregningen for tillæg for oprettelse af BSA uden samproduktion eller foretage yderligere præcisering af tjenesten i notatet.

LRAIC-arbejdsgruppen finder det på ingen måde berettiget, at styrelsen på denne vis tolker det, at der stilles berettiget tvivl om grundlaget for styrelsens antagelser som om der er blevet udtrykt ønske om, at tjenesten skal ophøre med at være omfattet af modellen eller prisreguleringen i øvrigt.

LRAIC-arbejdsgruppen ønsker selvsagt, at denne tjeneste fortsat skal være omfattet af LRAIC-reguleringen, og at der i den forbindelse - og i modsætning til nu - kommer til at ske en retvisende prissætning heraf.

TDC opkræver årligt mere end DKK 5 mio. fra alternative udbydere for den såkaldte drift af lokale samtrafikpunkter. LRAIC-arbejdsgruppen finder derfor ikke, at det er et urimeligt krav, at der klart og tydeligt bliver redegjort for hvilke konkrete omkostninger, der bliver dækket ind gennem disse meget betydelige betalinger. Såfremt styrelsen i den forbindelse måtte finde grundlag for at fastholde,

at det er relevant at indregne løbende driftsomkostninger til NMC systemet må det ligeledes kunne forventes, at styrelsen fremlægger detaljerne i dette regnestykke og herunder beskriver, hvorledes styrelsen har sikret sig, at der sker modregning for disse omkostninger andetsteds så der ikke samlet finder overdækning sted.

The comments from the LRAIC Forum have given rise to some confusion as to the precise nature of these comments. This has led to an unfortunate misunderstanding in NITA's response from the 14th of January on this issue.

There is of course still a need to calculate set up cost and annual cost for the Local POI service.

Regarding the costs for "samtrafikbundter", these costs have since 2005 been included in the prices for interconnection points. The effect of this has been that there has been no separate charge for this cost element.

Apart from these 30-groups, NITA believes there are valid reasons for including a share of the cost for network management centre in the annual charge for local POI. NITA think it is fair to assume that the cost of network surveillance are affected by the number of interconnecting operators and locations for which interconnection is provided.

All together, NITA's opinion is that there are costs associated with maintaining interconnection circuits with operators. As NITA has not received any information that would give rise to changes of the resource estimates in the model, the original modelling has been maintained.

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5 Specific comments to the Consolidation model

5.1.1 Comments to the sheet *O_Output and O_results*

TDC notes that the outputs from the consolidation model are divided into two sheets, the 'O_output' and the 'O_results'.

TDC finds it transparent to group the regulated services into one sheet and request NITA to clean up the sheets in the next release.

Ref 1: O_Output

TDC finds it is too premature to comment on pricing of new product given the uncertainty/inconsistency regarding definition of routing factors.

For IPTV (which TDC finds should be named 'multicast' to make the naming neutral to the end-usage) TDC has to stress that the current per customer pricing is only relevant for the specific customer base in the current version of the model. In particular, the cost base for a multicast stream for each operator is dependent only of the capacity of the multicast stream - and not of the number of end-users. Therefore, the cost per end-user is in this respect irrelevant and cannot be used as dimensioning factor.

TDC request NITA to price the multicast service per capacity per operator, and not per end-user.

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In the second draft release, NITA has made various changes to the O_Results sheet in order to remove many of the products that are not regulated.

With specific regard to multicast services, NITA can confirm that the model now shows the costs on a per operator basis.

5.1.2 Comments to the sheet *I_FA_Cost*

Ref 1: I_FA_Cost, table 5.4

TDC notes that the wholesale mark-up is calculated like the present model, but the mark-up percentage in row 283 is not used in unit cost calculation for core wholesale services.

TDC perceives this as an error and request NITA to update the link.

TDC has further noticed that the percentage mark-up are hard typed 0% for co-location in row 283.

TDC perceives this as an error and request NITA to update the link.

Ref 2: I_FA_Cost, table, 1

TDC reminds that the efficiency adjustment to FTEs was implemented to reduce the FA cost according to decreasing voice volumes. Since FTEs in the draft

model are now sensitive to volume an efficiency adjustment is no longer required.

NITA is requested to remove the efficiency parameter.

Ref 3: I_FA_Cost, table, 5.2

Debtor days from TD-model should be applied. For switched interconnect TDC finds 85 debtor too low, since the operators are due to pay end of the month after the month, where TDC has issued the invoice. Given the quarterly payment interval, this gives an average period of $(90/2+30+30)$ 105 days.

Ref 4: I_FA_Cost, table, 5.1

TDC finds that the calculation of the Common business overhead mark-up is wrong. The formula is taken from version 2.4, but the references to 'C_services' sheet is not updated. This is required since new network elements have been added and displaced the original elements.

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TDC requests NITA to alter the links in the formula.

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Ref 5: I_FA_Cost,

TDC can identify significant differences in the number of FTEs used in the version 2.5 and the input given by TDC in the TD-model documentation. TDC does not find any documentation for the efficiency adjustment NITA has made. In TDCs opinion, NITA has the burden of proof that fewer FTEs are required in the modelled network.

TDC requests NITA to use TDC's input.

Ref 6: I_FA_Costs and C-Services

Number portability costs is calculated in I_FA_Cost row 286-298 and TDC lacks information on how the total cost for IN/NP was calculated.

TDC finds that a higher percentage than 3.5% should be allocated for number portability. NP is our most expensive IN application service due to the requirement for absolutely no downtime. In addition, no ordinary assumption about BHC can be used since it should always be able to provide service even during new years evening where traffic is very intensive.

In this respect TDC can not accept that only 3.5% of the cost for NP is allocated to interconnection. Instead this figure should be calculated as a proportion of the interconnect calls to the total numbers of calls.

TDC can neither see that the calculated cost for NP is used further in the model. It shall be added to the cost of all interconnect calls.

Ref 1

These have been corrected in the second draft release of the revised model.

Ref 2

Regarding the comments made by TDC with regard to the efficiency factor in I_FA_Costs, NITA acknowledges that a part of the reason for an efficiency factor was falling volumes. However, another part was ordinary productivity gains (technical progress, better administrative procedures etc). NITA has therefore decided to leave the factor input in the model to take account of the last factor.

Ref 3

This issue was also discussed in 2005⁵, where TDC also claimed that there should be used 105 debtor days. NITA remarked that:

“For udveksling af trafik bemærkes, at de af TDC fremførte 105 dage afspejler den situation, hvor TDC først fremsender en faktura præcist en måned efter udløbet af et kvartal, hvilket vil være det længst mulige. I praksis vil der være mellem 75 (hvor regningen udsendes umiddelbart efter udløbet af et kvartal) og 105 debitor-dage (hvor regningen udsendes en måned efter udløbet af et kvartal).

IT- og Telestyrelsen har vurderet, at en effektiv udbyder ikke ville udsende regninger senere end 10 dage efter udløbet af et kvartal, og at 85 debitor-dage for udveksling af trafik derfor er rimeligt.

IT- og Telestyrelsen har således ladet antal debitor-dage for accesstjenester være uændret –15; mens antal debitor-dage for udveksling af trafik er ændret fra 53 til 85.”

The model has therefore not been adjusted for this in the second release.

Ref 4

These have been corrected in the second draft release of the revised model.

Ref 5

NITA acknowledges the comments made by TDC with regard to the required FTE. However, NITA does not find that simply using the numbers in the TD model would be at all appropriate since the two networks are fundamentally different.

In lieu of TDC engaging with NITA on an in depth analysis of the required FTE (and indeed other operating expenses), NITA is of the opinion that it is not appropriate to consider any increase in the numbers of FTE currently in the model, which are in any event very similar to those in version 2.4.

Ref 6

NITA can inform TDC that this issue of NP/IN was discussed in length in the 2005-review of the model⁶. NITA at that time (section 4.7) stated that:

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⁵ http://www.itst.dk/samtrafikregulering/telepriser-pa-engrosniveau/filarkiv-engrospriser/iraic/iraic-priser/2006/Horningsnotat_over_afgorelsesudkast_221205.pdf

“Efter gennemgang af den modtagne yderligere information fra parterne er det IT- og Telestyrelsens vurdering, at den andel, som NP skal bære af IN-omkostningerne, bør være på samme niveau for både kapitalomkostninger og driftsomkostninger.

Hvad angår andelens størrelse, har informationerne givet mulighed for en mere detaljeret vurdering af omkostningsfordelingen. Det er på baggrund af oplysningerne fra TDC om, at det er nødvendigt at foretage opslag i NP-databasen ved terminerende kald på regionalt niveau, således at kaldet kan dirigeres til korrekt central, styrelsens opfattelse, at kun den del af samtrafikopkald, som terminerer i TDC's net på regionalt niveau, skal påføres NP-relaterede omkostninger.

Ud fra de foreliggende trafiktal og baseret på et forsigtigt skøn har IT- og Telestyrelsen foretaget en beregning, som viser, at samtrafikopkald, der terminerer i TDC's net på regionalt niveau, udgør maksimalt 8,8 % af den samlede NP-relaterede trafik i TDC's net. Som tidligere anført, er IT- og Telestyrelsen ikke i besiddelse af detaljeret dokumentation på dette område, men antages NP's andel af IN til at være på 40%, vil samtrafikrelaterede opkald skulle bære 3,5 pct. heraf.”

NITA is of the view that NP/IN functionality would be available within the overall IMS platform. However, since specific data were not available to assess the extent, or otherwise, of any associated cost, NITA was of the opinion that the existing method of modelling NP/IN should be left within the model. NITA is not therefore inclined to adjust the inputs within that approach, unless the parties bring forward new information.

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5.1.3 Errors in allocation of access costs

The **LRAIC Forum** notes that in model version 2.4 the network service “xDSL” was defined such that it included both TDC’s internal (BSA) demand and external demand.

In model version 2.5 this principle has apparently been changed so that “xDSL” does not include external BSA demand, cf. I_Network_Demand in the access model. Whether “xDSL” is still supposed to include demand of resold xDSL-lines has not been revealed so far.

This change of modelling has implications for the cost allocation that takes place in the consolidation model which NITA seemingly has overlooked.

In particular, to avoid significant over-recovery of the access costs, the second term in all sum formulas in row 239, 271, 303, 335 in the sheet C_Services should be deleted.

These have been corrected in the second draft release of the revised model.

⁶ http://www.itst.dk/samtrafikregulering/telepriser-pa-engrosniveau/filarkiv-engrospriser/lraic/lraic-priser/2006/Horningsnotat_over_afgorelsesudkast_221205.pdf