Report for the Norwegian Post and Telecommunications Authority (NPT)

Cost modelling of co-location services

Response to operator consultation

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analysys mason

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1 Introduction

The Norwegian Post and Telecommunications Authority ('NPT') has commissioned Analysys Mason Limited ('Analysys Mason') to develop a long-run incremental cost (LRIC) model for interconnection on fixed networks (Markets 2 and 3) and for full and shared access to fixed access networks (Market 4), applicable to telecommunications operators in Norway. In addition, the modelling scope included a cost-based analysis of co-location services currently available in Norway. On 7 July 2011, NPT released the draft co-location model developed by Analysys Mason so that industry could consult on the modelling implementation. Submissions were received from Altibox,[1] NextGenTel,[2] TDC[3] and Telenor.[4]

The remainder of this report is structured as follows:

- **Section 2: Comments on the draft co-location model** – In this section we review the comments received on the draft co-location model and present our responses. We also consider whether changes are required to the draft co-location model calculations.
- **Section 3: Comments raised on policy or process matters** – Comments were also received that were considered to be of relevance to pricing or modifications to the reference offer itself, not to the model. Such comments are identified in this section for clarity but not commented on in this document. These include comments on the pricing structure for power and additional co-location services to be modelled.
- **Section 4: Confidential responses** – This section summarises our response to Telenor's comments on the confidential components of the draft co-location model.

> We have implemented a number of corrections or modifications to the draft co-location model based on operator feedback. NPT has finalised the inputs in the model as part of this process.

Note: certain sensitive data within this document has been redacted, as shown by the scissor symbol ('✂').

1 'Altibox tilbakemelding, nasjonal høring -- samlokaliseringsmodell, 20110915.pdf'.

2 'NGTCoLo.pdf'.

3 '110915 TDC input to the draft LRIC co location model.pdf'.

4 '110916 Final Tnr-2009-08 TN Response Fixed co-loc model.pdf'.

2 Comments on the draft co-location model

In this section we review the comments received on the draft co-location model and present our responses. We also consider whether changes are required to the draft co-location model calculations.

Comments on the draft co-location model can be split into categories based on the sections of calculations within the model, corresponding to the groups of modelled products, namely 'accommodation', 'power' and 'other'. A 'general comments' section is also included at the end of this section. These are presented below.

2.1 Accommodation services

Rental of separate rooms (Telenor, p.3)

"It is noted that pricing of separate rooms to co-location services for larger installations is not covered at all in the model. The costs for Telenor Norway related to such rooms vary significantly based on location."

Analysys Mason response

These rooms are not priced in the reference offer, since they are priced on a commercial basis. Therefore, they are not relevant to the scope of the co-location model.

Rental (Telenor, p.4)

"Telenor offers co-location product at a lot of different types of sites, and the price per square meter varies a lot. A significant proportion of the external accommodation rental revenues arise from small "kiosks" with an RSx and maybe a DSLAM. While such kiosks do not have any efficiency loss from overhead area like stairs etc., the average floor space per rack tends to be higher than the figure suggested by NPT in the draft model, even after the mark-up for common space.

Telenor's current reference offer pricing is based on a kiosk of 2.3m×6m typically requiring a investments of approx. NOK✂ for the site, NOK✂ for the shell construction and NOK✂ for interior adaptations required for installation of technical equipment. With a 7.52% cost of capital and 50 years depreciation, as suggested in the LRIC models, the annual cost per square metre is NOK✂ per year.

This indicates that the current annual price per square metre of NOK 1200 per year is too low. Telenor does not have additional statistical material to support this assumption at the present time. Hence, Telenor does reserve the right to return to the question of average floor area per rack when the model is updated if such data can be provided at that time. The development in floor area costs observed after the restructuring mentioned in chapter 1.1 is also an aspect which

is likely to have an impact on upcoming model updates."

Analysys Mason response

We note that the input used was based on the data made available by Telenor during the data collection process. We note that the decision to use a single national average price was in part due to the limited availability of data from Telenor that could distinguish between the sites priced on a cost basis and those priced on a market basis. ✂

Cost of space (TDC, p.2)

"TDC notes a seemingly draft and rounded value of 1200 NOK/m2/year is used for exchange cost (input to the space unit price). From our experience in the market the cost per m2 should not be higher than 950 NOK in the central areas for comparable locations.

1200 NOK is not documented anywhere in the model and this is a high level that should be revised. TDC requests PT to revise the value for cost of space in exchange buildings."

Analysys Mason response

We understand that TDC's data is from its own internal calculations based on its own Norwegian operations, whereas the value of NOK1200 per square metre is based on Telenor's data, specifically ✂. NPT decided to not change this input in the final co-location model.

Accommodation rental (NextGenTel, p.1)

"Modellberegningene for så vidt gjelder leiekostnader er basert på bruk av standardisert utstyrsenhet (kabinett/skap) med størrelse 600x600x2l00 mm, med tillegg av plass på 1100 mm foran, 500 mm bak og 200 mm på hver side av skapet.' Dette innebærer at det i modellberegningene legges til grunn at utstyrsenheten opptar plass på til sammen 2,1 m2, med en "mark-up for common space" på 20 %.

NextGenTel kan ikke se hvorfor beregningene i LRIC-modellen på dette punktet skal ba-seres på andre og langt høyere faktorer enn tilsvarende modellberegninger i andre land. I Sverige eksempelvis, benytter tilsvarende LRIC-modell utstyrsenhet eller kabinett som til sammen bare opptar 1 til 1,5 m2 plass, og det gjøres ikke påslag for "common space".

LRIC-modellen legger deretter til grunn en utnyttelsesgrad ("utilisation of rack") av re-spektive kabinett på 50 %. Til dette må bemerkes at utnyttelsesgraden av kabinett vil variere med bakgrunn i stasjonens størrelse. En stor stasjon med mange fulle kabinett vil ha en høyere utnyttelsesgrad enn 50 %, mens små stasjoner med færre kabinett kan komme til å ha utnyttelsesgrad ned mot 50 %. Modellutkastet bør derfor justeres slik at det legges en høyere utnyttelsesgrad til grunn. Slik NextGenTel ser det, er det mer rimelig å anta en gjennomsnittlig utnyttelsesgrad på 75-85 %.

NextGenTel setter dessuten sporsmålstegn ved at det i modellen gjores et

påslag for andre elementer som trappehus, korridorer, etc. på hele 100 %. Slik NextGenTel ser det, er dette et altfor hoyt siffer som bør undersøkes nærmere av PT.

Oppsummert legges det i utkast til samlokaliseringsmodell opp til kostnader som er signifikant høyere enn de tilsvarende leiekostnadene som anvendes i modellene i både Danmark2 og Sverige3 - hhv. NOK 142 og 413 pr. mnd. Seiv om engangsavgiftene i forannevnte land er høyere enn i Norge, vil den høye månedsavgiften som anvendes i samlokaliseringsmodellutkastet fra PT likevel ha kompensert for den lavere månedsavgiften allerede etter noen få måneder.

Med bakgrunn i ovennevnte, mener således NextGenTel at de modellerte kostnadene ikke kan sies å reflektere kostnadene til en effektiv operatør. NextGenTel oppfordrer derfor PT til å gjennomgå nevnte kostnadselementer for å finne frem til kostnader i denne sammenheng som i større grad gjenspeiler kostnadene til en effektiv operatør."

Analysys Mason response

Regarding the mark-up used for space, we note that there are two for the accommodation rental service. Firstly, there is a 20% mark-up applied for the walkway space around the rack itself within the co-location space. Secondly, there is a 100% mark-up for other common space in the building (i.e. excluding the co-location space).

We first of all note that setting a mark-up for both types of space is a reasonable step, since the space is required in reality within an exchange building. The value of 20% is defined using first-principles (in terms of walkway required around a rack) and we believe it therefore to be reasonable. The value of 100% was derived using spatial data for a sample of six Telenor sites.

We note that Telenor rents space from its property company Telenor Eiendom in a significant number of buildings that used to hold large volumes of equipment. Much of this equipment has since been superseded by more compact modern technology. Therefore, an efficient operator today could provide the same services within smaller premises, which might have less common space.

Telenor have since provided data on a further twelve sites. Using this larger sample, the mark-up for common space has been re calculated to a revised value of 85%, which we have included in the final co-location model. This value could nonetheless be further refined in the future using larger samples from Telenor.

Utilisation of racks

"TDC notes that PT uses a 50% utilisation of racks. This utilisation might be correct if only one rack is installed. However, TDC finds that this

(TDC, p.2)

utilisation is only representative for the `last' rack installed, while the former installed racks have a utilisation closed to 100% (say 95%). Ex. having three racks installed gives an average utilisation of (95%+95%+50%)/3= 80%.

TDC requests PT to derive the average utilisation based on the actual number of racks used."

Analysys Mason response

We note that in NITA's co-location model,[5] there are two inputs of relevance. These are:

- "Proportion of full rack space for Technical House rack" = 67% (not used)
- "Average utilisation of the shelves in a Technical House rack" = 75%

We further note that in PTS's co-location model,[6] there is one input of relevance, namely "average utilisation (shelves in a rack)", which has a value of 84%.

All these data points indicate that a higher rack utilisation would be reasonable. On this basis the model input has been revised to 80%. This is in line with the suggested values from both TDC and NextGenTel. These values are themselves supported by the values of 75% and 84% from the other two Scandinavian cost models.

2.2 Power services

Utilisation of power supply (TDC, p.2)

"In the monthly rental for power supplies, power is paid in increments of 20W or 100W. The price of such increment is based on a fully utilisation (in terms of power consumptions) of 20W or 100W respectively. However, for the last increment, the use will not be 20W or 100W in practice. This increment will therefore cause over recovery of cost. Here the 50% utilisation similar to equipment utilisation can be used. Ex. having three times 100W increment gives an average utilisation of (100%+100%+50%)/3= 83%. Thus, the power consumption will be an average 83W for a 100W increment.

TDC finds that this is an unreasonable practice since the actual use is lower. TDC wants the actual power usage to be measured as a basis for invoicing. The utilization of power supply is at a stabile level over the week. Since the model use increment there will be rounding errors that affect the price adversely. In the used example we will be overcharged by 100 minus 83

5 See http://www.itst.dk/tele-og-internetregulering/smp-regulering/engrospriser/lraic-1/lraic-processer/lraic-fastnet/lraic-pa-fiber-og-kabel-tv/copy_of_horing-over-udkast-til-lraic-model-og-prisafgorelse-for-fiber-kabel-tv-og-multicast/Modeller%20LRAIC%2C%20DONG-net%2014042011.zip

6 See http://www.pts.se/upload/Ovrigt/Tele/Bransch/Kalkylarbete%20fasta%20nätet/revidering%202011/10-420-final-hybrid-model-8.1.zip

watt = 17.

Alternatively TDC requests NPT to derive the average "utilisation" of power increments based on the actual number increments used."

Analysys Mason response

We note that this is a pricing issue for NPT, not a modelling issue per se. The co-location model currently calculates the costs of power in 20W/100W increments, since that is the current pricing structure in the reference offer. Should NPT determine that a smaller charging increment was reasonable for the purposes of pricing, then the cost of a smaller increment could be calculated. With additional data on typical power demand usage per co-locating operator, this could be taken into account.

Electricity cost (TDC, p.2)

"The level in the model of 0,84 NOK/KWh is too high. In the Norwegian co-location market 0,73 NOK (inclusive net rental and exclusive mva) is an average level. Telenor has a high volume and should therefore not have electricity cost at a higher level than 0,73 NOK. Telenor should not be allowed to have additional revenue on this element since it is already covered in the WACC.

We request NPT to update the model using a lower level for electricity cost."

Analysys Mason response

The number in the draft model is derived from ✂. We understand that TDC's datapoint is from its own internal calculations. NPT decided to not change this input in the final co-location model.

2.3 Other services

Documentation (Telenor, p.3)

"The model documentation explains the methodology and the workings of the model. Since the LRIC model documentation doesn't apply for this model, Telenor would have preferred to see a chapter describing the principles of modelling added to the documents. The detailed model documentation was useful in the reviewing process, and Telenor have no comments on the documents themselves."

Analysys Mason response

Section 5.4 of the final model specification, issued in February 2010, outlines the structure of the co-location module. Due to insufficient data, a multi-year calculation (as used in the Core model and Access model) was neither feasible nor practical for co-location services.

We do however note that the draft co-location model annualised capex[7] using standard annuities i.e. it assumed flat nominal cost trends. As part of

[7] Specifically, the capex that was not recovered through initial charges.

the model finalisation, all such instances of standard annuity have been replaced with a tilted annuity calculation. Corresponding cost trend input cells have also been included in the co-location model. This approach is then consistent with the annualisation methods used in equivalent models in other jurisdictions, such as those used by NITA and PTS.

Service costs (Telenor, p.3)

"As the model is no LRIC model, the inputs of the co-location service cost module haven't been matched to the supplied information for the core, access and top-down model. This makes it hard to verify the different assumptions and cost components.

In general the modelled opex related to manager, technician and support is far too low. Summing up all these costs would indicate that there are 3–4 FTE (full-time equivalents) working with the co-location products. Looking at the details on the modelled opex there is no cost for managers in any of the products. Cost for technicians are only included for Exchange duct access. Costs for support are included in the three accommodation products, but not to any of the other products. There is no explanation for this approach. There are cost related to the managing the products, and there are significant costs related to technical support and fault handling on several co-location products."

Analysys Mason response

✂

The draft model sought to attain a reasonable, but efficient, cost level compared with the reference offer. Since the same fully allocated cost across all staff types has been assumed, the split of man-hours was unimportant. We have since reviewed the split of hours by employee type, and reassigned them between the staff types. This will futureproof the model should the cost per hour by staff type be revised to vary by staff type.

Ducts and pipes (Telenor, p.4)

"The current reference offer was developed several years ago, prior to the current cost model for the access network. Hence, in Telenor's view, cost data developed for the access network model should be taken as the starting point also for costing of ducts and pipes. There are however a few differences between the costs relevant to the access network model and the costs relevant to the co-location model:

- While the access network model digging prices from contractors are based on contractor products which include the task of placing of the cables into the ditches/trenches, the corresponding contractor products for digging or trenches without placing the cables into the trench have been used for the figures given below.

- Plastic pipes, which were not included in the access network model, has

to be added to the pure digging costs in the co-lo model. They are shown separately below.

- The need to deploy barrels or similar at cable junctions were not included in the access network model. However, it's expected that with a growing demand for duct access related to FTTH projects, the extent of access requests related to segments of long pipes will arise more frequently. Segment access leads to the need to establish a costly junction barrel or similar at the point of entry into the pipe. The costs associated with this are so high that Telenor – for our own operation – in many cases choose to dig a new, parallel ditch with a separate pipe in cases where a short, new segment is required in parallel with an existing, long pipe. This is also motivated by the fact that any segmentation of a long pipe is likely to lead to an increase in maintenance costs and a higher cost associated with blowing new fibres into the pipe over the complete distance. Hence, the time & material costs associated with establishing a cabling joint barrel is shown below.

- Use of subpipes almost exclusively takes place where there is a need to deploy new cables into already established pipes. Otherwise, several parallel pipes are installed at initial deployment. While Telenor already has a significant volume of subpipes installed, it has not been possible to get detailed data on this. Hence, its important that the model facilitates costing and pricing for deployment of subpipes when such installation is required for access requests to ducts. Time & material costs for this task is shown below.

- Any access to ducts or pipes requires preparation of "mounting instructions" to be used by contractors at time of implementation of the access. This cost element is not relevant to the general access network deployment, but to duct/pipe access and accommodation – rental."

Analysys Mason response

Telenor's comments on the absence of cable installation costs and duct costs from the product are reasonable. Analysys Mason has added new inputs to the co-location model to include these items and identified the relevant cost from the Core and Access models.

Separate line items have also been added for the costs of cable joint barrels and subducts. These have been populated with inputs (where available) from the Core and Access models, and using values from the NITA model otherwise. Should NPT wish to capture these network elements within the exchange access product in future versions of the co-location model, then the values from the NITA model can be refined with input from Norwegian

industry.

We note that mounting instructions are covered by a separate price (see below) and are now included in the co-location model as a separate product.

The cost of a cable joint barrel is converted into a cost per metre based on new inputs for the average length of a duct access. This input is specified as both a national average and de-averaged values for "Oslo", "Cities / Towns" and "Rural." Inputs have been informed by Norwegian operator data. The de-averaged values are then used for the monthly rental calculations for these three areas.

Mounting instructions (Telenor, p.6)

"In addition, the preparation of 'mounting instructions' which is already a part of the reference offer, has not been taken into account in the model. This price element is at NOK 4500 per access/accommodation arrangement in Telenor's current reference offer."

Analysys Mason response

This service can be found in Section 2.3.7 of the reference offer. It was deemed to be out-of-scope in the draft model. Analysys Mason has added this service in, as a bottom-up calculation of man-hours, split across all three staff types. Telenor have subsequently provided data on the number of hours required for mounting instructions for a number of different cases. This data has been used to inform the inputs used in the final model.

Depreciation (Telenor, p.6)

"Depreciation over 40 years has been suggested in the draft model. In Telenor's view, this may be a reasonable period for concrete ducts in inner cities, but not for plastic pipes constructed for fibre cable deployment. In Telenor's view, 20 years is a more reasonable timeframe for depreciation of such assets."

Analysys Mason response

The inputs we use are consistent with those in the Access model, as well as the models used by both PTS and NITA.

Although the fibre cable in the Access model is assumed to have a lifetime of 20 years, the ducts are assumed to have a lifetime of 40 years, since after 20 years the initial fibre deployment can be extracted and replacement fibre blown through. The value of 40 years will therefore be retained.

Other issues (NextGenTel, p.2)

"NextGenTel vil også bemerke at Telenor i dag tar ut en startavgift på NOK 147.000 og en månedsavgift på NOK 5.000 fra alle som har avtale om samlokalisering. Slik NextGenTel ser det, er det viktig at PT sikrer at også denne kostnaden er beregnes i LRIC-modellen for samlokalisering."

Analysys Mason response

Analysys Mason notes that these two charges are not included in the reference offer price list.[8] These fees are not part of the co-location agreements, but are instead included in the agreements for unbundled access. They are therefore out of scope for the co-location model.

2.4 General comments

LRIC model principles (Telenor, p.2)

"The co-location model is no LRIC model. It is a bottom-up calculation of the costs of particular co-location services. Since the model principles described in the model specification doesn't apply for this model, Telenor expected further explanation on the modelling principles. This isn't the case, and it is hence difficult to compare the capex and opex charges to the observed reality, and impossible to make a reconciliation to the top-down inputs."

Analysys Mason response

The calculation is similar to that of co-location models developed by PTS in Sweden and NITA in Denmark, in that it is a bottom-up calculation of capex and opex associated with a selection of co-location services. However, we note that a difference is that capex is not annualised in all cases. We have refined the co-location model to allow capex to be annualised according to a tilted annuity calculation. The additional inputs required have been added into the model.

Spare capacity (Telenor, p.3)

"The co-location model includes several long-lived assets, e.g. accommodation, power, trenches and ducts, with a demand that varies by geography and over time. The module has made no assumptions with regard to how long term total demand is likely to develop.

Availability of accommodation, power, trench and duct for wholesaling will be dependent on available spare capacity. The module presents average costs for input to the co-location products, which are only appropriate when there is spare capacity available."

Analysys Mason response

We first note that Telenor has not provided any data on how demand for the co-location services (and similar self-supplied facilities for location of technical equipment) varies by geography or how they have evolved over time.

Analysys Mason believes that it is broadly reasonable that the prices cover average costs when there is spare capacity. We note that there is a conceptual issue as to how to recognise this in price setting. One approach

[8] See http://www.jara.no/Images/Ovrige_Telelosji_Bilag_3_Priser_og_prisforutsetninger_110101_tcm55-128702.pdf

would be to reflect the actual level of spare capacity in the network, but this would require a great deal more data to be provided by Telenor about current installed resources and spare capacity. Another approach would be to optimise (i.e. reduce) the spare capacity, such as by reducing the assumed building size. This might be an excessive level of optimisation if by so doing the additional "spare" space needed for future co-location was removed.

Finally, it is potentially a reasonable point if Telenor can show that specified locations are "full" and that additional capacity would be much more expensive. This is already in effect the position as regards power supplies, where if the investment required is over a threshold, then the full amount is payable. However, whilst wanting to avoid artificially low prices, it is also not desirable to give Telenor incentives to make inefficient use of resources, namely making them "full" and consequently deterring co-location.

NPT would need to consider these issues in any future pricing decisions related to these services.

WACC (TDC, p.1)

"TDC recognise that a 2009-WACC is used in the draft model. TDC find the WACC should be updated with the latest changes in the market before the model is used for pricing. The WACC is updated every year in Denmark and the experience is that the WACC has gone down the recent years. The current WACC NPT is using is already two years old and it is therefore time make a new calculation."

Analysys Mason response

This input will be updated in the co-location model should NPT update the calculation of the WACC in the future.

Wages (TDC, p.1)

"From our understanding of the model the wages element is flat - all categories of employees are at a flat level. The model should differentiate between different kinds of manpower to bring it to an exact level. The comments in the model give an impression that the level is set after a discussion, but we have not been a part of this. Transparency is important in this process and we would like NPT to review this element."

Cost per hour (TDC, p.1)

"TDC notes a high and undiversified hourly cost is used in the model. We find that the cost should be diversified depending of the actual use of managers, technicians and supports.

TDC request PT to revise the draft hourly cost according to actual Norwegian wages level with correction to non-productive time such as holidays, courses, leaves and other absence. Such a fully loaded hourly cost is used in the Danish collocation -model, file Co-location Fv4.0, sheet 'A3_I_Costs' table 5.

These costs are 30%-55% lower (in NOK) than the cost used in NPT's model."

Analysys Mason response

Both of TDC's comments relate to the level of fully loaded costs by staff types. The value used is based on a data point from Telenor. Telenor did not provide any breakdown by staff type.

In order to address these comments, we have identified sources to inform the possible variation in fully loaded cost by staff type and then updated the model accordingly.

We have identified that there is a fairly consistent variation between the fully loaded costs by staff type in the PTS and NITA fixed LRIC models, using their v8.0 and Fv4.0 releases respectively. We have also identified data from Statistisk sentralbyrå[9] (SSB) on average monthly earnings in administration for these staff types, which appears to also corroborate this variation. For each of the three sources, we calculate the value of fully loaded cost (respectively earnings for the SSB data) by staff type as a proportion of fully loaded cost (respectively earnings) for the technician. These proportions are summarised in Figure 2.1 below.

Staff type	*PTS v8.0model*	*NITA Fv4.0 model*	*SSB data*
Technician	100%	100%	100%
Support	81%	75%	80%
Manager	143%	124%	130%

Figure 2.1: Value of fully loaded cost (or average earnings) as a proportion of value for technician [Source: PTS, NITA, SSB]

We have therefore assumed that the ratios from the SSB data, since they will most closely reflect Norwegian conditions, reflect the *relative* levels of fully loaded costs by staff type in the co-location model.

We have then back-calculated the *absolute* fully loaded costs by staff type for use in the co-location model so that the weighted average is NOK750. This has required an assumption of the distribution of staff by staff type; we have used the average distribution from the PTS and NITA models. This gives that 80% of staff are technical, 12.5% are support and 7.5% are managers.

This calculation has been integrated into the model and fully loaded costs per hour now vary by staff type.

Structure of "Vi registrerer imidlertid at denne modellen inneholder forutsetninger om

[9] See http://www.ssb.no/lonnkomm_en/arkiv/tab-2011-03-16-04-en.html

digging costs (Altibox, p.1)

enkelte kostnadselementer som også vil inngå i den kommende modellers for aksessnett. I samlokaliseringsmodellen er gravekostnader deft inn i tre kategorier. På aktørmøtet om LRIC-modell for aksessnett i mars 2011 ble en inndeling i fem kategorier presentert. Beløpene som er lagt inn for gravekostnader i samlokaliseringsmodellen er også annerledes enn de som ble omtalt på aktørmøtet om aksessnettmodellen i mars 2011."

Analysys Mason response

For the avoidance of doubt, the assumed digging cost in the draft co-location model was set to be a rounded value of NOK1000 per metre for illustrative purposes only, since the Access model had not yet been finalised. The inputs in the final version of the co-location model have been set consistently with those in the Core and Access models.

Regarding the categories of terrain in the co-location model, the five terrain types in the Access model capture the diversity in terrain throughout Norway, which are not all relevant to the co-location model. This is because the exchange access product is restricted to buried routes outside of exchange buildings. These will have, on the whole, more urban characteristics. In particular, it is unlikely that the costs of the Zone 5 terrain type would be relevant to the co-location model.

Therefore, we do not believe that the terrain used in the co-location model is inconsistent with the Access model. Moreover, these three terrain types are specifically used to be comparable with the pricing in the current reference offer, which classifies exchange duct access into three subtypes ('Oslo', 'Cities/towns' and 'Rural').

We note that these three subtypes (and their definitions) have been slightly modified in Telenor's 2012 reference offer[10] to be "urban", "suburban" and "rural."

10 See http://jara.no/Images/Telelosji%20Bilag%203%20Priser%20og%20prisforutsetninger%2001042012_tcm55-185654.pdf

3 Comments raised on policy or process matters

Respondents also commented on issues not directly related to the draft co-location model. These comments are all described below, as follows:

- comments on amending pricing in the reference offer (Section 3.1)
- comments on amending the services in the reference offer (Section 3.2)
- comments related to the Access model (Section 3.3).

We have not answered on these points as they are not related to the co-location cost model.

3.1 Comments on amending pricing in the reference offer

Access to ducts (Telenor, p.5)

"It's expected that the volume may rise in conjunction with further deployment of FTTH projects, and as the geographic distribution of such an increase in volume is highly unclear, the geographic categorization of digging costs should follow more closely the structure developed for costing of the copper access network. The current geographic differentiation of access to ducts does not reflect the variation in digging costs. Hence, it's suggested to make use of three cost levels for digging as shown in the list below, which in turn may be reflected in pricing. Telenor has also been made of that the report TeleInfo Fiber 2011 from Norsk Telecom A/S provides figures for digging costs which substantiate similar levels of digging costs, and it's assumed that those figures are based on broader inputs."

Volumes discounts (TDC, p.3)

"Telenor's standard agreement on co-location has a volume discount that we request NPT to take a separate look at. In the document called "Bilag 3 - priser og prisforutsetninger" clause 2.4 the discount structure shows that discount can be given up till 28 %. TDC does not find that this level can be cost documentet (e.g. in terms of economies of scale). The effect of the discount model as it is constructed is that it is only Telenor that can be given the highest levels of discount. This is discriminating behavior.

We request that NPT ask Telenor to verify the objective reasons for this model and to revise the discount structure if such grounds are not verified."

3.2 Comments on amending the services in the reference offer

New services

"NPT states that the cost model for co-location will be one factor among several which will be taken into account in the future price regulation of co-

(Telenor, p.5)

location services. Hence, Telenor recommends that the following new/revised cost elements are built into the model as separate elements which in turn may be incorporated into a revised reference offer for co-location:

- Digging costs (No cable deployment included, revised zone structure – please refer revised overview over digging products and costs per zone in Annex):
  - A: Inner cities (mix of Oslo and other city centres (access network model zones 1,2)): NOK✂/m
  - B: Suburban areas (mix of access network model zones 3,4); NOK✂/m
  - C: Rural (access network model zones 5): NOK✂/m
- Plastic pipes
  - Material: NOK ✂/meter (weighted average between 40mm, 50mm and 110m pipes)
  - Deployment (contractor product): NOK ✂/meter
- Junction barrel, or similar (when triggered by access seeker):
  - Material NOK ✂ (2011 prices, type depending upon size required and location)
  - Time (contractor product): NOK ✂ (2011 prices, type depending upon size required and location)
- Subpipes:
  - Material NOK ✂/m(2011)
  - Time (contractor product): NOK ✂/m (2011).”

Co-location reference interconnect offer (Telenor, p.6)

“As described in section 3.3.1 [of the Telenor response], it has been identified a need to adjust some, and add some price elements in the reference offer for co-location. Hence, it’s important that such revision of the price structure is provided for by the cost model.”

Revising the reference offer (Telenor, p.7)

“✂”

3.3 Comments related to the Access model

Inclusion of fibre in the access model (Altibox, p.1)

"…ettersom PT i følgebrev til denne høringen viser til at valg av forutsetninger i samlokaliseringsmodellen ikke vil legge føringer for hvilke forutsetninger som skal legges til grunn i aksessmodellen, vil Altibox komme tilbake med innspill mht. gravekostnader dersom fiberaksesser tas inn i den endelige aksessmodellen.

Det vises for øvrig til Altibox' tilbakemeiding til PT fra oktober 2010 hvor vi anmodet PT om en forklaring på hvorfor fiber er tatt inn i LRIC-modellen, samtidig som andre aksessteknologier, herunder bredbåndsaksess som er basert på kabel TV-nett, ikke er inkludert. Ettersom vi ikke har fått noe svar pa denne anmodningen, og dette er egnet til å skape usikkerhet rundt fremtidig regulering og dermed kan påvirke investeringsinsentiver hos Altibox-partnerne, ber vi på nytt om en forklaring på hvorfor kun fiber er tatt inn som eneste alternative aksessteknologi til kobber i aksessmodellen når bredbånd via kabel TV-nett representerer en mye større markedsandel enn fiberbredbånd i aksessmarkedet."

4 Responses to confidential components of the model

In this section we respond to comments received from Telenor related to confidential aspects of the co-location model, as set out in Section 5 of the Telenor response.

Telenor's specific model (Telenor, p.6)

"As for the access model, there hasn't been developed a Telenor-specific co-location model and there is no explanation why.

Telenor recognises key inputs on space requirement, spare capacity and power consumptions, so the results in a Telenor-specific model would probably be quite similar to the existing model."

Analysys Mason response

As is the case in the Access model, NPT seeks to have a model of co-location services that can be viewed as freely as possible by the rest of industry. Therefore, we have tried to use as few confidential inputs as possible.

Top-down model / hybridisation (Telenor, p.6)

"No effort has been made to compare the results from the co-location model with the inputs and results of the top-down model. It is impossible to perform verification 1 and 2 when the model isn't based on LRIC principles. Information on the opex of the co-location product from Verification 3 could be used as a calibration for the opex included in the model. Even though the co-location model doesn't include product volumes and it doesn't separate opex and capex charge, it is fairly easy to compare the opex charges per year.

The opex of the co-location product of the top-down inputs shows a total of MNOK✂. These costs include large opex cost categories like accommodation civils / power systems, provision and installation and overhead, and a wider range of product than the model e.g. co-location in separate rooms, contracting and mounting activities as described in the sheet RIO_colo chapter 2.4.7.

A cost analysis of the top-down inputs shows this relevant opex for co-location products:

Cost categories	*Top-down*	*Relevant cost*
Other network O&M	✂	✂
Maintenance and repairs	✂	✂
Network planning and development	✂	✂
Wholesale billing	✂	✂
Materials and other equipment maintenance	✂	✂
Sum accommodation civils/power systems	✂	✂
Sum Provision and instalment	✂	✂
Sum Overhead	✂	✂
Sum other activities	✂	✂
Sum	✂	✂

Figure 4.1: Relevant opex for co-location products [Source: Telenor]

The result from dividing the relevant cost of MNOK✂ between accommodation – rental (MNOK✂) and power (MNOK✂) indicates that an the opex charge for both product categories should be higher than reflected in the draft model.

Dividing the cost of accommodation-rental by approximately ✂ units (registered in Telenor's accounting system) gives an indication of an opex charge pr U pr month of ✂ NOK, compared to the modelled 1.2NOK."

Analysys Mason response

We note that verification 1 has not been possible since Telenor's provision of demand data and asset counts related to co-location is too fragmentary. Verification 2 has also not possible since the breakdown of gross book value provided by Telenor does not illustrate what is specifically incurred for co-location services. Presumably, these investments appear within Telenor's top-down CIM categories such as Q01/Q11, R01–R41 and S51.

Analysys Mason has implemented a comparison of the opex (Verification 3) allocated to co-location by Telenor in their top-down submission. This has been included in a new "CONF_TD" worksheet. We have been able to replicate the values in the "Top-down (1)" column of Figure 4.1 by mapping each of the top-down data entries to one of the nine categories. We have then been able to replicate Telenor's stated top-down opex charge of NOK✂ per unit per month, which, the operator asserts, indicates that the modelled accommodation rental is too low.

The majority of Telenor's discussion remains vague. In particular:

- Telenor does not describe how the values in the "Relevant cost column"

were derived, although we understand that they are supposed to represent the costs relevant to the co-location products captured in the co-location model

- Telenor does not explicitly state whether these "relevant" costs are assumed to only represent the ongoing charges for accommodation rental and power, or whether they include other ongoing charges, such as those for termination blocks
- Telenor does not justify its assumed ✂ split of the relevant costs between accommodation rental and power[11]
- Telenor does not justify why the top-down value of NOK✂ illustrates the power charges are too low
- Telenor also does not include any cost from the "Sum accommodation civils/power systems" top-down category in its cost analysis that derives the value of relevant opex of NOK✂ million, even though this value is then compared against accommodation rental and power-related charges.

The co-location model now includes a summary of top-down data for NPT to consider the bottom-up calculations against the top-down opex allocated to co-location services by Telenor. The lack of sufficiently detailed data in this regard makes any further comparisons extremely difficult. In particular, there are some cost elements in the model which are relevant and yet have not been subject to detailed scrutiny in previous reconciliation work, due to this lack of data.

[11] We note that it is somewhat similar to the split of co-location opex between the "switch building rentals" and "energy" categories (✂) that Telenor merges into the "Sum accommodation civils/power systems" category.